

Port of Hastings: SUZ1 and Land Transport Corridor

Desktop Flora and Fauna Assessment

DRAFT REPORT

Prepared for AECOM and GHD Joint Venture

19 December 2014

GHD Ref: AGH-CEP0-EV-REP8

In May 2016 the Special Minister of State asked Infrastructure Victoria to provide advice on the future capacity of Victoria's commercial ports. Specifically, the Minister has asked for advice on when the need for a second container port is likely to arise and which variables may alter this timeline. The Minister has also asked for advice on where a second container port would ideally be located and under what conditions, including the suitability of, and barriers to investing in, sites at the Port of Hastings and the Bay West location.

In undertaking this task, Infrastructure Victoria reviewed work that was completed as part of the Port of Hastings development project before it was cancelled in 2014. This document forms part of the initial work undertaken for the proposed port development at Hastings. Infrastructure Victoria considers that much of the previous Hastings work, although preliminary in nature, is relevant and suitable for informing a strategic assessment. Therefore, Infrastructure Victoria has made the reports previously commissioned for the development project part of the evidence base on which Infrastructure Victoria will use in providing the Minister with advice.

The opinions, conclusions and any recommendations in this document are based on conditions encountered and information reviewed at the date of preparation of the document and for the purposes of the Port of Hastings Development Project.

Infrastructure Victoria and its consultants have used the information contained in these reports as an input but have not wholly relied on all the information presented in these reports.

Biosis offices

AUSTRALIAN CAPITAL TERRITORY

Canberra

Floor 1, Unit 3, 38 Essington Street
Mitchell ACT 2911

Phone: (02) 6241 2333
Fax: (03) 9646 9242
Email: canberra@biosis.com.au

NEW SOUTH WALES

Newcastle

39 Platt Street
Waratah NSW 2298

Phone: (02) 4968 4901
Email: newcastle@biosis.com.au

Sydney

Unit 14 17-27 Power Avenue
Alexandria NSW 2015

Phone: (02) 9690 2777
Fax: (02) 9690 2577
Email: sydney@biosis.com.au

Wollongong

8 Tate Street
Wollongong NSW 2500

Phone: (02) 4229 5222
Fax: (02) 4229 5500
Email: wollongong@biosis.com.au

QUEENSLAND

Brisbane

Suite 4 First Floor, 72 Wickham Street
Fortitude Valley QLD 4006

Phone: (07) 3831 7400
Fax: (07) 3831 7411
Email: brisbane@biosis.com.au

VICTORIA

Ballarat

506 Macarthur Street
Ballarat VIC 3350

Phone: (03) 5331 7000
Fax: (03) 5331 7033
Email: ballarat@biosis.com.au

Melbourne (Head Office)

38 Bertie Street
Port Melbourne VIC 3207

Phone: (03) 9646 9499
Fax: (03) 9646 9242
Email: melbourne@biosis.com.au

Wangaratta

16 Templeton Street
Wangaratta VIC 3677

Phone: (03) 5721 9453
Fax: (03) 5721 9454
Email: wangaratta@biosis.com.au

Document information

Report to: AECOM and GHD Joint Venture
Prepared by: Biosis: Matt Dell, Kirsty Kay & Daniel Gilmore
GHD: Simon Harrow

Biosis project no.: 18568

File name: 18568.PoH.SUZ1.LTC.FF.DS.DFT04.191214.docx

Citation: Biosis 2014. Port of Hastings: SUZ1 and Land Transport Corridor, Desktop Flora and Fauna Assessment. Report for AECOM and GHD Joint Venture. Authors: Dell M, Kay K and Gilmore D – Biosis; Harrow, S, Lind P. - GHD. Biosis Pty Ltd, Melbourne. Project no. 18568

Document control

Version	Internal reviewer	Date issued
Draft version 01	Ian Smales, Biosis	20/08/14
Draft version 02	Kirsty Kay, Biosis	20/08/14
Draft version 03	Kirsty Kay, Biosis	17/09/14
Draft version 04	Kirsty Kay, Biosis	19/12/14

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- GHD/AECOM; Simon Harrow, David May and Megan Shaw
- Department of Environment and Primary Industries for access to the Victorian Biodiversity Atlas and Native Vegetation Information Tools.

The following Biosis staff were involved in this project:

- Marion Shadbolt (Research Assistant)
- Sally Mitchell and Lachlan Milne for mapping
- Ian Smales for review and technical input.

© Biosis Pty Ltd

This document is and shall remain the property of Biosis Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of the Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Disclaimer:

Biosis Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation and current industry best practice. The company accepts no liability for any damages or loss incurred as a result of reliance placed upon the report content or for any purpose other than that for which it was intended.

Contents

Executive Summary	V
Glossary of Terms.....	VII
1. Introduction	8
1.1 Project Summary	8
1.2 Purpose of this Report	8
1.3 Scope.....	8
2. Legislation, Policy and Guidelines.....	10
2.1 Commonwealth Legislation	10
2.1.1 <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act).....	10
2.2 State.....	11
2.2.1 <i>Flora and Fauna Guarantee Act 1988</i> (FFG Act)	11
2.2.2 <i>Catchment and Land Protection Act 1994</i> (CaLP Act).....	11
2.2.3 <i>Planning and Environment Act 1987</i> (incl. Planning Schemes).....	11
2.2.4 Victoria's Biodiversity Assessment Guidelines	11
2.2.5 DEPI Advisory list of rare and threatened species	12
2.2.6 <i>Fisheries Act 1995</i>	12
2.2.7 <i>Environment Protection Act 1970</i> : State Environment Protection Policy (Waters of Victoria) 2003	13
3. Methodology	14
3.1 Literature and database review	14
3.2 Definitions of significance.....	15
3.2.1 Species and ecological communities.....	15
3.3 Likelihood of occurrence	15
3.4 Preliminary site investigation.....	16
3.4.1 Flora and fauna values inspection	16
3.4.2 Definition of native vegetation	16
3.5 Mapping.....	17
3.6 Qualifications.....	17
4. Results.....	19
4.1 Regional landscape context	19
4.2 Significant species of the study area.....	20
4.3 Biodiversity values of Port Landside Development Area (SUZ1)	23
4.3.2 Vegetation & ecological communities	23
4.3.3 Freshwater environments	23
4.3.4 EPBC Act listed ecological communities	24
4.3.5 FFG Act listed communities	24

4.3.6 Habitats for threatened flora & fauna species.....	27
4.4 Biodiversity values of the land transport corridor (LTC).....	28
4.4.1 Vegetation & ecological communities.....	28
4.4.2 Freshwater environments	29
4.4.3 EPBC Act listed ecological communities	29
4.4.4 FFG Act listed communities	29
4.4.5 Habitats for threatened flora & fauna species.....	32
5. Preliminary recommendations	33
5.1 Further surveys.....	33
References.....	34
Appendix A. Figures	38
Appendix B. Flora & fauna of the study area	39
Appendix C. Outline of further survey requirements	95

List of Tables

Table 1: Criteria for determining significance of species & ecological communities.....	15
Table 2: Summary of listed flora and fauna species most likely to occur in either SUZ1 or LTC	20
Table 3: Summary of vegetation and habitat types within SUZ1	24
Table 4: Summary of vegetation and habitat types within the LTC	30

Executive Summary

Biosis Pty Ltd was appointed by AECOM/GHD to prepare a desktop assessment to identify ecological values within the proposed Port of Hastings development area (SUZ1) and land transport corridor (LTC). This information is required to assist with identification of issues and constraints to project development and aid in selection of a land transport route.

The extensive study area contains a range of vegetation types and fauna habitats dispersed throughout a largely rural landscape on the Mornington Peninsula. It encompasses the residential centres of Hastings, Pearcedale and Tyabb as well as part of the Western Port coastal zone. It is included within the Western Port Biosphere Reserve and the Western Port Ramsar Wetland site (in part). The Ramsar site includes permanent and semi-permanent saline wetlands, including intertidal mud and sand flats, and areas of saltmarsh and mangroves. The biosphere reserve was declared on the basis that it contains significant natural values including internationally important wetlands as well as nationally significant values.

Whilst native vegetation is fragmented across most of the study area, there are also some areas of large, intact and high quality native vegetation including heathy woodland, damp heathland and swamp scrub, particularly located within BlueScope Steel land.

Key ecological values

Key ecological values identified within the study area are as follows:

- approximately 1,906 ha of native vegetation (from a mixture of modelled and ground-truthed mapping) with some large, high quality, intact patches including the coastal zone and BlueScope Steel land
- approximately 100 ha of the EPBC Act listed ecological community: Subtropical and Temperate Coastal Saltmarsh
- presence or likely presence of numerous EPBC Act and/or FFG Act listed flora and fauna species and suitable habitats
- high quality examples of coastal Ecological Vegetation Classes and regionally significant coastal-inland ecosystem gradients
- a large number of remnant scattered trees.

High value areas

Large patches of contiguous native vegetation generally provide the highest flora and fauna values. Loss or fragmentation of such areas can be detrimental to the species and ecosystems they support. Relevant areas within SUZ1 include:

- Crown Land abutting the coast that supports indigenous coastal vegetation communities
- BlueScope Steel property, south of Pikes Road and west of Whitney's Road and all areas of indigenous vegetation contiguous with and adjacent to the property
- areas of indigenous vegetation bounded by Dandenong-Hastings Road, Bungower Road, Tyabb-Tooradin Road and Watsons Creek
- areas of indigenous vegetation east of Tyabb-Tooradin Road and Whitneys Road to the coast (contiguous with coastal vegetation in the LTC).

Relevant areas within the LTC include:

- Crown Land abutting the coast that supports indigenous vegetation communities (contiguous with indigenous vegetation in SUZ1 to the south and outside the study area to the east).

Subject to further survey, especially regarding the quality of remnant vegetation, relevant areas within the LTC may also include:

- contiguous and less fragmented areas of indigenous vegetation that exist broadly across the LTC north of Pearcedale.

Further survey

The desktop assessment has demonstrated that substantial knowledge gaps exist with respect to biodiversity values of the study area and that most of the information available is not current. A lack of survey data does not necessarily indicate absence of species from an area rather it is likely to reflect a lack of survey effort, particularly within private land parcels. In order to better inform the project design process, targeted survey is recommended for several threatened flora and fauna species, and listed ecological communities to more accurately estimate presence/absence of threatened species or communities and their distributions within the study area.

Glossary of Terms

Term	Description
Authority	Port of Hastings Development Authority.
Land transport corridor (LTC)	Road and provision for rail corridors and associated rail marshalling staging areas to connect the port with the state and national transport networks.
Marine development area	Marine components of the project including shipping channels, swing basins, anchorage and aids for navigation connecting the port to Bass Strait as well as dredging and dredge material management.
Port landside development area (SUZ1)	Port precinct and port environs within the area covered by the Special Use Zone (SUZ1) for port related activities, and the container terminal at Long Island Point which extends into the intertidal area of Western Port.
Project	Port of Hastings Development Project.
Project area	Area where the project is located.
Study area	Area considered by this assessment.

1. Introduction

1.1 Project Summary

The Victorian Government has identified the Port of Hastings as the preferred site for the state's next major container port. This port is considered to be essential for the long-term economic growth of Victoria as container trades are increasing and the Port of Melbourne is expected to reach capacity.

The Port of Hastings Development Authority (the Authority) is progressing staged planning of the Port of Hastings Development Project from 2014 to 2018, culminating in the development of a rigorous business case and a full environmental and social impact assessment.

The Authority has selected a team of specialists to undertake detailed environmental, social and economic studies that will form part of a strict approval process. Specialists will also plan the conceptual design of new port infrastructure including wharf facilities and a logistics precinct, with road and rail access to the Port. Involvement of community and industry will be a critical part of the success.

By the mid-2020's it is envisaged that a world-class sustainable container port facility will begin operations at Hastings, handling up to 3 million twenty foot equivalent units (TEUs) each year, increasing to around 9 million TEU by 2060.

The Project would include the following components:

- **Port landside development area** - includes the port precinct and port environs within the area covered by the Special Use Zone (SUZ1) for port related activities, and the container terminal at Long Island Point which extends into the intertidal area of Western Port.
- **Land transport corridor (LTC)** - road and provision for rail corridors and associated rail marshalling staging areas to connect the port with the state and national transport networks.
- **Marine development area** - marine components of the project would include shipping channels, swing basins, anchorage and aids for navigation connecting the port to Bass Strait as well as dredging and dredge material management.

1.2 Purpose of this Report

The purpose of the assessment is to provide an overview of flora and fauna values within the study area based on currently available information as well as an indication of potential issues and spatial constraints for development of the Project. This is particularly relevant to selection of a land transport route, including rail and road infrastructure. Detailed field assessments have not been undertaken, rather flora and fauna database information and previous reports for the Western Port Highway and surrounds have been reviewed to identify issues and constraints affecting the Project area.

1.3 Scope

The scope of this desktop assessment includes preparation of a report providing detail on flora and fauna as well as their associated ecological communities in the project area. It is a compilation of existing knowledge and information available at the time of preparation. It provides a basis for the planning of further comprehensive investigations designed to improve understanding of existing conditions which, in turn, will permit evaluation of potential impacts. Further studies that would be required are detailed in Appendix C.

The study area for this assessment is shown in Figure A1 and includes the Hastings SUZ1 component of the port landside development area and the Transport Infrastructure Development Area to the south of Ballarto Road.

The objectives of this investigation are to:

- review and summarise flora and fauna database information, previous studies and other publicly available information
- undertake a brief visit to the study area to provide a high-level confirmation of the presence and distribution of biodiversity values within the study area
- identify extant and potentially occurring ecological communities, including Ecological Vegetation Classes (EVCs); and threatened terrestrial and freshwater flora and fauna species
- provide information about the listed conservation status of potentially occurring and extant flora and fauna
- provide a review of legislation and government policies for biodiversity conservation against which the project is likely to be assessed
- confirm whether further assessments of the study area are needed
- highlight areas of ecological sensitivity with respect to future transport and development options, and the issues and constraints associated with the project, in particular for selection of land transport routes.

The contents of this document reflect the current position on the subject matter held by Biosis and GHD. It is provided for discussion or information purposes and is intended to be a guide only. The contents of this document should not be relied upon as representing the final position of Biosis or GHD on the subject matter, unless stated otherwise. Any views expressed by Biosis or GHD in this document may change as a consequence of Biosis or GHD finalising formal technical studies or specifications, or legislative, or procedure and regulatory developments. Any figures provided are indicative only, are subject to change and are dependent upon a number of factors.

2. Legislation, Policy and Guidelines

This section provides a summary of relevant biodiversity legislation and government policies and guidelines against which the project is likely to be assessed. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

Prescriptions and guidance for appropriate flora and fauna survey and assessment methods are provided in a number of policies associated with relevant legislation.

The Project has been declared under the *Major Transport Project Facilitation Act 2009* (MTPF Act). The Authority is preparing a Project Proposal as part of the decision-making and approval process under the MTPF Act to inform a decision by the Minister for Planning on the appropriate assessment pathway for the project. The primary State approvals required for the project, and that are capable of being granted under the MTPF Act, are called Applicable Approvals. At this stage of the Project development, the Applicable Approvals relevant to biodiversity that may be sought for the Project under the MTPF Act include:

- consent under the *Coastal Management Act 1995*
- planning scheme amendment under the *Planning and Environment Act 1987*
- licence to take and use water, and works on waterways licence under the *Water Act 1989*
- consents under the *Road Management Act 2004* for connecting to a freeway
- consent under the *Conservation, Forest and Lands Act 1987*.

Permits under the *Flora and Fauna Guarantee Act 1988*, *Wildlife Act 1975* and consent for works on a roadway under the *Road Management Act 2004* would be sought following the MTPF Act approval process as these require a more detailed level of design.

2.1 Commonwealth Legislation

2.1.1 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act (Figure A2). Actions that may have a 'significant impact' on MNES are subject to approval by the Australian Government Minister for the Environment.

The desktop assessment indicates that a number of MNES exist, or are likely to exist, within the study area. They include listed threatened species and ecological communities; listed migratory species and the Western Port Wetland of International Importance (Ramsar site).

The Project will therefore be referred under the EPBC Act to the Minister for Environment for a decision on whether the Project would constitute a controlled action. The Authority is anticipating that the Project will be declared a controlled action, as it is being proposed within a Ramsar wetland and will substantially modify an area of the wetland among other terrestrial MNES. The EPBC Act offset policy prescribes offsets as mitigation for impacts on MNES, and offsets are likely to be generated for impacts due to the Port of Hastings Development Project.

The Authority is concurrently seeking agreement to accredit the assessment process under the MTPF Act for assessment of the impacts to MNES as listed under the EPBC Act.

2.2 State

2.2.1 *Flora and Fauna Guarantee Act 1988 (FFG Act)*

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes (listed species in the study area are shown in Figure A3). Under the FFG Act a permit is required from DEPI to 'take' protected flora species from public land. A permit is generally not required for removal of protected flora from private land. Authorisation under the FFG Act is required to collect, re-locate, kill, injure or disturb listed fish.

While the desktop assessment has not identified any FFG Act listed communities within the study area, there is potential for at least one community, Herb-rich Plains Grassy Wetland (West Gippsland), to occur.

2.2.2 *Catchment and Land Protection Act 1994 (CaLP Act)*

The CaLP Act identifies and classifies certain species as noxious weeds or pest animals, and provides a system of controls on noxious species. Declared noxious weeds and established pest animals identified in the study area and within a 5 km radius are listed in Appendix B1.2.

The proponent must take all reasonable steps to eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds, and prevent the spread of and as far as possible eradicate established pest animals. The State is responsible for eradicating State prohibited weeds from all land in Victoria.

2.2.3 *Planning and Environment Act 1987 (incl. Planning Schemes)*

The *Planning and Environment Act 1987* is expected to be covered under Applicable Approvals of the MTPF Act. The discussion here is provided for information especially in light of recent reforms to the native vegetation permitted clearing regulations (gazetted in December 2013) through a planning scheme amendment. The reforms made changes to the Victoria Planning Provisions including the State Planning Policy Framework clauses of all planning scheme within Victoria and introduced the Permitted clearing of native vegetation: Biodiversity Assessment Guidelines (DEPI 2013a).

Of particular relevance to the development proposal are controls relating to the removal, destruction or lopping of native vegetation contained within the relevant planning schemes, including permit requirements. The Scheme defines 'native vegetation' as '*plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses*'.

The study area is covered by some overlays relevant to biodiversity within the relevant municipalities. These should be reviewed and a determination should be made as to whether a permit to remove native vegetation is required. Where a permit is required under an overlay and not under Clause 52.17 the proponent should consider applying native vegetation permitted clearing policy set out within the Guidelines (DEPI 2013a) where the objective of the overlay relates to biodiversity conservation and protection of threatened species.

2.2.4 *Victoria's Biodiversity Assessment Guidelines*

The Guidelines are incorporated into the Victoria Planning Provisions and all planning schemes in Victoria (DEPI 2013a). The purpose of the Guidelines is to guide how impacts to biodiversity should be considered when assessing a permit application to remove, destroy or lop native vegetation.

The Guidelines describe the following objective for permitted clearing of native vegetation in Victoria:

'No net loss in the contribution made by native vegetation to Victoria's biodiversity'.

This objective is to be achieved through Victoria's planning system using a risk-based approach that relies on strategic planning and the permit and offset system. The key strategies for achieving no net loss at the permit level are:

- avoiding the removal of native vegetation that makes a significant contribution to Victoria's biodiversity
- minimising impacts to Victoria's biodiversity from the removal of native vegetation
- where native vegetation is permitted to be removed, ensuring it is offset in a manner that makes a contribution to Victoria's biodiversity that is equivalent to the contribution made by the native vegetation to be removed.

Under the Guidelines, there are three risk-based pathways for assessing an application for a permit to remove native vegetation: low, moderate and high. A planning application for removal of native vegetation must meet the requirements of, and be assessed in, the appropriate risk pathway. Given the scale of the Project and likely requirements for native vegetation removal, it is likely to be assessed under the high risk-based pathway.

Design and layout of the LTC and other project infrastructure should therefore be sited in existing cleared land or infrastructure routes and avoid clearance of native vegetation and scattered trees.

2.2.5 DEPI Advisory list of rare and threatened species

The DEPI Advisory Lists are intended to be used in a range of planning processes, although there are no direct legal requirements or consequences that flow from inclusion of a species in advisory lists. Some species in these advisory lists are also listed as threatened under the FFG Act.

To support decision making under the Guidelines, DEPI has produced models for Victoria describing the extent of habitat for most listed rare or threatened species. These models are called 'habitat importance models' and they assign a 'habitat importance score' to a location based on its importance in the landscape as habitat for a particular rare or threatened species relative to other suitable habitat for the species elsewhere in the State (DEPI 2013a).

Under the Guidelines, these models form the basis for determining the impact of potential native vegetation clearing on rare and threatened species where the proposal is considered to be on the moderate or high risk-based application pathways. The habitat importance scores are used to calculate the type and extent of biodiversity offsets required for native vegetation removal that impacts on individual rare or threatened species habitat for moderate or high risk application pathways.

For any proposal to remove native vegetation, habitat for one or more state threatened species may be impacted. If the impact to that species at state level exceeds certain thresholds a 'specific offset' would be required. Options analysis for transport routes or potential locations for other port land facilities should consider the distribution of modelled habitats for those state listed species present or assessed as having a high likelihood of occurrence.

2.2.6 Fisheries Act 1995

The Fisheries Act 1995 provides a legislative framework for the regulation, management and conservation of Victorian fisheries including aquatic habitats.

A person must not take, injure, damage, destroy or release any protected aquatic biota. Protected aquatic biota includes all species of the family Syngnathidae (seahorses, sea dragons and pipefish), and any fish or aquatic invertebrate or community that is listed under the FFG Act.

2.2.7 *Environment Protection Act 1970: State Environment Protection Policy (Waters of Victoria) 2003*

The *Environment Protection Act 1970* underpins the State Environmental Protection Policy (SEPP) - Waters of Victoria which provides a legal framework for the protection and rehabilitation of Victoria's surface water environments.

The project is likely to directly and/or indirectly impact upon some waterways and their aquatic ecosystems. The SEPP requires that aquatic ecosystem values be protected. Environmental quality objectives and indicators are defined to protect beneficial uses (i.e. the uses and values of the water environment) and an attainment program provides guidance on protection of the beneficial uses.

Impacts to surface water quality must not result in changes that exceed background levels and/or the water quality objectives specified for Western Port to protect surface water uses and values.

3. Methodology

3.1 Literature and database review

Information about flora and fauna was obtained from relevant public databases for the study area and from within 5 km of the study area (the 'local area'). Aquatic fauna records were searched for all catchments which are within or intersected the study area. These data provide an indication of species and ecosystems that may exist within the study area (Figure A4). Records from the following databases were collated and reviewed:

- Flora Information System which includes records from the Victorian Biodiversity Atlas 'VBA_FLORA25, FLORA100 & FLORA Restricted' August 2012 © The State of Victoria, DEPIDEPI (the contribution of the Royal Botanical Gardens Melbourne to the database is acknowledged)
- Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' August 2012 © The State of Victoria
- DEPI Biodiversity Interactive Map (BIM)
- BirdLife Australia, the New Atlas of Australian Birds 1998–2012 (BA)
- Protected Matters Search Tool of the Australian Government Department of the Environment for MNES under the EPBC Act
- Melbourne Water Fish database (MWF).

Other sources of biodiversity information:

- DEPI Native Vegetation Information Management (NVIM) system and BIM
- DEPI NaturePrint; accessed through the BIM
- Biosis records that have been submitted to DEPI and Melbourne Water but do not yet appear on the VBA, FIS or MWF)
- DEPI Arthur Rylah Institute.

The following studies and consultant reports relating to the study area were reviewed in preparation of this report. The main focus in the review of these documents was to validate EVC distribution for the study area and to determine any implications of threatened species survey results:

- AECOM 2013. Western Port Highway Planning Study – Ballarto Road to Hodgins Road: Desktop Flora and Fauna Assessment. Report to VicRoads. Author: White, C. AECOM, Melbourne. Job No. 60308273.
- AECOM 2009. Flora and Fauna Desktop Study: Western Port Highway Planning Study Ballarto Road to Hodgins Road. Report to VicRoads. Authors: Matthew, J. and Jenkin, A. AECOM, Melbourne. Job No. M60062901.
- Biosis 2014. Port of Hastings Development Authority: Flora and fauna assessment for the geophysical and geotechnical surveys. Report to Port of Hastings Development Authority. Authors: Mueck S. and Smales I. Biosis Pty Ltd, Melbourne. Project no. 17228.
- Biosis Research 2012. Scoping framework for the terrestrial ecological assessment of the expansion of the Port of Hastings. Report to Major Projects Victoria. Author: Venosta, M. Biosis Research, Melbourne. Matter No. 14062.

- Biosis Research 2011. Port of Hastings Stage 1 Investigation Area: Threatened flora and fauna survey and habitat hectare assessment. Report to Port of Melbourne Corporation. Authors: Venosta, M., Mueck, S. and Bloink, C. Biosis Research Pty Ltd, Melbourne. Matter No. 11173.
- Biosis Research 2009. Flora and fauna assessment of Port of Hastings Stage One Investigation area, Victoria. Report to AECOM Pty Ltd. Authors: Venosta, M., Mueck, S. and Bloink, C. Biosis Research Pty Ltd, Melbourne. Project no. 7540 & 7930.
- DEPI 2014a. Sub-regional Species Strategy for the Southern Brown Bandicoot. Victorian Government Department of Environment and Primary Industries, Melbourne.
- GHD 2013. Port of Hastings Development Authority, Port Container Expansion Project: Preliminary Ecological Assessment. Report to Port of Hastings Development Authority. Job No. 31/29838/06.
- Legg 2006. Flora and Fauna Survey and Management Prescriptions for Crib Point Stony Point Foreshore, Crib Point, October, 2005 to October, 2006. Report to Crib Point Stony Point Foreshore Committee of Management Inc. Author: Legg, M. Mal's Environmental and Ecological Services.

A catalogue of literature relating to the Western Port Biosphere Project was updated by Mungere (2008) which includes ecological studies and other literature (1800 references) (MPWPBRF 2014).

3.2 Definitions of significance

3.2.1 Species and ecological communities

The significance of a species or community is determined by its listing as rare or threatened under Commonwealth or State legislation / policy. The sources for categories of significance of species and communities are summarised below in Table 1.

Table 1: Criteria for determining significance of species & ecological communities

Significance	
National	Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) under the EPBC Act.
State	Listed as threatened (critically endangered, endangered, vulnerable) or rare for flora species, in Victoria on a DEPI Advisory List (DSE 2005, 2013a) Listed as threatened under the FFG Act.

Fauna species listed on DEPI Advisory lists as near threatened or data deficient are listed in Appendix B2.1, however in accordance with advice from DEPI these fauna species are not considered to be at the same level of risk as higher categories of threat. These species are generally not discussed in detail in this report.

3.3 Likelihood of occurrence

The likelihood of occurrence is a broad categorisation used by Biosis to indicate the potential for a species to occur within the study area. It implies the relative value of a site for a particular species. The categorisation is based on documentary evidence for the presence of relevant species; the existence of suitable habitat within the study area; and, experience, particularly for species that are cryptic and have never been recorded in the study area or have not been recorded for a substantial period. Account is taken of the rigour, and effort of surveys for particular taxa and the time that has elapsed since field investigations were undertaken.

Likelihood of occurrence is assessed only for species listed under the EPBC Act or listed as threatened under the FFG Act (hereafter referred to as 'listed species'). The habitat value for species listed on the DEPI Advisory Lists is calculated by the Habitat Importance Modelling produced by DEPI (DEPI 2013a). Where DEPI Advisory List species are recorded in the study area this is noted in Appendix B1.1 and Appendix B2.1.

The likelihood of listed species occurring within the study area is ranked as negligible, low, medium or high.

Species which have medium or high likelihood of occurrence are given further consideration in this report.

3.4 Preliminary site investigation

3.4.1 Flora and fauna values inspection

A general inspection of the study area was undertaken on 31 August 2014 for the purpose of providing context to the desktop assessment. The inspection was undertaken by two botanists, a zoologist and an aquatic ecologist. The extent of native vegetation was assessed to determine implications for threatened terrestrial flora and fauna species, listed ecological communities and other ecological values. The extent of native vegetation was not mapped during this process although notes were made where the vegetation type appearing on existing maps was considered incorrect or there were other anomalies such as native vegetation modelled where no native vegetation occurred. The landscape, vegetation types, fauna habitat and selected sites on all named waterways were observed. Potential aquatic habitat was noted to gauge the suitability of waterways for species which have the potential to inhabit these areas.

3.4.2 Definition of native vegetation

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. Native vegetation is classified by Victoria's Biodiversity Assessment Guidelines into two categories (DEPI 2013a):

- A **remnant patch** of native vegetation (measured in hectares) is either:
 - *An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey cover is native plants.*
 - *An area with three or more indigenous canopy trees where the tree canopy cover is at least 20 percent.*

Remnant patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DEPI.

- A **scattered tree** is defined as (extent measured by number of trees):
 - *An indigenous canopy tree that does not form part of a remnant patch of native vegetation.*

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A condition score and extent is applied to each scattered tree based on information provided by DEPI's online Native Vegetation Information Management (NVIM) system.

Species nomenclature for flora follows the Flora Information System (FIS).

3.5 Mapping

The study area boundaries for the project and are shown in Figure A1.

EVC data for the desktop assessment maps (Figure A3) have been sourced from a combination of verified mapping where available and modelled 2005 EVC layers (DEPI 2014). Where verified mapping is available this has been used as a first preference and generally occurs within the southern parts of the study area, including the Mornington Peninsula Shire. Modelled layers have been presented in the absence of ground-truthed data.

Data include:

- EVC mapping within Mornington Peninsula Shire, available at 1:10 000 scale (Sinclair 2006)
- Victorian Saltmarsh Study (Boon *et al.* 2011), which entailed detailed mapping of saltmarsh communities and provides accurate information about the extent of intertidal EVCs
- EVC mapping within BlueScope Steel (Biosis 2014) available at 1:10 000 scale
- DEPI modeled 2005 EVCs generally available at 1:25 000 scale (DEPI 2014), which occur within the northern part of the study area and can be easily identified on Figure A3 due to the pixelated form of the data.

Accuracy of point locations for threatened species in databases varies from 15 m to several kilometres.

Mapped locality records of flora and fauna species reproduced in Figures A2 and A3 are included for their indicative value. Many of them are opportunistic records rather than results of systematic investigations and they are not considered to provide definitive information about current distribution of species within the study area.

Maps of potential threatened fauna habitat (Figure A5) have been derived for the purposes of this report from the occurrence of certain EVCs known to be valuable or provide suitable habitat to a particular fauna species.

Figure A6 indicates high priority areas for detailed survey within the study area and is based on the presence of areas of native vegetation and expert judgement.

Mapping has been produced using a Geographic Information System (GIS). All mapping conforms to Geocentric Datum of Australia 1994.

3.6 Qualifications

Records of flora and fauna species obtained from relevant databases are vetted for authenticity by authorities responsible for their management. For the purposes of this preliminary assessment the species identities and metadata associated with them are accepted here at face value. Some of these records are historic but a paucity of recent records does not necessarily reflect the current local status of the species in question. It may simply be the result of a lack of recent survey for the species. This appears to be the case especially within SUZ1 where little flora and fauna investigation has been undertaken in recent decades.

Ecological surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected at a site during survey, such as low abundance, patchy distribution, species dormancy, seasonal conditions, and migration and breeding behaviours. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a site. The present assessment represents a compilation of pre-existing information and is not, of itself, constrained by any such limitations. However, the assessment is preliminary in nature and has demonstrated that

substantial knowledge gaps exist and that much information about biodiversity values of the study area is not current.

DRAFT

4. Results

This section provides a summary of the biodiversity values of the study area. Following a summary of the landscape context, a list of significant species of flora and fauna for the entire study area is provided. Important values of the two sections of the study area, SUZ1 and the LTC, are then described.

4.1 Regional landscape context

The study area is located approximately 70 km to the south east of the Melbourne central business district on the Mornington Peninsula. It is centred on the township of Hastings and extends north to Ballarto Road, encompassing a mixture of private and public land tenures (Figure A1).

The study area is within the:

- Gippsland Plain Bioregion
- Management area of Melbourne Water and/or the Port Phillip and Western Port Catchment Management Authority (CMA)
- Mornington Peninsula Shire, City of Frankston and City of Casey.

The study area is located within a largely rural setting which includes private properties with mixed agricultural and horticultural uses. Residential centres including Hastings, Pearcedale and Tyabb have higher densities of houses and planted vegetation for landscape amenity. The coastal zone (within 0.5 km of the shoreline) comprises largely native vegetation and represents a high diversity of plant communities and associated fauna habitats which in some parts grade into other natural environments further inland.

The study area includes part of the Western Port shoreline and coastal ecosystems within the Western Port Ramsar Site. The Western Port Ramsar Site includes the whole of Western Port with an arbitrary boundary line between Point Leo and San Remo (excluding the land area of French Island). It includes 26,272 ha of permanent and semi-permanent saline wetlands comprising marine sub-tidal aquatic beds, intertidal mud and sand flats, intertidal marshes (including saltmarshes) and intertidal forested wetlands (mangroves) (DSE 2003a). Western Port's status as a Ramsar wetland of international importance is due to the ability of the area to supporting a large number of waterbirds and waterfowl.

Land to the east of the study area includes either farmland with modified pasture or predominantly native scrubs, woodlands and forests. Native vegetation patches within this area are remnants of the largely cleared Koo-wee-rup Swamp (Yugovic 2011) and retain some ecological connectivity with more elevated land around Cranbourne and Pakenham. The native vegetation remnants of the Koo-wee-rup Swamp contribute to a significant area of the lower Western Port catchment and support a number of significant ecological features including nationally threatened flora and fauna species. The linear network of vegetated and well-connected drains and roadsides in the Koo Wee Rup-Tooradin area are well known for their habitat value for Southern Brown Bandicoot, Swamp Skink and Growling Grass Frog. These species have persisted in areas of both native and substantially non-native vegetation along these linear corridors by virtue of their high level of landscape connectivity. Within 2 km to the east of the study area the Royal Botanic Gardens Cranbourne is a large example of heathy and wetland vegetation types and includes a significant population of Southern Brown Bandicoots.

Land within 2 km to the west of the study area has largely the same geomorphology as the study area. The Langwarrin Flora and Fauna Reserve nearby to the northwest, includes a large area of native vegetation with a high diversity of native species. The landscape to the west has largely been cleared of native vegetation in

lowland areas and extant native vegetation is mostly restricted to roadsides, waterways and smaller private and public reserves.

While habitat connectivity is less important for some biota, such as nomadic and migratory birds, it is vital for the viability of populations of numerous flora and fauna species. The capacity for dispersal of many plant seeds and propagules and of various animal species relies on contiguous suitable habitat and cannot occur across expanses of modified or otherwise unsuitable areas. Connectivity is particularly important for species that are largely sedentary or disperse only short distances because their populations depend upon gene flow that can occur only through contiguous areas of habitat. This obviously applies to many plants but is also the case for fauna like small mammals and reptiles.

Well connected native vegetation along the Western Port coast within and beyond the study area provides a valuable network of habitats for species such as Swamp Skink and Southern Brown Bandicoot.

4.2 Significant species of the study area

Species listed under the EPBC Act and FFG Act and/or included on threatened species advisory lists published by DEPI that have been recorded or are predicted to occur within 5 km of the study area or from the relevant catchment (aquatic species) are provided in Appendix B1.1 (flora) and Appendix B2.1 (fauna) and mapped in Figure A4. An assessment of the likelihood of these species to occur in the study area and an indication of where they may occur (i.e. relevant habitats or features), is also included.

A summary of those species recorded and with a medium or high likelihood of occurring in either of the two sections of the study area is provided in Table 2 below in order of threat significance. The locations of previous records of EPBC Act listed flora and fauna species within the study area are illustrated in Figure A2. Previous records of state listed threatened flora and fauna species within the study area are shown in Figure A3.

Table 2: Summary of listed flora and fauna species most likely to occur in either SUZ1 or LTC

Species name	EPBC Act status	FFG Act status	DEPI Advisory List	Habitats of value within the study area	SUZ1	LTC
Flora						
Purple Eyebright	Endangered	listed	Endangered	Grassy Woodland		✓
Clover Glycine	Vulnerable	listed	Vulnerable	Grassy Woodland		✓
Matted Flax-lily	Vulnerable	listed	Endangered	Grassy Woodland		✓
Dense Leek-orchid	Vulnerable	listed	Endangered	Heathy Woodland	✓	✓
Green-striped Greenhood	Vulnerable	listed	Vulnerable	Heathy Woodland and Lowland Forest	✓	✓
Swamp Everlasting	Vulnerable	listed	Vulnerable	Grassy wetlands, Aquatic Herbland	✓	✓
Swamp Fireweed	Vulnerable	listed	Vulnerable	Grassy wetlands, Aquatic Herbland	✓	✓
River Swamp Wallaby-grass	Vulnerable			Grassy wetlands, Aquatic Herbland	✓	✓
Purple Diuris		listed	Vulnerable	Grassy Woodland	✓	✓

Species name	EPBC Act status	FFG Act status	DEPI Advisory List	Habitats of value within the study area	SUZ1	LTC
Fauna						
Orange-bellied Parrot	Critically Endangered	listed	Critically endangered	Coastal Saltmarsh	✓	✓
Southern Brown Bandicoot	Endangered	listed	Near threatened	Heathlands and heathy woodlands, other woodlands and forests, weedy areas affording abundant cover	✓	✓
Australasian Bittern	Endangered	listed	Endangered	Densely vegetated freshwater and brackish wetlands	✓	✓
Swift Parrot	Endangered	listed	Endangered	Native and planted eucalypts, particularly species that produce copious nectar	✓	✓
Growling Grass Frog	Vulnerable	listed	Endangered	Man-made waterbodies, natural wetlands and drainage lines with abundant aquatic vegetation	✓	✓
Grey-headed Flying-fox	Vulnerable	listed	Vulnerable	Native and planted trees and shrubs that produce nectar, pollen and / or succulent fruits	✓	✓
New Holland Mouse	Vulnerable	listed	Vulnerable	Heathlands and heathy woodlands	✓	✓
Dwarf Galaxias	Vulnerable	listed	Vulnerable	Still or slow-flowing wetlands, swamps, drains with abundant aquatic vegetation (particularly Watsons Creek)	✓	✓
Grey-tailed Tattler		listed	Critically endangered	Coastal zone in Western Port	✓	✓
Intermediate Egret		listed	Critically endangered	Coastal zone in Western Port and freshwater wetlands	✓	✓
Gull-billed Tern		listed	Endangered	Coastal zone in Western Port	✓	✓
Terek Sandpiper		listed	Endangered	Coastal zone in Western Port	✓	✓
Great Knot		listed	Endangered	Coastal zone in Western Port	✓	✓

Species name	EPBC Act status	FFG Act status	DEPI Advisory List	Habitats of value within the study area	SUZ1	LTC
Little Egret		listed	Endangered	Coastal zone in Western Port and freshwater wetlands	✓	✓
Lewin's Rail		listed	Vulnerable	Densely vegetated wetlands	✓	✓
Baillon's Crake		listed	Vulnerable	Densely vegetated wetlands	✓	✓
Eastern Great Egret		listed	Vulnerable	Coastal zone in Western Port and freshwater wetlands	✓	✓
Grey Goshawk		listed	Vulnerable	Forests and woodlands	✓	✓
White-bellied Sea-Eagle		listed	Vulnerable	Coastal zone in Western Port and freshwater wetlands	✓	✓
Powerful Owl		listed	Vulnerable	Forests and woodlands	✓	✓
Chestnut-rumped Heathwren		listed	Vulnerable	Woodlands	✓	✓
Swamp Skink		listed	Vulnerable	Coastal Saltmarsh, damp woodlands and heathlands, dense vegetation near watercourses, Swamp Scrub, Estuarine Scrub	✓	✓
Pale Mangrove Goby		listed	Vulnerable	Coastal Zone in Western Port; Mangrove Shrubland	✓	✓
White-footed Dunnart		listed	Near threatened	Healthlands and heathy woodlands	✓	✓
Magpie Goose		listed	Near threatened	Large freshwater wetlands	✓	✓
Hooded Robin		listed	Near threatened	Woodlands	✓	✓
Lace Monitor			Vulnerable	Woodlands	✓	✓
Southern Toadlet			Vulnerable	Low-lying damp areas including in woodlands	✓	✓
Common Long-necked Turtle			Data deficient	Man-made waterbodies and natural wetlands	✓	✓
Latham's Snipe			Near threatened	Grassy wetlands, Aquatic Herbland	✓	✓

4.3 Biodiversity values of Port Landside Development Area (SUZ1)

The SUZ1 comprises mostly mixed agricultural and horticultural land with some areas of higher density residential land. However, SUZ1 also contains the largest intact and highest quality, native vegetation within the overall study area at BlueScope Steel and the coastal crown land as well as part of the Western Port Ramsar site. The native vegetation within BlueScope Steel land is also one of the least surveyed areas due to public access restrictions.

As a general principle, the largest patches of native vegetation and those that are contiguous with other such patches both within the study area and beyond it can be expected to offer the most significant flora and fauna values. Loss or fragmentation of such areas is likely to be detrimental to the species and ecosystems they support. Relevant high value areas that have been identified within SUZ1 (Figure A3) therefore include:

- Crown Land abutting the coast that supports indigenous vegetation communities
- BlueScope Steel property, south of Pikes Road and west of Whitney's Road and all areas of indigenous vegetation contiguous within and outside the property
- areas of indigenous vegetation bounded by Dandenong-Hastings Road, Bungower Road, Tyabb-Tooradin Road and Watsons Creek
- areas of indigenous vegetation east of Tyabb-Tooradin Road and Whitneys Road to the coast (contiguous with coastal vegetation in the LTC).

4.3.2 Vegetation & ecological communities

Most of the native vegetation is Grassy Woodland or Heathy Woodland but relatively large areas of Swamp Scrub and coastal saltmarsh communities are also present.

The locations and areas of native vegetation within SUZ1 along with their contributions to Victoria's biodiversity are shown in Figure A7. The three categories of contribution shown are derived from DEPI's Strategic Biodiversity Score model. The coastal zone within 1–2 km of the shoreline (excluding existing developed areas) contains mostly vegetation which has >0.8 contribution and is therefore important for the state's biodiversity. The remaining area of SUZ1 comprises approximately half 0.4–0.8 contribution and <0.4 contribution.

Grassy Woodland vegetation has naturally few shrubs in the understorey and in many examples this has been cleared or is regularly slashed / grazed. Heathy Woodland is naturally shrubby in the understorey. Where larger blocks of these EVCs occur, a denser cover of understorey vegetation persists. A range of coastal EVCs exist within SUZ1. The most substantial of these is Coastal Saltmarsh.

Extant native vegetation within SUZ1 represents several different ecosystems within a relatively short distance along the coastal–inland gradient. There are few similar examples within the Port Phillip and Western Port region where this gradient is relatively contiguous and occupied by native vegetation of good quality.

The BlueScope Steel property and contiguous crown land to its south represents one of the largest and most diverse, intact areas of native vegetation within the Port Phillip and Western Port coastal region (Figure A3).

Other than the larger contiguous coastal patches and the BlueScope Steel property, native vegetation within SUZ1 is generally fragmented and occurs in small patches.

4.3.3 Freshwater environments

Natural and artificial wetlands, including farm dams and other impoundments, provide habitat for waterbirds, turtles, frogs and some fish species.

Named waterways within the area include Watsons Creek (flowing eastwards to the north of SUZ1) and Olivers Creek, which traverses the south-west section of SUZ1. The lower reaches of both waterways are estuarine.

Watsons Creek has been classified as being in 'very poor' condition by DEPI as part of the Index of Stream Condition program (DEPI 2013); having an 'extremely modified' flow regime, poor water quality and a low diversity and/or pollution tolerant macroinvertebrate community. Aquatic fauna habitat in the freshwater reaches of Oliver Creek was assessed by Biosis (2009) as being poor to moderate, with significant barriers to fish passage and limited riparian vegetation but with some aquatic vegetation present. Mangrove habitat was observed in the lower reaches, which is likely to provide fish and crustacean habitat.

4.3.4 EPBC Act listed ecological communities

The SUZ1 contains approximately 37 ha of the Ecological Vegetation Class: Coastal Saltmarsh (EVC 9). Most of this vegetation is likely to conform to the ecological community Tropical and Temperate Saltmarsh, which is listed as vulnerable under the EPBC Act (Figure A2). The Victorian Saltmarsh Study (Boon *et al.* 2011) entailed detailed mapping of saltmarsh communities and provides accurate information about the extent of this Ecological Vegetation Class. Estimates of the extent of the listed community can therefore be made with a higher level of certainty compared with some other EPBC Act matters within the study area.

There is some likelihood that further survey on private land may reveal the presence of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains. The presence of this community is determined by the size and distribution of patches as well as the composition of species within. It is often consistent with higher quality examples of the Ecological Vegetation Class Plains Grassy Wetland. The community may be found within the northern parts of the SUZ1 area.

There are no other EPBC Act listed ecological communities that are likely to occur within the study area.

4.3.5 FFG Act listed communities

Plains Grassy Wetland that may occur within SUZ1 would meet the definition of the FFG listed community Herb-rich Plains Grassy Wetland (West Gippsland).

Small areas of Plains Grassland (South Gippsland) Community occur close to the study area along the South Gippsland Highway and at Clyde. As a result, if any naturally occurring grassland is found (excluding coastal saline communities) during detailed survey it is possible that it will also accord with the listed community.

A summary of the vegetation types and listed ecological communities is shown in Table 3 below.

Table 3: Summary of vegetation and habitat types within SUZ1

EVC or listed ecological community	Description	Estimated area
Aquatic Herbland EVC 653	Occurs in shallow depression of black clays or peat, on floodplains and dune depression which are seasonally inundated. This EVC is treeless and typically contains the dominant species Water Ribbon <i>Triglochin procera</i> , Streaked Arrowgrass <i>Triglochin striata</i> , Swamp Lily <i>Ottelia ovalifolia</i> , Red Pondweed <i>Potamogeton cheesemanii</i> , White Purslane <i>Montia australasica</i> , Soft Twig-sedge <i>Baumea rubiginosa</i> , Water Plantain <i>Alisma Plantago-aquatica</i> , milfoils <i>Myriophyllum</i> spp., Common Reed <i>Phragmites australis</i> , Tall Sedge <i>Carex appressa</i> and rushes <i>Juncus</i> spp.	0.5 ha

EVC or listed ecological community	Description	Estimated area
Coastal Saltmarsh EVC 9	Occurs on coastal flats and estuaries which are subject to tidal flows. This EVC is treeless and commonly comprises a suite of halophytic herb and shrub species such as <i>Tecticornia arbuscula</i> Shrubby Glasswort, <i>Suaeda australis</i> Austral Seablite, Creeping Brookweed <i>Samolus repens</i> , Coast Saw-sedge <i>Gahnia filum</i> , Australian Salt-grass <i>Distichlis distichophylla</i> , Knobby Club-sedge <i>Ficinia nodosa</i> and Rounded Noon-flower <i>Disphyma crassifolium</i> .	37 ha
EPBC Act Subtropical and Temperate Coastal Saltmarsh	Areas which correspond with Coastal Saltmarsh EVC 9 described above are likely to qualify as the EPBC Act listed community on the basis of the definition threshold criteria. Definitions of the EVC and the EPBC Act listed community may not coincide precisely, which may lead to minor differences between the areas they occupy.	37 ha
Damp Heathland EVC 710	Occurs in peaty sands, usually amongst Heathy Woodland or Damp Heathy Woodland. This EVC is a treeless vegetation type that is dominated by a number of shrub species and graminoids (grasses, sedges and rushes). Total vegetation cover is typically high (>50%) with shrubs to about 3 m tall and taller graminoid with few areas of open ground. Within the local area, this EVC typically includes the following floristics. Characteristic species include Bushy Needlewood <i>Hakea decurrens</i> , Manuka <i>Leptospermum scoparium</i> , Silver Banksia <i>Banksia marginata</i> , Scented Paperbark <i>Melaleuca squarrosa</i> , Bordered Panic <i>Entolasia marginata</i> , Common Scale-rush <i>Lepyrodia muelleri</i> and Slender Bog-sedge <i>Schoenus lepidosperma</i> .	10 ha
Damp Heathy Woodland EVC 83	Damp Heathy Woodland is a treed vegetation type that occurs on largely sandy-clay soils. It includes a moderately shrubby understorey with a usually dense cover of graminoids and scattered forbs. Within the local area, this EVC typically includes the following floristics. The canopy is usually dominated by Narrow-leaf Peppermint and Swamp Gum <i>Eucalyptus ovata</i> may occur occasionally. The shrub layer typically includes Bushy Needlewood and Silver Banksia and the ground flora is usually dominated by Thatch Saw-sedge <i>Gahnia radula</i> , Pithy Sword-sedge <i>Lepidosperma longitudinale</i> and Spreading Rope-rush <i>Empodisma minus</i> .	16 ha
Damp Sands Herb-rich Woodland EVC 3	Occurs inland on sandy substrates with a clayey upper horizon. This EVC is characterised by an overstorey containing Rough barked Manna-gum <i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i> and Narrow-leaf Peppermint with a ground layer rich in grasses and other herbs. The dominant shrub species include Scrub Sheoke <i>Allocasuarina paludosa</i> , Dagger Hakea <i>Hakea teretifolia</i> subsp. <i>hirsuta</i> and Hedge Wattle <i>Acacia</i>	69 ha

EVC or listed ecological community	Description	Estimated area
	<i>paradoxa</i> . Understorey vegetation may be dominated by grasses, rushes and/or sedges in some examples including Zig-zag Bog-sedge <i>Schoenus brevifolius</i> , Common Scale-rush <i>Lepyrodia muelleri</i> , Knobby Club-sedge, Thatch Saw-sedge <i>Gahnia radula</i> , wallaby-grasses <i>Rytidosperma</i> spp. and spear-grasses <i>Austrostipa</i> spp.	
Estuarine Scrub EVC 953	Occurs usually in a coastal belt behind Coastal Saltmarsh or other low-statured coastal vegetation. This EVC appears structurally as Swamp Scrub and has the same dominant shrubs species Swamp Paperbark <i>Melaleuca ericifolia</i> to about 6 m tall. The understorey vegetation includes a moderate diversity of halophytes as well as glyophytes which tolerate periodic exposure to saline conditions.	5.7 ha
Estuarine Wetland EVC 10	Estuarine Wetland occurs in upper and lower reaches of estuaries, where there is tidal influence. This EVC is treeless and is dominated by Chaffy Saw-sedge <i>Gahnia filum</i> and Coast Saw-sedge <i>Gahnia trifida</i> both of which provide relatively high cover. Other co-occurring species include a suite of halophytes typically found in Coastal Saltmarsh; these EVCs often occur in a mosaic.	1 ha
Grassy Woodland EVC 175	Occurs inland on loamy soils. The dominant canopy species Coast Manna Gum. The understorey is dominated by native grasses such as wallaby grasses <i>Rytidosperma</i> spp., and spear grasses <i>Austrostipa</i> spp., and it has scattered shrubs such as Black Sheoak <i>Allocasuarina littoralis</i> and Blackwood <i>Acacia melanoxylon</i> . High quality examples occur within the BlueScope Steel land at Tyabb where common species included Coast Manna-gum, Hedge Wattle, Prickly Tea-tree, Kangaroo Grass, Bristly Wallaby-grass <i>Rytidosperma setaceum</i> , Slender Wallaby-grass <i>Rytidosperma racemosum</i> , Supple Spear-grass <i>Austrostipa mollis</i> , Veined Spear-grass <i>Austrostipa rudis</i> subsp. <i>rudis</i> , Pale Grass-lily <i>Caesia parviflora</i> , sun-orchids <i>Thelymitra</i> spp., onion-orchids <i>Microtis</i> spp., Long Purple Flag <i>Patersonia occidentalis</i> , Milkmaids <i>Burchardia umbellata</i> and Chocolate Lily <i>Arthropodium strictum</i> .	80 ha
Heathy Woodland EVC 48	Occurs inland on older sand dunes. This EVC includes the dominant canopy species Coast Manna-gum <i>Eucalyptus viminalis</i> subsp. <i>pryoriana</i> . Common taller shrub species include Heath Tea-tree <i>Leptospermum myrsinoides</i> , Prickly Tea-tree and Wedding Bush <i>Ricinocarpos pinifolius</i> . A high diversity of ground flora occurs in intact examples with characteristic species such as Prickly Guinea-flower <i>Hibbertia acicularis</i> , Showy Parrot-pea <i>Dillwynia sericea</i> and Austral Bracken <i>Pteridium esculentum</i> .	77 ha
Mangrove Shrubland EVC 140	Occurs on coastal mudflats and in estuaries. This EVC almost entirely comprises the shrub White Mangrove	33 ha

EVC or listed ecological community	Description	Estimated area
	<i>Avicennia marina</i> subsp. <i>australasica</i> which usually is <2 m tall. Several halophytes species occur as minor components to this EVC. This number is low due to the boundary of SUZ1 not encompassing the entire coastal environment, which extends beyond the	
Swamp Scrub EVC 53	Occurs throughout numerous drainage lines, floodplains, swamps and riparian zones. This EVC is dominated by Swamp Paperbark <i>Melaleuca ericifolia</i> and may also include Blackwood <i>Acacia melanoxylon</i> , Black Wattle <i>Acacia mearnsii</i> and occasional eucalypts. Understorey components include Weeping Grass <i>Microlaena stipoides</i> , rushes <i>Juncus</i> spp. and Bracken <i>Pteridium esculentum</i> .	97 ha
Swampy Riparian Woodland (SRW) EVC 83 / Swampy Woodland (SW) EVC 937	Occurs in low lying areas with often poorly drained seasonally waterlogged soils and in riparian zones of smaller waterways. The dominant canopy species is typically Swamp Gum <i>Eucalyptus ovata</i> and the understorey shrub Swamp Paperbark <i>Melaleuca ericifolia</i> is common. The ground flora is usually modified and includes Weeping Grass <i>Microlaena stipoides</i> , Common Tussock-grass <i>Poa labillardierei</i> , Shrubby Fireweed <i>Senecio minimus</i> , rushes and sedges. Swampy Riparian Woodland occurs in riparian zones and Swampy Woodland occurs on floodplains associated with waterways. As such, Swampy Woodland may occupy flats over larger areas and tends to therefore extend into agricultural land.	SRW – 10 ha SW – 70 ha
Wetland Formation EVC 74	Occurs in low-lying inland areas which undergo seasonal or permanent inundation. This vegetation type includes a range of saline and freshwater EVCs.	10 ha

4.3.6 Habitats for threatened flora & fauna species

Potential threatened fauna habitat is mapped in Figure A5 for various species that are most likely to occur within the SUZ1 portion of the study area. These maps have been derived from the occurrence of EVCs that are most likely to provide suitable habitat for the various species.

Within SUZ1 substantial blocks of vegetation including woodland ecosystems and coastal vegetation communities offer the most significant habitats for a range of flora and fauna including threatened species. Biodiversity values of crown land within SUZ1, especially coastal land, and the BlueScope Steel property, south of Pikes Road and west of Whitney's Road (Fig 3c) have not ever been rigorously investigated by targeted field surveys. These are required to more comprehensively determine the biodiversity values these land parcels support, but the preliminary assessment indicates that they are particularly important. Due to the relatively large areas of these land parcels and of the vegetation communities they support, they are likely to maintain high levels of general species diversity and to better maintain functional ecosystems than smaller or more fragmented patches of native vegetation in other areas. Within the study area, it has the highest likelihood of supporting populations of a number of threatened flora species. Fauna species that may exist there include Southern Brown Bandicoot and the New Holland Mouse which was recorded from the Hastings area during the 1970s and 1980s and may persist there.

Saltmarsh vegetation communities along the coast of SUZ1 are potential habitat for the Orange-bellied Parrot. This species has historically used saltmarsh at various places around Western Port.

Substantial areas of Swamp Scrub occur and this community and coastal saltmarsh communities are habitat for the Swamp Skink. This species is known to occur in coastal saltmarsh at Hastings.

Natural and artificial wetlands, including farm dams and other impoundments, provide potential habitat for some listed waterbirds, Common Long-necked Turtle and Growling Grass Frog.

The FFG-listed Pale Mangrove Goby is known to inhabit Olivers Creek. No other significant native fish species have been recorded within this waterway. Dwarf Galaxias have previously been collected from Watsons Creek. In addition, a number of drains, wetlands and dams are also located within the study area and may support native fish, including Dwarf Galaxias.

4.4 Biodiversity values of the land transport corridor (LTC)

The LTC comprises mostly mixed agricultural and horticultural land with some areas of higher density residential land. A small south-eastern portion of the area abuts the Western Port Ramsar site. Native vegetation has been modelled as typically either Grassy Woodland or Heathy Woodland (DEPI 2014).

Relevant high value areas that have been identified within the LTC include:

- Crown Land abutting the coast that supports indigenous vegetation communities (contiguous with indigenous vegetation in SUZ1 to the south and outside the study area to the east).

Subject to further investigation, especially regarding the quality of remnant vegetation, relevant areas within the LTC may also include:

- contiguous and less fragmented areas of indigenous vegetation communities that exist broadly across the LTC north of Pearcedale (shown in Figure A3).

4.4.1 Vegetation & ecological communities

Grassy Woodland vegetation has naturally few shrubs in the understorey and in many examples the understorey has been cleared of native components or is regularly slashed / grazed. Heathy Woodland is naturally shrubby in the understorey. Where larger blocks of these EVCs occur, a denser cover of understorey vegetation persists. A range of coastal EVCs occur in the south east of the LTC and, although they are less extensive here, they still represent the more intact native vegetation patches within the area. They are ecologically connected to coastal vegetation within SUZ1.

The contribution of the vegetation to Victoria's biodiversity in the form of the modelled Strategic Biodiversity Score layer is shown in Figure A7. Approximately 75% of the area's native vegetation falls within a zone with modelled contribution <0.4. Other areas comprise the coastal zone (within approximately 1 km) with >0.8 contribution and remaining areas with 0.4–0.8 contribution. The coastal zone with >0.8 contribution may therefore be regarded as providing an important contribution to the state's biodiversity.

Patches of vegetation to the western side of the Western Port Highway in the northern part of the study area may potentially be Lowland Forest. Further survey is required to confirm the presence of this EVC.

The EVC Plains Grassy Wetland and the EPBC Act listed Seasonal Herbaceous Wetland (Freshwater) of the Temperate Lowland Plains may be found in this section of the study area. Further on-ground vegetation mapping is required to confirm the presence of these vegetation types, which are defined in the DEPI modelled layer.

By comparison with the SUZ1, the LTC area contains more fragmented native vegetation in smaller patches. When comparing the modelled EVC data (1:25 000) with aerial imagery, it is clear that the coverage of modelled vegetation is actually an overestimate of the true extent of native vegetation (mostly Heathy Woodland and Grassy Woodland).

In the LTC, Grassy Woodland areas, in particular, have been historically cleared more so than coastal vegetation types to the south, due to their value for converting to grazing and other agricultural uses.

A summary of the vegetation types and listed ecological communities is listed in Table 4 below.

4.4.2 Freshwater environments

Named waterways within the area include the Eastern Contour Drain (north section of study area), Boggy Creek (north-west of area), Langwarrin Creek (a number of tributaries flowing eastwards through the central part of the study area), Watsons Creek and King Creek (southern section of study area).

Watsons Creek has been classified as being in 'very poor' condition by DEPI as part of the Index of Stream Condition program (DEPI 2013), having an 'extremely modified' flow regime, poor water quality and a low diversity and/or pollution tolerant macroinvertebrate community. Melbourne Water's Regional River Health Strategy (RRHS) (Melbourne Water 2007) describes the poor water quality in Watson Creek as being a risk to Yaringa Marine Park, within Western Port. The RRHS also describes Langwarrin and King Creeks as being in poor condition, with a lack of streamside vegetation and elevated nutrients due to agricultural run-off. High siltation and weed infestation was also observed at sites visited. The lower reaches of King and Langwarrin Creeks are estuarine and mangrove habitat was observed in King Creek, which is likely to support fish and crustacean habitat.

4.4.3 EPBC Act listed ecological communities

The LTC contains approximately 65 ha of the Coastal Saltmarsh community (EVC 9). Most of this vegetation is likely to also conform to the EPBC Act listed ecological community Tropical and Temperate Saltmarsh which is vulnerable listed under the Act. The Victorian Saltmarsh Study (Boon *et al.* 2011) involved detailed mapping of saltmarsh communities and as such, within this area there is accurate information about the extent of this EVC. Estimates of the extent of the listed community can therefore be made with a higher level of certainty compared with other EPBC Act matters within the study area.

There is some likelihood that further survey on private land may reveal the presence of the EPBC Act listed community, Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains. The presence of this community is determined by the size and distribution of patches as well as the composition of species. It is often consistent with higher quality examples of the EVC Plains Grassy Wetland.

It is considered unlikely that any other EPBC Act listed ecological communities are likely to occur within the LTC.

4.4.4 FFG Act listed communities

If found during more detailed assessment within the study area, Plains Grassy Wetland is likely to meet the definition of the FFG Act listed community: Herb-rich Plains Grassy Wetland (West Gippsland).

In the event that any naturally occurring grassland (other than coastal saline communities) is found it may accord to the FFG Act listed community: South Gippsland Plains Grassland. Small areas of Plains Grassland occur along the South Gippsland Highway to the east and at Clyde to the northeast of the study area.

Table 4: Summary of vegetation and habitat types within the LTC

EVC or listed ecological community	Description	Estimated area
Coastal Saltmarsh EVC 9	Occurs on coastal flats and estuaries which are subject to tidal flows. This EVC is treeless and commonly comprises a suite of halophytic herb and shrub species such as <i>Tecticornia arbuscula</i> Shrubby Glasswort, <i>Suaeda australis</i> Austral Seablite, Creeping Brookweed <i>Samolus repens</i> , Coast Saw-sedge <i>Gahnia filum</i> , Australian Salt-grass <i>Distichlis distichophylla</i> , Knobby Club-sedge <i>Ficinia nodosa</i> and Rounded Noon-flower <i>Disphyma crassifolium</i> .	65 ha
EPBC Act Subtropical and Temperate Coastal Saltmarsh	Areas which correspond with Coastal Saltmarsh EVC 9 described above are likely to qualify as the EPBC Act listed community on the basis of the definition threshold criteria. Definitions of the EVC and the EPBC Act listed community may not coincide precisely, which may lead to minor differences between the areas they occupy.	65 ha
Damp Heathy Woodland EVC 83	Damp Heathy Woodland is a treed vegetation type that occurs on largely sandy-clay soils. It includes a moderately shrubby understorey with a usually dense cover of graminoids and scattered forbs. Within the local area, this EVC typically includes the following floristics. The canopy is usually dominated by Narrow-leaf Peppermint and Swamp Gum <i>Eucalyptus ovata</i> may occur occasionally. The shrub layer typically includes Bushy Needlewood and Silver Banksia and the ground flora is usually dominated by Thatch Saw-sedge <i>Gahnia radula</i> , Pithy Sword-sedge <i>Lepidosperma longitudinale</i> and Spreading Rope-rush <i>Empodisma minus</i> .	2 ha
Damp Sands Herb-rich Woodland EVC 3	Occurs inland on sandy substrates with a clayey upper horizon. This EVC is characterised by an overstorey containing Rough barked Manna-gum <i>Eucalyptus viminalis</i> subsp. <i>pyroriana</i> and Narrow-leaf Peppermint with a ground layer rich in grasses and other herbs. The dominant shrub species include Scrub Sheoke <i>Allocasuarina paludosa</i> , Dagger Hakea <i>Hakea teretifolia</i> subsp. <i>hirsuta</i> and Hedge Wattle <i>Acacia paradoxa</i> . Understorey vegetation may be dominated by grasses, rushes and/or sedges in some examples including Zig-zag Bog-sedge <i>Schoenus brevifolius</i> , Common Scale-rush <i>Lepyrodis muelleri</i> , Knobby Club-sedge, Thatch Saw-sedge <i>Gahnia radula</i> , wallaby-grasses <i>Rytidosperma</i> spp. and spear-grasses <i>Austrostipa</i> spp.	18 ha
Estuarine Scrub EVC 953	Occurs usually in a coastal belt behind Coastal Saltmarsh or other low-statured coastal vegetation. This EVC appears structurally as Swamp Scrub and has the same dominant shrubs species Swamp Paperbark <i>Melaleuca ericifolia</i> to about 6 m tall. The understorey vegetation includes a moderate diversity of halophytes as well as glyophytes which tolerate periodic exposure to saline conditions.	9 ha

EVC or listed ecological community	Description	Estimated area
Estuarine Wetland	Estuarine Wetland occurs in upper and lower reaches of estuaries, where there is tidal influence. This EVC is treeless and is dominated by Chaffy Saw-sedge <i>Gahnia filum</i> and Coast Saw-sedge <i>Gahnia trifida</i> both of which provide relatively high cover. Other co-occurring species include a suite of halophytes typically found in Coastal Saltmarsh; these EVCs often occur in a mosaic.	1.3 ha
Grassy Woodland EVC 175	Occurs inland on loamy soils. The dominant canopy species Coast Manna Gum. The understorey is dominated by native grasses such as wallaby grasses <i>Rytidosperma</i> spp., and spear grasses <i>Austrostipa</i> spp., and it has scattered shrubs such as Black Sheoak <i>Allocasuarina littoralis</i> and Blackwood <i>Acacia melanoxylon</i> . High quality examples occur within the BlueScope Steel land at Tyabb where common species included Coast Manna-gum, Hedge Wattle, Prickly Tea-tree, Kangaroo Grass, Bristly Wallaby-grass <i>Rytidosperma setaceum</i> , Slender Wallaby-grass <i>Rytidosperma racemosum</i> , Supple Spear-grass <i>Austrostipa mollis</i> , Veined Spear-grass <i>Austrostipa rudis</i> subsp. <i>rudis</i> , Pale Grass-lily <i>Caesia parviflora</i> , sun-orchids <i>Thelymitra</i> spp., onion-orchids <i>Microtis</i> spp., Long Purple Flag <i>Patersonia occidentalis</i> , Milkmaids <i>Burchardia umbellata</i> and Chocolate Lily <i>Arthropodium strictum</i> .	550 ha
Heathy Woodland EVC 48	Occurs inland on older sand dunes. This EVC includes the dominant canopy species Coast Manna-gum <i>Eucalyptus viminalis</i> subsp. <i>pyroriana</i> . Common taller shrub species include Heath Tea-tree <i>Leptospermum myrsinoides</i> , Prickly Tea-tree and Wedding Bush <i>Ricinocarpos pinifolius</i> . A high diversity of ground flora occurs in intact examples with characteristic species such as Prickly Guinea-flower <i>Hibbertia acicularis</i> , Showy Parrot-pea <i>Dillwynia sericea</i> and Austral Bracken <i>Pteridium esculentum</i> .	447 ha
Mangrove Shrubland EVC 140	Occurs on coastal mudflats and in estuaries. This EVC almost entirely comprises the shrub White Mangrove <i>Avicennia marina</i> subsp. <i>australasica</i> which usually is <2 m tall. Several halophytes species occur as minor components to this EVC.	17 ha
Swamp Scrub EVC 53	Occurs throughout numerous drainage lines, floodplains, swamps and riparian zones. This EVC is dominated by Swamp Paperbark <i>Melaleuca ericifolia</i> and may also include Blackwood <i>Acacia melanoxylon</i> , Black Wattle <i>Acacia mearnsii</i> and occasional eucalypts. Understorey components include Weeping Grass <i>Microlaena stipoides</i> , rushes <i>Juncus</i> spp. and Bracken <i>Pteridium esculentum</i> .	47 ha
Swampy Riparian Woodland (SRW) EVC 83 / Swampy Woodland (SW) EVC 937	Occurs in low lying areas with often poorly drained seasonally waterlogged soils and in riparian zones of smaller waterways. The dominant canopy species is typically Swamp Gum <i>Eucalyptus ovata</i> and the understorey shrub Swamp Paperbark <i>Melaleuca ericifolia</i> is common. The ground flora is usually modified and includes Weeping Grass <i>Microlaena stipoides</i> , Common Tussock-grass <i>Poa labillardierei</i> , Shrubby Fireweed <i>Senecio minimus</i> , rushes and sedges. Swampy Riparian Woodland occurs in riparian zones and	SRW – 44 ha SW – 22 ha

EVC or listed ecological community	Description	Estimated area
	Swampy Woodland occurs on floodplains associated with waterways. As such, Swampy Woodland may occupy flats over larger areas and tends to therefore extend into agricultural land.	
Wetland Formation EVC 74	Occurs in low-lying inland areas which undergo seasonal or permanent inundation. This vegetation type includes a range of saline and freshwater EVCs.	3 ha

4.4.5 Habitats for threatened flora & fauna species

Habitat for terrestrial flora and fauna, including those for threatened species, occur broadly in scattered and fragmented areas of native vegetation within the LTC. This includes coastal vegetation communities which are confined to a relatively small area of the Western Port coast in the south-east of the LTC. Records of nationally threatened flora and fauna species are provided in Appendix B.

Potential threatened fauna habitat has been mapped in Figure A5 for various species that are most likely to occur within the study area. These maps have been derived from the occurrence of EVCs that are most likely to provide suitable habitat for the various species.

The Southern Brown Bandicoot is known from recent records in coastal vegetation communities near Tyabb (DEPI 2014a). The species has a recent history of decline and local extinction across this general area but it persists at the Royal Botanic Gardens Cranbourne and nearby areas (DEPI 2014a) that are close to the northern parts of the LTC. It is thus possible that occasional dispersing individuals may utilise woodland communities within the LTC.

Broad zones of Grassy Woodland and Heathy Woodland exist across the northern portion of the LTC. Their values as habitat for a range of threatened flora and fauna species is somewhat uncertain and targeted surveys are required to improve understanding of this. The extent to which these remnant woodland communities continue to support such species is largely dependent on the level of disturbance to which they have been subjected (such as loss of natural understory and grazing by introduced stock) and their size and degree of fragmentation.

Saltmarsh vegetation communities on the coast near Tyabb are potential habitat for the Orange-bellied Parrot. This species has historically used saltmarsh at various places around Western Port.

Natural and artificial wetlands including farm dams and other impoundments provide potential habitat for some listed waterbirds, Common Long-necked Turtle and Growling Grass Frog.

Dwarf Galaxias have been recorded either from, or in the vicinity of, the Eastern Contour Drain, Boggy Creek, Langwarrin Creek and Watsons Creek. The estuarine reaches of King, Langwarrin and Watsons Creeks may support the Pale Mangrove Goby, which has been recorded in close vicinity to King Creek. A number of drains, wetlands and dams are also located within the study area which may support native fish, including Dwarf Galaxias.

5. Preliminary recommendations

5.1 Further surveys

The desktop assessment has demonstrated that substantial knowledge gaps exist with respect to biodiversity values of the study area and that most of the information available is not current. In order to provide comprehensive ecological information to assist with planning and development of the project it is recommended that further flora and fauna information is collected through a program of on-ground field surveys.

Planning of relevant surveys is currently being undertaken in conjunction with the Authority as part of the broader project planning phase. An outline of species-specific surveys required is provided in Appendix C.

The majority of field assessments will be required between September and November in order to meet relevant survey guidelines. High priority areas for detailed survey are mapped in Figure A6.

References

- AECOM 2009. Flora and Fauna Desktop Study: Western Port Highway Planning Study Ballarto Road to Hodgins Road. Report to VicRoads. Authors: Matthew, J. and Jenkin, A. AECOM, Melbourne. Job No. M60062901.
- AECOM 2013. Western Port Highway Planning Study – Ballarto Road to Hodgins Road: Desktop Flora and Fauna Assessment. Report to VicRoads. Author: White, C. AECOM, Melbourne. Job No. 60308273.
- Andrew DL, Lumsden LF and Dixon JM. 1984. *Sites of zoological significance in the Westernport region*. Victorian Department of Conservation, Forests and Lands.
- ASFB 2010. Conservation status of Australian fishes. *Australian Society for Fish Biology Newsletter* 40(2), December 2010.
- Biosis 2014. Port of Hastings Development Authority: Flora and fauna assessment for the geophysical and geotechnical surveys. Report to Port of Hastings Development Authority. Authors: Mueck S. and Smales I. Biosis Pty Ltd, Melbourne. Project no. 17228.
- Biosis Research 2009. Flora and fauna assessment of Port of Hastings Stage One Investigation area, Victoria. Report to AECOM Pty Ltd. Authors: Venosta, M., Mueck, S. and Bloink, C. Biosis Research Pty Ltd, Melbourne. Project no. 7540 & 7930.
- Biosis Research 2011. Port of Hastings Stage 1 Investigation Area: Threatened flora and fauna survey and habitat hectare assessment. Report to Port of Melbourne Corporation. Authors: Venosta, M., Mueck, S. and Bloink, C. Biosis Research Pty Ltd, Melbourne. Matter No. 11173.
- Biosis Research 2012. Scoping framework for the terrestrial ecological assessment of the expansion of the Port of Hastings. Report to Major Projects Victoria. Author: Venosta, M. Biosis Research, Melbourne. Matter No. 14062.
- Brown GW and Main ML. 2010. National Recovery Plan for the Southern Brown Bandicoot *Isodon obesulus obesulus*. Draft for Comment. Department of Sustainability and Environment, Victoria.
- Boon P, Allen T, Brook J, Carr G, Frood D, Harty C, Hoyer J, McMahon A, Mathews S, Rosengren N, Sinclair S, White M and Yugovic J. 2011. *Mangroves and coastal saltmarsh of Victoria. Distribution, condition, threats and management*. Institute for Sustainability and Innovation, Victoria University, Melbourne.
- Carter O. 2010. National Recovery Plan for the Matted Flax-lily *Dianella amoena*. Department of Sustainability and Environment, Victoria.
- Carter O and Walsh N. 2011. National Recovery Plan for the Swamp Everlasting *Xerochrysum palustre*. Department of Sustainability and Environment, Melbourne.
- Coates F, Jeanes J and Pritchard A. 2002. Recovery Plan for Twenty-five Threatened Orchids of Victoria, South Australia and New South Wales 2003 - 2007. Department of Sustainability and Environment, Melbourne.
- Cogger H. 1996. Reptiles and Amphibians of Australia. Reed Books, Sydney.
- DEPI 2013a. Advisory List of Threatened Vertebrate Fauna in Victoria – 2013. Victorian Government Department of Environment & Primary Industries, Melbourne.
- DEPI 2013b. *Permitted clearing of native vegetation - Biodiversity assessment guidelines*. Victorian Government Department of Environment and Primary Industries, Melbourne (September 2013).

DEPI 2013c. *Native vegetation gain scoring manual, version 1*. Victorian Government Department of Environment and Primary Industries, Melbourne (May 2013).

DEPI 2013d. Sub-Regional Species Strategy for the Growling Grass Frog. The Victorian Government Department of Environment and Primary Industries, East Melbourne.

DEPI 2013e. Index of Stream Condition. The Third Benchmark of Victorian River Condition ISC3. Victorian Government Department of Environment and Primary Industries, Melbourne, September 2013.

DEPI 2014a. Sub-regional Species Strategy for the Southern Brown Bandicoot. Victorian Government Department of Environment and Primary Industries, Melbourne (January 2014)

DEPI 2014b. Permitted clearing of native vegetation – Biodiversity assessment handbook. Version 0.2. Victorian Government Department of Environment and Primary Industries, Melbourne (January 2014).

DEWHA 2009a. *Matters of National Environmental Significance. Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Australian Government Department of the Environment, Water, Heritage & the Arts, Canberra.

DEWHA 2009b. Significant impact guidelines for the vulnerable Growling Grass Frog (*Litoria raniformis*). Nationally threatened species and ecological communities EPBC Act policy statement 3.14, Department of the Environment, Water, Heritage & the Arts, Australian Government, Canberra.

DEWHA 2009c. Significant impact guidelines for 36 migratory shorebird species: Migratory species. Draft EPBC Act policy statement 3.21. Australian Government Department of the Environment, Water, Heritage & the Arts, Canberra.

DEWHA 2010. *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies. Significant impact guidelines 1.2*. Australian Government Department of the Environment, Water, Heritage and the Arts, Canberra.

DoE 2013. *Matters of National Environment Significance: Significant impact guidelines 1.1. Environment Protection Biodiversity Conservation Act 1999*. Australian Government Department of the Environment, Canberra.

DoE 2014. *Glycine latrobeana* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>. Accessed Mon, 18 Aug 2014 12:54:43 +1000.

DSE 2003a. Flora and Fauna Guarantee Action Statement No. 182: Central Gippsland Plains Grassland, Forest Red-gum Grassy Woodland, Northern Plains Grassland, South Gippsland Plains Grassland, Western (Basalt) Plains Grassland. Department of Sustainability and Environment, Melbourne.

DSE 2003b. Flora and Fauna Guarantee Action Statement No. 74: New Holland Mouse *Pseudomys novaehollandiae*. The Victorian Department of Sustainability and Environment, East Melbourne.

DSE 2005a. *Advisory List of Rare or Threatened Plants in Victoria – 2005*. Victorian Government Department of Sustainability & Environment, East Melbourne.

DSE 2005b. *Index of Stream Condition: The Second Benchmark of Victorian River Condition*. Victorian Government Department of Sustainability & Environment, East Melbourne.

DSE 2010a. Victorian Biodiversity Atlas 'VBA_FAUNA25, FAUNA100 & FAUNARestricted, FLORA25, FLORA100 & FLORARestricted' August 2010. Victorian Government Department of Sustainability & Environment, Melbourne.

DSE 2013. *Advisory List of Threatened Vertebrate Fauna in Victoria – 2013*. Victorian Government Department of Environment & Primary Industries, Melbourne.

DSEWPaC 2011a. *Environment Protection and Biodiversity Conservation Act 1999* draft referral guidelines for the endangered southern brown bandicoot (eastern), *Isoodon obesulus obesulus*. Australian Government Department of Sustainability, Environment, Water, Population & Communities, Canberra.

DSEWPaC 2011b. *Survey guidelines for Australia's threatened fish: Guidelines for detecting fish listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Australian Government Department of Sustainability, Environment, Water, Population & Communities. Canberra.

DSEWPaC 2012. Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, listing advice. Threatened Species Scientific Committee, Department of Sustainability, Environment, Water, Populations and Communities, Canberra.

Duncan M, Pritchard A and Coates F. 2009. National Recover Plan for Fifteen Threatened Orchids in South-eastern Australia. Department of Sustainability and Environment, Victoria.

GHD 2013. Port of Hastings Development Authority, Port Container Expansion Project: Preliminary Ecological Assessment. Report to Port of Hastings Development Authority. Job No. 31/29838/06.

Hero JM, Littlejohn M and Marantelli G. 1990. *Frogwatch Field Guide to Victorian Frogs*. Department of Conservation and Environment, East Melbourne.

Jeanes J and Backhouse G. 2006. *Wild Orchids of Victoria Australia*. Aquatic Photographics, Australia.

Legg M. 2006. Flora and Fauna Survey and Management Prescriptions for Crib Point Stony Point Foreshore, Crib Point, October, 2005 to October, 2006. Report to Crib Point Stony Point Foreshore Committee of Management Inc. Author: Legg, M. Mal's Environmental and Ecological Services.

Melbourne Water 2007. *Port Phillip and Western Port Regional River Health Strategy*. Western Port Catchment, Melbourne Water, Melbourne.

Melbourne Water 2013a. *Port Phillip and Western Port Healthy Waterways Strategy*. Western Port Catchment, Melbourne Water, Melbourne

Melbourne Water 2013b. *Port Phillip and Western Port Stormwater Strategy*. Western Port Catchment, Melbourne Water, Melbourne

Mungere J. 2008. Mornington Peninsula and Western Port Biosphere Reserve Foundation LTD Information Resource Database Updating Project. School of Geography and Environmental Science / Mornington Peninsula and Western Port Biosphere Reserve Foundation Board, Melbourne.

Mornington Peninsula & Western Port Biosphere Reserve Foundation Ltd (MPWPBRF). 2014. Western Port Biosphere. <http://www.biosphere.org.au/index.html>. Accessed 4th August 2014.

Oates A and Taranto M. 2001. *Vegetation mapping of the Port Phillip & Westernport region*. Arthur Rylah Institute for Environmental Research, Victorian Government Department of Natural Resources & Environment, Melbourne.

PPWCMA 2004. *Port Phillip and Westernport Regional Catchment Strategy*. Port Phillip & Westernport Catchment Management Authority, Victoria.

PPWCMA 2006. *Port Phillip and Western Port Native Vegetation Plan*. Port Phillip & Westernport Catchment Management Authority, Frankston, Victoria.

Robertson P, Heard GW and Scroggie M. 2002. The ecology and conservation status of the Growling Grass Frog *Litoria raniformis* within the Merri Creek corridor. Interim Report: Distribution, Abundance and Habitat Requirements. Wildlife Profiles Pty Ltd Report for the Department of Natural Resources and Environment.

Sinclair S, Tonkinson D, Downe J, Taranto M, Kefford E and White M. 2006. Remnant Native Vegetation on the Mornington Peninsula: Mapping and Condition Assessment. Final Report. Arthur Rylah Institute for Environmental Research Heidelberg, Victoria.

Van Dyck and Strahan. 2008. The Mammals of Australia. Reed New Holland, Sydney.

Walsh NG and Stajsic V. 2007. A Census of the Vascular Plants of Victoria. Eighth edition, Royal Botanic Gardens Melbourne.

Wong T, Breen P and Lloyd S. 2000. *Water Sensitive Road Design – Design Options for Improving Stormwater Quality of Road Runoff*. Technical Report 00/1, Cooperative Research Centre for Catchment Hydrology.

Yugovic J. 2011. Ecology of the Kooweerup Swamp and associated grasslands. *Proceeding of The Royal Society of Victoria*: 123(2): 172–188.

DRAFT

Appendix A. Figures

Figure A1: Location of the study area

Figure A2: Matters of national environmental significance

Figure A3: Ecological vegetation classes and records of threatened species

Figure A4: Significant flora and fauna records within 5 km of the study area

Figure A5: Potential threatened fauna habitat

Figure A6: High priority areas for detailed survey

Figure A7: Strategic Biodiversity Score

DRAFT

Appendix B. Flora & fauna of the study area

DRAFT

Appendix B1. Flora

Notes to tables:

EPBC Act: CR - Critically Endangered EN - Endangered VU – Vulnerable PMST – Protected Matters Search Tool	DSE 2005: e - endangered v - vulnerable r - rare
FFG Act: L - listed as threatened under FFG Act P - protected under the FFG Act (public land only)	
Noxious weed status: SP - State prohibited species RP - Regionally prohibited species RC - Regionally controlled species RR - Regionally restricted species	# - Native species outside natural range

B1.1 Listed flora species

The following table includes the listed flora species that have potential to occur within the study area. The list of species is sourced from the Victorian Flora Information System and the Protected Matters Search Tool (DoE; accessed on 05.08.14), or added by Biosis on the basis of expert opinion.

Table B1.1. Listed flora species recorded / predicted to occur within 5 km of the study area

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
National Significance									
Caladenia insularis	French Island Spider-orchid	VU	v	L	-		Dense, wet heath and heathy woodland.	Low – while this species appears confined to French Island, its habitat is present with the SUZ1 and it conceivable that its range could extend into this area.	Negligible – habitat generally absent.
Amphibromus fluitans	River Swamp Wallaby-grass	VU			2007	PMST	Swampy areas, mainly along the Murray River between Wodonga and Echuca with scattered records from southern Victoria.	Present – recorded south of the Tyabb Waste Disposal Centre.	Medium – may be found in suitable wetland vegetation where such vegetation is found.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Caladenia orientalis</i>	Eastern Spider-orchid	EN	e	L	-		Heath and heathy woodlands in coastal areas between the Mornington Peninsula and Wilsons Promontory.	Low – Habitat for this species (s.s.) is found within SUZ1 although it has not been recorded within the Western Port area.	Negligible – habitat not present.
<i>Caladenia robinsonii</i>	Frankston Spider-orchid	EN	e	L	-		Coastal heathy woodland; only confirmed population is near Rosebud.	Negligible – associated vegetation types present although not recorded in the Western Port area.	Negligible – habitat not present.
<i>Dianella amoena</i>	Matted Flax-lily	EN	e	L	-		Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	Negligible – associated vegetation types generally scarce.	Medium – associated vegetation type present although not recorded in the Western Port area.
<i>Euphrasia collina</i> subsp. <i>muelleri</i>	Purple Eyebright	EN	e	L	1919		Grasslands and grassy woodlands; few populations are known to still exist.	Low – associated vegetation types generally scarce.	Medium – associated vegetation types present.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
Glycine latrobeana	Clover Glycine	VU	v	L	2009	PMST	Grasslands and grassy woodlands, particularly those dominated by Themeda triandra.	Low – associated vegetation types generally scarce.	Medium – associated vegetation types present.
Prasophyllum frenchii	Maroon Leek-orchid	EN	e	L	-		Grassland and grassy woodland environments on sandy or black clay loam soils, that are generally damp but well drained.	Low – associated vegetation types generally scarce.	Low – associated vegetation types generally scarce or in low condition.
Prasophyllum spicatum	Dense Leek-orchid	VU	e		-		Heathland and Heathy Woodlands.	Medium – associated vegetation types present. Found to the south of Hastings at Cribb Point.	Low - associated vegetation types generally scarce or in low condition.
Pterostylis cucullata	Leafy Greenhood	VU	v	L	-		Alkaline scrub dominated by tea tree, sheoke and other shrubs.	Negligible – no habitat present.	Negligible – no habitat present.
Pterostylis chlorogramma	Green-striped Greenhood	VU	v	L	-		Heathy Woodland, Damp Heathy Woodland and Lowland Forest	Medium – associated vegetation types present.	Low – associated vegetation types generally scarce or in low condition.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Senecio psilocarpus</i>	Swamp Fireweed	VU	v	-	-		Seasonally-inundated herb-rich swamps, growing on peaty soils or volcanic clays.	Medium – may be found in wetland vegetation.	Medium – may be found in wetland vegetation.
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	EN	e	L	-		Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities at drier inland sites.	Low –habitat present although not recorded in the Western Port area.	Negligible – no habitat present.
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU		L	-		Heathy open forest and woodlands, on well-drained sand, gravel and clay loam soils.	Low –habitat present although not recorded in the Western Port area.	Low –habitat present although not previously recorded.
<i>Xerochrysum palustre</i>	Swamp Everlasting	VU	v	L	-		Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	Medium – may be found in wetland vegetation.	Medium – may be found in wetland vegetation.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
State Significance									
Acacia howittii	Sticky Wattle		r		2006		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	As per DEPI habitat model	As per DEPI habitat model
Alternanthera sp. 1 (Plains)	Plains Joyweed		k		2007		Clay or gilgai soils of the Riverina area and drier clay/clay-loam soils of the basalt plains west of Melbourne.	As per DEPI habitat model	As per DEPI habitat model
Atriplex paludosa subsp. paludosa	Marsh Saltbush		r		1999		Boggy, saline soils on coastal or near-coastal saltmarshes and tidal-flats.	As per DEPI habitat model	As per DEPI habitat model
Avicennia marina subsp. australasica	Grey Mangrove		r		2009		Low energy coastlines in the inter-tidal zone.	As per DEPI habitat model	As per DEPI habitat model
Caesia parviflora var. minor	Pale Grass-lily		k		1977		Lowland grasslands and grassy woodlands, often in sites with poor drainage.	As per DEPI habitat model	As per DEPI habitat model

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Caladenia aurantiaca</i>	Orange-tip Finger-orchid		r		1999		Lowland forest and heathy woodlands, typically near the coast.	As per DEPI habitat model	As per DEPI habitat model
<i>Caladenia dilatata</i> s.s.	Green-comb Spider-orchid		k		2006		Heathy Woodland, Damp Heathy Woodland and Lowland Forest.	As per DEPI habitat model	As per DEPI habitat model
<i>Caladenia mentiens</i>	Cryptic Pink-fingers		k		2003		Heathland and Heathy Woodland.	As per DEPI habitat model	As per DEPI habitat model
<i>Cardamine paucijuga</i> s.s.	Annual Bitter-cress		v		1998		Moist forests and riparian habitats	As per DEPI habitat model	As per DEPI habitat model
<i>Chiloglottis X pescottiana</i>	Bronze Bird-orchid		r		1997		Lowland Forest	As per DEPI habitat model	As per DEPI habitat model
<i>Chorizandra australis</i>	Southern Bristle-sedge		k		1995		Swamps and waterholes.	As per DEPI habitat model	As per DEPI habitat model
<i>Correa reflexa</i> var. <i>lobata</i>	Powelltown Correa		r		1981		Heathland and Heathy Woodland.	As per DEPI habitat model	As per DEPI habitat model
<i>Corunastylis ciliata</i>	Fringed Midge-orchid		k		1965		Heath, and heathy and grassy woodlands.	As per DEPI habitat model	As per DEPI habitat model
<i>Corymbia maculata</i>	Spotted Gum		v		2009		In Victoria, naturally confined to a small population near Mt Tara in the east of the state.	As per DEPI habitat model	As per DEPI habitat model

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Craspedia canens</i>	Grey Billy-buttons		e	L	1920		Low altitude grasslands between Cranbourne and Traralgon.	Negligible – no habitat present.	Low – some associated grassy vegetation may be present in the north of the study area.
<i>Dianella</i> sp. aff. <i>longifolia</i> (Benambra)	Arching Flax-lily		v		2008		The habitat requirements of this species are poorly known.	As per DEPI habitat model	As per DEPI habitat model
<i>Diuris punctata</i> var. <i>punctata</i>	Purple Diuris		v	L	1997		Fertile, loamy soils and periodically wet areas in lowland grasslands, grassy woodlands, heathy woodlands and open heathlands.	Medium – associated vegetation types present. Recent records from nearby.	Medium – associated vegetation types present. Recent records from nearby.
<i>Diuris subalpina</i>	Small Snake-orchid		e		1919		Various woodlands and forest.	As per DEPI habitat model	As per DEPI habitat model
<i>Entolasia stricta</i>	Upright Panic		k		2008		Damp Heathland	As per DEPI habitat model	As per DEPI habitat model
<i>Eucalyptus fulgens</i>	Green Scentbark		r		2006		Forests and woodlands of the Gippsland Plain and adjacent foothills.	As per DEPI habitat model	As per DEPI habitat model
<i>Eucalyptus X studleyensis</i>	Studley Park Gum		e		1994		Swampy Woodland and some other woodland / forests	As per DEPI habitat model	As per DEPI habitat model

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Eucalyptus yarraensis</i>	Yarra Gum		r		2005		Valley flats and along stream on soils subject to periodic inundation or waterlogging.	As per DEPI habitat model	As per DEPI habitat model
<i>Exocarpos syrticola</i>	Coast Ballart		r		1988			As per DEPI habitat model	As per DEPI habitat model
<i>Juncus revolutus</i>	Creeping Rush		r		2008		Saltmarshes and other similarly saline inland habitats.	As per DEPI habitat model	As per DEPI habitat model
<i>Lachnagrostis perennis</i> spp. agg.	Perennial Blown-grass		k		1990		Wetlands	As per DEPI habitat model	As per DEPI habitat model
<i>Lachnagrostis robusta</i>	Salt Blown-grass		r		2008			As per DEPI habitat model	As per DEPI habitat model
<i>Lawrenia spicata</i>	Salt Lawrenzia		r		1991		Fringe habitats of coastal saltmarsh communities.	As per DEPI habitat model	As per DEPI habitat model
<i>Limonium australe</i>	Yellow Sea-lavender		r		2008		Margins of Saltmarshes and other similarly saline inland habitats.	As per DEPI habitat model	As per DEPI habitat model
<i>Lotus australis</i> var. <i>australis</i>	Austral Trefoil		k		2003		Mostly coastal vegetation within the study area.	As per DEPI habitat model	As per DEPI habitat model
<i>Marsilea mutica</i>	Smooth		k		1998		Wetlands		

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
	Nardoo								
Melaleuca armillaris subsp. armillaris	Giant Honey-myrtle		r		2011		Near coastal heath/scrub, rocky coast and foothill outcrops.	As per DEPI habitat model	As per DEPI habitat model
Prasophyllum lindleyanum	Green Leek-orchid		v		1919		Fertile soils in woodland or scrubby heath.	As per DEPI habitat model	As per DEPI habitat model
Pterostylis pedoglossa	Prawn Greenhood		v		1997		Heath and heathy woodland near the coast.	As per DEPI habitat model	As per DEPI habitat model
Pterostylis tunstallii	Granite Greenhood		v		1960		Lowland and foothill forests, often on base of large granite boulders.	As per DEPI habitat model	As per DEPI habitat model
Ruppia maritima s.s.	Water Tassel		k		1980		Waterways	As per DEPI habitat model	As per DEPI habitat model
Senecio glomeratus subsp. longifructus	Annual Fireweed		r		1921		Areas adjacent to streams, swamps and saline flats.	As per DEPI habitat model	As per DEPI habitat model
Sparganium subglobosum	Floating Bur-reed		k		1954		Waterways	As per DEPI habitat model	As per DEPI habitat model

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in other LTC
		EPBC	DSE	FFG					
<i>Thelionema umbellatum</i>	Clustered Lily		r		1988		Sandy, often poorly drained soils of heathy woodlands and heathlands.	As per DEPI habitat model	As per DEPI habitat model
<i>Thelymitra circumsepta</i>	Naked Sun-orchid		v		2007		In damp, shaded areas in heath, woodlands and forest.	As per DEPI habitat model	As per DEPI habitat model
<i>Thelymitra pallidiflora</i>	Pallid Sun-orchid		e		2008		Heathy Woodland	As per DEPI habitat model	As per DEPI habitat model
<i>Triglochin minutissima</i>	Tiny Arrowgrass		r		2008		Scattered occurrences on damp saline soils near salt-lakes, and forming part of herbfields in coastal saltmarshes.	As per DEPI habitat model	As per DEPI habitat model
<i>Utricularia gibba</i>	Floating Bladderwort		v		1996		Aquatic Herbland	As per DEPI habitat model	As per DEPI habitat model
<i>Utricularia uniflora</i>	Single Bladderwort		k		1980		Aquatic Herbland	As per DEPI habitat model	As per DEPI habitat model

B1.2 CaLP Act listed weed species

Table B1.2. Weed species within the search area listed under the Catchment and Land Protection Act 1994

Scientific Name	Common_Name	CALP listing
Allium triquetrum	Angled Onion	RR
Alternanthera philoxeroides	Alligator Weed	SP
Alternanthera pungens	Khaki Weed	RP
Asparagus asparagoides	Bridal Creeper	RR
Calicotome spinosa	Spiny Broom	RP
Carduus pycnocephalus	Slender Thistle	RC
Carduus tenuiflorus	Winged Slender-thistle	RC
Cenchrus longispinus	Spiny Burr-grass	RP
Cenchrus macrourus	African Feather-grass	RP
Chrysanthemoides monilifera subsp. monilifera	African Boneseed	RC
Cirsium arvense	Perennial Thistle	RC
Cirsium vulgare	Spear Thistle	RC
Conium maculatum	Hemlock	RC
Convolvulus arvensis	Common Bindweed	RC
Crataegus monogyna	Hawthorn	RC
Cynara cardunculus subsp. flavescent	Artichoke Thistle	RC
Cytisus scoparius	English Broom	RC
Datura stramonium	Common Thorn-apple	RC
Diploaxis tenuifolia	Sand Rocket	RC
Dittrichia graveolens	Stinkwort	RC
Echium plantagineum	Paterson's Curse	RC
Eichhornia crassipes	Water Hyacinth	SP
Equisetum spp.	Horsetail	SP
Eragrostis curvula	African Love-grass	RC

Scientific Name	Common_Name	CALP Listing
Foeniculum vulgare	Fennel	RR
Genista linifolia	Flax-leaf Broom	RC
Genista monspessulana	Montpellier Broom	RC
Hypericum perforatum subsp. veronense	St John's Wort	RC
Hypericum tetrapterum var. tetrapterum	St Peter's Wort	RC
Jacobaea vulgaris	Ragwort	RC
Juncus acutus subsp. acutus	Spiny Rush	RC
Lavandula stoechas	Topped Lavender	RR
Leucanthemum vulgare	Ox-eye Daisy	RC
Lycium ferocissimum	African Box-thorn	RC
Moraea flaccida	One-leaf Cape-tulip	RC
Nassella tenuissima	Mexican Feather-grass	SP
Nassella trichotoma	Serrated Tussock	RC
Onopordum acanthium subsp. acanthium	Scotch Thistle	RP
Oxalis pes-caprae	Soursob	RR
Rosa rubiginosa	Sweet Briar	RC
Rubus fruticosus spp. agg.	Blackberry	RC
Salix cinerea	Grey Sallow	RR
Salix spp.	Willow	RR
Salpichroa organifolia	Pampas Lily-of-the-Valley	RC
Senecio pterophorus	African Daisy	RC
Solanum linnaeanum	Apple of Sodom	RC
Ulex europaeus	Gorse	RC
Watsonia meriana	Bugle Lily	RC
Watsonia meriana var. bulbillifera	Bulbil Watsonia	RC
Xanthium spinosum	Bathurst Burr	RC

Appendix B2: Fauna

Notes to tables:

EPBC Act: EX - Extinct CR - Critically Endangered EN - Endangered VU - Vulnerable CD - Conservation dependent	DSE 2013: ex - extinct cr - critically endangered en - endangered vu - vulnerable nt - near threatened dd - data deficient rx - regionally extinct
FFG Act: L - listed as threatened under FFG Act N - nominated for listing as threatened I - determined ineligible for listing	
Most recent database records are from the Victorian Biodiversity Atlas unless otherwise specified as follows # – Protected Matters Search Tool BA – Birds Australia Fauna species in these tables are listed within their taxonomic group.	

B2.1 Listed fauna species

The following table includes a list of the listed fauna species that have potential to occur within the study area. The list of species is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (DoE; accessed on 05.08.14), or added by Biosis on the basis of expert opinion.

TableB2.1: Listed fauna species recorded, or predicted to occur, within 5 km of the study area

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Mammals									
Sminthopsis leucopus	White-footed Dunnart		nt	L	1970		There are records of this species to the south of Hastings and suitable habitat occurs within the study area. This species inhabits diverse vegetation types but on the Gippsland Plain it is frequently associated with heathy vegetation communities.	High	Medium
Isodon obesulus obesulus	Southern Brown Bandicoot	EN	nt	L	2008	PMST	A population occurs at Jacks Beach Reserve in Hastings in Heathy Woodland. May also occur in other areas supporting Damp Heathy Woodland, Damp Sands Herb-rich Woodland, Estuarine Scrub, Grassy Woodland and Swamp Scrub. May also occur in non-native vegetation where there is sufficient cover.	Recorded	Recorded
Potorous tridactylus tridactylus	Long-nosed Potoroo	VU	en	L	1978	PMST	Six populations of Long-nosed Potoroo occur in Victoria within a range of habitats from open forests to heathy woodlands. The majority of their habitat is dominated by eucalypts. This species does not occur on the Mornington Peninsula.	Negligible	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu	L	-	PMST	Utilises a wide range of habitats from lowland rainforest in East Gippsland and coastal Stringybark forests to agricultural land and suburban gardens, with permanently established colonies in Melbourne, Geelong and Mallacoota. This species is likely to forage in flowering trees and shrubs throughout both SUZ1 and the LTC	High	High
Pseudomys novaehollandiae	New Holland Mouse	VU	vu	L	1984	PMST	Old records from heathy vegetation types around Hastings and Crib Point. Suitable Heathy Woodland and Damp Sands Herb-rich Woodland habitat occurs in the study area and populations may persist, despite the absence of contemporary records.	Recorded	Medium
Pseudomys fumeus	Smoky Mouse	EN	cr	L	-	PMST	Disjunct Victorian distribution with populations in the Snowfields, Eastern Highlands, East Gippsland, Otway Range and the Grampians. Recorded from a variety of vegetation communities ranging from coastal heath and heathy woodland in East Gippsland to subalpine heath and dry forest. The understorey vegetation is typically dominated by heathy shrubs, with seeds and berries providing an important food resource. This species does not occur on the Mornington Peninsula.	Negligible	Negligible
Arctocephalus	New Zealand		vu		-	PMST	Breeds on islands off the southern	High	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
forsteri	Fur Seal						Australian coast.		
Eubalaena australis	Southern Right Whale	EN	cr	L	-	PMST	Migrates between summer feeding grounds in the Southern Ocean to warmer northern waters over winter, where it can be found along the Victorian coastline. The coast 8km east of Warrnambool is a locally important calving and nursing site until late October or early November.	Low	Negligible
Megaptera novaeangliae	Humpback Whale	VU	vu	L	2010	PMST	Migrate between summer feeding grounds in the Southern Ocean to Northern waters where birthing and mating occurs. Increasingly recorded along the Victorian coast, occasionally entering Port Phillip and Western Port.	Recorded	Negligible
Balaenoptera edeni	Bryde's Whale		dd		-	PMST	A non-migratory species found year round in Australian waters, with the largest populations concentrated off the WA coast and around the Great Barrier Reef.	Low	Negligible
Birds									
Excalfactoria chinensis	King Quail		en	L	1981		The species has a preference for wet heath environments where they feed and nest on the ground, but have also been recorded in coastal heath. The current range of this species in Victoria is not known but it is likely to be severely restricted. While there is a population of this species on French Island in Western	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Geopelia cuneata	Diamond Dove		nt	L	2012		Port, it is unlikely that a population exists on the Mornington Peninsula. Is found in small flocks in grassy woodlands, semi-arid grasslands, spinifex and dry scrub areas. The species is rarely found far from water and is also known to inhabit open riparian woodlands. This species is not indigenous to the Mornington Peninsula and records most likely relate to aviary escapees.	Negligible	Negligible
Lewinia pectoralis	Lewin's Rail		vu	L	2013		Inhabits densely vegetated wetlands, including swamps, farm dams, saltmarshes, lakes and small pools that can range from fresh to saline water. May also use riverine forest.	As per DEPI's habitat model	As per DEPI's habitat model
Porzana pusilla	Baillon's Crane		vu	L	2011		Occurs in a variety of densely vegetated terrestrial and coastal wetlands including billabongs, swamps, creeks and rivers, including freshwater, brackish and saline environments. Occasionally recorded in grassed or vegetated areas (parks, gardens, golf courses) and marine environments (saltmarshes, coastal dunes and mudflats).	As per DEPI's habitat model	As per DEPI's habitat model
Pachyptila turtur	Fairy Prion		vu		1908		This marine waterbird can be found from sub-Antarctic to subtropical waters in the southern hemisphere, mostly occurring over continental shelves and slopes, and rarely coming close to shore except at	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							breeding islands and during rough weather.		
Diomedea exulans	Wandering Albatross	VU	en	L	-	PMST	Occurs from Antarctic to subtropical areas in the southern hemisphere. In Australia, observed over continental shelves often in areas of continental upwellings. Regularly recorded feeding in sheltered harbours, often gathering at sewerage outfalls.	Low	Negligible
Diomedea exulans	Wandering Albatross	VU	en	L	1960		Occurs from Antarctic to subtropical areas in the southern hemisphere. In Australia, observed over continental shelves often in areas of continental upwellings. Regularly recorded feeding in sheltered harbours, often gathering at sewerage outfalls.	Low	Negligible
Thalassarche melanophris	Black-browed Albatross	VU	vu	I	1980	PMST	Breeds in antarctic and sub-antarctic islands, but commonly occurs in pelagic waters off the coast of Victoria.	Low	Negligible
Thalassarche chrysostoma	Grey-headed Albatross	EN	vu	L	-	PMST	Occurs in warmer areas over winter, its breeding grounds are found in the Antarctic and subantarctic islands. Generally forages over the open oceans, there have been a small number of records over inshore and offshore areas along the Victorian coast.	Low	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
<i>Thalassarche cauta</i>	Shy Albatross	EN	vu	L	1980	PMST	The Shy Albatross is a marine pelagic species inhabiting sub-Antarctic and subtropical waters, spending the majority of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours.	Low	Negligible
<i>Diomedea antipodensis</i>	Antipodean Albatross	VU		L	-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
<i>Diomedea gibsoni</i>	Gibson's Albatross	VU		L	-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
<i>Diomedea sanfordi</i>	Northern Royal Albatross	EN			-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
<i>Thalassarche bulleri</i>	Pacific Albatross	VU			-	PMST	Buller's Albatross breeds in New Zealand and is a seasonal visitor to Victorian coastal waters where it occurs in pelagic and inshore waters.	Low	Negligible
<i>Thalassarche salvini</i>	Salvin's Albatross	VU			-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
<i>Diomedea exulans exulans</i>	Tristan Albatross	EN			-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
<i>Fregetta grallaria grallaria</i>	White-bellied Storm-Petrel (Tasman Sea)	VU			-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Thalassarche steadi	White-capped Albatross	VU			-	PMST	Breeds in antarctic and sub-antarctic islands, but occurs in pelagic waters off the coast of Victoria.	Low	Negligible
Phalacrocorax fuscescens	Black-faced Cormorant		nt		2002		Occurs in marine and estuarine habitats and forages over inshore waters and reefs, rarely entering small inlets or bays. Roost on islands, offshore rocks, sandbanks and jetties.	High	Low
Phalacrocorax varius	Pied Cormorant		nt		2013		Mainly inhabits marine environments and coastal waters including beaches, coastal lagoons, estuaries and rock platforms. Also found in terrestrial wetlands with open expanses of permanent water including rivers, inland lakes and billabongs. Breeds and roosts in trees or bushes along the edges of water body, as well as on artificial structures such as pylons.	High	High
Chlidonias leucopterus	White-winged Black Tern		nt		2006		A seasonal migrant that occurs in coastal, subcoastal and terrestrial wetlands including bays, estuaries, swamps and floodplains. Majority of records in Victoria are from the Gippsland Lakes and the western shoreline of Port Phillip Bay.	High	Medium
Chlidonias hybrida	Whiskered Tern		nt		2006		A breeding migrant to Australia from September to March where it occurs in wetlands, lakes, swamps, rivers, and other water bodies with submerged and emergent vegetation such as grasses,	High	High

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							sedges, reeds and rushes. Rarely recorded along rivers or creeks.		
Gelochelidon nilotica	Gull-billed Tern		en	L	2007		Usually occurs on shallow terrestrial wetlands, less often using sheltered embayments, estuaries, tidal mudflats and beaches. In Australia mainly breeds in inland areas following major flooding events.	As per DEPI's habitat model	As per DEPI's habitat model
Hydroprogne caspia	Caspian Tern		nt	L	2011		Occurs on exposed ocean beaches or in sheltered coastal embayments including harbours, lagoons, inlets, estuaries and river deltas usually with sandy or muddy margins and breeds in a variety of coastal habitats including banks, ridges and beaches of sand and shell, often in open or among low or sparse vegetation.	High	High
Sterna striata	White-fronted Tern		nt		1949		Regular migrant from March to October, where it can be found in Victoria's offshore waters, bays, reefs and islands.	High	High
Sternula albifrons	Little Tern		vu	L	2002	PMST	This bird is mostly recorded in sheltered coastal environments, including bays, lagoons and estuaries. Nests on sandy substrates containing much shell-grit, which provides good camouflage for their eggs.	As per DEPI's habitat model	As per DEPI's habitat model
Sternula nereis	Fairy Tern	VU	en	L	1981	PMST	Fairy Terns inhabit coastal environments including intertidal mudflats, sand flats and beaches. Nests above high-water mark on sandy shell-grit beaches.	High	Low

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Larus pacificus	Pacific Gull		nt	I	2013		Occurs along sandy and, less often, rocky coasts usually in areas protected from ocean swells, such as bays estuaries and lagoons. Breeds in a variety of coastal habitats including rocky outcrops, small hillocks, ridges, sides of cliffs and sometimes low-lying beaches. Sometimes occur up to 10 kilometres inland, especially at rubbish tips and wetlands.	High	High
Haematopus fuliginosus	Sooty Oystercatcher		nt		2007		A marine species typically inhabiting rocky shorelines, including cliff and reef areas, and sandy beaches between rocky headlands.	High	Low
Pluvialis squatarola	Grey Plover		nt		1981	PMST	Summer migrant to Australia, habitat includes mudflats, saltmarsh, tidal reefs and estuaries.	Medium	Negligible
Pluvialis fulva	Pacific Golden Plover		nt		1990	PMST	A migratory shorebird that usually occurs in small flocks and occupies a range of coastal habitats including mudflats, sandflats rocky shores and saltmarsh.	High	Medium
Thinornis rubricollis	Hooded Plover		vu	L	-	PMST	In south-east Australia, prefers sandy ocean beaches, especially those that are broad and flat, with a wide beach zone for feeding. Prefer beachcast seaweed for feeding activities and sparsely vegetated back dunes for shelter and nesting.	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Charadrius mongolus	Lesser Sand Plover		vu		1981	PMST	A migratory species that forages on exposed sand and mudflats. High tide roost sites are often located on beaches. This species has been recorded at Mud Islands within Port Phillip Bay, and Reef Island within Western Port. The species has also previously been recorded along the coastline at the Western Treatment Plant.	As per DEPI's habitat model	As per DEPI's habitat model
Charadrius leschenaultii	Greater Sand Plover		vu		-	PMST	A migratory species that forages on exposed sand and mudflats. High tide roost sites are often located on beaches. This species has been recorded at Mud Islands within Port Phillip Bay, and Reef Island within Western Port.	As per DEPI's habitat model	As per DEPI's habitat model
Numenius madagascariensis	Eastern Curlew		nt		2011	PMST	A migratory bird arriving in Australia from Russia and China from August and departing around February. Occurs in a variety of sheltered coastal habitats including harbours, inlets and coastal lagoons, usually with large sand flats or intertidal mudflats with seagrass. Occasionally observed on coastal rock platforms.	High	Recorded
Numenius phaeopus	Whimbrel		vu		1992	PMST	Whimbrels are summer migrants to Victoria where they are typically found in coastal environments foraging in mudflats, sandy shores and the crevices of rock platforms. The species is rarely	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Limosa limosa	Black-tailed Godwit		vu		1997		recorded inland. Primarily occurs in coastal environments such as bays, estuaries and lagoons with large intertidal mudflats or sandflats; occasionally found on rocky coasts or coral islets. Black-tailed Godwits have also been recorded in shallow and sparsely vegetated, near-coastal, wetlands; and less commonly inland in the environs of shallow, freshwater and saline lakes, swamps, dams and bore-overflows.	As per DEPI's habitat model	As per DEPI's habitat model
Tringa glareola	Wood Sandpiper		vu		-	PMST	Inhabits well vegetated shallow freshwater wetlands with emergent aquatic plants and dense fringing vegetation. This species is a migratory species from Eurasia with only a small number reaching Australia.	As per DEPI's habitat model	As per DEPI's habitat model
Tringa glareola	Wood Sandpiper		vu		1981		Inhabits well vegetated shallow freshwater wetlands with emergent aquatic plants and dense fringing vegetation. This species is a migratory species from Eurasia with only a small number reaching Australia.	As per DEPI's habitat model	As per DEPI's habitat model
Tringa brevipes	Grey-tailed Tattler		cr	L	1992	PMST	Summer migrant to coastal Australia it occurs in estuaries, tidal mudflats, mangroves, wave-washed rocks and reefs and shallow river margins coastal and inland.	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
<i>Actitis hypoleucos</i>	Common Sandpiper		vu		2010	PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March. Mainly found on saline intertidal mudflats in sheltered estuaries, embayments, harbours and lagoons.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Xenus cinereus</i>	Terek Sandpiper		en	L	1981	PMST		As per DEPI's habitat model	As per DEPI's habitat model
<i>Calidris canutus</i>	Red Knot		nt		2002	PMST	This non-breeding migrant typically occurs on intertidal mudflats, sandflats and sandy beaches of sheltered coasts, and a range of other coastal and near-coastal environments such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks; inland lakes and swamps are less commonly used.	High	Medium
<i>Calidris tenuirostris</i>	Great Knot		en	L	2002	PMST	Mainly found on intertidal mudflats, sandflats and sandy beaches.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Gallinago hardwickii</i>	Latham's Snipe		nt		2013	PMST	A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. Forages in soft mud at edge of wetlands and roosts in a variety of vegetation around wetlands including tussock	Recorded	Recorded

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							grasslands, reeds and rushes, tea-tree scrub, woodlands and forests.		
<i>Rostratula australis</i>	Australian Painted Snipe	EN	cr	L	-	PMST	Generally found in shallow, terrestrial freshwater wetlands with rank, emergent tussocks of grass, sedges and rushes. Australian Painted Snipe can occur in well vegetated lakes, swamps, inundated pasture, saltmarsh and dams.	Medium	Medium
<i>Grus rubicunda</i>	Brolga		vu	L	1845		Prefers shallow marshland areas, usually less than 50 cm deep with emergent vegetation. Most commonly found in south-west Victoria, the Northern Plains and associated parts of the Murray River. Feeds predominantly on wetland plants, but also forages in crops and pasture.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Plegadis falcinellus</i>	Glossy Ibis		nt		2006		Glossy Ibis are usually found foraging in wet pasture environments and low lying wetland areas. This species is only rarely recorded in Victoria. Prefers freshwater wetlands especially permanent or ephemeral water bodies on floodplains but also found in sheltered coastal environments.	Medium	Medium
<i>Platalea regia</i>	Royal Spoonbill		vu		2013		Often seen around permanent and ephemeral waters in the arid interior of east Australia foraging in shallow waters. Prefers terrestrial wetlands and wet grassland areas, particularly large expanses of water such as lakes, swamps	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							or lagoons. Also utilises rivers for its feeding activities and has regularly been recorded in coastal habitats such as estuaries, inlets and intertidal mudflats.		
Egretta garzetta	Little Egret		en	L	2012		Occupies a wide range of wetlands and typically prefers the shallows of wetlands for foraging activities. Occasionally they will forage in small waterways or wet grassland areas.	As per DEPI's habitat model	As per DEPI's habitat model
Ardea intermedia	Intermediate Egret		cr	L	2001		Breeds in flooded or fringing trees alongside wetlands.	As per DEPI's habitat model	As per DEPI's habitat model
Ardea modesta	Eastern Great Egret		vu	L	2013	PMST	Usually found in terrestrial wetland, estuarine and wet grassland habitats particularly permanent well-vegetated water bodies but also use freshwater meadows, channels and larger dams. Forages by wading on shallow open water, generally avoiding dry or deeply flooded areas preferring moist, low-lying, poorly drained pasture, especially near hollows and ditches and where tussocks of long grass are present. Uses estuarine mudflats as summer-autumn or drought refuges.	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Nycticorax caledonicus hillii	Nankeen Night Heron		nt		2013		Occurs in a variety of estuarine and terrestrial wetlands where it forages on the margins in shallow still or slow-moving water or exposed banks, mudflats and swamp vegetation of these environments. Also uses wet meadows and pastures, urban wetlands and ponds and preferring wetland areas with swampy fringing vegetation and nearby trees for roosting.	Recorded	Recorded
Ixobrychus minutus dubius	Little Bittern		en	L	2002		Inhabits terrestrial wetlands, preferably with dense emergent vegetation.	As per DEPI's habitat model	As per DEPI's habitat model
Botaurus poiciloptilus	Australasian Bittern	EN	en	L	2007	PMST	Occurs in wetlands with tall, dense vegetation where it forages in shallow water at the edges of pools or waterways. Prefers permanent freshwater habitats, particularly when dominated by sedges, rushes and reeds.	High	High
Anseranas semipalmata	Magpie Goose		nt	L	2008		Uses aquatic and terrestrial habitat, although most activity occurs on wetlands such as those associated with flood plains. Historically occurring in south-eastern Australia, however, loss of wetland habitats meant the species became extinct in Victoria in the early 1900s. Re-introduction attempts have had mixed results.	Medium	High

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Anas rhynchotis	Australasian Shoveler		vu		2013		Prefers large, permanent lakes and swamps with deep water, stable conditions and abundant aquatic vegetation. Less commonly recorded in small or shallow waters, such as billabongs, sewage ponds, freshwater rivers and densely vegetated farm dams. Forages in open water but nests in densely vegetated freshwater wetlands, where fringing vegetation may be an important habitat feature.	As per DEPI's habitat model	As per DEPI's habitat model
Stictonetta naevosa	Freckled Duck		en	L	2012		Freckled Ducks are usually found on densely vegetated freshwater wetlands. During dry conditions the birds move from ephemeral wetlands to large areas of permanent open water, particularly lakes and reservoirs.	As per DEPI's habitat model	As per DEPI's habitat model
Aythya australis	Hardhead		vu		2013		A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Also occurs in brackish wetlands and can be found in deep dams and water storage ponds. Occasionally in estuarine and littoral habitats such as salt pans, coastal lagoons and sheltered inshore waters. Avoids main streams or rivers, except in calm reaches where aquatic flora is developed.	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
<i>Oxyura australis</i>	Blue-billed Duck		en	L	2013		A largely aquatic species preferring deep, large permanent wetlands with stable conditions and abundant aquatic vegetation, including Melaleuca swamps. Occurs less commonly on river frontages, billabongs and flooded depressions. It is a secretive bird, rarely venturing far from dense vegetative cover in wetland areas.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Biziura lobata</i>	Musk Duck		vu		2010		A largely aquatic species preferring deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation. Often occurs in areas of dense vegetated cover within a wetland. Less commonly recorded in small or shallow waters, such as billabongs, sewage ponds, freshwater rivers and densely vegetated farm dams.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Circus assimilis</i>	Spotted Harrier		nt		2013		Inhabits open and wooded country of inland and sub-inland Australia, where they hunt over flat or undulating country with low vegetation cover. Most common over the Murray Valley with occasional visits to coastal Victoria.	High	High
<i>Accipiter novaehollandiae</i>	Grey Goshawk		vu	L	2011		Favours tall, wet forests in gullies but can occur in woodlands, dry forests, wooded farmlands and suburban parks. Relies on mature forests for breeding.	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		vu	L	2011	PMST	Occurs in marine habitats and terrestrial wetlands along or near coastal areas in eastern Victoria, particularly around large open wetlands such as deep freshwater swamps, lakes, reservoirs and billabongs. Uses tall trees in or near water for breeding.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Falco subniger</i>	Black Falcon		vu		2008		Primarily occurs in arid and semi-arid zones in the north, north-west and west of Victoria, though can be forced into more coastal areas by droughts and subsequent food shortages. Occurs in woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Hunts mostly over open plains and undulating land with large tracts of low vegetation.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Ninox connivens</i>	Barking Owl		en	L	2005		Prefers dry, open sclerophyll forests and woodlands across Australia including dense riparian galleries containing large hollow-bearing trees suitable for nesting. Often located at the interface between forests and cleared land containing abundant prey.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Ninox strenua</i>	Powerful Owl		vu	L	2013		Prefers tall open sclerophyll forest and woodlands and requires large, hollow-bearing eucalypts for breeding. While the species has been recorded from a wide range of woodland habitats, preferred	As per DEPI's habitat model	As per DEPI's habitat model

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							habitat typically contains a dense understorey and suitable roost trees with a dense canopy cover. The species is more commonly associated with large tracts of continuous forest, but will sometimes occur in more fragmented landscapes including suburban parklands though rarely, if ever, breeds in these areas.		
Neophema pulchella	Turquoise Parrot		nt	L	1982		Occupies woodlands and open forests in the foothills of the Great Dividing Range, in areas supporting a ground-cover of grasses and understorey of low shrubs. Individuals typically forage amongst grasses on or near the ground.	As per DEPI's habitat model	As per DEPI's habitat model
Neophema chrysogaster	Orange-bellied Parrot	CR	cr	L	1987	PMST	Annual migrant to coastal Victoria from breeding grounds in south-west Tasmania, appearing from approximately March to October. Forages on coastal or near-coastal areas such as saltmarshes, coastal dunes, pastures, shrublands, estuaries, islands, beaches and moorlands.	Medium	Medium
Lathamus discolor	Swift Parrot	EN	en	L	2011	PMST	Migrates to south-east mainland Australia during the winter months where it prefers dry, open eucalypt forests and woodlands, especially Box Ironbark Forest in north-central Victoria. Has also been recorded in urban parks, gardens, street	High	High

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Pezoporus wallicus	Ground Parrot		en	L	1845		trees and golf courses with flowering ornamental trees and shrubs. Mainly found in heathland, sedgeland or buttongrass plains providing medium to dense cover.		
Ceyx azureus	Azure Kingfisher		nt		2011		Azure Kingfishers are found in association with well vegetated freshwater wetlands and slow-flowing creeks and rivers, including artificial wetlands and drains, of open riverine or swamp forest or woodland environments and occasionally among mangroves in sheltered coastal areas. They usually perch in shady, overhanging vegetation, nest in burrows tunnelled into banks above the floodline and generally forage by plunge-diving from a perch into the water body.	As per DEPI's habitat model	As per DEPI's habitat model
Melanodryas cucullata	Hooded Robin		nt	L	2008		Occupies a range of open woodlands including those dominated by Eucalypts, Acacias and Callitris with an understorey of smaller trees, shrubs and grasses.	Medium	Recorded
Cinclosoma punctatum	Spotted Quail-thrush		nt		1929		Occurs in drier forests, woodlands and scrub of south eastern Australia. Prefers areas with leaf litter, branches, rocks and tussocks. Often found on the sunny side of dry ridges.	Low	Low

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler		en	L	2000		Typically occupies open forests and woodlands north of the Great Dividing Range including dry forests and woodlands, acacia scrub, wooded farmlands and roadside trees. Occurs in breeding groups that seldom remain in southern areas of Victoria.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Hylacola pyrrhopygia</i>	Chestnut-rumped Heathwren		vu	L	2003		Occurs in shrubland and heathland areas, and in dense scrubby areas of forests and woodlands. This is a shy species that typically forages on or near the ground and therefore requires habitat with suitable structure.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Chthonicola sagittata</i>	Speckled Warbler		vu	L	1909		Occurs in open forest and Box Ironbark Woodlands, usually with scattered shrubs and a cover of acacias. Seldom seen far from dense patches of shrubs.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Grantiella picta</i>	Painted Honeyeater		vu	L	2012		A migratory species that breeds in southern Australia, it occupies dry open woodlands and forests located on the inland foothills of the Great Dividing Range. Typically forages for fruit and nectar in mistletoes and in tree canopies.	As per DEPI's habitat model	As per DEPI's habitat model
<i>Anthochaera phrygia</i>	Regent Honeyeater	EN	cr	L	-	PMST	Inhabits dry woodlands and forests dominated by Box Ironbark eucalypts. Distribution currently restricted to the Chiltern - Mt Pilot National Park in north-eastern Victoria following severe range contraction and population decline.	Negligible	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Stagonopleura guttata	Diamond Firetail		vu	L	1908		Occurs mostly in the lowlands and foothills in the north of Victoria. It has specific habitat requirements, which include grassy woodlands with tree cover for refuge and an undisturbed ground layer with grasses.	As per DEPI's habitat model	As per DEPI's habitat model
Thalassarche melanophrys impavida	Campbell Albatross	VU			-	PMST	Occurs in open marine waters of southern and south eastern Australia. Breeding occurs on Campbell Island, New Zealand.	Medium	Low
Macronectes giganteus	Southern Giant-Petrel	EN	vu	L	1980	PMST	An opportunistic scavenger and predator, adults of this species are present all year round at Antarctic breeding colonies, from where immature birds disperse, some as far north as subtropical areas.	Medium	Low
Macronectes halli	Northern Giant-Petrel	VU	nt	L	-	PMST	Breeds in coastal habitats on subantarctic islands. Dispersal movements of juveniles are poorly known but have been observed along temperate coastal areas of Australia, Africa, South America and New Zealand. Often seen around sewer outfalls or seal and penguin colonies.	Medium	Low
Calidris subminuta	Long-toed Stint		nt		1986		Occurs on a variety of terrestrial freshwater or brackish wetlands such as lakes, swamps, river floodplains, streams, lagoons, sewage ponds and reservoirs. The species is commonly observed on muddy fringes of drying ephemeral lakes and swamps. It is less commonly found	High	Medium

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							on tidal estuaries, saline lakes, saltponds and bore swamps.		
Diomedea epomophora	Royal Albatross	VU	vu	L	-	PMST	Pelagic species that breeds on subantarctic islands	Medium	Low
Calidris melanotos	Pectoral Sandpiper		nt		2007		Occurs in a variety of wetland habitats with fringing mudflats including bays, coastal lagoons, lakes, swamps, creeks, inundated grasslands, saltmarshes and artificial wetlands. Mostly recorded from Port Phillip Bay and Murray River Valley region.	High	High
Reptiles									
Caretta caretta	Loggerhead Turtle	EN			-	PMST	Loggerhead Turtles forage widely in waters of coral and rocky reefs, seagrass beds and muddy bays throughout tropical eastern, northern and western Australia. Nesting occurs in coastal environments of northern WA, NT and QLD.	Negligible	Negligible
Chelonia mydas	Green Turtle	VU			-	PMST	Marine species with a pan-tropical distribution throughout the world. More abundant along the tropical coasts of Australia and the Great Barrier Reef. Green Turtles spend their first five to ten years drifting on ocean currents.	Negligible	Negligible
Dermochelys coriacea	Leathery Turtle	EN	cr	L	-	PMST	Marine species usually sighted along the eastern seaboard often in bays, estuaries and rivers. Occurs routinely in temperate waters.	Low	Low

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Varanus varius	Lace Goanna		vu		1973		Occurs in variety of wooded habitats, including woodlands. Shelters in hollow trunks, limbs and logs.	As per DEPI's habitat model	As per DEPI's habitat model
Lissolepis coventryi	Swamp Skink		vu	L	2010		Occupies swamp scrub habitat in cool, temperate, low-lying wetlands and swamp margins with a dense shrub layer, particularly in near-coastal areas ranging from the Mt Gambier region in the west, across southern Victoria to just beyond the NSW border to the east. Often associated with stands of paperbark and tea-tree, suitable habitat occurs along rivers, lakes, swamp margins and estuarine areas, usually in heathy or scrubby areas.	As per DEPI's habitat model	As per DEPI's habitat model
Pseudemoia rawlinsoni	Glossy Grass Skink		nt		2000		Primarily associated with damp environments like drainage lines, soaks and the margins of creeks though can also inhabit the fringes of coastal saltmarshes. Dense vegetation including rank grass, reeds and sedges, provide the moist microenvironments in which the species has been recorded most frequently.	High	High

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
Frogs									
Pseudophryne semimarmorata	Southern Toadlet	EPBC	DSE	FFG	vu	2013	Occupies a variety of habitats in south-eastern Australia, such as open forests, lowland woodlands and heathlands where adults shelter beneath leaf litter and other debris in moist soaks and depressions.	As per DEPI's habitat model	As per DEPI's habitat model
Litoria raniformis	Growing Grass Frog	VU	en	L	1999	PMST	Occupies a variety of permanent and semi-permanent water bodies generally containing abundant submerged and emergent vegetation, within lowland grasslands, woodlands and open forests.	Medium	Medium
Fishes									
Prototroctes maraena	Australian Grayling	VU	vu	L	-	PMST	A diadromous species which spends most of its life in freshwater within rivers and large creeks. Juveniles inhabit estuaries and coastal seas. Adults occur in freshwater habitats, typically rivers and streams with cool, clear waters and gravel substrates, but occasionally also in turbid waters. No records in catchments within SUZ1 or LTC. Generally inhabits larger waterways.	Low	Low
Galaxiella pusilla	Dwarf Galaxias	VU	vu	L	2009	PMST	Occurs in relatively shallow still or slow flowing water bodies including streams, wetlands, drains, that in many instances are ephemeral and partially dry up over summer. Typically requires abundant marginal and aquatic vegetation. Has	High	High

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
							been recorded within the LTC footprint or in waterways that pass through the footprint (Watsons Creek, Boggy Creek, Eastern Contour Drain and Langwarrin Creek)		
Nannoperca obscura	Yarra Pygmy Perch	VU	nt	L	-	PMST	A freshwater, non-migratory fish preferring heavily vegetated, slow flowing or still aquatic habitats but also known to occur in tiny semi-permanent habitats. No record in catchments within SUZ1 or LTC. Habitat may be present but last known record in Dandenong Creek in 1982.	Low	Low
Mugilogobius platynotus	Pale Mangrove Goby		vu	L	2009		In Victoria it is found almost exclusively in the tidal mangrove forests of estuaries.	As per DEPI's habitat model	As per DEPI's habitat model
Carcharodon carcharias	Great White Shark	VU	vu	L	-	PMST	The White Shark is widely distributed, and located throughout temperate and sub-tropical regions in the northern and southern hemispheres. It is primarily found in the coastal and offshore areas of the continental and insular shelves and offshore continent.	Low	Negligible

Scientific name	Common Name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in SUZ1	Likely occurrence in LTC
		EPBC	DSE	FFG					
Invertebrates									
Synemon plana	Golden Sun Moth	CR	cr	L	-	PMST	This medium-sized diurnal moth inhabits grassy woodlands and grasslands. Once thought to be a specialised species inhabiting grasslands dominated by Wallaby-grasses, it is now recognised that this species can occur in exotic grasslands dominated by Chilean Needle Grass Nassella neesiana.	Negligible	Negligible
Eucalliax tooradin	Ghost shrimp		vu	L	1965		Marine/estuarine species. Intertidal mudflats to a depth of 3 m	Medium	Negligible
Michelea microphylla	Michelea Species 5256		vu	L	1965		Marine/estuarine species. Intertidal mudflats to a depth of 3 m	Medium	Negligible

B2.2 Migratory species (EPBC Act listed)

Table B2.2. Migratory fauna species recorded or predicted to occur within 5 km of the study area.

Scientific Name	Common Name	Most recent record
Mammals		
<i>Caperea marginata</i>	Pygmy Right Whale	-
<i>Balaenoptera edeni</i>	Bryde's Whale	-
<i>Lagenorhynchus obscurus</i>	Dusky Dolphin	-
Birds		
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	1981
<i>Ardenna carneipes</i>	Flesh-footed Shearwater	-
<i>Fregata ariel</i>	Lesser Frigatebird	1929
<i>Stercorarius parasiticus</i>	Arctic Jaeger	1981
<i>Arenaria interpres</i>	Ruddy Turnstone	1991
<i>Pluvialis squatarola</i>	Grey Plover	1981
<i>Pluvialis fulva</i>	Pacific Golden Plover	1990
<i>Charadrius bicinctus</i>	Double-banded Plover	2011
<i>Numenius minutus</i>	Little Curlew	1986
<i>Limosa lapponica</i>	Bar-tailed Godwit	1981
<i>Tringa brevipes</i>	Grey-tailed Tattler	1992
<i>Tringa incana</i>	Wandering Tattler	-
<i>Tringa nebularia</i>	Common Greenshank	2002
<i>Tringa stagnatilis</i>	Marsh Sandpiper	1979
<i>Xenus cinereus</i>	Terek Sandpiper	1981
<i>Calidris ferruginea</i>	Curlew Sandpiper	2002
<i>Calidris ruficollis</i>	Red-necked Stint	2011
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	2007
<i>Calidris tenuirostris</i>	Great Knot	2002
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	-
<i>Pandion cristatus</i>	Eastern Osprey	-
<i>Merops ornatus</i>	Rainbow Bee-eater	2011
<i>Hirundapus caudacutus</i>	White-throated Needletail	2013

Scientific Name	Common Name	Most recent record
<i>Apus pacificus</i>	Fork-tailed Swift	1986
<i>Rhipidura rufifrons</i>	Rufous Fantail	2010
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	2013
<i>Monarcha melanopsis</i>	Black-faced Monarch	-
<i>Acrocephalus stentoreus</i>	Clamorous Reed Warbler	2013
<i>Tryngites subruficollis</i>	Buff-breasted Sandpiper	1984
<i>Philomachus pugnax</i>	Ruff	1983
<i>Sterna hirundo</i>	Common Tern	1974
<i>Bubulcus ibis</i>	Cattle Egret	2013
<i>Gallinago megala</i>	Swinhoe's Snipe	-
<i>Gallinago stenura</i>	Pin-tailed Snipe	-
Fishes		
<i>Lamna nasus</i>	Porbeagle	-

Appendix B3: Examples of EVCs within the study area



Plate B3.1: Swamp Scrub at Hastings. This EVC provides habitat for several threatened species including Southern Brown Bandicoot and Swamp Skink.



Plate B3.2: Mangrove Shrubland and Coastal Saltmarsh at Hastings.



Plate B3.3: Coastal Saltmarsh at Hastings. This EVC includes communities that are consistent with the EPBC Act listed ecological community Subtropical and Temperate Coastal Saltmarsh.



Plate B3.4: Scattered trees and patches of Damp Heathy Woodland in the north of the LTC.



Plate B3.5: Example of Damp Heathy Woodland with a largely cleared understorey in the north of the LTC.

Appendix B4: Aquatic features within the study area



Plate B4.1: Watsons Creek (Eramosa Road East).



Plate B4.2: Olivers Creek (Bayview Road).



Plate B4.3: King Creek (Marine Parade).



Plate B4.4: Langwarrin Creek (Baxter-Tooradin Road).



B4.5: Eastern Contour Drain (Cranbourne-Frankston Road).

Appendix B5: Ecology and Native Vegetation Glossary

Items marked with 'A' are cited from DEPI (2013a); items marked with 'B' are cited from DSE (2007b) and items marked with a 'C' are cited from DEPI (2014b).

Avoid^A

Avoiding removing any native vegetation when undertaking a use or development. This can be either by not permitting or not going ahead with the use or development, or locating it elsewhere so that removing native vegetation is not required.

Biodiversity^A

The variety of all life forms, the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part.

Biodiversity Interactive Map (BIM)

Web based interactive map available on the DSE website that provides information on the biodiversity of Victoria and displays flora and fauna data from the Victorian Biodiversity Atlas.

Bioregion^B

Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values. A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.

Canopy Tree^C

Is a mature tree greater than 3 m in height and is normally found in the upper layer of a vegetation type. Immature trees that are not yet able to flower and are less than three metres in height are considered part of the understorey (see definition of understorey).

Condition score

The score assigned to a habitat zone that indicates the quality of the vegetation relative to the ecological vegetation class benchmark,

usually expressed as a percentage or on a scale of 0 to 1.

Dispersed habitat^A

Habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area.

Ecological vegetation class (EVC)^A

A native vegetation type classified on the basis of a combination of its floristic, life form, environmental and ecological characteristics.

Forb

A herbaceous flowering plant that is not a graminoid (grass, sedge or rush).

General biodiversity equivalence score / units^A

Score or units used to quantify the relative overall contribution of a site to Victoria's biodiversity.

General offset^A

An offset that is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have a significant impact on habitat for any rare or threatened species.

Habitat importance map^A

A map that indicates the importance of locations as habitat for a particular rare or threatened species. This map is based on modelled data.

Habitat importance score^A

Measure of the importance of the habitat located on a site for a particular rare or threatened species.

Habitat zone^B

A discrete area of native vegetation consisting of a single vegetation type (EVC) within an assumed

similar quality. This is the base spatial unit for conducting a Habitat hectare assessment. Separate *Vegetation Quality Assessments* (or Habitat hectare assessments) are conducted for each habitat zone within the designated assessment area.

Highly localised habitat ^A

Habitat for rare or threatened species whose habitat is spread over a very restricted area (i.e. less than 2,000 ha). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species.

Incorporated document ^A

A document that is included in the list of incorporated documents in a planning scheme. These documents affect the operation of the planning scheme.

Indigenous vegetation ^B

The type of native vegetation that would have normally been expected to occur on the site prior to European settlement.

Landholder ^A

An owner, occupier, proprietor or holder of land.

Landscape scale information ^A

Mapped or modelled information based on data collected across the landscape rather than just on a particular site.

Listed species

A flora or fauna species listed under the Commonwealth *Environment Protection and Biodiversity Act 1999* or listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

Local Planning Policy Framework ^A

Framework outlining a Municipal Strategic Statement and the Local Planning Policies that apply to the local government area.

Location risk ^A

The risk that removing native vegetation in a particular location will have an impact on the persistence of a rare or threatened species.

Loss ^A

Loss in the contribution to Victoria's biodiversity when native vegetation is fully or partially removed, as measured in biodiversity equivalence scores or units.

Minimise ^A

Locating, designing or managing a use or development to reduce the impacts on biodiversity from the removal of native vegetation.

Native (indigenous) vegetation ^B

Native vegetation is plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses (as defined in Clause 72 of the planning scheme).

Native vegetation extent ^A

Area of land covered by native vegetation or the number of scattered trees.

Native Vegetation Information Management (NVIM) system ^A

An online tool used to access information about Victoria's native vegetation.

No net loss ^A

An outcome where a particular gain in the contribution to Victoria's biodiversity is equivalent to an associated loss in the contribution to Victoria's biodiversity from permitted clearing.

Offset ^A

Protection and management (including revegetation) of native vegetation at a site to generate a gain in the contribution that native vegetation makes to Victoria's biodiversity. An offset is used to compensate for the loss to Victoria's biodiversity from the removal of native vegetation.

Offset Management Plan (OMP)

A document which sets out the requirements for establishment, protection and management of an offset site.

On-site offset ^B

An offset located on the same property as the clearing.

Particular Provisions ^A

Provisions in the Victoria Planning Provisions that relate to specific activities (for example, native vegetation is a Particular Provision).

Patch (see Remnant Patch)

Permit ^A

A legal document that gives permission for a use or development on a particular piece of land.

Perennial ^A

A plant that lives for more than two years. Perennials include species that are always visible e.g. shrubs and trees, but also include species that are not always visible above ground.

Permitted clearing ^A

Removal of native vegetation for which a planning permit has been granted to remove native vegetation.

Permitted clearing regulations ^A

The rules in the planning system that regulate permits for the removal of native vegetation.

Planning provisions – See Victoria Planning Provisions.

Planning scheme ^A

Policies and provisions for the use, development and protection of land in a local government area.

Planning system ^A

Victoria's land-use planning system that includes the Victoria Planning Provisions and each local government's planning scheme.

Property Vegetation Plan ^B

A plan which relates to the management of native vegetation within a property, and which is contained within an agreement made pursuant to section 69 of the Conservation, Forests and Lands Act 1987.

Protected species

A flora species protected under the *Victorian Flora and Fauna Guarantee Act 1988*.

Protection (of a tree) ^B

An area with twice the canopy diameter of the tree(s) fenced and protected from adverse impacts: grazing, burning and soil disturbance not permitted, fallen timber retained, weeds controlled, and other intervention and/or management if necessary to ensure adequate natural regeneration or planting can occur.

Rare or threatened species ^A

A species that is listed in:

- DEPI's Advisory List of Rare or Threatened Plants in Victoria as 'endangered', 'vulnerable', or 'rare', but does not include the 'poorly known' category
- DEPI's Advisory List of Threatened Vertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories
- DEPI's Advisory List of Threatened Invertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories.

Referral authority ^A

An authority that a permit application is referred to for decision under Section 55 of the Planning and Environment Act 1987. All referral requirements are specified in Clause 66 of planning schemes.

Remnant patch of native vegetation ^A

Either:

- an area of native vegetation, with or without trees, where at least 25 per cent of the total perennial understorey plant cover is native plants
- an area with three or more indigenous canopy trees where the tree canopy cover is at least 20 per cent.

Remnant vegetation ^B

Native vegetation that is established or has regenerated on a largely natural landform. The species present are those normally expected in

that vegetation community. Largely natural landforms may have been subject to some past surface disturbance such as some clearing or cultivation (or even the activities of the nineteenth century gold rushes) but do not include man-made structures such as dam walls and quarry floors.

Responsible authority ^A

The authority charged with the responsibility for administering and enforcing particular aspects of a planning scheme.

Scattered tree ^C

An indigenous canopy tree that does not form part of a remnant patch of native vegetation (see definition of remnant patch of native vegetation).

Site ^A

An area of land that contains contiguous patches of native vegetation or scattered trees, within the same ownership.

Site loss ^A

Loss in the condition, or condition and extent, of native vegetation when native vegetation is fully or partially removed, measured in Habitat hectares.

sp.

Species (one species).

spp.

Species (more than one species).

Specific biodiversity equivalence score / units ^A

With reference to a specific species, a score or units used to quantify the relative contribution of a site to Victoria's biodiversity.

State Planning Policy Framework ^A

A collection of clauses in the Victoria Planning Provisions that inform planning authorities and responsible authorities of those aspects of state planning policy which they are to take into account and give effect to in planning and administering their respective areas.

Strategic biodiversity map ^A

A map that shows the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species. The map is based on modelled data.

Strategic biodiversity score ^A

A score that quantifies the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species.

Strategic planning ^A

A coordinated approach to planning where areas for conservation and areas which can be cleared are strategically identified.

Taxon (plural taxa)

A term used to describe any taxonomic unit. This term is typically used when referring broadly to any scientifically recognised species, subspecies or variety.

Third-party offset ^B

An offset located on a property owned by a person other than the landowner who incurs the native vegetation loss being offset.

Understorey

Understorey is all vegetation other than mature canopy trees – includes immature trees, shrubs, grasses, herbs, mosses, lichens and soil crust. It does not include dead plant material that is not attached to a living plant. More information on understorey life forms is set out in the Vegetation Quality Assessment Manual (DSE 2004).

Victoria Planning Provisions ^A

A list of planning provisions that provides a standard template for individual planning schemes.

Zone ^A

A zone in the Victoria Planning Provisions is a set of permitted uses of land which are defined spatially.

Appendix C. Outline of further survey requirements

Targeted searches for listed flora and fauna species

The standard method for targeted flora surveys is for two botanists to walk in a transect 5 m apart and search for the relevant species at each site. The target species are searched for during their peak flowering period and locations marked with a standard GPS.

Fauna survey methods vary depending on the species being targeted.

An outline of survey considerations and timing is outlined in Table C1.1 below.

Table C1.1: Survey considerations and timing

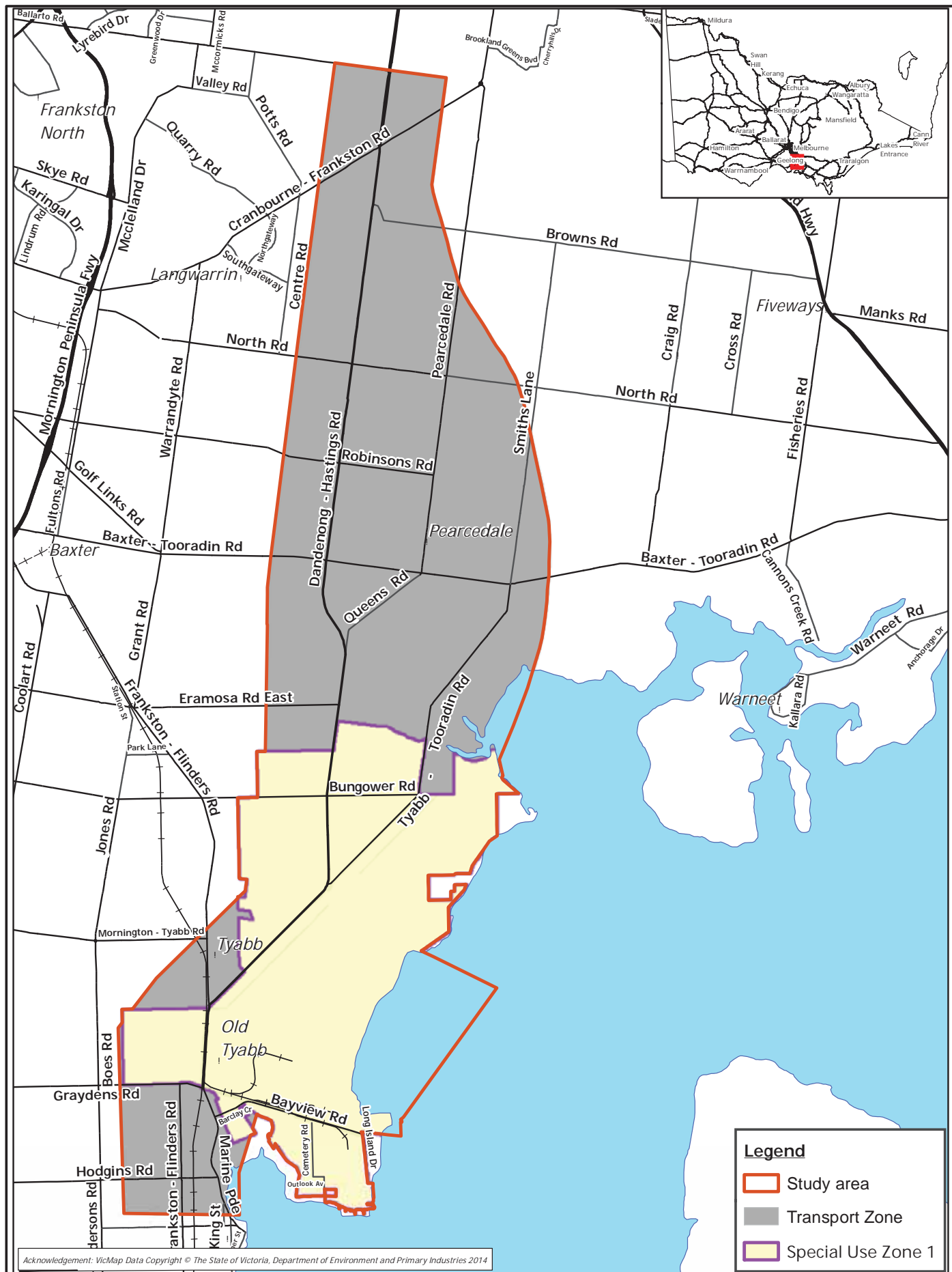
Protected matter	Timing information from EPBC survey guidelines (SPRAT profile) or listing advice	Recommendation
Clover Glycine	Flowering occurs from September to November.	Survey in October.
Dense Leek-orchid	Flowering occurs from early October to early November.	Survey in October.
Green Striped Greenhood	Flowering occurs from July to early September, and plants reproduce entirely from seed.	Survey in September.
Matted Flax-lily	Distinctive Matted Flax-lily features include shorter leaves, later flowering and larger flowers than similar species. Surveys should be conducted between November and February when pollinators are present and active to assist in determining the viability of the population. Summer water-stress can cause defoliation (Carr & Horsfall 1995), which makes identification difficult.	Check if material is flowering in October at reference site in Clyde. Otherwise, survey in November when most likely flowering. Survey in higher quality examples of Grassy Woodland.
Metallic Sun-orchid	The best time to conduct surveys is when the plant is likely to be flowering, from August through to November (Pobke 2007), and especially for several years after a fire disturbance event, before the associated vegetation recovers and shades out the orchid (Cropper 1993).	Survey in October.
Purple Diuris	Flowering occurs from October to November.	Survey in October.
Purple Eyebright	Flowering occurs from October to December.	Survey in October.
River Swamp Wallaby-grass	River Swamp Wallaby-grass is a slender aquatic or semi-aquatic perennial, with arching	Survey in November. Surveys for this species are dependent on

Protected matter	Timing information from EPBC survey guidelines (SPRAT profile) or listing advice	Recommendation
	flowering stems that may be longer than 1 m, but with around half the stem being below the water. The individual florets have a slender curved bristle and are aggregated into 5–12 flowered spikelets. Flowering and fruiting occurs mainly between November and March (Jacobs & Lapinpuro, 1986; Walsh, 1994).	presence of relevant vegetation type. This has not been determined due to seasonal limitations with the previous survey (see community details below). EVC mapping may reveal that there are no areas that require searching.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Surveys should be done in the appropriate season when the site is, or has recently been, reasonably wet. This will usually be spring to early summer but can vary depending on the rainfall pattern within seasons. Surveys should be postponed if the wetland vegetation has been recently modified e.g. grazed or mown.	Survey in October.
Spiral Sun-orchid	Flowering occurs from late August to early October (Backhouse & Jeanes 1995).	Survey in October.
Swamp Everlasting	Flowering occurs from September to December (bracts persist beyond flowering)	Survey in October.
Swamp Fireweed	Flowering occurs from November to March	Survey in November.
Growling Grass Frog	Nocturnal surveys incorporating call playback, active searching and spotlighting should be undertaken at the beginning of the breeding season, when male frogs are calling and readily detectable (between October and December). Surveys should be undertaken on mild-warm nights with little to no wind. At least two repeat surveys per site. Surveys for this species should comply with minimum survey requirements stated by guidelines under Commonwealth EPBC Act policy.	Two nights of nocturnal survey should be undertaken at key sites in October–November.
Lace Monitor	Observational searches for Lace Monitor within woodland habitats between beginning of October and end of February.	Survey in October–November.
Latham's Snipe	Survey for Latham's Snipe should be undertaken during the annual period in which the species is present in Australia (September to April). These will entail observational searches in appropriately vegetated shallow wetlands and their margins. They can be undertaken in an adjunct to surveys for	Survey in October–November.

Protected matter	Timing information from EPBC survey guidelines (SPRAT profile) or listing advice	Recommendation
	Swamp Skink, Glossy Grass Skink and Growling Grass Frog.	
Common Long-necked Turtle	Survey for Common Long-necked Turtle during the warmer months of the year, which should be taken concurrently with aquatic surveys.	Survey in October–November.
New Holland Mouse	The New Holland Mouse is a small, burrowing rodent that is associated with vegetation communities with a heathy understorey. The species is similar in size and appearance to the introduced House Mouse, therefore a combination of survey techniques is recommended including live trapping using Elliott traps and remote cameras.	Elliott trapping and remote camera surveys to be undertaken in relevant areas of high sensitivity, particularly BlueScope Steel land. Survey in October–November.
Swamp Skink	Surveys will entail diurnal deployment of Elliott traps within saltmarsh and swamp scrub.	Survey in October–November.
Orange-bellied Parrot	Regular surveys for Orange-bellied Parrot during the annual period in which the species is present on the Australian mainland (March/April to October, inclusive). These will entail observation surveys within appropriate saltmarsh environments.	Survey in March - October.
Southern Brown Bandicoot and White-footed Dunnart	These will entail deployment of remote cameras within areas identified as potentially suitable habitat during vegetation mapping surveys. Elliott trapping and hair sample collection have capacity to detect these species but camera surveys have proven to be more reliable and are less intensive. Cameras will be deployed for a minimum of 21 days at selected locations. Post-fieldwork assessment of photographs will be required.	Remote camera surveys for Southern Brown Bandicoot and White-footed Dunnart should be undertaken in relevant areas of high sensitivity, particularly BlueScope Steel land. Survey in October–November.
Southern Toadlet	Survey for Southern Toadlet should be undertaken between March and May within appropriately damp terrestrial environments. These will entail nocturnal surveys using call playback and aural surveys.	Survey in March–May.
Dwarf Galaxias	Database search results indicate that Dwarf Galaxias have been collected from within the study area or from waterways that are linked	Survey in spring-summer (avoiding May to October breeding season)

Protected matter	Timing information from EPBC survey guidelines (SPRAT profile) or listing advice	Recommendation
	<p>to the study area. Current distribution within the study area is unknown. It is proposed that a spring-summer survey (avoiding May to October breeding season to minimise potential impact on breeding success) within named waterways and other suitable habitat in the vicinity of these waterways should be carried out. Where salinity levels allow, backpack electrofishing should be used. Additional methods should include dip netting, baited traps and fyke nets, where conditions allow. The surveys should also extend to estuarine reaches, where applicable, to allow for detection of Pale Mangrove Goby.</p>	

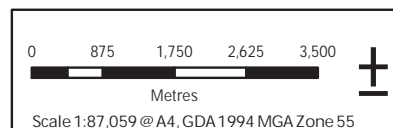
Seasonal constraints apply to all species although many are able to be surveyed in spring – early summer. The appropriate survey time is guided by policy documents and the seasonal conditions which apply to a location. If plants are observed flowering earlier or later than usual, survey(s) would be modified to suit.

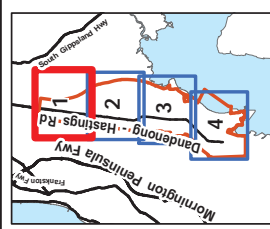


Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne,
Sydney, Wangaratta & Wollongong

Figure A1: Location of the Study Area, Hastings, Victoria

Matter: 18568,
Date: 17 September 2014,
Checked by: KJK, Drawn by: LDM, Last edited by: smitchell
Location: P:\18500s\18568\Mapping\





Legend

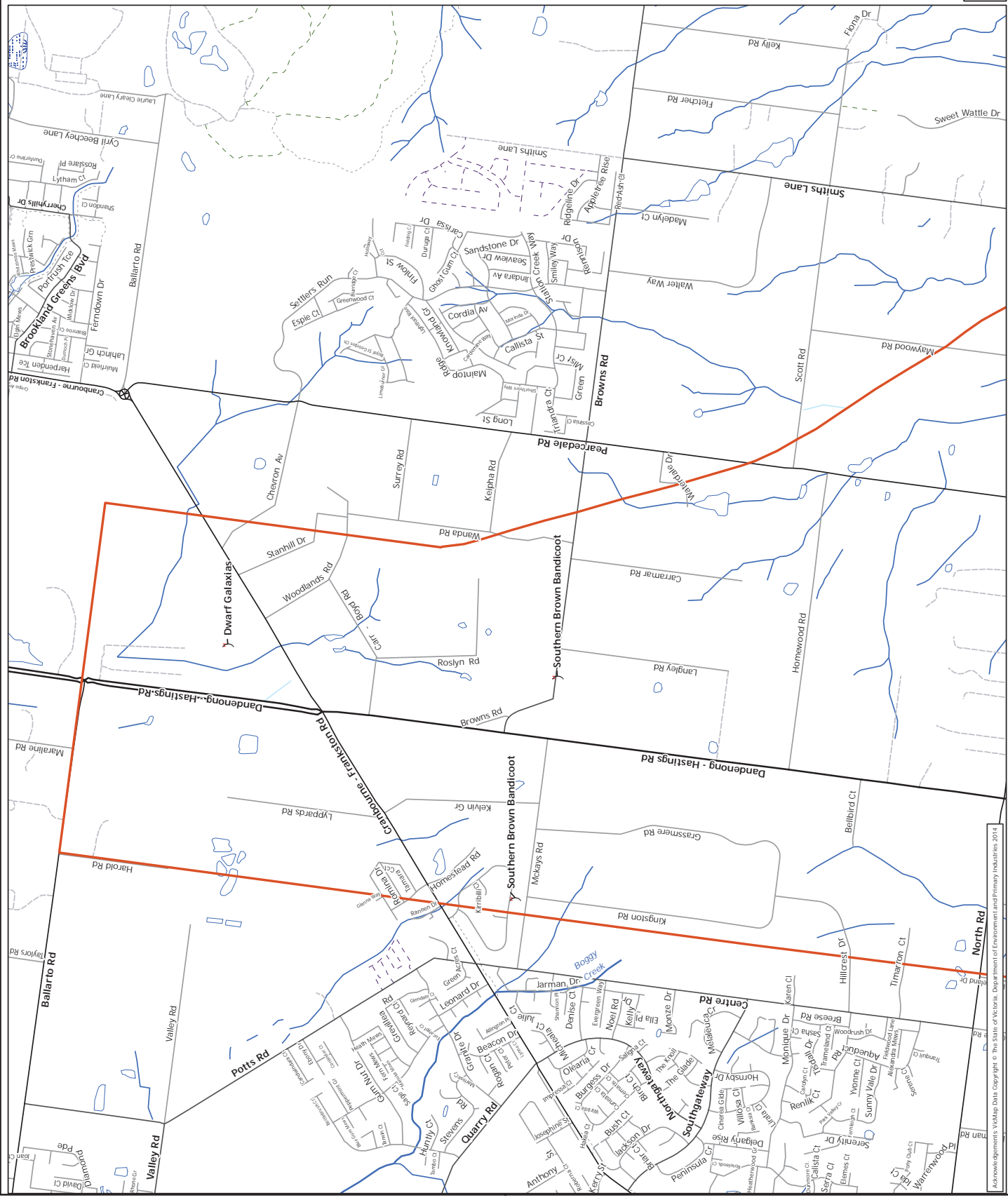
- Nationally significant fauna
- Study Area

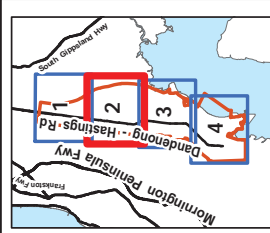
Figure A2.1: Matters of National Environmental Significance

0 190 380 570 760 950
 Metres
 Scale: 1:20143 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

biosis ⁺
 Biosys Pty Ltd
 Ballarat, Brisbane, Canberra, Melbourne,
 Sydney, Warragatta & Wollongong

Matter: 18568.
 Date: 17 September 2014. 3PM. Last edited by: smitchell
 Location: P:\18500\18568\mapping
 18568_A2.1.2.4_NationalEnvSig





Legend

- Nationally significant fauna
- Predicted distribution of EPBC listed Subtropical and Temperate Coastal Saltmarsh
- Study Area

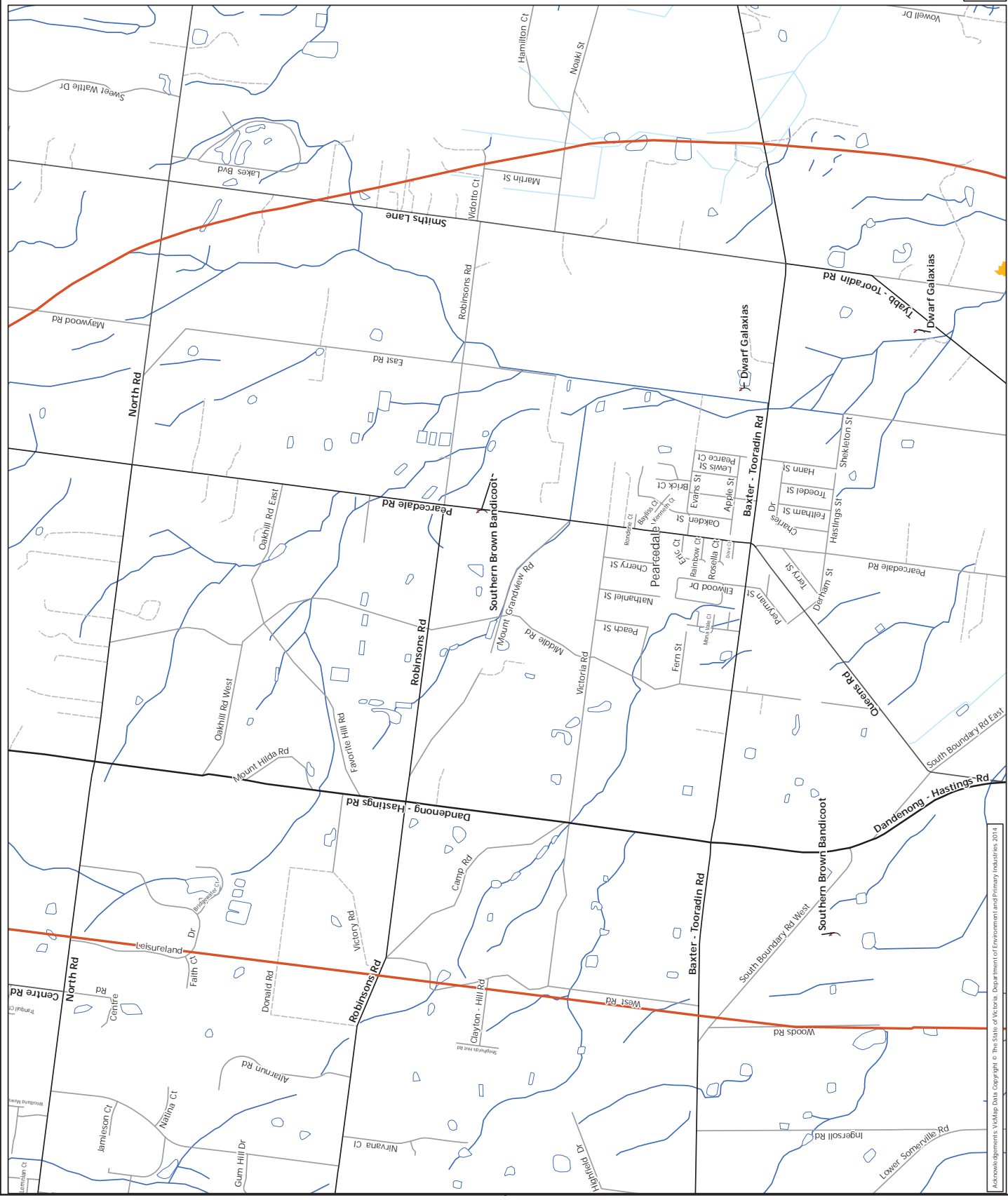


Figure A2.2: Matters of National Environmental Significance

0 190 380 570 760 950

Metres

Scale: 1:20143 @ A3

Coordinate System: GDA 1994 MGA Zone 55

biosis ⁺

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney, Warragatta & Wollongong

Matter: 18568.
Date: 17 September 2014. sgm. Last edited by: smitchell
Location: P:\18500\18568\mapping\18568_A2.1.2.4_NationalEnvsg

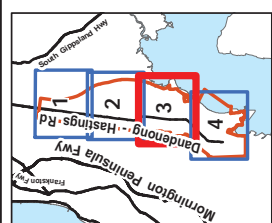


Figure A2.3: Matters of National Environmental Significance

0 190 380 570 760 950

Metres

Scale: 1:20143 @ A3

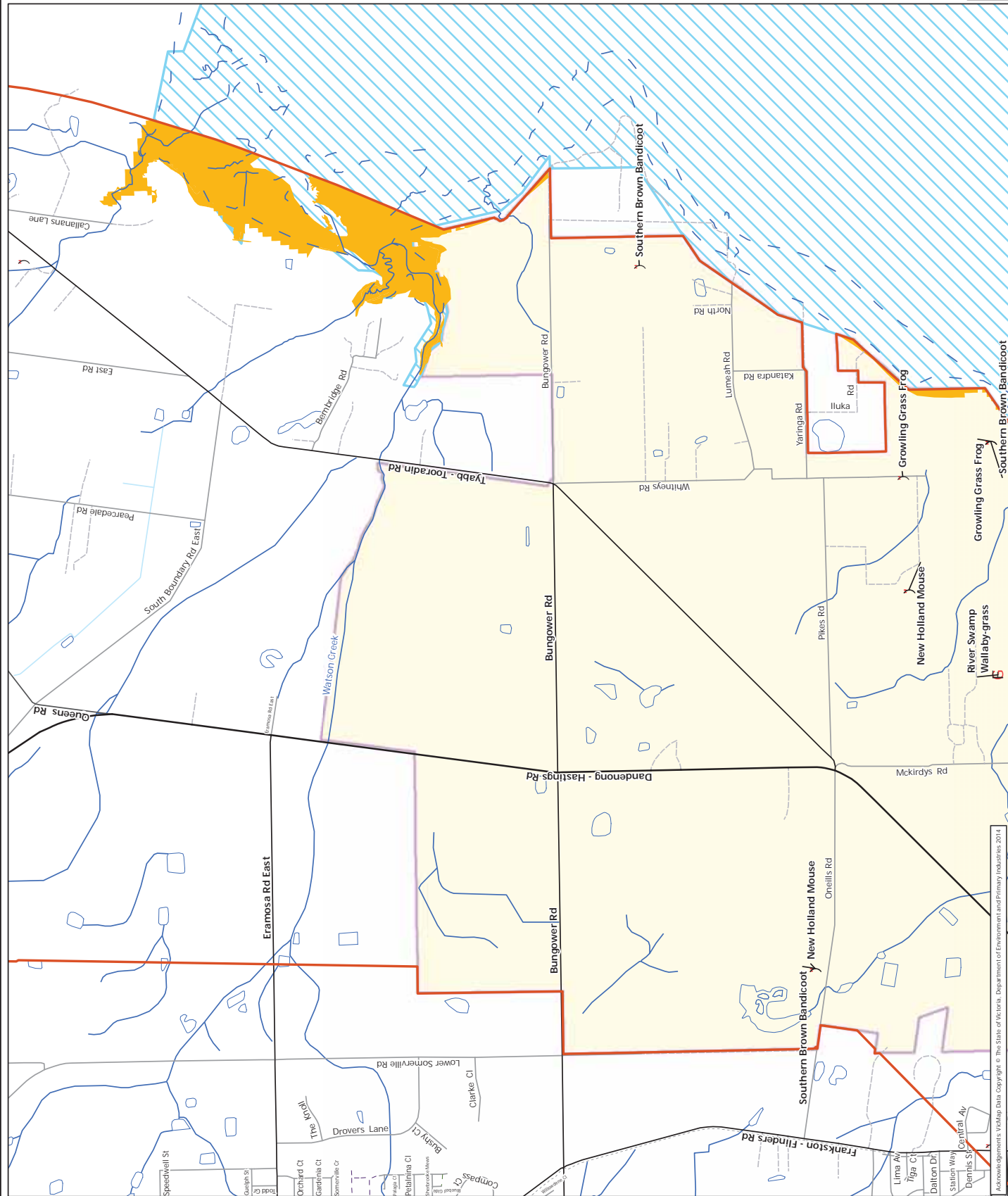
Coordinate System: GDA 1994 MGA Zone 55

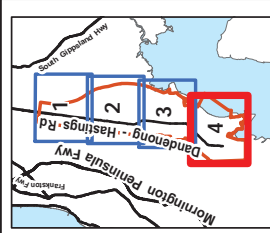


Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne,
Sydney, Warragatta & Wollongong

Matter: 18568.

Date: 17 September 2014. s.m. Last edited by: smitchell
Location: P:\18500\18568\mapping\18568_A2.1.2.4_NationalEnv.jpg





- Legend**
- █ Nationally significant flora
 - █ Nationally significant fauna
 - █ Predicted distribution of EPBC
 - █ Listed Subtropical and Temperate Coastal Saltmarsh
 - █ Ramsar Wetland
 - █ Study Area
 - █ Special Use Zone 1

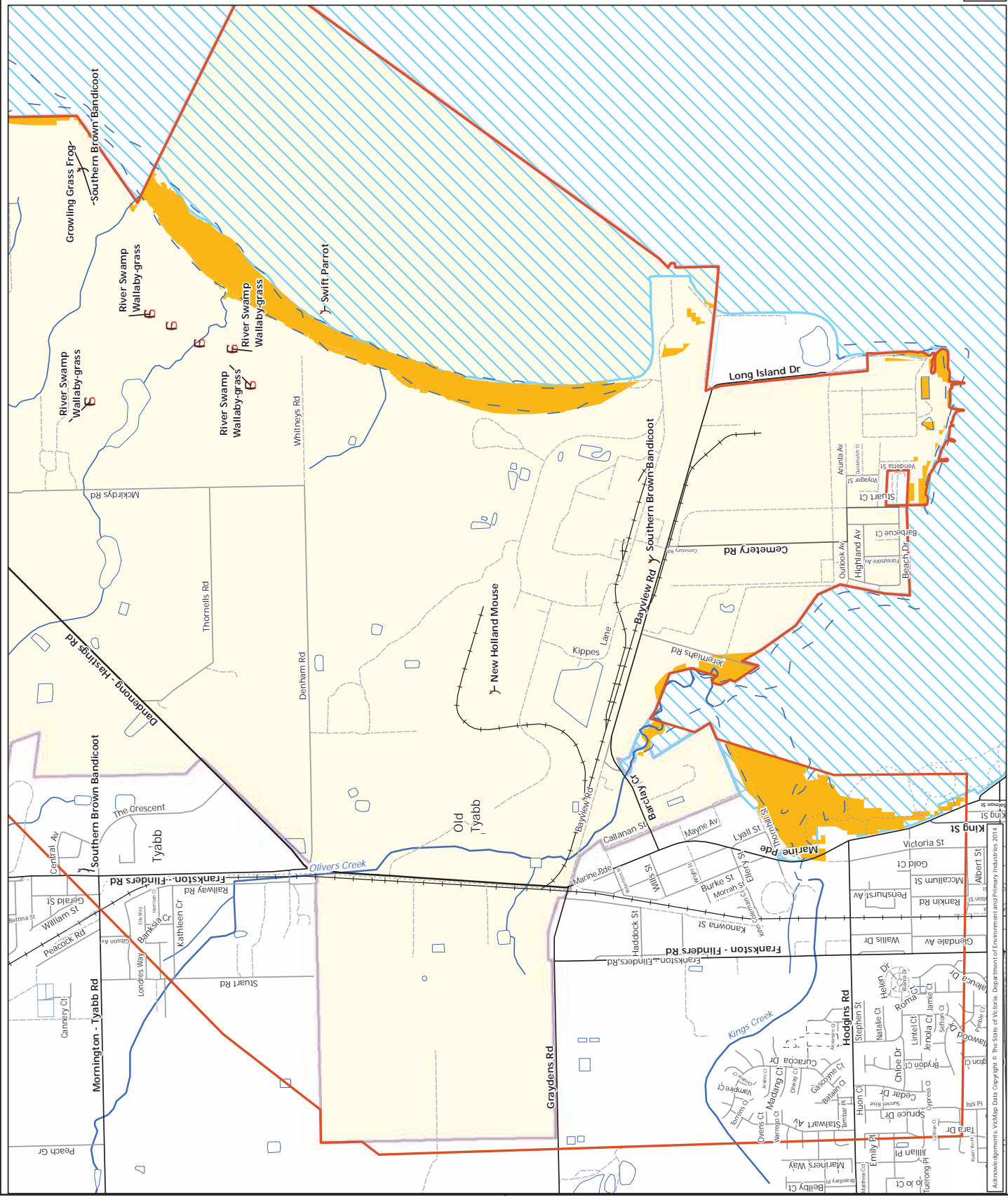
Figure A2.4: Matters of National Environmental Significance

0 190 380 570 760 950
Metres

Scale: 1:20143 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Matter: 18568.
Date: 17 September 2014. SPM Last edited by: smitchell
Location: P:\18506\18568\mapping\18568_A2.1.2.4_NationalEnvoy



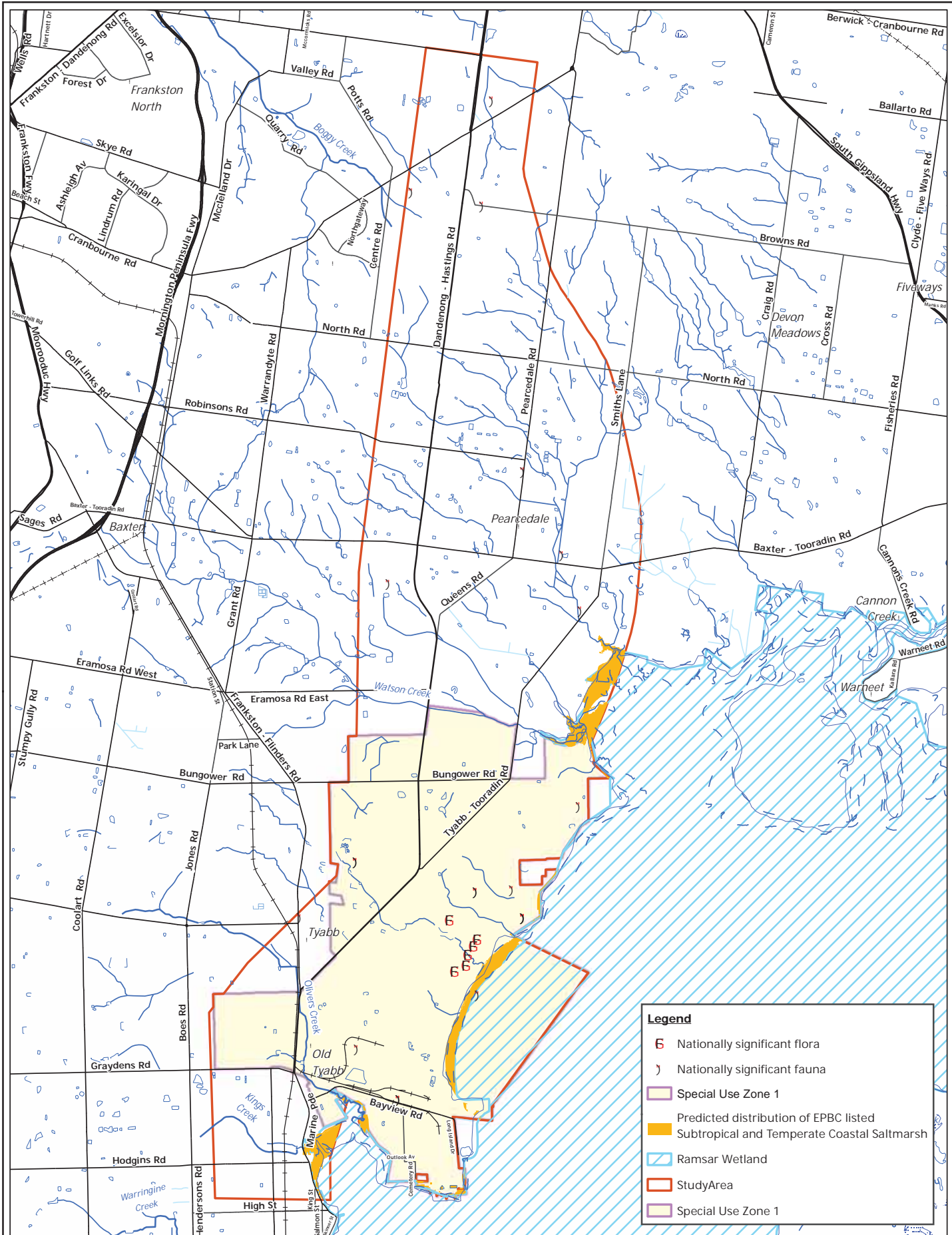
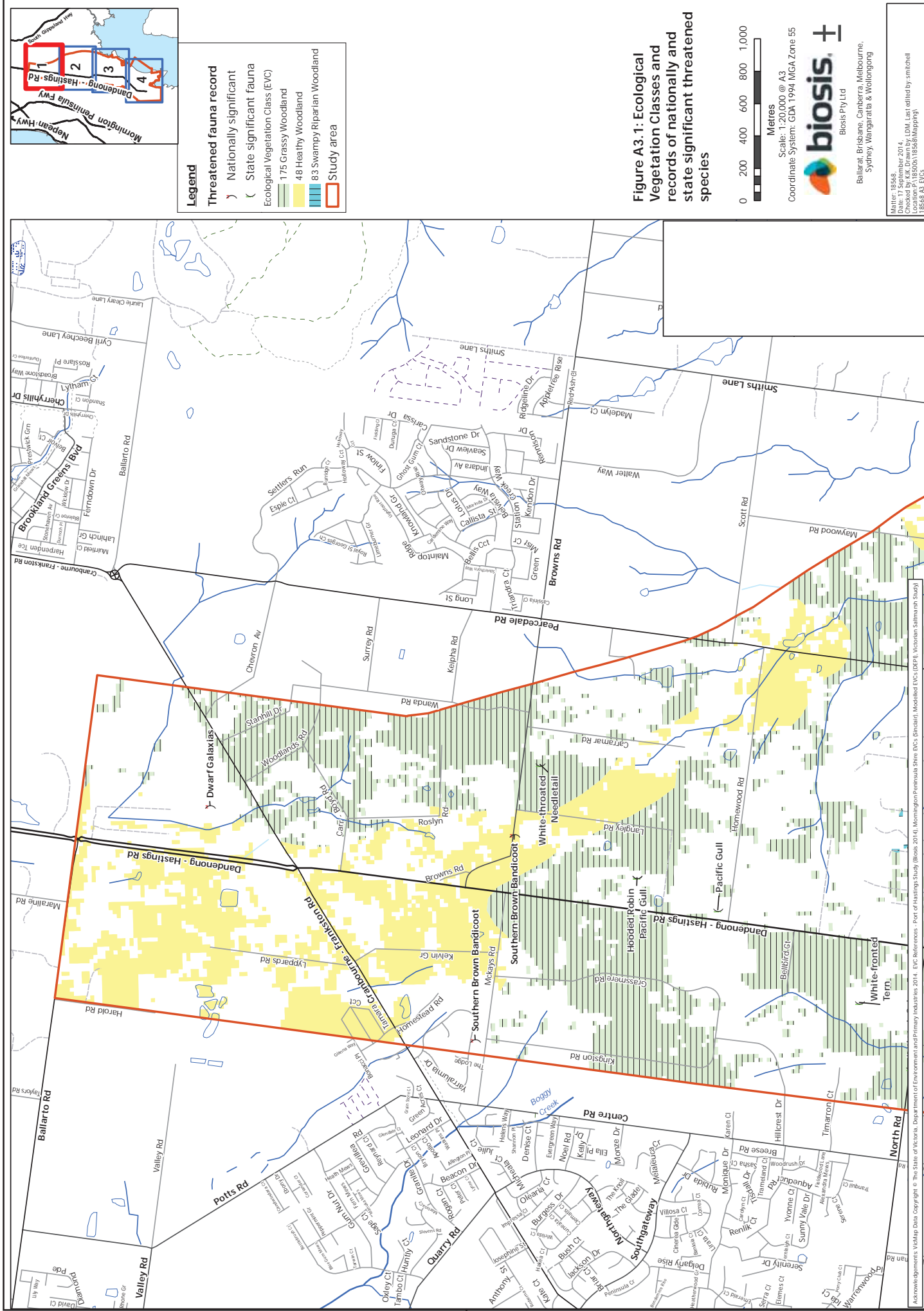
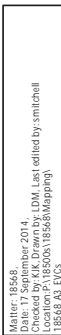
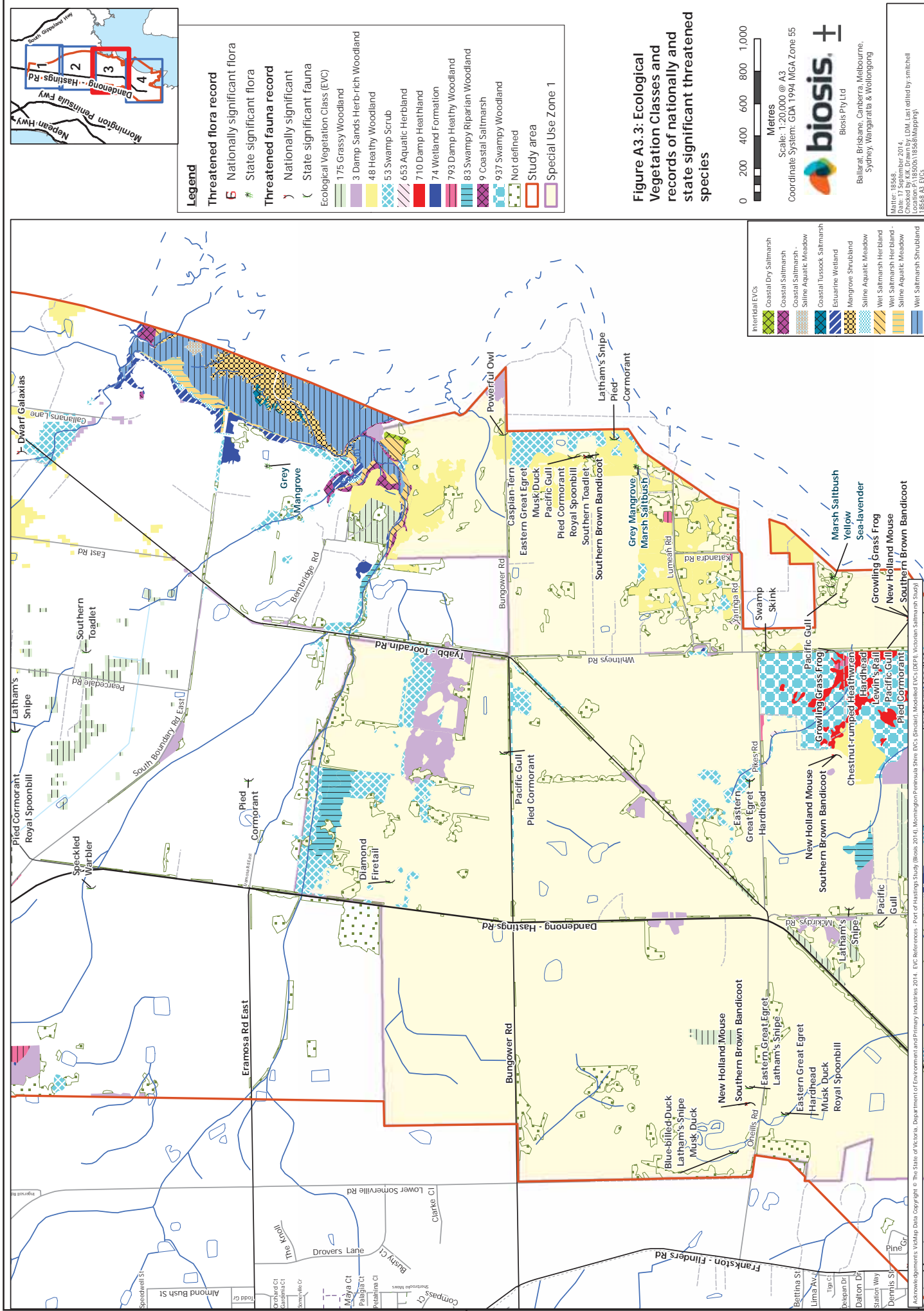


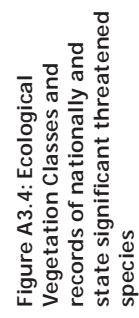
Figure A2: Matters of National Environmental Significance - Overview



Matter: 18568.
Date: 17 September 2014.
Location: PA18500618568 (Mapping)
1:8568 A3 EVCs





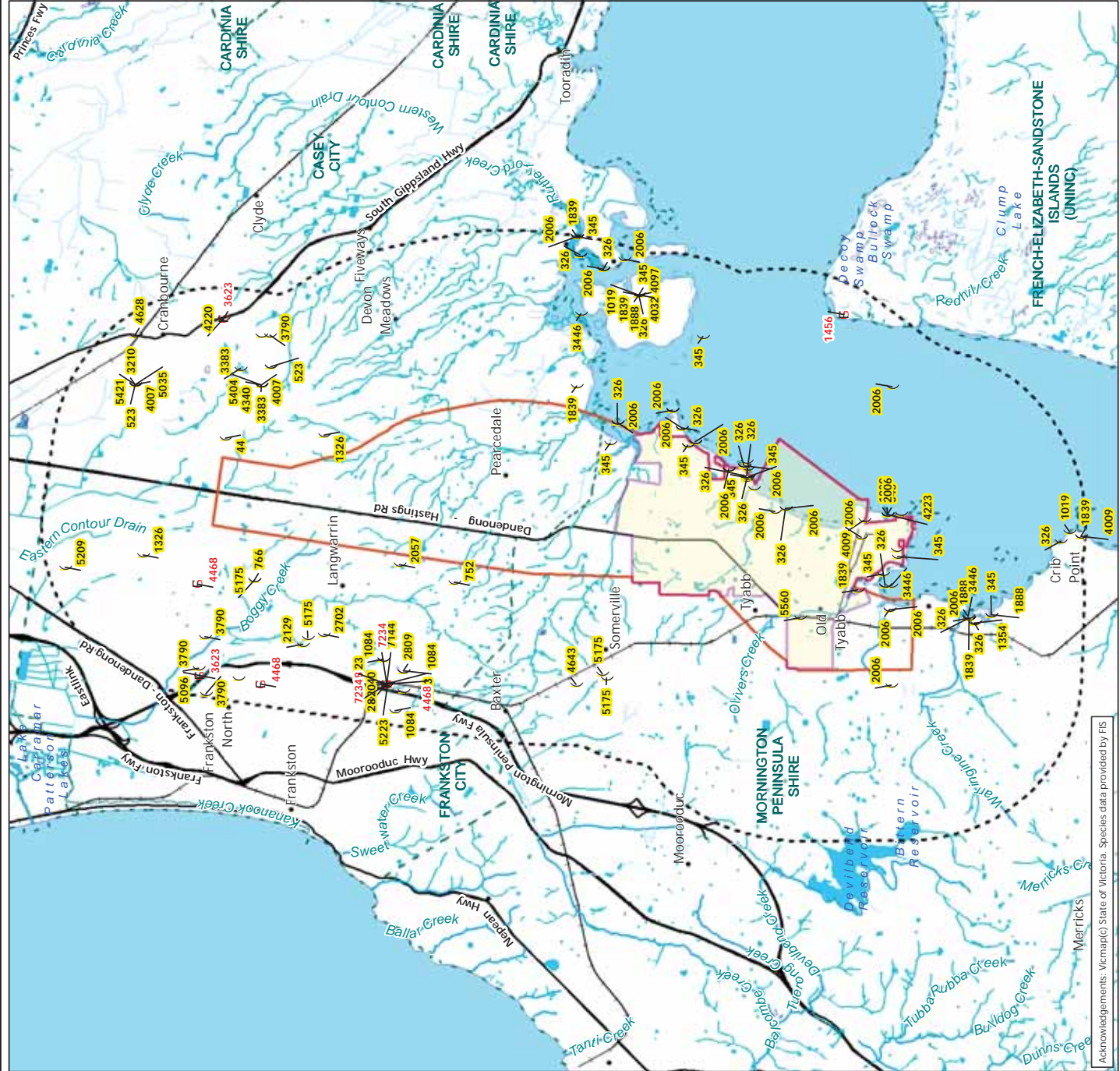


0 200 400 600 800 1,000
Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Ballarat, Brisbane, Canberra, Melbourne,
Sydney, Wangaratta & Wollongong

Date: 17 September 2014,
 Checked by: KJK, Drawn by: LDM, Last edited by: smitchell
 Location: P:\18500s\18568\Mapping\



Species list

Nationally significant flora

- 6 1456 - Clover Glycine
- 6 3623 - River Swamp Wallaby-grass
- 6 4468 - Purple Eyebright
- 6 7234 - Small Snake-orchid

State significant flora

- 1019 - Green-comb Spider-orchid
- 1084 - Purple Diuris
- 1326 - Yarra Gum
- 1354 - Coast Ballart
- 1839 - Creeping Rush
- 1888 - Salt Lawrenzia
- 2006 - Yellow Sea-lavender
- 2040 - Fringed Midge-orchid
- 2057 - Austral Trefoil
- 2129 - Smooth Nardoo
- 2702 - Green Leek-orchid
- 2809 - Prawn Greenhood
- 3210 - Floating Bur-reed
- 326 - Marsh Saltbush
- 3383 - Naked Sun-orchid
- 3446 - Tiny Arrowgrass
- 345 - Grey Mangrove
- 3790 - Upright Panic
- 4007 - Clustered Lily
- 4009 - Pallid Sun-orchid
- 4032 - Single Bladderwort
- 4097 - Water Tassel
- 4220 - Perennial Blown-grass

- 4223 - Salt Blown-grass
- 4340 - Pale Grass-illy
- 44 - Sticky Wattle
- 4628 - Granite Greenhood
- 4643 - Grey Billy-buttons
- 5035 - Annual Bitter-cress
- 5096 - Plains Joyweed
- 5175 - Green Scentbark
- 5209 - Studley Park Gum
- 5223 - Floating Bladderwort
- 523 - Orange-tip Finger-orchid
- 5404 - Powelltown Correa
- 5421 - Cryptic Pink-fingers
- 5560 - Arching Flax-illy
- 7144 - Annual Fireweed
- 752 - Bronze Bird-orchid
- 766 - Southern Bristle-sedge

- Study Area
- Search Area
- Special Use Zone 1

Figure A4.1 Significant flora within 5 km of the Study Area



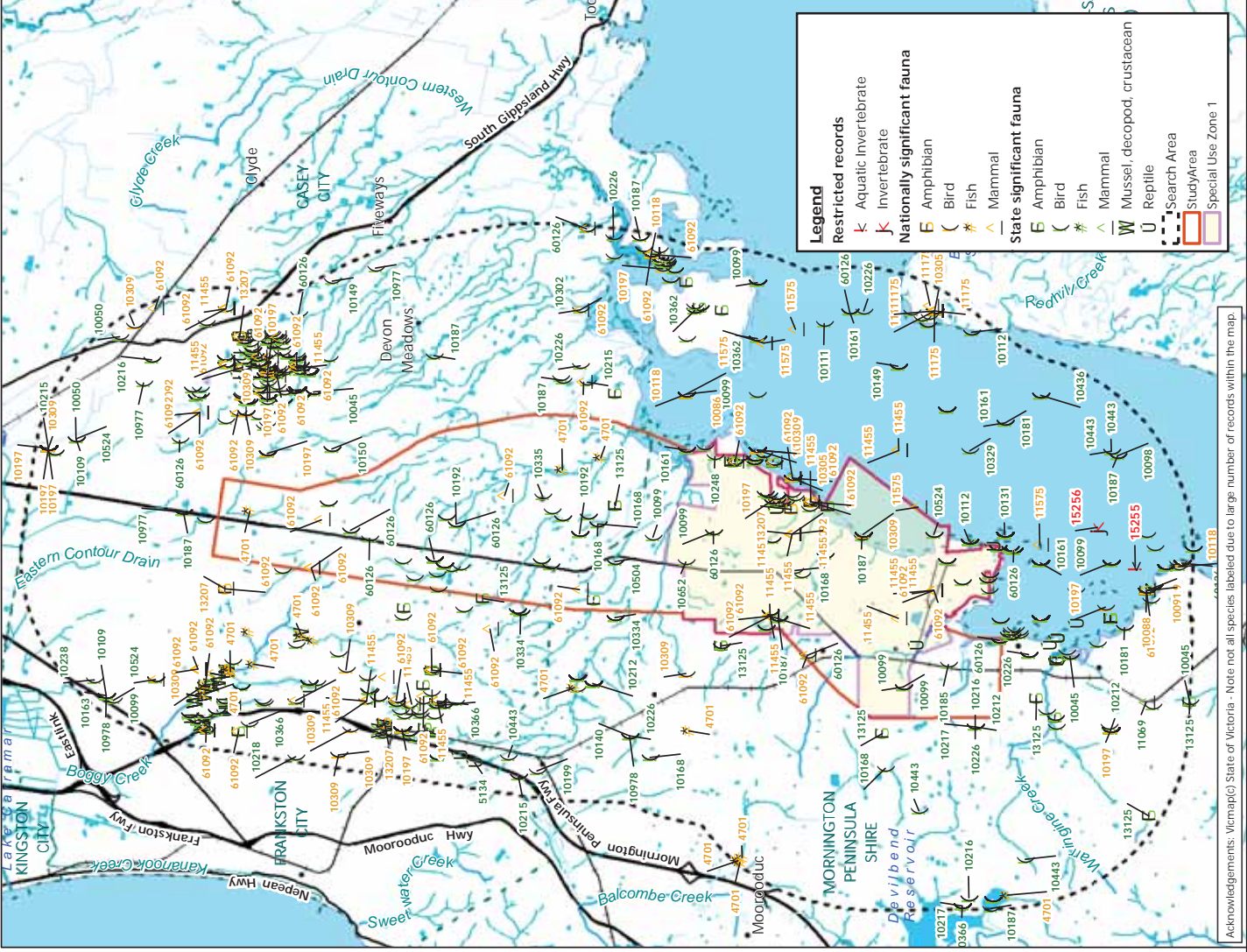
Scale: 1:115,000 @ A3
Coordinate System: GDA 1994 VICGRID94



Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne,
Sydney, Warragatta & Wollongong

Matter (Matter No)
Date: 17 September 2014
Location: PA185000118568Warragatta
18568_A4-1_Signiflora

Acknowledgements: Vicmap© State of Victoria. Species data provided by FIS



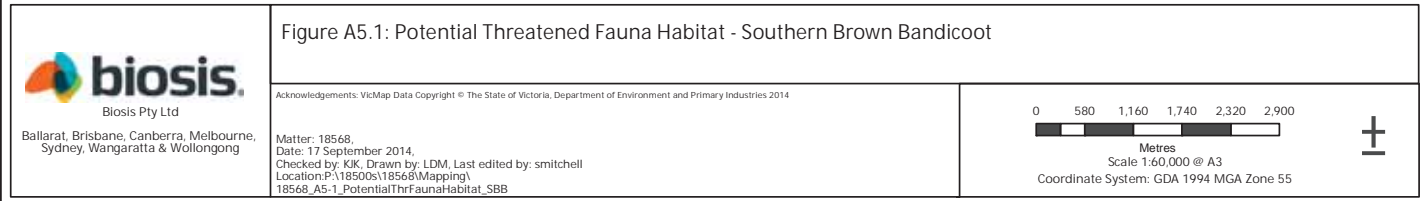
Species list	
Amphibians	
13125: Southern Toadlet	10163: Sharp-tailed Sandpiper
13207: Growling Grass Frog	10164: Red Knot
Aquatic invertebrates	
15255: Ghost shrimp	10165: Great Knot
Birds	
10012: King Quail	10168: Latham's Snipe
10031: Diamond Dove	10177: Brolga
10045: Lewin's Rail	10178: Glossy Ibis
10050: Ballon's Crake	10181: Royal Spoonbill
10071: Short-tailed Shearwater	10185: Little Egret
10083: Fairy Prion	10186: Intermediate Egret
10086: Wandering Albatross	10187: Eastern Great Egret
10088: Black-browed Albatross	10192: Nankeen Night Heron
10091: Shy Albatross	10195: Little Bittern
10098: Lesser Frigatebird	10197: Australasian Bittern
10099: Pled Cormorant	10199: Magpie Goose
10109: White-winged Black Tern	10212: Australasian Shoveler
10110: Whiskered Tern	10214: Freckled Duck
10111: Gull-billed Tern	10215: Hardhead
10112: Caspian Tern	10216: Blue-billed Duck
10114: White-fronted Tern	10217: Musk Duck
10117: Little Tern	10220: Grey Goshawk
10118: Fairy Tern	10238: Black Falcon
10128: Arctic Jaeger	10246: Barking Owl
10129: Ruddy Turnstone	10248: Powerful Owl
10131: Sooty Oystercatcher	10302: Turquoise Parrot
10136: Grey Plover	10305: Orange-bellied Parrot
10137: Pacific Golden Plover	10309: Swift Parrot
10139: Lesser Sand Plover	10311: Ground Parrot
10140: Double-banded Plover	10319: Azure Kingfisher
10149: Eastern Curlew	10329: Rainbow Bee-eater
10150: Whimbrel	10334: White-throated Needletail
10151: Little Curlew	10335: Fork-tailed Swift
10153: Bar-tailed Godwit	10362: Rufous Fantail
10154: Wood Sandpiper	10366: Satin Flycatcher
10155: Grey-tailed Tattler	10385: Hooded Robin
10157: Common Sandpiper	10436: Spotted Quail-thrush
10158: Common Greenshank	10443: Grey-crowned Babbler
10159: Marsh Sandpiper	10498: Chestnut-rumped Heathwren
10160: Terek Sandpiper	10504: Speckled Warbler
10161: Curlew Sandpiper	10524: Clamorous Reed Warbler
10162: Red-necked Stint	10598: Painted Honeyeater
	10652: Diamond Firetail
	10887: Buff-breasted Sandpiper
	10929: Southern Giant-Petrel
	10934: Ruff

Figure A4.2: Threatened
Fauna within 5 km of the
Study Area

Scale: 1:115,000 @ A3
Coordinate System: GDA 1994 VICGRID94

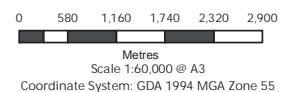
biosis.
Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne,
Sydney/Mangaratta & Wollongong

Matter: 18548
Date: 17 September 2014
Checked by: K.K. Drawn by: LDM. Last edited by: smitchell
18548_A4.2_S9 final



Acknowledgements: VicMap Data Copyright © The State of Victoria, Department of Environment and Primary Industries 2014

Matter: 18568,
Date: 17 September 2014,
Checked by: KJK, Drawn by: LDM, Last edited by: smitchell
Location: P:\18500s\18568\Mapping\
18568_A5-1_PotentialThrFaunaHabitat_SBB



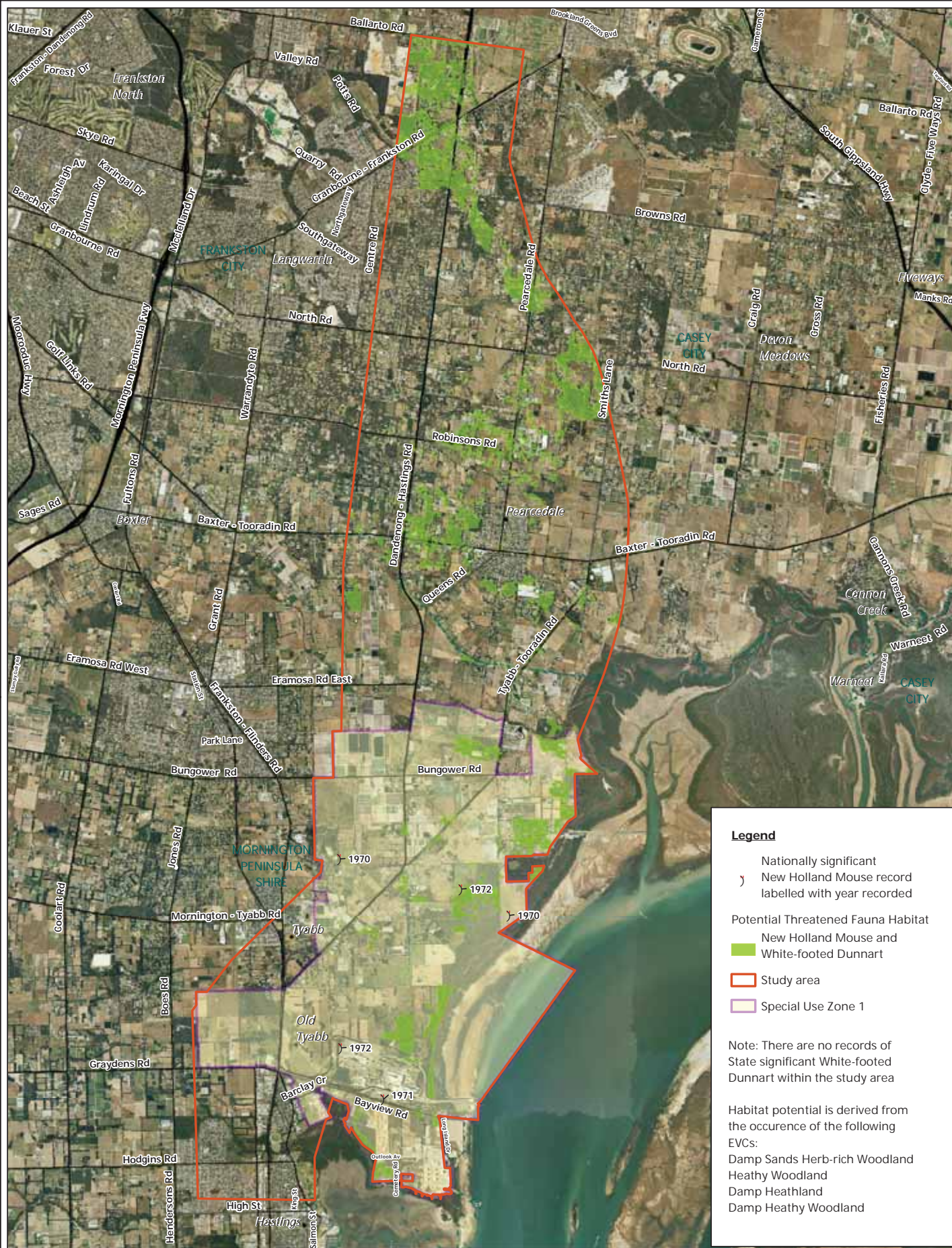


Figure A5.2: Potential Threatened Fauna Habitat - New Holland Mouse and White-footed Dunnart

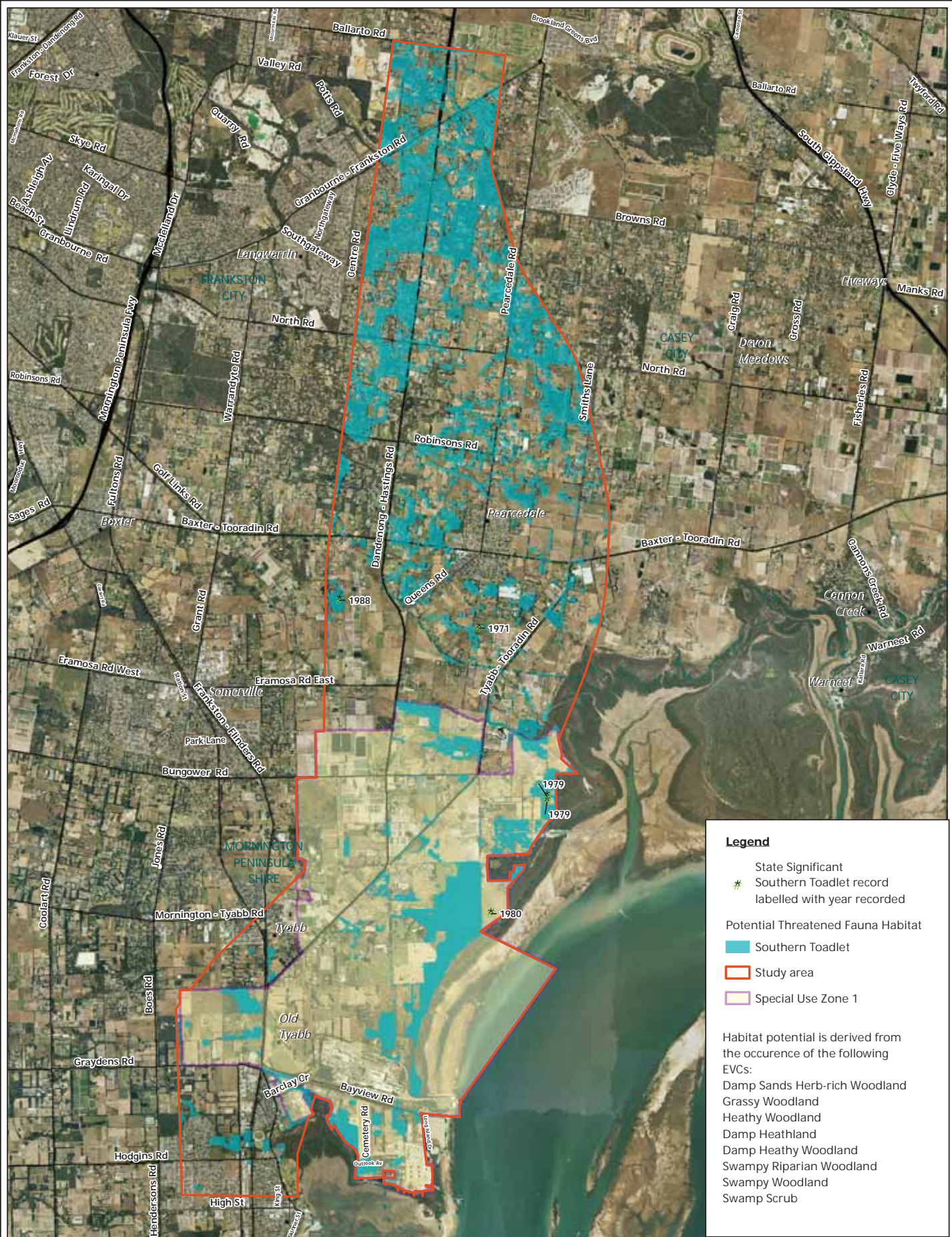


Figure A5.3: Potential Threatened Fauna Habitat - Southern Toadlet

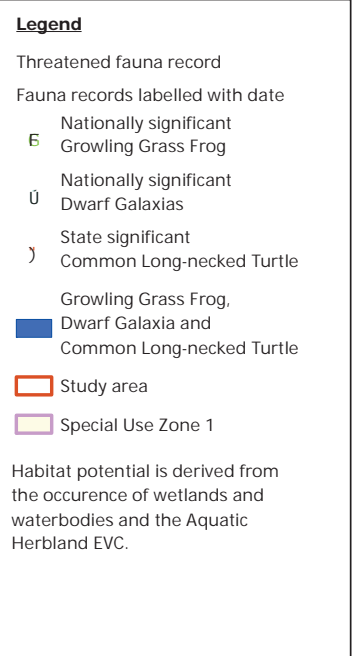




Figure A5.6 Potential Threatened Fauna Habitat - Orange-bellied Parrot

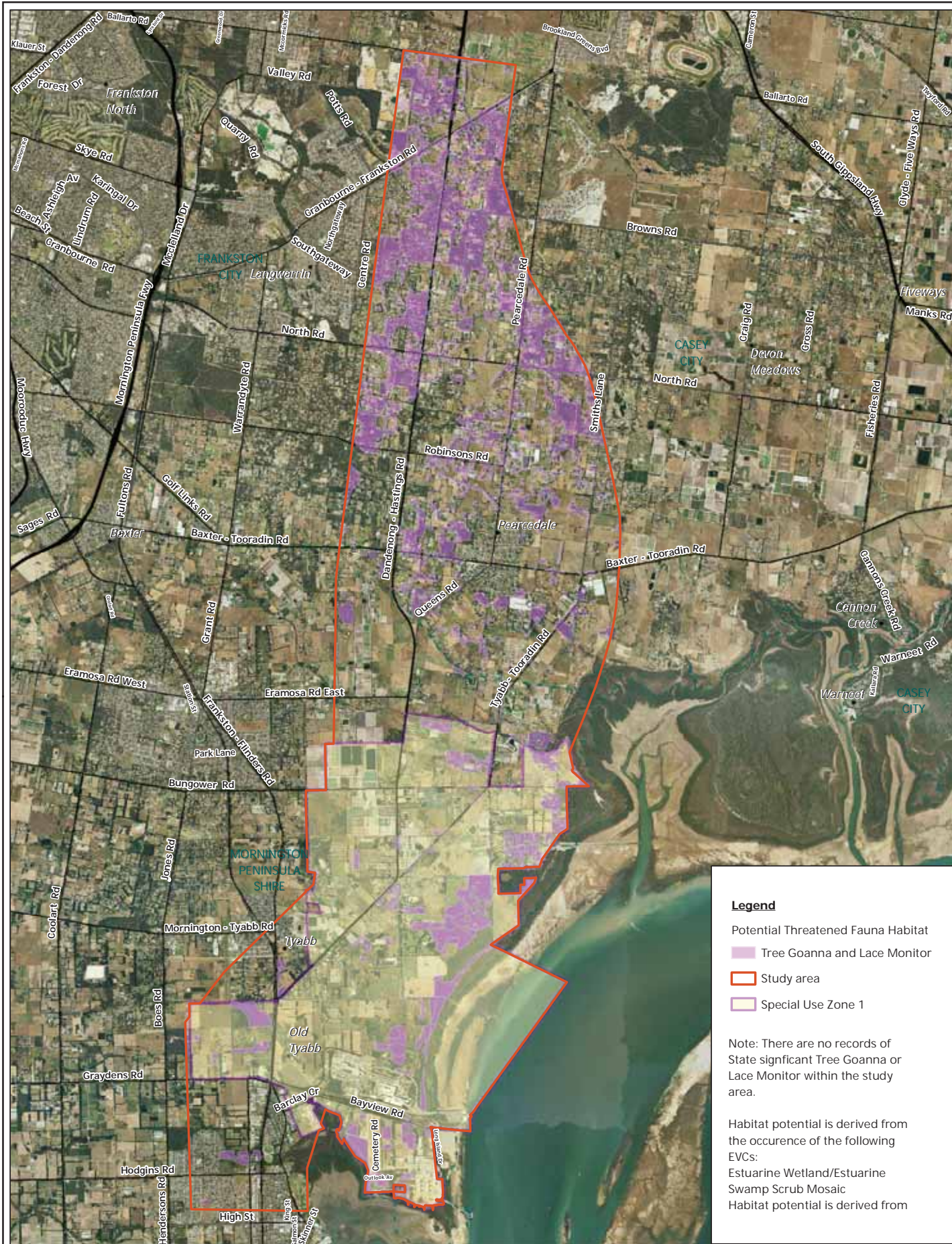


Figure A5.7 Potential Threatened Fauna Habitat - Tree Goanna and Lace Monitor

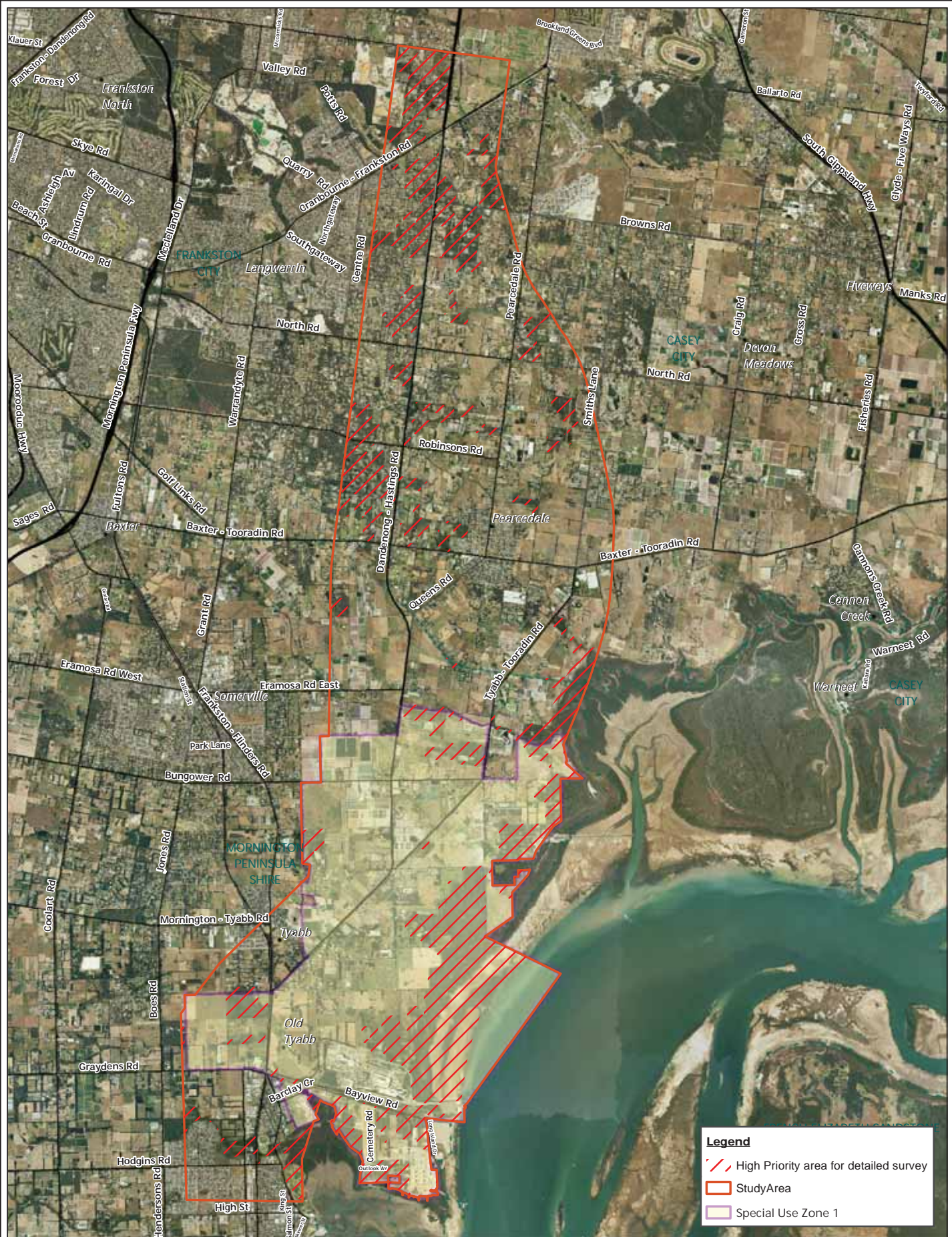


Figure A6: Overview of High Priority Areas for Detailed Survey

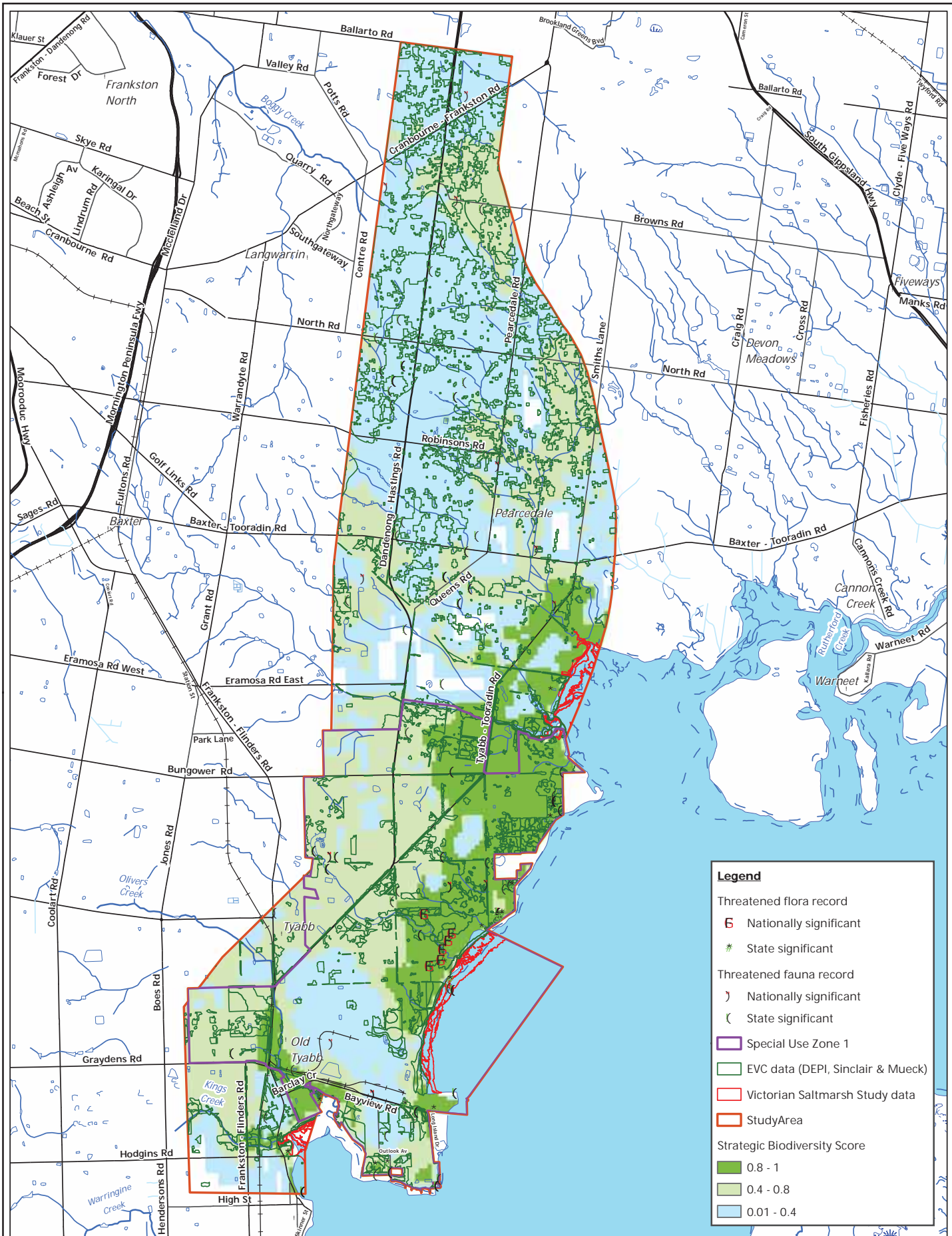


Figure A7: Strategic Biodiversity Score, native vegetation and records of nationally and state significant threatened species.

Acknowledgements: VicMap Data Copyright © The State of Victoria, Department of Environment and Primary Industries 2014

Matter: 18568,
Date: 17 September 2014,
Checked by: KIK, Drawn by: SKM, Last edited by: smithell
Location: P:\18500s\18568\Mapping\18568_A7_SBS_overview

0 580 1,160 1,740 2,320 2,900
Metres
Scale 1:60,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55