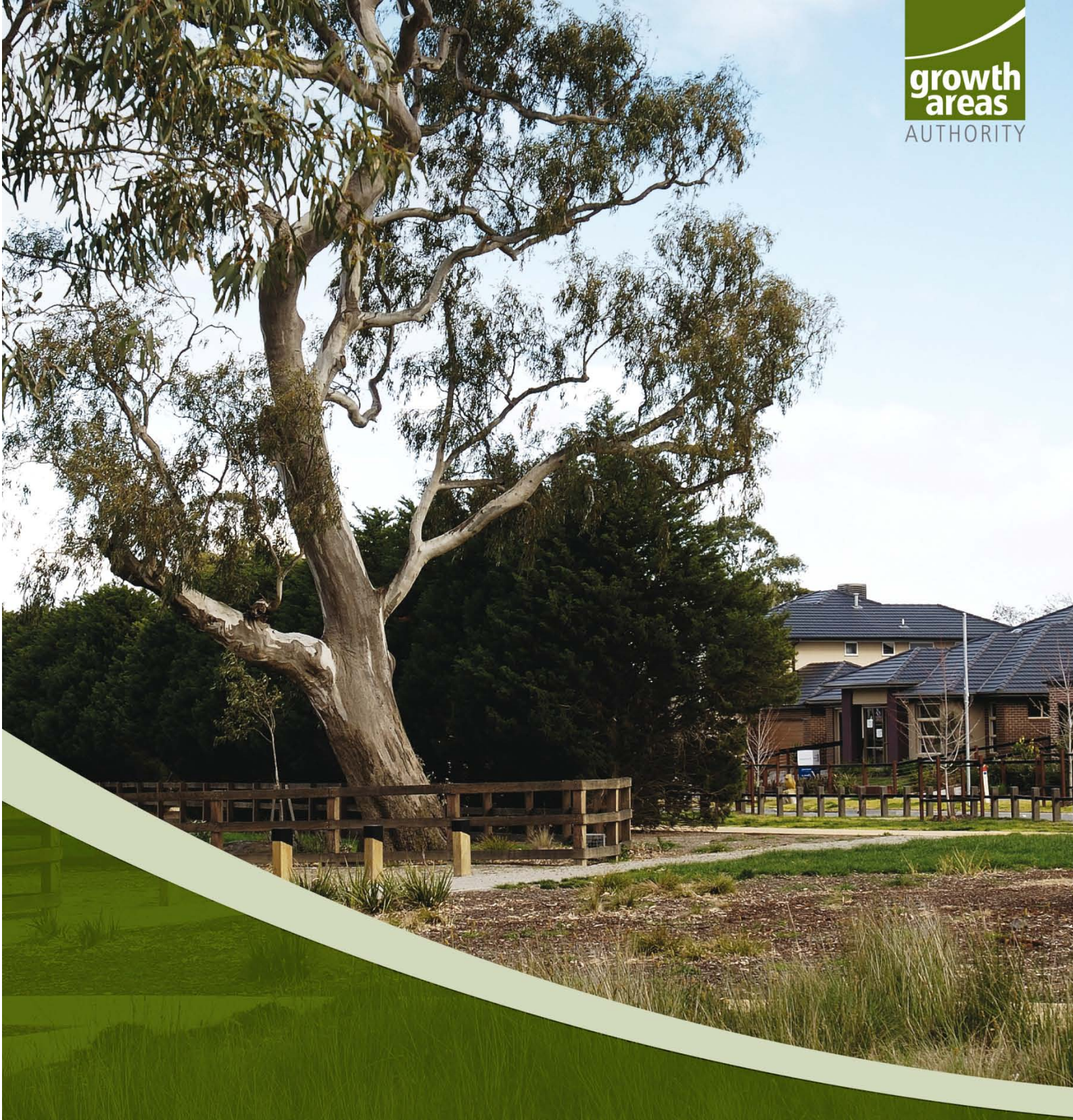

growth areas AUTHORITY

Biodiversity Assessment Report

Contract Area 43: Pound Road – PSP 1052

August 2012

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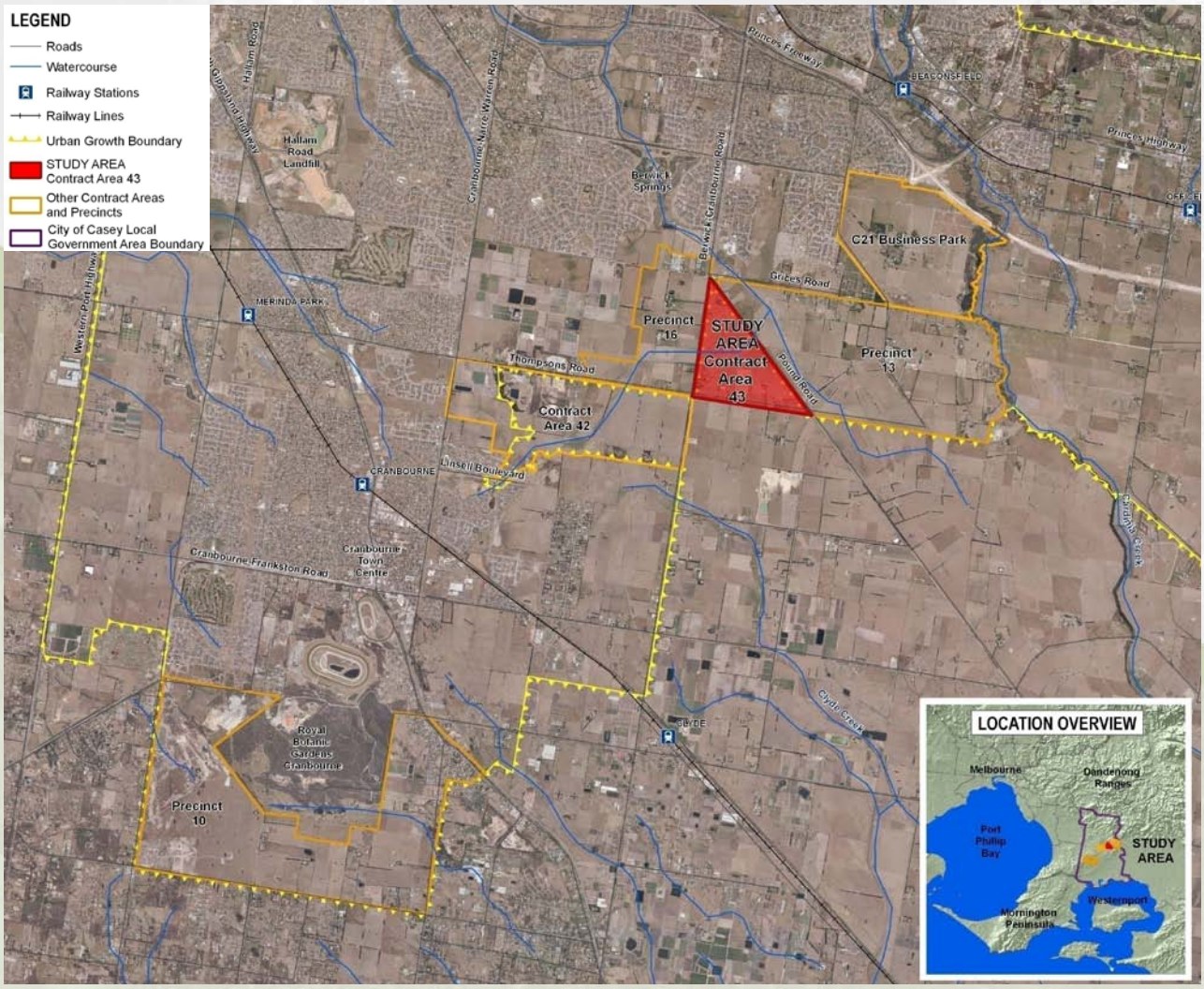
www.gaa.vic.gov.au

Biodiversity Assessment Report

Contract Area 43: Pound Road – PSP 1052

Growth Areas Authority

August 2012



MAP: Contract Area 43 – Pound Road PSP 1052

Biodiversity Mapping Project
Quality Assurance – Verification Sheet
Contract Area 43: Pound Road – PSP 1052

Document Title	Biodiversity Assessment Report		
Precinct (Name and Number)	Contract Area 43 Pound Road PSP 1052		
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	Organisation
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	Department of Sustainability and Environment ..... **Director, Ecosystem Services:** **Date:** 2.8.2012

Biodiversity Assessment Report: Investigation Area 43

4 October 2011

Report by Mark Shepherd, Joanne Henry and David Nance.

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Prepared for:	Growth Areas Authority	PE project number:	GAA 1087
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2	20 January 2011	DSE
3	12 July 2011	GAA/DSE
4	4 October 2011	

Internal review and auditing of this report for quality control was conducted by Peter Gannon.

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The following people and organisations contributed to the report, provided advice, information or provided technical support during the preparation of this report:

Practical Ecology

Staci Timms undertook GIS data processing and created maps for the report.

Mark Shepherd, Peter Gannon and Jeremy Neal undertook habitat hectare assessments.

Mark Shepherd undertook targeted flora surveys.

Jane Juliff and David Nance provided technical assistance.

Nic McCaffrey assisted with 'likelihood of occurrence' ratings of significant flora.

Annabelle Stewart, Joanne Henry, Zorza Goodman and David Nance undertook targeted and general fauna survey.

Mal's Ecological and Environmental Services

Malcolm Legg undertook general fauna survey and targeted survey for threatened fauna, and provided regional significance ratings for threatened fauna.

Rob Gration MWldMgt (Habitat); Certified Wildlife Biologist - Ecological Consulting Services

Rob Gration identified and analysed microbat calls recorded with bat detector.

Ecocentric Environmental Consulting

Peter Gannon undertook habitat hectare assessments and reviewed the draft report.

Department of Sustainability and Environment

Clare White, Biodiversity Precinct Planner, provided project advice relating to the determination of conservation significance of habitat zones within the contract area.

Biodiversity Information Group provided access to their ecological databases; Victorian Flora Site Database (VFSD) and Atlas of Victorian Wildlife (AVW).

Sub-Regional Species Surveys

Sub-Regional surveys were conducted for the Growling Grass Frog (GGF), the Golden Sun Moth (GSM), and the Southern Brown Bandicoot (SBB), as part of a separate project to the current Biodiversity Mapping Project 2009 – 2010. The purpose of the work was to inform and provide background information for the development of Sub-Regional strategies for each of these species.

Contractors were required to reference and use the Sub-Regional survey information as part of the preparation of the Biodiversity Assessment Reports. Accordingly, no targeted surveys were carried out for these species as part of the Biodiversity Mapping Project 2009 – 2010.

The Sub-Regional survey information referenced in the Biodiversity Assessment report will be superseded by the Sub-Regional Strategies for the relevant species and ultimately the Biodiversity Conservation Strategy once endorsed by the Federal Government.

EXECUTIVE SUMMARY

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a habitat hectare assessment, and flora and fauna assessment within Contract Area 43, Victoria. The purpose of this report is to provide information on the flora and fauna species and Ecological Vegetation Classes (EVCs) that occur within the contract area, as background information to a potential Precinct Structure Plan for this area .

Contract Area 43 is located in the suburb of Clyde North, within the City of Casey in Melbourne's south eastern growth corridor (Figure i). The contract area is approximately 135 hectares and is triangular in shape. Thompsons Road forms the southern boundary, Berwick-Cranbourne Road forms the western boundary, while the north-eastern boundary is formed by Pound Road. Thecontract area is surrounded predominately by grazing land (Figure i).

Flora

Seventy flora species were recorded within the contract area (Appendices 1 & 2). Twenty-one (43%) of these species are indigenous. No threatened flora species were recorded during the current assessment. Thirty-eight threatened flora species have been recorded within 10 kilometres of the contract area or are predicted to occur by DEWHA. Two of these species are considered to have at least a moderate likelihood of occurrence, based on nearby records and suitable habitat within the contract area.

A total of 2.47 hectares of native vegetation comprising 0.50 habitat hectares was defined within the contract area (Figure ii). Native vegetation comprising Habitat Zones within Contract Area 43 is confined primarily to road reserves and constructed drainage-lines within the Gippsland Plains Bioregion. Three EVCs were recorded and mapped within the contract area (Figure ii). This vegetation consists of Swamp Scrub (Endangered Conservation Status), Swampy Riparian Woodland (Endangered Conservation Status) and Sedge Wetland (Vulnerable Conservation Status) of relative low quality. All 38 patches of native vegetation recorded within the contract area have been assigned high conservation significance, as per Appendix 3 of Victoria's *Native Vegetation Framework*. Fifty-five scattered trees were recorded within the contract area. The majority of these trees occur in roadsides and farmland in the south of the contract area.

The majority of the remainder of the contract area is currently being used for cropping and grazing and features large open paddocks with some indigenous scattered trees and planted vegetation. Non-indigenous vegetation includes planted non-indigenous Eucalypts and other established trees along fence-lines and roadsides. Drainage lines, wetlands and roadsides include areas of modified native vegetation that comprise the floristic components of Swamp Scrub and other EVCs, but do not meet DSE's native cover thresholds. Non-native vegetation and Degraded Treeless Vegetation totals approximately 132 hectares at the contract area.

Fauna

Seventy-seven fauna species were recorded during the current assessment (excluding invertebrates). This included 63 native species and 14 exotic species. Two significant fauna species were recorded during the current assessment; Glossy Grass Skink *Pseudemoia* rawlinsoni and Southern Toadlet *Pseudophryne semimarmorata*.

Fifty-nine national and state significant fauna species have been recorded or are predicted to occur within ten kilometres of the study aea are documented on the Atlas of Victorian Wildlife (AVW) and EPBC Protected Matters Search Tool. Three significant fauna species the were recorded during the current assessment. These are the Glossy Grass Skink (listed as near threatened in Victoria (2007a)), Southern Toadlet (listed as vulnerable in Victoria (DSE 2007a)) and White-throated Needletail *Hirundapus caudacutus* (listed as migratory (DEWHA 2010a)). One additional species listed as migratory detected through database searches area considered to have a high likelihood of occurrence within the contract area, the Fork-tailed Swift *Apus pacificus*. A further six species detected through database searches are considered to have a moderate likelihood of occurrence within the contract area. These species are the Black Falcon *Falco subniger*, Dwarf Galaxias *Galaxiella pusilla*, , Rufous Fantail *Rhipidura rufifrons,* Spotted Harrier *Circus assimilis,* Swamp Skink *Egernia coventryi* and the Growling Grass Frog *Litoria raniformis*.

The majority of fauna habitat was found within roadside reserves and a network of constructed drainage lines that transect the investigation area. Both of these habitat types have value as corridors within a landscape largely dominated by pasture. Furthermore, two of the significant species recorded during this assessment were found within these habitats.

Growling Grass Frog and Southern Brown Bandicoot surveys were not conducted during this assessment. Refer to the Sub Regional Surveys for Southern Brown Bandicoot (O'Malley 2010) and Growling Grass Frog (Renowden et al. 2010) for further information on the potential occupancy and impacts.

Key Biodiversity Issues and Implications

The areas of highest conservation priority within the contract area consist of the remnant and recolonising Swamp Scrub, Swampy Riparian Woodlands and drainage-lines within roadsides and within 1100 Pound Road (PFI 208514974).

Land-use change within the contract area, such as residential, business or industrial developments have the potential to significantly impact existing native vegetation, ecosystem function, water quality, threatened species habitat and local and regional biodiversity, through the direct removal of native vegetation and habitat. However, approximately two percent of the contract area comprises indigenous vegetation, which provides significant opportunities to avoid native vegetation removal, as required first and foremost by Victoria's *Native Vegetation Management: a Framework for Action*.

While the majority of native vegetation within the contract area occurs along the roadsides, several other smaller areas of native vegetation and habitat occur within the contract area, such as:

- Swamp Scrub at 1100 Pound Road (PFI: 208514974);
- drainage-lines throughout the contract area, especially within 1100 Pound Road; and scattered trees, especially within 1865 Thompsons Road (PFI: 636937).

A large part of the contract area is covered by a Land Subject to Inundation Overlay (LSIO). Potential development will need to liaise with water authorities to manage potential flood risk. Mitigating flood risks should not interfere with conservation opportunities, including managing habitat for Dwarf Galaxias *Galaxiella pusilla*. Dwarf Galaxias require periodic flooding for opportunities to migrate. Water movement through a landscape forms part the overall connectivity within a landscape.There is potential to mitigate or avoid habitat losses and improve the habitat values through implementation of rehabilitation and conservation programs, and through improved land and water use practices that promote natural regeneration of the site's native vegetation. Potential mitigation and improvements relevant to the contract area include:

- Retention and rehabilitation of drainage-lines (including within 1100 Pound Road) and the Sedge Wetland EVC remnants contained therein.
- Incorporation of the above mentioned drainage lines in Water Sensitive Urban Design (WSUD) stormwater treatment systems and the establishment of aquatic habitat for the region's significant fauna (with particular emphasis on the provision of habitat for Glossy Grass Skink and Southern Toadlet).
- Establishment of stormwater retention wetlands to reduce pollutants entering drainage lines and reduce hydrological changes and increase aquactic habitat within the contract area.
- Establishment of supporting terrestrial habitat to either side of the drainage lines.
- Establishment of adequate buffer zones to either side of the abovementioned drainage lines for the purpose of controlling pedestrian access.
- Retention of roadside remnant areas and drainage lines offering aquatic habitat values to the region's significant fauna (in particular sites known to support Glossy Grass Skink and Southern Toadlet and potential to support Dwarf Galaxias).
- Retention of the Swamp Scrub remnant (north east corner of land parcel 208514974) and its incorporation into WSUD stormwater treatment systems, provision of sufficient buffer area for its conservation, and the development of

habitat for the region's significant fauna species (in poarticular Glossy Grass Skink and Southern Toadlet).

- Establishment of a scattered tree reserve in the south-west corner of the contract area for the retention and conservation of several significant Large and Medium Old Trees and the regeneration of Plains Grassy Woodland habitat.

A potential PSP area design should also incorporate ecological rehabilitation with the particular aim of improving habitat connectivity within the region. Potential habitat links between Contract Area 43 and neighbouring Precinct can play an important role in linking core habitats between Western Port Bay and the foothills of the Great Dividing Range.

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VERSION: 02	DATE: 04/10/10

MAP AND SURVEY DETAILS

Mapping by: Staci Timms, 29/04/10
Generated from: Aerial Imagery and GIS base layers supplied by DSE and GAA, additional GIS layers from Geoscience Australia.

For further detail of Contract Area 43, refer to "FIGURE 1: Study Area"

DATUM: GDA 94 VICGRID 94

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LEGEND

- Roads
- Watercourse
- Railway Stations
- Railway Lines
- Urban Growth Boundary
- STUDY AREA Contract Area 43
- Other Contract Areas and Precincts
- City of Casey Local Government Area Boundary

FIGURE i
REGIONAL CONTEXT
Contract Area 43
Biodiversity Mapping Project 2009-2011

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DATUM: GDA 94 VICGRID 94

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MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.
For more detailed maps of Access, EVCs and Scattered Trees, refer to Figures 2 and 5.

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 43 Site Boundary
- Property Access Constraints - Survey not completed
- Other Contract Areas and Precincts
- Remnant Patch
- Scattered Trees
- Non Native Vegetation
- Degraded Treeless Vegetation

FIGURE ii

HABITAT ZONES, SCATTERED TREES AND PROPERTY ACCESS
Contract Area 43

Biodiversity Mapping Project 2009-2011

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MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 14582 Property PFI

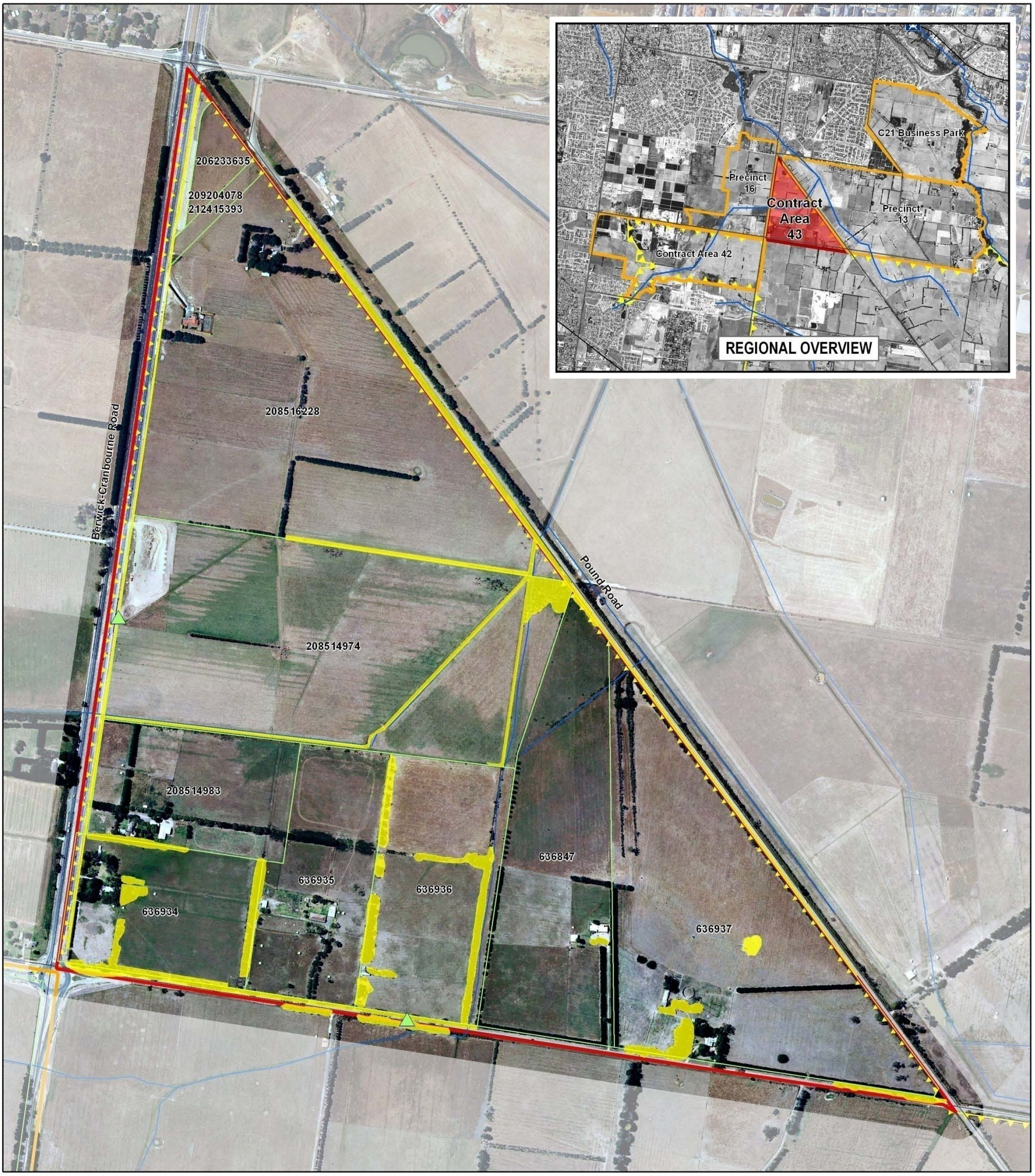
Conservation Significance - Scattered Trees
- High

Conservation Significance - Habitat Zones
- High

FIGURE iii

CONSERVATION SIGNIFICANCE Contract Area 43

Biodiversity Mapping Project 2009-2011



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Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.
For more detail on significant flora, fauna habitat and significant fauna records refer to Figures 2, 7 and 8 respectively

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 561854 Property PFI
- Practical Ecology Fauna Survey Results State Significant Species
- Fauna Habitat

FIGURE iv

SIGNIFICANT SPECIES RECORDS AND FAUNA HABITAT Contract Area 43

Biodiversity Mapping Project 2009-2011

Contents

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INTRODUCTION

1.1 Project background

Project Purpose

The role of the Growth Areas Authority (GAA) is to plan for the new suburbs on the periphery of metropolitan Melbourne, to improve planning process and achieve better outcomes for new communities.

The GAA has undertaken detailed scale flora and fauna assessment and mapping to determine biodiversity values within Melbourne's growth areas. This is an essential input into the planning process and informs the environmental outcomes that can be achieved from the process. Assessment and mapping of biodiversity values, as part of Melbourne's planning, has never been undertaken on this scale before.

The project provides biodiversity information which is needed to carry out the detailed planning for future urban precincts. Importantly, this information (which includes determination of 'habitat hectares' of native vegetation in each precinct) will enable the application of the *Victorian Native Vegetation Management Framework* principles of 'avoid, minimise and offset' and the achievement of 'net gain' outcomes.

Planning of new precincts in Melbourne must also meet National objectives for the conservation of matters of National Environmental Significance as described by the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999. The biodiversity reports prepared by the GAA are an important tool in Victoria meeting its obligations under Commonwealth legislation and achieving these national environmental objectives.

The purpose of the GAA Biodiversity Assessment and Mapping Project is to:

- Undertake detailed field surveys of native vegetation and targeted flora and fauna species and to assess and map the ecological significance of these.
- Prepare Biodiversity Reports (covering native vegetation and flora and fauna habitat) as essential background input into precinct structure planning at an early stage in the planning process.
- Inform the preparation of precinct structure plans in areas designated for future urban development
- Assist the long term planning of Melbourne's growth areas, including working with infrastructure authorities to ensure their requirements are met over the next 30-50 years;

The project has been undertaken over two consecutive years covering a total of 43,577 hectares, using prescribed survey techniques to map native vegetation, and targeted flora and fauna species. Experienced botanists and zoologists have been contracted by the GAA to undertake field surveys according to standards established by the GAA and the Victorian Department of Sustainability and Environment (DSE).

The total areas surveyed during the first year of the project (2008/2009) was 32,899 hectares of which 6,070 hectares was inside the Urban Growth Boundary; 20,320 hectares was within investigation areas (proposed Urban Growth Boundary); and 6,509 hectares of western grassland areas – resulting in the production and publication of 13 Biodiversity Reports.

The second year of the project (2009/2010) assessed and mapped an additional area of 10,678 hectares of land proposed for future urban development and will result in the preparation of a further 20 Biodiversity Reports.

Biodiversity Reports

These Biodiversity Reports will inform the preparation of precinct structure plans in areas designated for future urban development. In particular, the reports provide data about the quality, type, extent and significance of native vegetation and flora and fauna habitat within each planning precinct. Additionally, the Reports provide data used for preparation of Native Vegetation Precinct Plans and, in some cases, for preparation of Conservation Management Plans.

This process enables the planners and other professionals working on the precinct plan to understand the ecological value of habitat existing within the precinct and to make decisions about the future urban structure and provision of infrastructure within the precinct using the principles contained in *Victoria's Native Vegetation Management Framework* of 'avoid, minimise and offset'.

The State Government's goal for conserving native vegetation in Victoria is 'to achieve a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain'. The assessment and mapping of Victoria's biodiversity values make a significant contribution to the State Government's goal in the context of planning for Melbourne's growth areas.

Streamlining Initiative

Detailed assessment and mapping of biodiversity prior to precinct planning is an initiative developed by the GAA to improve and streamline the planning process. It is an innovative approach to structure planning practice and improves both planning and environmental outcomes in Victoria by the following:

- The assessments are carried out early in the planning cycle so that they can inform design and decision making.

- The field work is undertaken at the correct time of the year according to ecological standards and according to survey techniques established and agreed by GAA and DSE.

- Multiple field surveys are conducted concurrently by qualified practitioners, which is a more efficient method of collecting the biodiversity data.

- Economies of scale are achieved by contractors covering large land areas (at the precinct scale), reducing the cost and time required.

- The resulting Biodiversity Reports provide all stakeholders with consistent and reliable information about flora, fauna and habitat values within the precinct to enable better decision making and environmental outcomes to be achieved.

- GAA carrying out this work reduces the burden on local governments and land owners and provides greater certainty for urban development and biodiversity outcomes.

As a streamlining initiative, the project follows GAA principles of carrying out the necessary background research competently and early in the process. By the GAA establishing the survey and reporting standards required up front and by doing the research early in the process, it avoids others having to repeat or rectify the research later in the process. Repeat surveys and inadequate quality of surveys has often occurred in the past and the GAA seeks to avoid this occurring in current planning work.

New Standards of Practice

The GAA Biodiversity Mapping and Assessment Project establishes new standards in the integration of biodiversity conservation in the planning of new suburbs in growth areas by:

- Determining up front with the Department of Sustainability and Environment the prescribed survey techniques to be used by contractors working in the field.

- Establishing up front with the Department of Sustainability and Environment which targeted surveys (for which species of flora and fauna) are required in each precinct according to known or likely habitat.

- Agreements between GAA and DSE mean that a more strategic approach has been taken to surveys for specific species – using either an 'assumed' presence model (e.g. Striped Legless Lizard) and a sub-regional survey approach (for Southern Brown Bandicoot, Growling Grass Frog and Golden Sun Moth).

- Use of hand-held GPS field mapping devices and a common approach to map presentation to provide consistent and quality mapping standards to be achieved.

- All contractors, while being experienced and qualified scientists, were required to undergo three days of compulsory training in habitat hectare assessment

techniques and a competency check (managed by DSE) and field based quality checks of their work.

The GAA flora and fauna mapping and assessment project was undertaken in close association with the Department of Sustainability and Environment (DSE) which is the regulator for biodiversity protection and conservation in Victoria. This collaborative and proactive approach by the GAA to work with the DSE has added significant value to the quality and reliability of the project outcomes. The data collected by the project and it assessment and mapping adds to the protection, management and restoration of the environment through the precinct planning process.

The Biodiversity Reports prepared for each planning precinct are a key input into the detailed planning for the precinct. They support the preparation of key documents such as:

- The Biodiversity Plan (setting out the key biodiversity issues and implications) included within the Precinct Structure Plan.
- Native Vegetation Precinct Plan (setting out the native vegetation to be retained, removed and offset within the precinct).
- A Conservation Management Plan if required (which sets out the management prescriptions for matters of national environmental significance).

Collaboration by GAA with the Victorian Department of Sustainability and Environment (DSE) throughout the project has enabled the development of a robust methodology and a biodiversity template for the production of reports.

Quality of Professional Work and Final Product

The GAA approach has established appropriate standards at the outset of the project and ensured that the work is done to meet these standards, to avoid re-work and future delays. Measures have been put in place throughout this project to ensure quality standards are met and reflected in the final reports. These can be summarised as follows:

- A project governance structure has been used by the project from start to finish involving both the GAA (undertaking the project) and DSE (the regulator for biodiversity matters under Victorian legislation) in establishing the project scope and standards to be achieved.
- A project scope was prepared and reflected within the Tender specification used by the GAA to ensure that contractors who were selected by the GAA had the experience and skill required to carry out the project and meet the required quality standards.
- Contractors working on the project were required to undertake 3 days of compulsory training and to meet a competency check.

- Contractors were required to submit monthly reports of the data collected to GAA and DSE to enable checking of data and mapping integrity. This quality check provided confidence in the information collected and rectification of any deficiencies prior to acceptance of the results.

- Biodiversity Reports which explain and interpret the data collected in the field were prepared by qualified ecologists and are designed to enable planners, engineers, designers and others to understand the information and use it in practical applications.

- Quality assurance of draft reports by another qualified ecological consultant has been used to ensure work is accurate and consistent in meeting project standards. The quality assurance process provides a streamlined approach to checking and amending reports before they are finalised and accepted by GAA and DSE.

1.2 Objectives

Outline the objectives of the report:

1. To identify, assess, and map significant flora, fauna, and habitat in the Precinct area and their level of conservation significance.

2. To collect data at sufficient detail and standard that enables a Precinct structure Plan and Biodiversity Plan to be developed

3. To provide advice on any works or management measures that may reduce adverse impacts of the development on species known or likely to occur in the Precinct.

4. To ensure that development of the precinct is able to comply with Government legislative and policy requirements on the protection of indigenous fauna and flora species and communities.

Contract area

Contract Area 43 is located within the suburb of Clyde North, in the City of Casey in Melbourne's south eastern growth corridor (Figure 1). Contract Area 43 is approximately 135 hectares in area and is triangular in shape. Thompsons Road forms the southern boundary, Berwick-Cranbourne Road forms the western boundary, while the north-eastern boundary is formed by Pound Road. The contract area is surrounded predominately by grazing land (Figure 1).

The contract area consists of seven privately owned properties and an easement, and includes adjacent road reserves. The majority of the contract area is currently being used for grazing stock and features large open paddocks intersected by planted rows of conifers

and non-indigenous Eucalypts. Native vegetation is common in roadsides and drainage-lines (Figure 7A, 7B and 7C).

Approximately half of Contract Area 43 is zoned *Urban Growth Zone*, while the remaining half is zoned Urban Floodway. The Urban Floodway zoning coincides by a *Land Subject to Inundation Overlay* (LSIO) (DPCD 2009). A 20m wide Public Acquisition Overlay applies adjacent to Berwick-Cranbourne Road. No conservation zoning or overlays apply to the contract area.

The contract area is not covered by any Biosites, as defined by DSE (2005a). The contract area falls within the Gippsland Plains Bioregion (DSE 2010a). Contract Area 43 shares a north-eastern boundary with Clyde North Precinct Structure Plan (PSP) area and a western boundary with Cranbourne North Stage 2 PSP area. Contract Area 42 is located to the immediate south-west of Contract Area 43. Several other PSP areas or GAA contract areas are situated within several kilometres of Contract Area 43.

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DATUM: GDA 94 VICGRID94

N

0 100 200 300 400

Metres

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MAP AND SURVEY DETAILS

Mapping by: Staci Timms, April 10

Generated from: Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 25436 Property PFI

FIGURE 1

STUDY AREA
Contract Area 43

Biodiversity Mapping Project 2009-2011

METHODS

Terminology

Flora taxonomic nomenclature is consistent with the Flora Information System (FIS) database when accessed through Viridans software (DSE 2009a). Taxonomic nomenclature for scientific names is derived from Walsh and Stajsic (2008).

Fauna taxonomic nomenclature is consistent with Atlas of Victorian Wildlife (AVW) (DSE 2009b) database, accessed through Viridian software.

Literature and Database Review

Background information on the contract area's bioregion and EVC distribution (pre-1750, and current) and previous threatened flora and fauna data was gathered by literature and database review prior to site surveys. Planning reports and land management documents were also reviewed.

Several GIS mapping layers were provided to Practical Ecology by the Department of Sustainability and Environment (DSE) and were incorporated into a GIS. Mapping layers and data sources are detailed below.

GIS data

The following GIS mapping layers supplied to Practical Ecology by DSE for use in this project included:

- cadastre data, identifying individual land parcels, and individual parcel identifiers;
- pre 1750 EVCs;
- extant EVCs;
- biosite25_region mapping layer; and
- geo-referenced and ortho-rectified aerial photographs of the contract area.

Victorian resources

Flora Information System (FIS) and Atlas of Victoria Wildlife (AVW): The FIS (DSE 2009a) and AVW (DSE 2009b) databases were queried to a distance of 10 kilometres from the contract

area boundary. The recorded locations of significant flora and fauna taxa were referred to in the field during the surveys and were used to assist in the determination of likelihood of occurrence. Flora species record sheets were generated using the FIS.

DSE Aquatic Fauna Database. The DSE's database of aquatic fauna was reviewed (DSE 2010b) and DSE's records of Dwarf Galaxias was reviewed (DSE 2010b).

DSE Advisory Lists. DSE's advisory lists of rare and threatened flora and fauna, including invertebrate fauna were reviewed (DSE 2005b; 2007a; 2009c).

Commonwealth resources

EPBC Act Protected Matters Search Tool. The *Protected Matters Search Tool* (DEWHA 2010b) was queried for a 10 km buffer from the contract area boundary. The search tool provides information on EPBC Act listed species occurring or predicted to occur in the search area: http://www.environment.gov.au/erin/ert/epbc/index.html

EPBC Act Species Profile and Threats Database. EPBC Act listed species profiles were investigated on the Department of Environment, Water, Heritage and the Arts (DEWHA) species profile and threats database (DEWHA 2010a): http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Environmental Reporting Tool (ERT) The ERT was consulted for threatened species, important wetlands and heritage sites within the contract area (DEWHA 2010c): http://www.environment.gov.au/apps/boobook/mapservlet?app=ert

National Recovery Plans National Recovery Plans for EPBC Act listed flora and fauna were reviewed: http://www.environment.gov.au/biodiversity/threatened/recovery.html (DEWHA 2010d).

Consultant's Reports

A review was conducted of ecological reports, including Strategic Impact Assessments/ Surveys made available to us that were relevant to the contract area. This literature assisted the identification of significant sites, species, habitat corridors and other relevant matters.

These reports included:

- Draft sub-regional survey for Growling Grass Frog *Litoria* ranifomis (Renowden et al. 2010)
- Draft Sub-regional survey for Southern Brown Bandicoot *Isoodon obesulus* (Stewart and Shepherd 2010)

- Draft sub-regional strategy for Southern Brown Bandicoot *Isoodon obesulus* (O'Malley 2010)
- Biodiversity Enhancement Strategy – City of Casey (McMillan et al. 2003);
- City of Casey Revegetation Strategy (Brett Lane and Associates 2008).
- Dwarf galaxias survey of the Cardinia Creek Retarding Basin and selected locations in the Cardinia Creek catchment (McGuckin 2010).

Ecology Australia undertook a Sub-regional targeted survey for Growling Grass Frog for Growth Areas Authority within the entire south-east growth corridor, within which the contract area is included (Renowden et al. 2010). This report is part of a *Strategic Impact Assessment* and was completed as part of an arrangement between DEWHA and DSE to address EPBC Act listed species on a sub-regional scale. This report was reviewed and survey results were incorporated into the results and discussion sections of this report.

Consultation with field naturalists

Malcolm Legg, Mal's Ecological and Environmental Services, assisted with general and targeted fauna surveys, and the identification of potential habitat for threatened and significant flora and fauna.

Rob Gration, MWldMgt (Habitat); *Certified Wildlife Biologist ® Ecological Consulting Services,* provided advice on the use of bat detectors and the survey of micro-bats.

Determination of likelihood of occurrence for threatened species

Threatened flora

Likelihood of occurrence for threatened flora species was determined by habitat analysis and proximity to past records (DSE 2009a). All current and past significant flora records within 10 kilometres of the contract area were displayed on a working map to aid the determination of likelihood of occurrence.

The Flora of Victoria (Walsh and Entwisle 1994) and FIS (DSE 2009a) was reviewed for habitat descriptions and distributions of threatened flora.

Threatened Fauna

Likelihood of occurrence for threatened fauna species was determined by habitat analysis and proximity to past records (DSE 2009b). All current and past significant fauna records within 10 kilometres of the contract area were displayed on a working map to aid the determination of likelihood of occurrence.

Malcolm Legg provided zoological expertise in potential habitat to target for conservation significant species.

Field survey techniques

General flora survey

General flora survey was undertaken on foot. The majority of survey was undertaken between September 2009 and December 2009.

Particular attention was given to areas of high floristic diversity, including areas of indigenous habitat and drainage-lines. Flora species were recorded on species record sheets generated from the FIS (2009a).

Habitat hectare assessments

Habitat hectare assessments were undertaken in accordance with specifications developed for GAA's *Biodiversity Mapping Project 2009-2011*. Surveys were consistent with DSE's *Vegetation Quality Assessment Manual* (DSE 2004) and *Growth Areas Authority Biodiversity Assessment Project 2009/10: vegetation mapping and condition assessment procedures* (DSE 2009d). Training was provided by DSE in a three day session at the project's inception. Auditing was undertaken by DSE throughout the fieldwork stage.

Flora data was collected in the field using a hand-held Person Digital Assistant (PDA). Habitat hectare and significant species data was recorded in the field on the PDA using a GIS software application for ArcPad developed by DSE for the *Biodiversity Mapping Project 2009-2011* (DSE 2008). DSE's software application enabled the collection of data as outlined in the sections below. The resulting ESRI shapefiles were processed using ArcView V.9 software to re-edit and refine data for electronic submission.

GIS data was submitted to GAA and DSE for monthly review throughout the project. Requested edits were completed and data was resubmitted. At the conclusion of the fieldwork, the monthly data was merged to form a single GIS file, which was exported to into excel spreadsheets for presentation in this report.

Habitat hectare assessments included:

- Mapping the extent of remnant and non-remnant vegetation.
- Mapping Habitat Zone polygons, as defined below and in accordance with Victoria's *Native Vegetation Management Framework* (DNRE 2002) and DSE's *Vegetation Quality Assessment Manual* (DSE 2004).
- Determination of Ecological Vegetation Classes (EVC).

- Native vegetation condition assessment (Habitat Hectares site and landscape context score) and assessment of other site attributes including land-use, habitat attributes and high threat environmental weeds.

- Determining the quantity, size (small, medium, large and very large) and genera of indigenous canopy trees (either within habitat zones or as individual trees when scattered in the landscape).

Vegetation in the contract area was classified into different categories. These categories and their definitions are consistent with policy and legislation, particularly *Victoria's Native Vegetation Management Framework* (DNRE 2002), and assists in identifying where such policies come into effect.

The following categories were applied in accordance with the *Growth Areas Authority Biodiversity Assessment Project 2009/10: vegetation mapping and condition assessment procedures*.

Remnant Vegetation Patch

- EVCs and Habitat Zones were identified within each patch in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).

- Each Habitat Zone was mapped and a Habitat Hectares Assessment using DSE's PDA based 'Habitat Hectares for ArcPad' application.

- The number of Very Large Old Trees (VLOTS), Large Old Trees (LOTS), Medium Old Trees (MOTS) and Small Trees (STs) within habitat zones were recorded in the PDA based 'Habitat Hectares for ArcPad' application.

- The number of small trees within vegetation patches cannot be recorded via the 'Habitat Hectares for ArcPad' application and was therefore recorded manually and transferred to a spreadsheet for submission (refer to *Growth Areas Authority Biodiversity Assessment Project 2009/10: vegetation mapping and condition assessment procedures* for more information).

Scattered Trees

- Scattered tree points were assigned in the field and any scattered tree the EVC was assigned in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).

- The size class (VLOT, LOT, MOT and ST) was recorded for each scattered tree using DSE's PDA based application.

- The common name and species name of each scattered tree was recorded using DSE's PDA based application. Habitat Zones and Scattered Trees were assigned a simple unique identifier.

Degraded Treeless Vegetation

Degraded treeless vegetation was recorded as any contiguous area of remnant vegetation occurring below 25% overall cover, defined at a scale of approximately 1:5000.

Non-Native Vegetation

Non-native vegetation was recorded as any contiguous area of non-native vegetation, including areas of non-indigenous native flora species, defined at a scale of approximately 1:5000.

Targeted flora survey

Targeted Flora Surveys were conducted for designated flora species outlined in Appendix 6 of the Growth Areas Authority *Biodiversity Mapping Project Request for Tender* document No. D/09/4006:

- Matted-flax lily
- River Swamp Wallaby-grass
- Swamp Everlasting
- Maroon Leek-orchid
- Grey Billy buttons

An additional nine flora species were targeted during general flora searches:

- Pale Swamp Everlasting
- Veined Spear-grass
- Purple Diuris
- Naked Sun Orchid
- Wine-lipped Spider Orchid
- Frankston Spider Orchid
- Cream Spider Orchid
- Green-stripeed Spider Orchid

- Metallic Sun Orchid

The appropriate season and conditions were chosen for each of the targeted flora species within appropriate habitat at the contract area.

Appropriate habitat for threatened flora species within the contract area was identified during general flora survey and during reconnaissance visits at the beginning of the survey period. Six broad areas of habitat were identified (Figure 2).

Targeted flora surveys were undertaken in six locations in spring. The six locations were surveyed again in early summer (Figure 2). Areas of highest floristic diversity and potential to harbor threatened species were prioritised over areas of least floristic diversity and potential. In general, drainage-lines, areas of Swamp Scrub and vegetated roadsides were prioritised over areas of cleared farmland for the purpose of targeted flora searches.

Targeted searches were undertaken in contiguous patches of appropriate habitat within a defined area of 1 to 4 hectares for at least two hours. In most cases, searches for targeted species were also carried out during general flora survey and habitat hectare assessments. In some cases, areas of highest floristic diversity and potential to harbor threatened species were surveyed multiple times. Targeted flora study sites 2,3,4 and 6 comprise lineal drainage-lines and roadsides approximately 2-5m wide. These study sites were assessed as a line search. Study sites 1 and 5 were assessed using a grid search, spaced at approximately 5 metres.

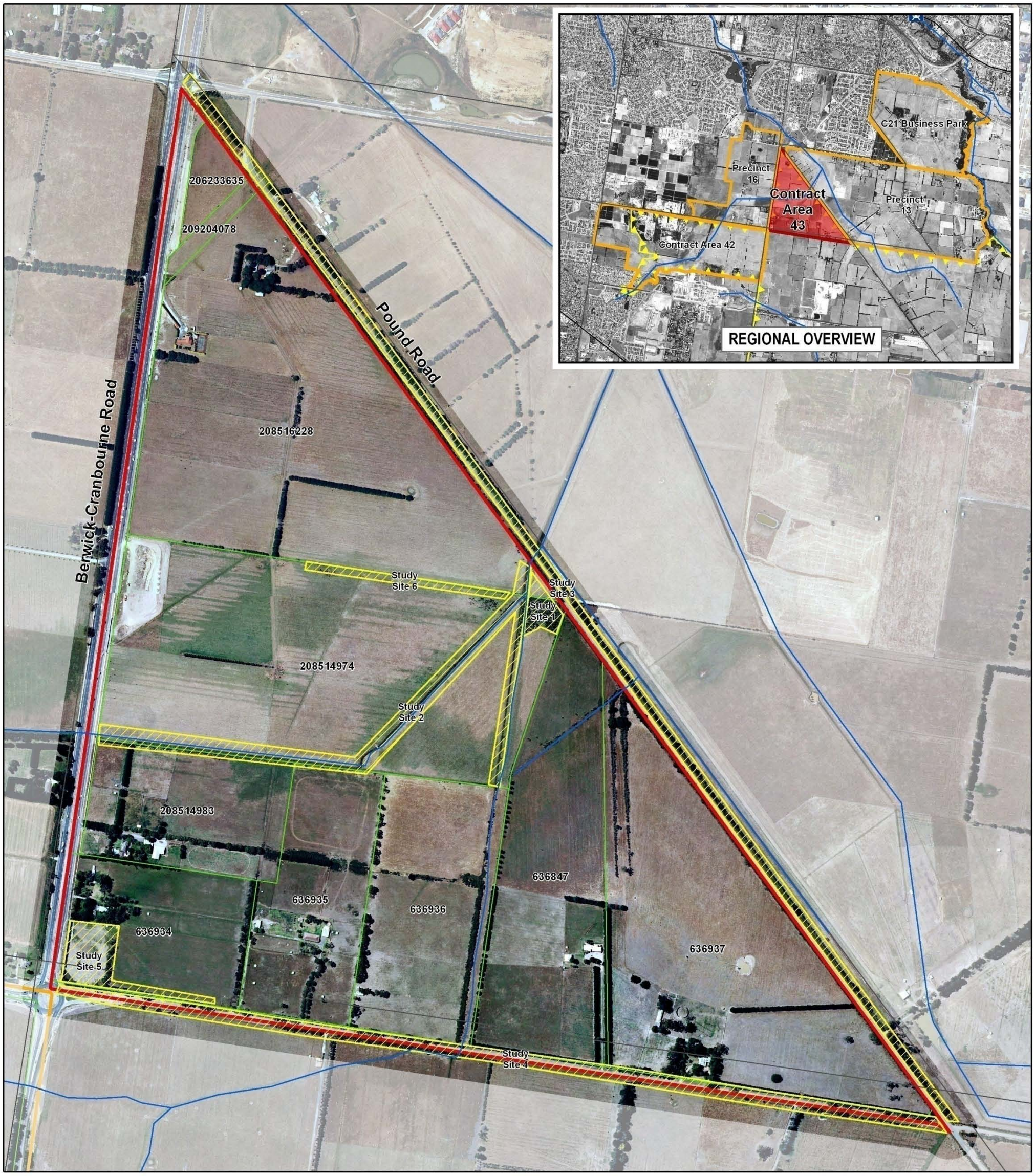
General Fauna Survey

The contract area was surveyed by Malcolm Legg of *Mal's Environmental and Ecological Services* and by Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of *Practical Ecology* between September 2009 and April 2010.

General fauna survey was undertaken throughout potential habitat areas within the contract area. This included diurnal bird surveys, invertebrate surveys, micro-bat surveys and spotlighting which targeted arboreal mammals and nocturnal birds (Figure 3). All incidental fauna seen or heard was recorded during targeted surveys.

Bird census was undertaken throughout the Precinct. Incidental records were also compiled for fauna species recorded within this Precinct.

All fauna sampling within the contract area was carried out under Research Permit Numbers 10004805 (Practical Ecology) and 10004056 (Mal's Environmental and Ecological Services).



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VERSION: 02	DATE: 04/10/10

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DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250 300

Metres

1:7,000 when printed at A3

MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, 27 April '10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 52687 Property PFI
- Targeted Flora Survey Study Sites

Significant Flora Species
No flora species of National or State Significance were detected during survey nor listed from database searches.

FIGURE 2

SIGNIFICANT FLORA AND SURVEY EFFORT
Contract Area 43

Biodiversity Mapping Project 2009-2011

Spotlighting

Spotlighting was undertaken at least 30 minutes after sunset on foot using 50 watt spotlights. Potential habitat was targeted during the spotlight surveys undertaken over three separate nights. All fauna seen and heard during spotlight walks were recorded. Figure 3 displays the location of spotlighting surveys undertaken within the contract area.

Invertebrate survey

Areas of potential habitat were identified and two invertebrate pitfall transects were deployed. Each transect comprised ten pitfalls located approximately 20m apart. Pitfall traps were filled with a solution of biodegradable, odourless, chemical free detergent, table salt and water. The detergent serves to break the surface tension of the water while the salt acts as a preservative for short periods. Traps were open for three consecutive nights during warm weather. Invertebrates were collected each day and traps reset.

Active searching was undertaken at each transect site, including log turning, bark removal, pooter (vacuum) collection and the sweeping of areas with a large canvas net. Aquatic invertebrate sampling involved netting and the collection of silt. Other collection of invertebrates took place opportunistically in areas of habitat throughout the precinct. Figure 3 displays the locations of invertebrate pitfalls undertaken within the contract area.

Invertebrates were preserved in an ethanol solution and identified and photographed in a laboratory. Classification of invertebrates was undertaken to Order and in some instances Family level.

Micro-bat surveys

Anabat II and Anabat SD1 were used to detect micro-bat presence within the contract area. The Anabat detectors were used passively and actively during the surveys. Passive survey involved leaving the Anabat out unattended during the evening, and active survey involved carrying the Anabat detector whilst surveying with a spotlight. Both techniques are effective for detecting micro-bat species. Figure 3 displays the locations of Anabat surveys undertaken within the contract area.

Bird surveys

Bird Surveys were undertaken at every habitat type twice between dawn and midday and twice preceding sunset. Wetland birds were surveyed during daylight hours. All birds were identified using sight and call vocalisation. All birds seen and heard during other targeted surveys were recorded. Figure 3 displays the locations of bird surveys undertaken within the contract area.

General and incidental survey

Non-target amphibians, reptiles, birds and mammals were subject to incidental survey during targeted searches undertaken with a particular emphasis placed on threatened species using the following methods:

- Birds, including wetland birds were identified by sight and vocalisation during daytime and spotlight walks. Woodland birds were surveyed between dawn and midday and two hours preceding nightfall.
- Reptiles were identified by sight, during log and rubbish turning and during general inspection of habitat. Where possible, reptiles were captured by hand to assist identification. All reptiles were returned to the point of capture after identification.
- Reptiles and small mammals were also surveyed using the Glossy Grass Skink methods detailed in section 2.3.5 below.
- Mammals were identified by vocalisation, sight and by identifying diggings, scats and footprints.
- Amphibians were identified by vocalisation and sight, including spotlighting and fish trapping (tadpoles were detected using small fish traps and dip netting) within a selection of appropriate amphibian habitat during spotlighting surveys.

A fauna species list for the entire contract area was compiled. This included species recorded in the contract area and those flying over or heard close to the contract area.

Targeted Fauna Survey

Targeted searches were commissioned by GAA for four fauna species listed as threatened under State and Federal legislation or as threatened by DSE (DSE 2007a) (Table 1). Targeted searches for any other threatened species were not commissioned by GAA. Please note this biodiversity assessment does not include targeted surveys of Growling Grass Frog and Southern Brown Bandicoot as surveys for those species were undertaken during the Sub Regional Surveys required under the Strategic Assessment.

Table 1. Threatened Species Targeted for Fauna Survey

FFG	EPBC	DSE (2007a)	Common name	Scientific name
L	VU	v	Dwarf Galaxias	*Galaxiella pusilla*
		n	Glossy Grass Skink	*Pseudemoia rawlinsoni*
		v	Southern Toadlet	*Pseudophryne semimarmorata*
L		v	Swamp Skink	*Egernia coventryi*

Dwarf Galaxias

Dwarf Galaxias *Galaxiella pusilla* were targeted using rectangular bait traps baited with White Bait and glow sticks placed in appropriate habitat, near reeds and sedges. Lights traps were deployed in all potential habitats. Traps were left overnight and checked the following morning. Dip-nets were also used near the banks of waterways in and around reeds and sedges in random searches at each survey location. Trap locations are displayed in Figure 3.

Glossy Grass Skink

Glossy Grass Skink *Pseudemoia rawlinsoni* was surveyed by using 30cm by 30cm pieces of colour-bond tin placed at 10-20 metre intervals within suitable habitat. Habitat included drainage lines, along Cardinia Creek, around wetlands and dams throughout the contract area. The tin sheets were lifted during the morning prior to 11am and reptiles sheltering under the tin for warmth were caught or observed. Three hundred tin pieces were deployed within the contract area and were checked four times each. Surveys were undertaken in all weather throughout the survey period.

Tin locations are displayed in Figure 3.

Southern Toadlet

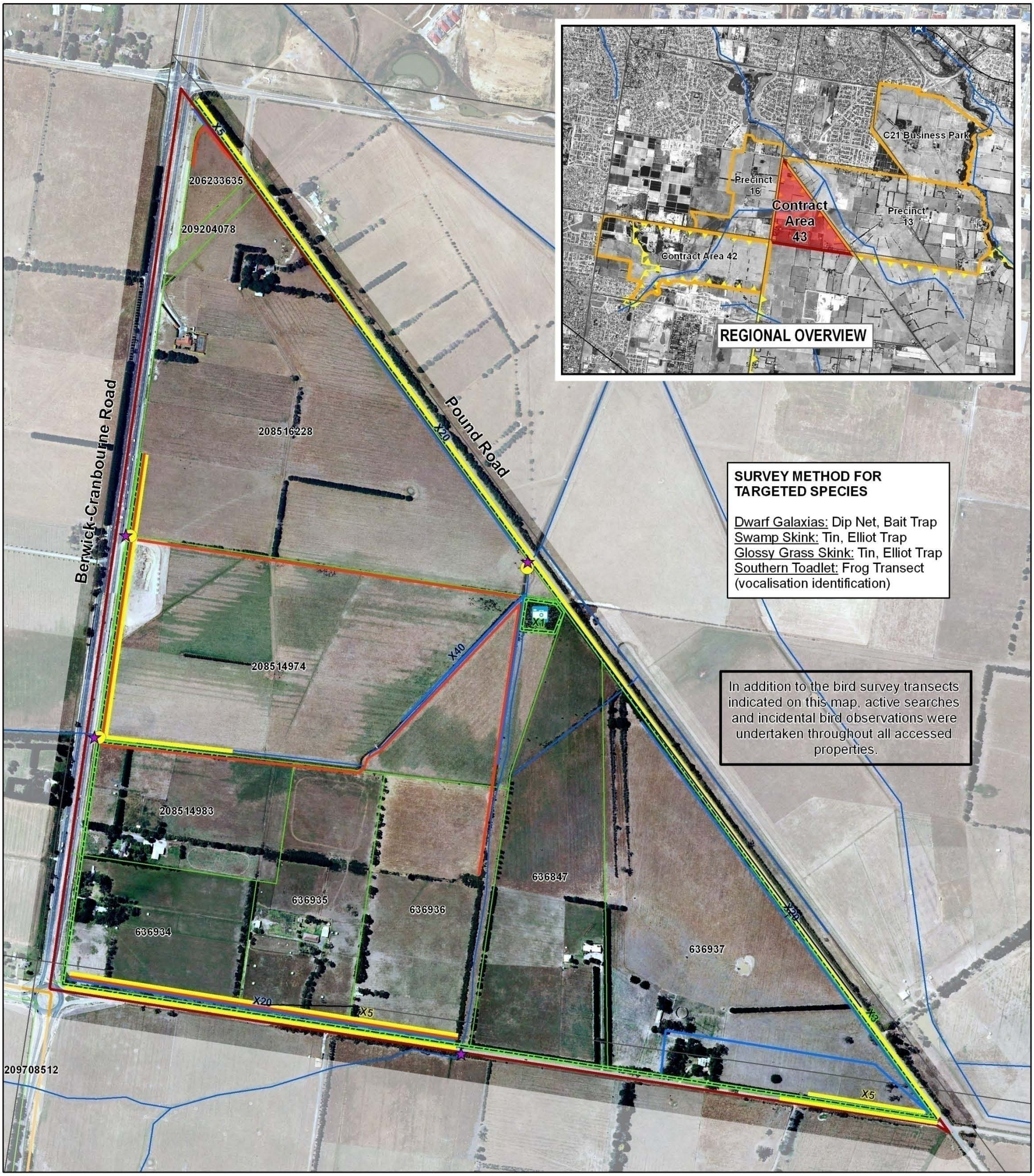
Areas of potential Southern Toadlet *Pseudophryne semimarmorata* habitat within the contract area, including roadsides and drainage lines were identified. Many of these sites have been traversed on foot to identify Southern Toadlet calls during wet weather. Southern Toadlet is a late summer to autumn calling species; therefore the Southern Toadlet survey was still in progress at the time of this draft report submission. However, Southern Toadlet survey results to date are included within this draft report and final results will be published with the final report.

Areas of potential habitat that have been traversed are displayed in Figure 3.

Swamp Skink

Swamp Skink *Egernia coventryi* was surveyed by using 30cm by 30cm pieces of corrugated tin placed at 10-20 metre intervals within suitable habitat. Habitat included drainage lines and around wetlands and dams throughout the precinct. The tin pieces were lifted during the morning prior to 11am and reptiles sheltering under the tin for warmth were caught or observed. Three hundred tin pieces were deployed and most were checked a total of four times each. Surveys were undertaken in all weather throughout the survey period.

Swamp Skinks were also surveyed using Elliot traps. Traps were baited with a mixture of peanut butter, oats, molasses and sardines and were placed in potential habitat throughout the contract area. A total of 120 Elliot traps were deployed for four nights, traps were checked each morning. Tin and trap locations are displayed in Figure 3.



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DATUM: GDA 94 VICGRID 94

N

0 50 100 150 200 250 300

Metres

1:7,000 when printed at A3

MAP AND SURVEY DETAILS
Surveyed by: Jo Henry, David Nance, Zorza Goodman, Annabelle Stewart and Mal Legg, Oct09-Apr10
Mapping by: Staci Timms, 27 April '10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Watercourse
- Property Boundary
- 52687 Property PFI

Survey Method*

- Tin Tiles — X50 Number of tiles
- Spotlight
- Anabat
- Elliot Traps — X40 Number of traps
- Frog Transect
- Dip Net
- Light Trap
- Motion Sensor/ Infrared Camera

*Survey locations mapped are general only and do not represent exact spatial location of route taken or position of traps.

FIGURE 3

FAUNA SURVEY EFFORT
Contract Area 43

Biodiversity Mapping Project 2009-2011

Limitations

Property access

Two properties did not grant access for flora and fauna survey (Figure 4). These properties are:

- 1785 Thompsons Road Clyde North (property PFI: 636935)
- 700 Berwick-Cranbourne Road Clyde North (property PFI: 208514983)

Flora survey timing

Flora survey during the current assessment was undertaken during the spring/summer period. Targeted surveys for threatened flora species are ideally extend over a twelve month period or longer, with extensive survey being conducted during the spring flowering-seed set period. Greater certainty of the presence or absence of threatened flora species would be gained if targeted surveys were undertaken for at least a twelve month period.

Scattered Trees

The number of Very Large Old Trees (VLOTs), Large Old Trees (LOTs), Medium Old Trees (MOTs) and Small Trees (STs) were recorded for each scattered tree zone using DSE's PDA based STLocn shapefile in accordance with the GAA *Vegetation Mapping User Guide*, Size classifications were based on the trunk diameter at breast height (DBH), as measured at 1.3 metres from ground level. Records of actual DBH measurements of individual trees were not kept, in accordance with the project brief and the *User Guide*. The DBH of small trees is however, required to calculate tree recruitment offset requirements for small trees in accordance with the *Port Phillip and Westernport Native Vegetation Plan* (PPWCMA 2006).

Fauna Survey

The optimal time for most fauna sampling is during spring/summer, which is when this survey was undertaken, however different results may have been achieved if surveying was undertaken in different times of the year and over a longer period. An extended survey period would produce more detailed results and a greater certainty of presence or absence of fauna species. Fully comprehensive fauna survey should therefore occur during all seasons over a number of years. This study included four targeted species surveys; Glossy Grass Skink, Swamp Skink, Dwarf Galaxias and Southern Toadlet. However, other threatened species that have the potential to occur within the contract area were not targeted for survey.

In addition to targeted fauna survey, general fauna survey was also undertaken. Incidental observations were made during all surveys. On the basis of existing information and the

new information from this study, it is expected that a reasonable proportion of the species expected to be present within the contract area were detected. While tin trapping, Elliot trapping, AnaBat recording, light trapping, dip netting, frog transects, bird census and spotlighting were undertaken as part of general fauna survey, it is likely that other species would be detected over a longer survey period over different seasons.

While spotlighting is a common and proven survey technique, there are a number of limitations associated with it. While spotlighting took place on warm still nights, bright moonlight may have resulted in some fauna species present within the study site remaining undetected. This is due to increased visibility and hence a higher likelihood of predation leading to spotlight avoidance by fauna, which is a common limitation associated with spotlighting.

Tin, Elliot and light trapping also come with limitations. No fauna trapping technique will result in conclusive survey results as many individuals and some species are can be 'trap shy'. While traps were placed in areas that were considered optimal habitat, individuals may not necessarily come into contact with the trap.

In addition to these limitations, a number of species may not have been observed due to drought and other environmental conditions and also due to not being able to access some properties.

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MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers
supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Urban Growth Boundary
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts

Property Access

- Access granted Flora and Fauna Surveys completed
- Access denied No surveys undertaken onsite

FIGURE 4

PROPERTY ACCESS
Contract Area 43

Biodiversity Mapping Project 2009-2011

RESULTS

General Flora Survey

Flora species recorded

Seventy flora species were recorded within the contract area (Appendices 1 & 2). Twenty-one (43%) of these species were indigenous. The remaining 49 (57%) were either exotic species or native species occurring outside of their natural range.

Threatened flora species recorded within 10 Kilometres

Thirty-eight threatened flora species were identified in database searches as recorded within 10 kilometres (DSE 2009b) or are predicted to occur using the Protected Matters Search Tool (DEWHA 2010b).

Thirty-six of these threatened flora species have been recorded within 10 kilometres of the contract area on the FIS (DSE 2009a). Two of these species are considered to have a moderate likelihood of occurrence; Wetland Blown-grass *Lachnagrostis filiformis* var. 2 and Matted Flax-lily *Dianella amoena*, based on nearby records and suitable habitat within the contract area. The remaining species have a low likelihood of occurrence (Appendix 3).

Eight threatened flora species are predicted to occur by DEWHA (2010b). Six of these species have also been recorded within 10 kilometres (DSE 2009a). One of these species predicted to occur; River Swamp Wallaby-grass *Amphibromus fluitans* has been assigned a moderate likelihood of occurrence, while the remaining species have a low likelihood (Appendix 3).

A description of habitat requirements for threatened flora species recorded within 10 kilometres and species predicted to occur by DEWHA (2010b) is presented in Appendix 3. Appendix 3 also includes an explanation of likelihood of occurrence for each threatened flora species.

Threatened flora species recorded within the contract area

No threatened flora species were recorded within the contract area during the current assessment.

Best or Remaining 50% habitat for rare or threatened flora species

Best or remaining 50% habitat determinations using threatened flora species for individual habitat zones were not influenced by any threatened flora species occurring within 10 kilometres of the contract area (DSE 2009a) or predicted to occur by DEWHA (2010b).

All threatened species recorded within 10km or predicted to occur by DEWHA (2010b) were granted a likelihood of occurrence no greater than *moderate*, based on an evaluation of habitat suitability within the contract area and proximity to records. It was therefore determined that, based on the moderate likelihood of occurrence rating, 'no further consideration is required for those species' when addressing Question D in Table 2 of DSE's *Guide for Assessment of Referred Planning Permit Applications* (DSE 2007b).

Vegetation

Approximately 2.5 hectares of the 135 hectare contract area (2%) comprises native vegetation classified as Habitat Zones (Figure 4). Appendices Figures 7A, 7B and 7C display Ecological Vegetation Classes and Scattered Trees at a finer scale.

Ecological Vegetation Classes

Three EVCs were identified and mapped within the contract area (Figure 4). Table 2 summarises EVCs recorded within the contract area.

Summary of EVCs recorded within the contract area.

EVC Name	EVC Number	EVC cons status	Area (ha)
Swamp Scrub	GipP0053	Endangered	1.06
Swampy Riparian Woodland	GipP0083	Endangered	0.66
Sedge Wetland	GipP0136	Vulnerable	0.75
		Total	**2.47**

The following EVC descriptions are based on the condition of Habitat Zones found on site, and include more general descriptions referenced from EVC benchmarks available on-line (DSE 2009e) and from Oates and Taranto (2001).

Swamp Scrub (EVC 53)

Swamp Scrub is dominated by Swamp Paperbark *Melaleuca ericifolia* or sometimes Woolly Tea-tree *Leptospermum lanigerum* which forms a dense closed canopy. The EVC forms on poorly drained sites or on alluvial deposits along streams. Swamp Paperbark typically out-competes Eucalypt species, although emergent Swamp Gum *Eucalyptus ovata* may occur. Shrubs are usually absent; while a herbaceous and grassy under-storey may be present depending on light availability (Oates and Taranto 2001).

Thirteen mostly small patches of Swamp Scrub were recorded within the contract area on low-lying, damp reaches of roadside verge and drainage-line. These patches are generally the result of natural regeneration of this EVC within damp, marshy sites that have been left relatively undisturbed. One relatively large patch of recolonising Swamp Scrub of low-moderate quality was recorded within the 1100 Pound Road (PFI 208514974).

Swamp Scrub within the contract area is dominated by a closed cover of Swamp Paperbark over an under-storey of low-moderate diversity. Swamp Scrub patches generally show good signs of regeneration and colonisation suggesting that this EVC would naturally colonise damp sites and flood zones if left un-grazed and un-slashed. Small patches with an immature canopy cover were common within the contract area.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2010a).

Melalueca ericifolia colonising farmland

Sedge Wetland (EVC 136)

Sedge Wetland more typically occupies in low-lying areas where landforms such as billabongs, lakes, swamps or depressions occur. Vegetation is generally treeless, however shrubs may be present at the fringes and occasionally scattered throughout the EVC. Vegetation is dominated by sedges, rushes and reeds and tends to be low in diversity in central areas with more variety towards the fringes (DSE 2010a).

This EVC was found mostly within a large drainage-line within 1100 Pound Road (PFI 208514974) within the contract area. Floristic diversity was generally poor. The exotic species Drain Flat-sedge **Cyperus eragrostis* dominated many sections, while indigenous

species such as Slender Knotweed *Persicaria decipiens*, Hollow Rush *Juncus amabilis*, Narrow-leaf Cumbungi *Typha domingensis* and other common aquatic and semi-aquatic indigenous species occurred at varying densities.

This EVC has a 'Vulnerable' Conservation Status within the Gippsland Plains bioregion (DSE 2010a).

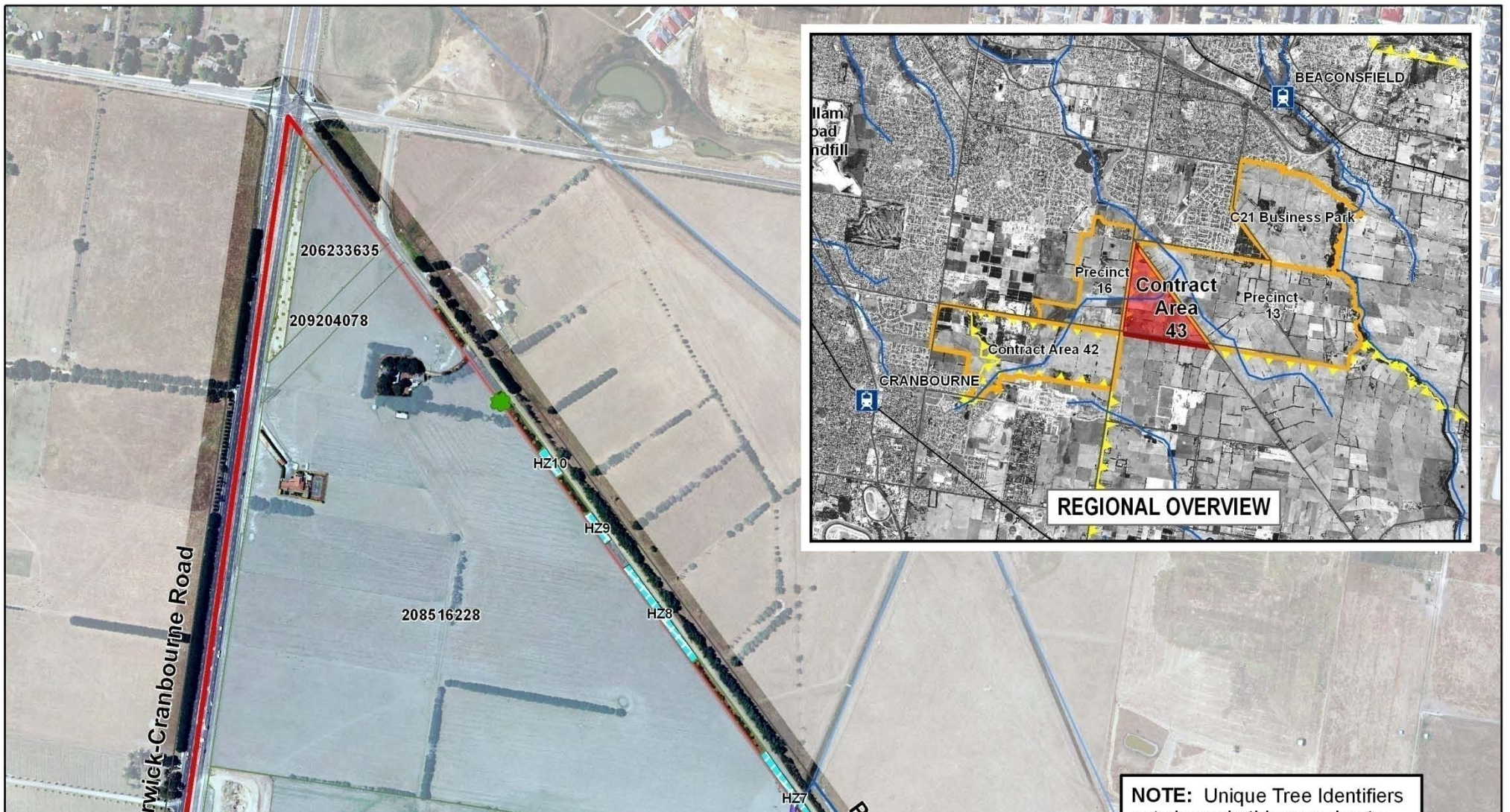
Drainage-line occupied by indigenous species

Swampy Riparian Woodland (EVC 83)

Swampy Riparian Woodland was once common along broad drainage lines and on levees near streams in the Gippsland Plains Bioregion (Oates and Taranto 2001). The EVC is typically dominated by Swamp Gum *Eucalyptus ovata* with the middle and understorey dominated by Swamp Paperbark *Melaleuca ericifolia*, Wooly Tea-tree *Leptospermum lanigerum* and Common Reed *Phragmites australis* (Oates and Taranto 2001).

Swampy Riparian Woodland was recorded mostly within the Thompsons Road reserve at the southern boundary. The EVC has most likely colonised the damp road verge following construction of the road many years ago. The over-storey was dominated by relatively mature stands of Swamp Gum *Eucalyptus ovata*. The Swamp gum canopy was established well enough to be contiguous with the adjacent roadside canopy in many sections of Thompsons Road. The understory was mostly dominated by introduced grasses, especially Toowoomba Canary-grass **Phalaris aquatica* and generally comprised poor floristic diversity.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2010a).



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MAP AND SURVEY DETAILS
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Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD.
Aerial Imagery and GIS base layers supplied by DSE and GAA.
For more detail of the EVCs and Scattered Trees, refer to Figures 5A-C

LEGEND

- Roads
- Watercourse
- Contract Area 42 Site Boundary
- Other Contract Areas and Precincts
- Property Access Constraints - Survey not completed
- Degraded Treeless Vegetation
- Non Native Vegetation

Modelled Vegetation

- Highly likely native vegetation - woody

Ecological Vegetation Class

- EVC 53: Swamp Scrub
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland

Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree

FIGURE 5

ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES Contract Area 43

Biodiversity Mapping Project 2009-2011

Habitat Hectare and Scattered Tree assessments

Habitat Zones

A total of **2.47 hectares** of native vegetation comprising **0.50 habitat hectares** was defined as meeting DSE's (2004) native vegetation cover thresholds within the contract area.

Vegetation patches within the contract area that constitute Habitat Zones, in accordance with Victoria's *Native Vegetation Management Framework* policy (DNRE 2002), vary between 0.01 and 0.66 hectares and are generally less than 0.1 hectares per habitat zone. Many patches of native vegetation are modified and not contiguous with other native vegetation. This was reflected in the mostly low habitat hectare assessment scores, which were generally less than 0.16. The low scores are a reflection of the modified agricultural landscape within which the contract area occurs. Low habitat hectare scores can be attributed to, but not necessarily limited to:

- pugging (due to hard hooves) by livestock, particularly within damper soils in the gullies and around marshy areas;
- soil disturbance, such as gully erosion, tracks through remnants and areas of exposed soil with little to no vegetative cover;
- introduction of grassy weeds, pasture grasses and high nutrient levels;
- cropping of tussock grasses and the ground storey vegetation in general;
- general absence of regeneration of woody species (due to grazing and rabbits) and subsequently a declining canopy coverage;
- loss of middle and ground-storey vegetation resulting in a depauperate native vegetative understorey cover; and
- removal of canopy eucalypts within riparian corridors, likely for fence-post production and agricultural land use.

Habitat hectare and scattered tree assessments were undertaken within the contract area between 15 September 2009 and 7 February 2010 (Table 3).

Habitat hectare and Scattered Tree assessments within the contract area

Month	Survey date	Property Address	Property PFI
September	15-17/9/2009	1775 Thompsons Rd (Roadside reserve)	R636934
	15-17/9/2009	1785 Thomspons Rd (Roadside reserve)	R636935
	15-17/9/2009	1825 Thomspons Rd (Roadside reserve)	R636936
	15-17/9/2009	1845 Thomspons Rd (Roadside reserve)	R636847
	15-17/9/2009	1865 Thomspons Rd (Roadside reserve)	R636937
	15-17/9/2009	1100 Pound Road (Roadside reserve)	R208516228
	15-17/9/2009	700 Berwick-Cranbourne Rd (Roadside reserve)	R208514983
October	20/10/2009	1100 Pound Road	208516228
	20/10/2009	1100 Pound Road	208514974
	20/10/2009	1100 Pound Road	206233635
	20/10/2009	97R Grices Road	212415393
	20/10/2009	97R Grices Road	209204078
	21/10/2009	1775 Thompsons Rd	636934
	27/10/2009	1845 Thompsons Rd	636847
November	n/a	n/a	n/a
December	n/a	n/a	n/a
January	28/01/2010	1865 Thompsons Rd	636937
	28/01/2010	1825 Thomspons Rd	636936
February	7/02/2010	Thomspons Rd - southern roadside reserve	unknown

Conservation Significance of habitat zones

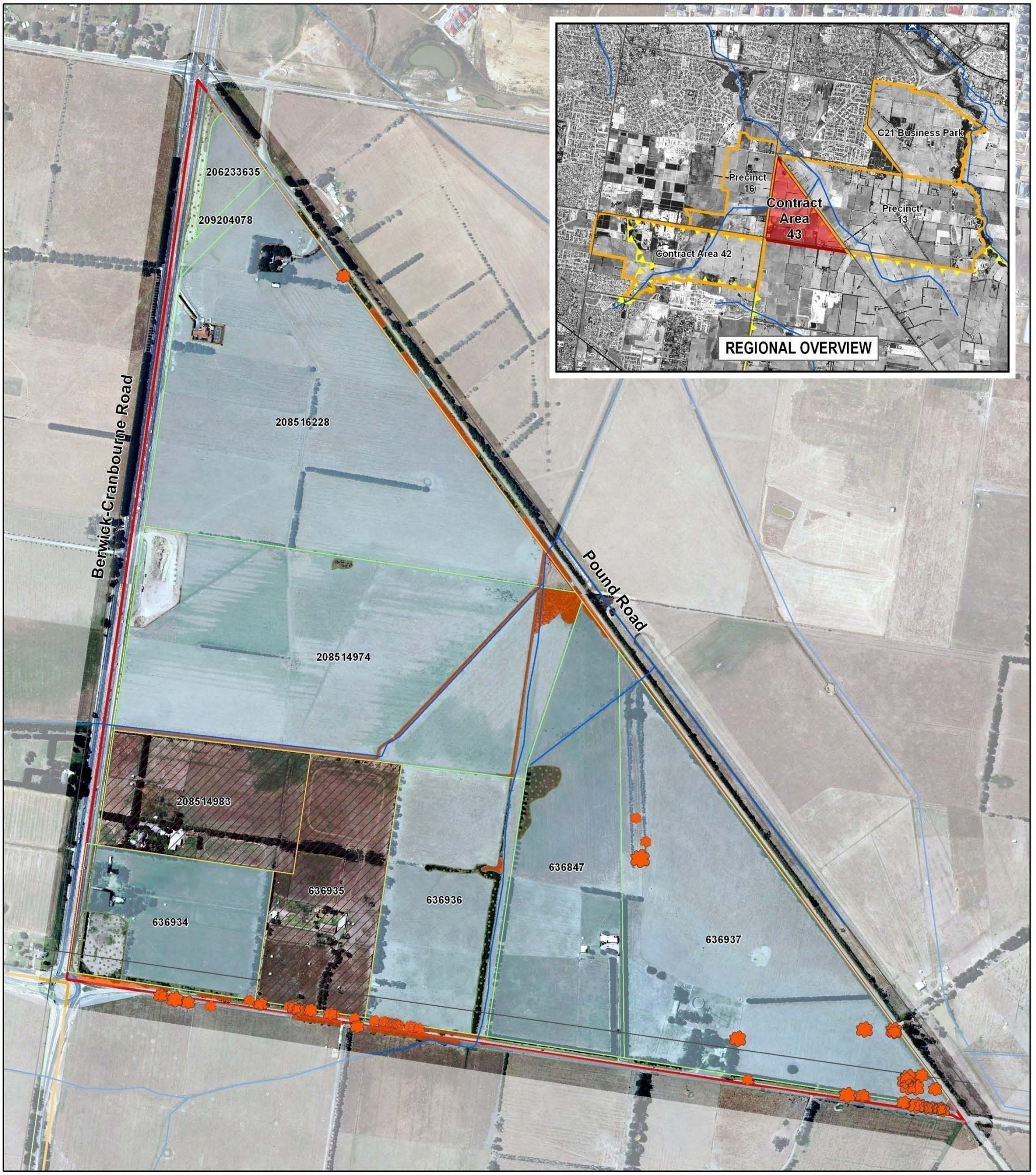
All 22 patches of native vegetation recorded within the contract area have been assigned **high** conservation significance, as per Appendix 3 of Victoria's *Native Vegetation Framework* DNRE (2002) and in accordance with DSE's *Guide for Assessment of Referred Planning Permit Applications* (DSE 2007b) (Appendix 4; Figure 5).

The high conservation significance determinations within the contract area are due primarily to the remaining *50% habitat for threatened fauna species* determination for all habitat zones and the Vulnerable and Endangered conservation status of the EVCs recorded within the contract area. 'Other site attributes' have not influenced the overall conservation significance of any patches (Figure 5).

Vegetation Quality (habitat hectares)

Vegetation quality in terms of habitat scores varies between 0.10 and 0.43 (Appendix 4).

The relatively low habitat scores are a reflection of the highly modified nature of the agricultural landscape within which the contract area is situated. Landscape scores are $\leq$10, which is a reflection of a lack of surrounding native vegetation and large conservation reserves within 5 kilometres.



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LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 14582 Property PFI
- Property Access Constraints - Survey not completed
- Degraded Treeless Vegetation
- Non Native Vegetation

Conservation Significance

Scattered Trees
- High

Habitat Zones
- High

FIGURE 6

CONSERVATION SIGNIFICANCE Contract Area 43

Biodiversity Mapping Project 2009-2011

Appendix 4 presents all habitat hectare scores recorded within the contract area during the current assessment.

Scattered trees

Fifty-five 'scattered trees', as defined by DSE (2007b), occur within the contract area (Table 4; Figure 5). Scattered trees constitute important habitat for the region's indigenous fauna and in many cases are the only source of tree hollows and canopy nectar in an otherwise highly modified environments.

In general, scattered trees displayed poorer than expected canopy health, most likely due to:

- below average rainfall in recent years;
- higher than expected mistletoe infestations;
- cattle pugging and soil compaction at the base of the trees;
- tree trunk damage due to stock rubbing against trees; and
- general impacts associated with agricultural use of the land such as:
  - removal of supporting ground and middle-storey vegetation;
  - soil cultivation;
  - introduction of fertilizers and nutrients; and
  - changes to the surface and sub-surface hydrology.

All scattered trees found within the contract area belong to the genus *Eucalyptus*. Appendix 5 lists all scattered trees recorded within the contract area.

Conservation Significance of scattered trees

The Conservation Significance of scattered trees is determined by a combination of:

- EVC conservation status;
- the presence of threatened species; and
- 'other site attributes'.

Scattered trees within the contract area are remnants of Plains Grassy Woodland and Swampy Riparian Woodland EVCs contract area based on the species (predominately River Red-gum and Swamp gum), their location, soil type and pre-1750 EVC. Both Plains Grassy

Woodland and Swampy Riparian Woodland are classified as an 'Endangered' within the Gippsland Bioregion (DSE 2010a).

No scattered trees were considered 'best or remaining 50%' habitat' for any threatened or significant fauna species that occur within ten kilometres of the contract area or were recorded on site during the current assessment. Thirty-one scattered trees have been assigned **high** conservation significance based on the endangered status of Plains Grassy Woodland and Swampy Riparian Woodland in the Gippsland Plains bioregion. The remaining 24 scatterted trees are small trees and have been assigned **low** conservation significance. 'Other site attributes' have not influenced the overall conservation significance of any scattered trees.

Degraded Treeless Vegetation Non-Native Vegetation

Degraded Treeless Vegetation (DTV) and Non-native Vegetation (NNV) dominate the contract area in the form of grazing land (Figure 2). NNV constitutes the largest area of any vegetation vategory within the contract area and comprises exotic pasture grasses, such as Rye grasses *Lolium* spp with occasional introduced crop weeds such as Thistles and other broadleaf weeds. Residential areas (including gardens), windbreaks and other areas vegetated with non-indigenous flora have been included within NNV at the contract area.

Planted European trees and planted non-indigenous native species such as Eucalypts, Giant Honey-myrtle *Melaleuca armillaris* subsp *armillaris* ocurr throughout the contract area. This vegetation holds significantly more value as habitat for native fauna compared to the surrounding cleared farmland. Flowering gums within this vegetation, for example, provide food resources for Swift Parrot *Lathamus discolor*, which has been recorded within ten kilometres of the contract area (DSE 2009a) and is predicted to occur by DEWHA's *Protected Matters Search Tool* (DEWHA 2010b).

Targeted flora

No threatened flora species were recorded within the contract area during the current assessment (Figure 4).

Targeted surveys for threatened flora were undertaken in six areas of habitat (Figure 4; Table 2). Species nominated by DSE and GAA were targeted, in addition to other species that were known or predicted to occur within 10 km for which suitable or potential habitat was identified on-site (Appendix 3).

Table 2. Threatened flora survey effort

Month	Site No	Property Address	Assessor	Survey date	Duration of survey (hrs)	Temperature range (°C)^	Species Surveyed *
September							
October	**1**	1100 Pound Road	Mark Shepherd	20/10/2009	2	11.0-26.6	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	2	1100 Pound Road	Mark Shepherd	20/10/2009	2	11.0-26.6	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	6	1100 Pound Road	Mark Shepherd	20/10/2009	2	11.0-26.6	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	5	1775 Thompsons Rd	Mark Shepherd	21/10/2009	2	11.6-18.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
November	**3**	Thompsons Rd Rd Reserve	Mark Shepherd	13/11/2009	2	12.0-27.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	4	Thompsons Rd Rd Reserve	Mark Shepherd	13/11/2009	2	12.0-27.1	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
December	**2**	1100 Pound Road	Mark Shepherd	11/12/2010	2	10.9-19.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	6	1100 Pound Road	Mark Shepherd	11/12/2010	2	10.9-19.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	3	Thompsons Rd Rd Reserve	Mark Shepherd	17/12/2009	2	17.0-20.9	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	4	Thompsons Rd Rd Reserve	Mark Shepherd	17/12/2009	2	17.0-20.9	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
	1	1100 Pound Road	Mark Shepherd	23/12/2010	2	12.0-38.0	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
January	**2**	1100 Pound Road	Mark Shepherd	27/1/2010	2	14.5-20.8	MFL, RSWG, SE, MLO, GBB, PSE, VSG, PD, NSO, WSO, FSO, CSO, GSO, MSO.
February							

*

MFL	Matted Flax-lily
RSWG	River Swamp Wallaby-grass
SE	Swamp Everlasting
MLO	Maroon Leek-orchid
GBB	Grey Billy buttons
PSE	Pale Swamp Everlasting
VSG	Veined Spear-grass
PD	Purple Diuris
NSO	Naked Sun Orchid
WSO	Wine-lipped Spider Orchid
FSO	Frankston Spider Orchid
CSO	Cream Spider Orchid
GSO	Green-striped Spider Orchid
MSO	Metallic Sun Orchid

^ BOM (2010)

The six areas of habitat identified for targeted searches within the contract area included the following habitat types:

- Swamp Scrub within Pound Road road reserve and within 1100 Pound Road.
- Constructed drainage-lines within 1100 Pound Road.
- Swampy Riparian Woodland in the Thompsons Road road reserve.

Locations of threatened flora targeted searches are displayed in Figure 4.

Fauna Survey Results

Fauna habitats

The majority of the contract area has been highly modified by farming and comprises open paddocks and pasture of limited habitat value to fauna. Fauna habitat values are highest within:

- a relatively large patch of Swamp Scrub at 1100 Pound Road;
- Swamp Scrub and drainage-line habitat within the Pound Road road reserve;
- drainage lines throughout the contract area, especially within 1100 Pound Road; and
- Swampy Riparian Woodland within the Thompsons Road road reserve.

In addition, exotic vegetation that occurs along the roadsides and in planted rows along fencelines within the contract area provide habitat for fauna (Figure 6). While exotic vegetation occurring in narrow bands may have limited value as habitat for many fauna, this type of habitat is especially important for connectivity between habitats for many fauna species including threatened fauna.

The determination of areas classified as having high faunal habitat values is based on all or any of the following factors:

- The area is a representative or remnant vegetation community;
- The area constitutes a wildlife corridor;
- The area contains important breeding sites; and
- The area has high floristic and/or structural diversity.

The contract area has been divided into four primary habitat types for the purpose of analysis and discussion. An evaluation of each of the habitat types is provided below.

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Mapping by: Staci Timms, 27 April '10
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LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Boundary
- 257462 Property PFI

Significant Fauna Species

- Practical Ecology Survey Results
- Glossy Grass Skink (2009) State Significant Species Date of Record

Habitat Type

- Drainage line
- Non-Native Woodland
- Non-indigenous Eucalypt Woodland
- Remnant Woodland
- Swamp Scrub
- Wetland

FIGURE 7

FAUNA HABITAT AND SIGNIFICANT FAUNA RECORDS
Contract Area 43

Biodiversity Mapping Project 2009-2011

Swamp Scrub

Remnant and recolonising Swamp Scrub and Swampy Riparian Woodland within roadsides (Figure 4) provides fauna habitat within the contract area. Many roadsides are highly modified and do not meet DSE native vegetation cover thresholds in order to be determined to be a 'patch' of native vegetation (DSE 2004). However, many roadsides comprise higher floristic diversity and structural complexity compared to adjacent grazing land, therefore have higher value as fauna habitat.

Swamp Scrub of particular habitat significance within the contract area includes the central section of roadside with the Pound Road road reserve, which is contiguous with a patch of Swamp Scrub in the adjacent 1100 Pound Road. These small patches of vegetation provide significant habitat in a landscape largely devoid of native vegetation.

Many areas of Swamp Scrub within roadsides are dominated by exotic plantings and introduced shrubs such as Boxthorn *Lycium ferocissimum*. Exotic plantings and weed infestations such as Boxthorn thickets provide potential habitat for woodland birds and other ground dwelling and arboreal mammals.

Other roadsides within the contract area are dominated by exotic grasses with occasional trees. These areas may support reptiles and ground-dwelling mammals and are potentially important dispersal routes for fauna. Roadside drains are important for threatened species such Glossy Grass Skink, Southern Toadlet and Swamp Skink.

Figure??? Swamp Scrub within 1100 Pound Road

Drainage-lines

Drainage-lines throughout the contract area provide habitat for a number of amphibians and potentially native fish species. Southern Toadlet was recorded during this assessment in a number of drainage-lines within the contract area (Figure 6). It is likely that Swamp Scrub patches within the drainage lines also provide habitat for Glossy Grass Skink which was seen in woodland along Thompsons road and may also provide habitat for Swamp Skink. Drainage lines also provide important resources for other fauna such as invertebrates, birds and small mammals.

Introduced species including foxes, rabbits and black rats were recorded during the study. These species are likely to threaten populations of native species from predation pressure and competition for resources such as food and habitat. Drainage lines may also serve as migratory routes and spawning habitat for the threatened Dwarf Galaxias during time of flood.

Drainage-lines are also important for their role in habitat connectivity throughout the region, in particular drainage lines throughout this area may be providing connectivity for threatened species such as Dwarf Gallaxias and Growling Grass Frogs.

Drainage-line habitat within 1100 Pound Road

Roadside Vegetation

Roadside vegetation offers potential habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet, in addition to a suite of other reptiles, amphibians, mammals,

invertebrates and birds. Glossy Grass Skink was recorded within roadside vegetation during the current assessment.

Many roadsides comprise exotic grasses with scattered trees. Tall exotic grasses provide habitat for ground-dwelling mammals, birds and reptiles. These grasses, along with the scattered trees and shrubs, also act as dispersal routes for many fauna species. Threatened species such as the Swamp Skink, Glossy Grass Skink and Southern Toadlet are known to use roadside vegetation and drains as habitat.

Other patches of roadside vegetation are dominated by exotic plantings and introduced shrubs such as Boxthorn. Exotic plantings and weed infestations such as Boxthorn thickets provide potential habitat for woodland birds and other ground dwelling and arboreal mammals.

Roadsides are also important for their role in habitat connectivity throughout the region.

Roadside habitat (Pound Road)

Woodlands

Remnant woodlands are highly restricted within the contract area and are only found in small patches along Thompsons Road and near the Thompsons Road, Pound Road

intersection. Some of the trees within the contract area have hollows suitable for hollow-dependent fauna such as arboreal mammals, bats and birds. There are some logs present from fallen branches and trees, which provide habitat for skinks, invertebrates and small mammals.

There are also several scattered Large and Medium Old Trees in the southeast corner of the precinct. These hollow bearing trees (and standing stags) offer canopy habitat values for birds and arboreal mammals, and limited groundstorey habitat within fallen branches and litter for reptiles, frogs, invertebrates and ground mammals.

There are very small patches of non-native 'woodland' along fencelines which are important as wildlife corridors within the contract area.

Woodlands in the contract area provide potential habitat for a number of locally and regionally significant birds and mammals.

Thomspons Road woodland within roadside

Farmland and exotic vegetation

Areas of farmland and exotic vegetation serve a less important role as habitat for most native species. However, these areas still provide resources for many fauna. A number of the more generalist bird species and raptors were recorded throughout farmland within the contract area. Open farmland areas and open areas fringing vegetation are important hunting grounds for raptors such as Brown Falcon *Falco subniger,* Brown Goshawk *Accipiter* fasciatus, Black-shouldered Kite *Elanus axillaris*, Whistling Kite *Haliastur sphenurus* and Nankeen Kestrel *Falco cenchroides* (Pizzey and Knight 2007).

Fauna Species

Fauna species recorded

A total of 77 fauna species were recorded within the contract area (excluding invertebrates). Sixty-three of these are native and 14 are exotic. Of the native species recorded, there were: seven amphibian species, five reptile species, 43 bird species, and eight mammal species. A list of all native species recorded within the contract area is provided in Appendix 7. Of the exotic species recorded there were seven birds, one fish and six mammals. A list of exotic fauna recorded within the contract area is provided in Appendix 8. A list of species recorded for each property is shown in Appendix 9.

Eighty-six invertebrate species, totalling 811 individuals were identified during invertebrate surveys within the contract area (Appendix 10). Many invertebrates could not be identified beyond Order, however most have been recorded photographically and are provided separately on a disk.

Database records and previous surveys

A total of 303 fauna species are documented on DSE's VFD (DSE 2009b) from within 10 km of the contract area boundary. Fifty-nine national and state significant fauna species recorded or predicted to occur within ten kilometres of the contract area are documented on the AVW (DSE 2009b) and EPBC Protected Matters Search Tool (DEWHA 2010b) (Appendix 11).

In determining the 'likelihood of occurrence' and utilisation of the study site by national or state significant fauna, the following factors were considered:

- The conservation status of the species and its distribution.
- Previous recordings of species in the local area.
- The quality, distribution and availability of suitable habitat for individual species.

- The generally fragmented and highly modified nature of fauna habitat surrounding the contract area.

Based on the review criteria detailed above, one species recorded on AVW and EPBC searches; Fork-tailed Swift *Apus pacificus* is considered to have a high likelihood of occurrence within the contract area. A further three significant species were recorded within the contract area and have been assigned a high likelihood of occurrence for the remainder of the study area:

- Glossy Grass Skink *Pseudemoia rawlinsoni*
- Southern Toadlet *Pseudophryne semimarmorata*, and
- White-throated Needletail *Hirundapus* caudacutus.

An additional six significant species are considered to have at least a moderate likelihood of occurrence within the contract area (Appendix 11):

- Black Falcon *Falco subniger*
- Dwarf Galaxias *Galaxiella pusilla*
- Growling Grass Frog *Litoria raniformis*
- Rufous Fantail *Rhipidura rufifrons*
- Spotted Harrier *Circus assimilis*
- Swamp Skink *Egernia coventryi*.

The habitat requirements for significant species detected on AVW and EPBC searches are detailed in Appendix 11.

Threatened fauna species

Three fauna listed as threatened or migratory under state and federal policy and legislation were recorded within the contract area during the current assessment (Figure 6). One species is a reptile, one a migratory bird and one is an amphibian:

- Glossy Grass Skink *Pseudemoia rawlinsoni* is listed as Near Threaten in Victoria (DSE 2007a).
- Southern Toadlet *Pseudphryne semimarmorata* is listed as Vulnerable in Victoria (DSE 2007a)
- White-throated Needletail *Hirundapus caudacutus* is listed as Migratory under the EPBC Act.

Threatened Fauna Species likely to occur in the precinct

The GAA Sub-Regional Fauna Survey Southern Brown Bandicoot (Stewart and Shepherd 2010) reported that habitat for the species within the Precinct was limited to highly modified roadside vegetation and is unlikely to support populations of Southern Brown Banciicoot. However, areas of dense vegetation along drainage lines and roadsides may provide opportunities for movement throughout the landscape for this species.

This may also be the case for Dwarf Gallaxias and Growling Grass Frog. Vegetation along drainage line is highly modified however these areas may provide connectivity between better quality habitats throughout the greater area.

Best or Remaining 50% habitat for rare and threatened fauna species

Habitat zones have been assessed for determination of 'best or remaining 50% habitat' for all threatened fauna species that were detected through database searches and recorded during the current assessment. Drainage lines throughout the investigation area are considered remaining 50% habitat for Southern Toadlet and Dwarf Galaxias.

Targeted fauna

Two targeted threatened fauna species listed as Vulnerable within Victoria (DSE 2007a) were recorded within the contract area; Southern Toadlet and the Glossy Grass Skink. Southern Toadlet was recorded in drainage lines within the investigation area and the Glossy Grass Skink was recorded in roadside vegetation along Thompsons Road (Figure 6). No other targeted fauna species were recorded within the contract area during the current assessment.

Targeted Surveys Undertaken

Month	Survey Date	Property Address	Survey Type	Common Name	Scientific name	Mean Temperature range (°C)
November	7/11/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	11.0–30.1
	7/11/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	11.0–30.1
	10/11/2009–14/11/2009	Pound Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.0–29.5
	10/11/2009–14/11/2009	Pound Road	Elliots	Swamp Skink	*Egernia coventryi*	14.0–29.5
	10/11/2009–14/11/2009	Thompsons Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.0–29.5
	10/11/2009–14/11/2009	Thompsons Road	Elliots	Swamp Skink	*Egernia coventryi*	14.0–29.5
	14/11/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	13.0–29.4
	14/11/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	13.0–29.4
	14/11/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	13.0–29.4
	14/11/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	13.0–29.4
	15/11/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	9.9–24.8
	15/11/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	9.9–24.8
	15/11/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	9.9–24.8
	15/11/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	9.9–24.8
	27/11/2009	Pound Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Pound Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	1100 Pound Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	1100 Pound Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Berwick–Cranbourne Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
	27/11/2009	Berwick–Cranbourne Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	13.5–26.5
December	4/12/2009	Thompsons Road	Dip Net	Dwarf Galaxias	*Galaxiella pusilla*	10.0–20.5
	4/12/2009	Thompsons Road	Bait Trap	Dwarf Galaxias	*Galaxiella pusilla*	10.0–20.5
	4/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	4/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	4/12/2009	Berwick–Cranbourne Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	Berwick–Cranbourne Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	4/12/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.0–20.5
	4/12/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.0–20.5
	9/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	8.1–24.0

	9/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	8.1–24.0
	11/12/2009	Berwick–Cranbourne Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9–19.0
	11/12/2009	Berwick–Cranbourne Road	Tin	Swamp Skink	*Egernia coventryi*	10.9–19.0
	11/12/2009	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9–19.0
	11/12/2009	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.9–19.0
	11/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9–19.0
	11/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	10.9–19.0
	11/12/2009	1100 Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	10.9–19.0
	11/12/2009	1100 Pound Road	Tin	Swamp Skink	*Egernia coventryi*	10.9–19.0
	15/12/2009	Thompsons Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	8.5–27.1
	15/12/2009	Thompsons Road	Tin	Swamp Skink	*Egernia coventryi*	8.5–27.1
January	27/01/2010	Pound Road	Tin	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.5–20.8
	27/01/2010	Pound Road	Tin	Swamp Skink	*Egernia coventryi*	14.5–20.8
	27/01/2010–01/02/2010	1100 Pound Road	Elliots	Glossy Grass Skink	*Pseudemoia rawlinsoni*	14.4–26.8
	27/01/2010–01/02/2010	1100 Pound Road	Elliots	Swamp Skink	*Egernia coventryi*	14.4–26.8
April	8/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	16.0–21.3
	9/04/2010	Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	12.6–21.3
	9/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	12.6–21.3
	13/04/2010	Berwick–Cranbourne Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5–16.6
	13/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5–16.6
	13/04/2010	Thompsons Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	11.5–16.6
	22/04/2010	1100 Pound Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	13.3–27.2
	22/04/2010	1825 Thompsons Road	Vocalisation Id	Southern Toadlet	*Psuedophryne semimarmorata*	13.3–27.2

RELEVANT POLICY AND LEGISLATION

The following section outlines the implications of legislation, treaties, plans, or policies, for habitat hectare, flora and fauna values found on site.

Commonwealth Policy and Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Act 1999* (EPBC Act 1999) applies to sites where proposed developments or projects may have a *significant impact* on *matters of National Environmental Significance*. Numerous threatened species and communities listed under the EPBC Act have been recorded, or have the potential to occur in the Casey-Cardinia Growth Area, within which the contract area is situated. The development of the Casey-Cardinia growth area has the potential to have a significant impact on matters of National Environmental Significance, including impacts on threatened fauna species (DSE 2009f).

Under the EPBC Act 1999, a proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

An agreement under the Strategic Assessment provision of the EPBC Act (Section 146(1) Agreement, Part 10 Strategic Assessment (EPBC Act)) was made between the Commonwealth of Australia and the State of Victoria on 16th June 2009. The Strategic Assessment provides an opportunity to align State and Commonwealth requirements and approval standards for issues of common interest.

Growling Grass Frog and Southern Brown Bandicoot surveys were not conducted during this assessment. Refer to the Sub Regional Surveys for Southern Brown Bandicoot and Growling Grass Frog.

Two EPBC Act listed fauna species; Growling Grass Frog and Southern Brown Bandicoot are included and addressed in the Casey-Cardinia Growth Area SIA (DSE 2009f). Targeted surveys for Growling Grass Frog and Southern Brown Bandicoot were commissioned by GAA for the entire south-east growth area, which included the contract area.

The SIA notes that:

> *Extending the urban area to the south-east will further compromise ecological processes persisting in those areas. In the south-east, some road reserves and minor drainage lines are known to afford narrow avenues of connected habitat for the Southern Brown-bandicoot, albeit tenuous ones (Practical Ecology 2009). This connectivity within the south-east will more than likely be removed as a result of urban development. The mitigation emphasis will be on*

maintaining and restoring connectivity at a sub-regional level, focusing on larger areas of habitat and major strategic linkages. The challenge for monitoring will be finding practical ways to assess the degree of ecological function remaining in this part of the landscape, and identifying how urban development and the mitigation strategies influence the net result.

Source: DSE (2009f).

The SIA states that habitat corridors and indirect impacts to Southern Brown Bandicoot are likely to be the greatest impacts.

The SIA lists mitigation objectives, including:

- Exclude major areas of suitable habitat from development.
- Retain, upgrade and connect existing habitats within proposed precincts and outside the Urban Growth Boundary, including the important population at the Royal Botanic Gardens Cranbourne.
- Secure and manage retained habitat and linkages to conserve Southern Brown Bandicoot.
- Monitor retained and new habitat and adjust management accordingly.
- Carefully plan and construct urban development within precincts to minimise impacts on species (such as employing road design and other techniques that facilitate road crossings, and restricting cat, dog and human access in particular areas).

The SIA also outlines the objectives of a Sub-regional Strategy and Conservation Management Plan for each PSP area.

- The SIA outlines the greatest threats to Growling Grass Frog due to the expansion of the urban growth boundary include:
    - Loss of terrestrial habitat surrounding waterbodies
    - Altered hydrology and/or altered wetland vegetation
    - Loss of connectivity and increased fragmentation within a landscape
    - Introduction of predatory fish

    Mitigation objectives for Growling Grass Frog include:

    - Identify and monitor key populations within the south east growth area
    - Retain, upgrade, connect and enhance or buffer existing habitat
    - Create new habitat within precincts
    - Carefully manage hydrology to exclude predatory fish from entering new areas

- Monitor new habitat and adapt management as required

To meet these objectives a number of strategies are outlined in the SIA. These include managing and creating new wetlands within the south eastern growth area. Water quality and hydrology will be carefully managed to increase quality and connectivity for the Growling Grass Frog. All areas of habitat will be monitored and management techniques adapted according to monitoring results.

Four other EPBC Act listed fauna species which were recorded on site or have the potential to occur have not been addressed in the SIA.

Three species listed as 'migratory' under the EPBC Act were recorded or have potential to occurr within the contract area, there are:

- White-throated Needletail *Hirundapus caudacutus*
- Fork-tailed Swift *Apus pacificus*
- Rufous Fantail *Rhipidura rufifrons*

This species is almost entirely aerial and it is considered unlikely that it will need to be referred to DEWHA as a controlled action under the EPBC Act 1999.

Under the EPBC Act 1999, the proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

One other EPBC Act listed threatened fauna species with at least a moderate likelihood of occurrence that are not addressed in the SIA, may also need to be addressed in a referral to DEWHA. This is:

Dwarf Galaxias *Galaxiella pusilla*No EPBC Act listed flora species were recorded within the contract area. Two EPBC Act listed flora species are considered to have at least a moderate likelihood of occurrence within the contract area:

- River Swamp Wallaby-grass *Amphibromus fluitans*
- Matted Flax-lily *Dianella amoena*

These species may therefore need to be addressed in a referral to DEWHA.

Ramsar – The Convention on Wetlands of International Importance 1971

There are no Ramsar wetlands within the contract area, however, drainage within the contract area flows into Westernport Bay Ramsar Site Within the contract area drainage lines are integrally linked and all have a high conservation value. Large and dramatic changes such as those that will come

with urban development will most likely impact water regimes and water quality. Furthermore, The Westernport Bay Ramsar site is located less than 20 kilometres south of the contract area, so hydrological changes within the contract area also have the potential to impact this Ramsar site. Creek-line, wetlands and riparian vegetation are key biodiversity areas within the contract area and should have management plans that include ongoing monitoring to identify changes and associated hazards.

The RAMSAR *Handbook 16: Managing Wetlands* suggest that all wetlands require a dynamic management plan that sets out key objectives (Ramsar Convention Secretariat 2007). A risk assessment can also be carried out and wetlands should have ongoing monitoring to identify and manage hazards.

Recovery Plans

Recovery plans address research priorities and management strategies to halt decline and conserve threatened species listed under the EPBC Act. Recovery plans aim to provide a framework by which relevant stakeholders can optimise the long-term survival of threatened species and ecosystems in-situ. The following Recovery Plans may be relevant to threatened species that have been recorded within Investigation Area 43 or have the potential to occur within the contract area.

The relevant Recovery Plans and basic objectives are listed below.

The National Recovery Plan for the Dwarf Galaxias *Galaxiella pusilla* (Saddlier, Jackson and Hammer 2010)

Management actions to ensure the National Recovery Plan for the Dwarf Galaxias objectives are met are as follows:

- *No direct loss of habitat through wetland drainage on either public or private land.*
- *No physical alteration to Dwarf Galaxias habitat as a consequence of incidental works on land adjoining Dwarf Galaxias habitat.*
- *Applications for water abstraction or dam construction do not compromise flow regimes for Dwarf Galaxias.*
- *Habitat and adjoining riparian habitat are fenced off to stock access.*
- *Off-stream watering points are provided for stock.*
- *No further damage to riparian vegetation.*
- *Damaged or depleted riparian vegetation is protected and (if necessary) supplemented by active revegetation works.*
- *Plans to clear vegetation lying adjacent to Dwarf Galaxias habitat will not impact upon water quality (no increase in sedimentation/nutrient levels/pesticides/herbicides etc).*

- *Plans to revegetate with plantation timber/crops will not impact upon overall water yield (and subsequently flow regime of Dwarf Galaxias habitat).*
- *Proposals to translocate aquatic species into Dwarf Galaxias habitat are subject to relevant risk management processes according to relevant National and State guidelines.*

Source: Saddlier *et al.* 2010

Dwarf Galaxias was not recorded within the contract area, however there are records for this species within the Cardinia Creek which is only approximately 3 kilometres from the contract area. contract area. Therefore, the above guidelines must be incorporated into the precinct structure planning of the contract area.

There is a National Recovery Plan being prepared for the Southern Brown Bandicoot which may impact the ongoing management of the Cardinia Creek riparian corridor and associated drainage lines. A National Recovery Plan is in preparation for the Growling Grass Frog which may have recommendations for the management of newly created wetlands within the contract area (DEWHA 2010a).

Conservation Advices

Conservation advices provide information to various stakeholders on implementing on-ground actions for identifying threats to communities or species of concern and on developing management plans to control those threats.

There are 12 conservation advices for the Port Phillip and Westernport Area. These include:

- Alpine *Sphagnum* Bogs and Associated Fens.
- *Amphibromus fluitans* (River Swamp Wallaby Grass).
- Gippsland Red Gum (*Eucalyptus tereticornis subsp. Mediana*) Grassy Woodland and Associated Native Grassland.
- Grey Box (*Eucalyptus macrocarpa*) Grassy Woodlands and Derived Native Grasslands of Southern-eastern Australia.
- Natural Temperate Grassland of the Victorian Volcanic Plain.
- *Neophema chrysogaster* (Orange Bellied Parrot).
- *Prasophyllum colemaniae* (Swamp Fireweed, Smooth-fruited Groundsel).
- *Thalassarche chrysostoma* (Grey-headed Albatross).
- *Thalassarche melanophris* (Black-browed Albatross).

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- *Prasophyllum colemaniae* Lilac Leek-orchid.

Source DEWHA 2010b

Threat Abatement Plans

Threat abatement plans are created to address key threatening processes outlined for threatened species under the EPBC Act 1999. Threat abatement plans aim to provide a national framework by which coordinated and integrated management of key threatening processes are undertaken.

Threat Abatement Plans that may be implemented within the contract area are:

- Threat abatement plan for competition and land degradation by rabbits 2008.
- Threat abatement plan for dieback caused by the root-rot fungus *Phytophthora cinnamomi*.
- Threat abatement plan infection of amphibians with chytrid fungus resulting in chytridiomycosis.
- Threat abatement plan for predation by the European red fox 2008.
- Threat abatement plan for predation by feral cats 2008.

Source DEWHA 2010b

These threat abatement plans set out objectives for each threat management and provide actions on how to achieve set objectives.

State policy and legislation

Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

Under the Act a Planning Permit is required for development within Victoria which may have significant effects on the environment, or which the responsible authority considers the environment may have on the use or development. The objectives of planning and the planning framework include (among others):

- To provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity.
- To establish a system of planning schemes based on municipal districts to be the principal way of setting out objectives, policies and controls for the use, development and protection of land.
- To ensure that the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land.
- To facilitate development which achieves the objectives of planning in Victoria and planning objectives set up in planning schemes.

Clause 52.17 of the Planning Scheme is the principle action of the Planning and Environment Act within the Scheme relating to native vegetation impacts, unless:

- The application is exempt under the Table of Exemptions 52.17-6 within the Clause.
- A Native Vegetation Precinct Plan applies.

Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act 1988) was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. A key component of the FFG Act 1988 is to ensure the sustainable use of flora and fauna resources whether they are threatened or not.

The FFG Act 1988 lists:

- Threatened species of flora and fauna.
- Threatened communities of flora and fauna.
- Protected flora.
- Potentially threatening processes.

There were no threatened flora species listed under the FFG Act 1988 recorded during this survey within the contract area. There are also no listed threatened communities known to occur within the contract area.

All flora species listed as threatened under the FFG Act that ocurr within 10 km (DSE 2009a) or are predicted to ocurr by DEWHA (2010b) are considered to have a low likelihood of occurrence within the contract area.

Protected Flora are species classified as protected to regulate exploitation including removal from the wild for cultivation and the cut-flower industry. Among others the list includes all members of

the Asteraceae (daisies) family, all members of Epacridaceae (heaths), all members of Orchidaceae (orchids) and all Acacias (excluding Silver Wattle, Early Black Wattle, Lightwood, Blackwood and Hedge Wattles). No flora species recorded within the contract area are listed under the FFG Act 1988 as Protected Flora.

One FFG Act listed fauna species was recorded within the contract area (see below), three FFG listed fauna species are assessed as having a moderate likelihood of occurrencewithin the contract area. These species are listed below.

- The FFG listed species recorded within the contract are is:Southern Toadlet *Pseudophryne semimarmorata*

The FFG listed fauna species thought to have a moderate likelihood of occurrence include:

- Dwarf Galaxias *Galaxiella pusilla.*
- Swamp Skink *Egernia coventryi.*
- Growling Grass Frog *Litoria raniformis*

A permit is required if proposed works may kill, injure or disturb protected listed flora species on public land.

Environment Effects Act 1978

The Environment Effects Acts 1978 only relates to public works deemed so by Order of the Minister and stated in the Government Gazette. If this is the case then the Act states that:

> "*Before commencing any public works to which this Act applies, the proponent must cause an Environment Effects Statement to be prepared and submit it to the Minister for the Minister's assessment of the environmental effects of the works.* [and] *A copy of the statement shall be submitted to the relevant Minister by the proponent.* [and] *A statement under this Act shall be prepared and submitted at the expense of the proponent of the works.*"

An Environmental Effects Statement is prepared prior to development to identify potential environmental impacts and indicate ways in which environmental damage is mitigated or risks reduced.

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

State Environment Protection Policies (SEPPs) express, in law, the Victorian community's expectations, needs and priorities for protecting and sustainably using the environment, and the social and economic values that depend on it. Made under the *Environment Protection Act 1970*, SEPPs are a means of setting agreed outcomes against which we can measure progress and coordinate environment protection throughout Victoria.

The SEPP Waters of Victoria then sets the framework for government agencies, businesses and the community to work together, to protect and rehabilitate Victoria's surface water environments. The Waters of Victoria SEPP details the uses and values of our water environments (beneficial uses), sets measurements and indicators so we know how well they are being protected (environmental quality objectives) and outlines what needs to be done to protect them (attainment program).

The result is a 'blueprint' for achieving agreed environmental outcomes and strategic directions for protecting Victoria's water. More detailed management frameworks and tools are provided through statewide strategies (e.g. the Victorian River Health Strategy) and more detailed actions are provided in regional plans developed by catchment, coastal and water management bodies.

The *Environment Protection Act 1970* also adopts as a principle tenet the Precautionary Principle where, in the threat of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act 1994) contains provisions relating to the integrated management and protection of catchments, encourages community participation in the management of land and water resources, and sets up a system of controls for the management of noxious weeds and pest animals. This Act also provides a legislative framework for the integrated and coordinated management of private and public land at a catchment level which:

- Focuses on long-term land productivity while also conserving the environment.
- Ensures that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.
- Establishes processes that can be used to assess the condition of the State's land and water resources and the effectiveness of land protection measures.
- Establish processes to encourage and support participation of land holders, resource managers and other members of the community in catchment management and land protection.
- Establishes and supports the operation of the Victorian Catchment Management Council and the Catchment Management Authorities.
- To provide for the control of noxious weeds and pest animals.

The study site supports a number of weeds that are declared noxious under the CaLP Act 1994. Plants occurring on this list are known, or have the potential to, result in detrimental environmental or economic impact.

Under the CaLP Act 1994 declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories include:

- State Prohibited Weeds (S) – are either currently absent in Victoria or are restricted enough to be eradicated. The Victorian Government is responsible for their control.

- Regionally Prohibited Weeds (P) – in the Port Phillip Catchment Management Authority area are not necessarily widespread but have the potential to become widespread. It is expected that weeds that meet this criteria can be eradicated from the region. For weeds considered to be Regionally Prohibited it is the responsibility of the land owner to control these weeds on their land but not on adjacent roadside reserves.

- Regionally Controlled Weeds (C) – are usually widespread but it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property and on adjacent roadside reserves.

- Restricted – occur in other states and are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria. No weeds are currently listed as Restricted Weeds.

The contract area supports regionally controlled noxious weeds listed by DPI (2010) (Appendix 2). The control of these weeds on private land and adjacent roadsides is the responsibility of the landholder. The landholder must take all reasonable measures to prevent their spread and control these weed species (DPI 2010).

Victoria's Native Vegetation Management Framework: A Framework for Action

A principle tenet of Victoria's *Native Vegetation Management Framework* is the objective of retention and management of native vegetation (DNRE 2002). According to the DSE (2002:14) the goal of native vegetation management in Victoria is to achieve:

> *A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain.*

Four individual actions to achieve the above goal are outlined in the DNRE's (2002) Framework. These are:

- Active improvement of the quality of existing vegetation.

- Avoidance or minimisation of further permanent losses through clearing.

- Strategic increase in the cover of native vegetation through biodiverse revegetation.

- The flexibility that is required to support landholders as they move towards more sustainable land use.

To achieve the most strategic outcome for native vegetation across Victoria the *Native Vegetation Management Framework* embraces a system of classification determining both the land protection and conservation significance of any given site. The Net Gain methodology is intended to provide a systematic approach that ensures the conservation of the majority of remnant vegetation across

Victoria. DNRE (2002) has established a three step approach to use when applying the Net Gain process. These steps are:

- To avoid adverse impacts, particularly through vegetation clearance.
- If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.
- Identify appropriate offset options.

The outcome of the Net Gain process is intended to ensure that the most significant vegetation incurs no losses (exceptions may apply) and less significant vegetation is adequately managed through commensurate offsets based on the level of significance. During the planning process, it must be ensured that every effort has been made to avoid clearing remnant vegetation at the outset and, if clearance is unavoidable, impacts have been minimised. Preference must also be given to the avoidance of damage or loss of the most significant vegetation and reduce the amount of overall vegetation cleared.

The Precinct development is in the early phases of structure planning that will determine future land use. The Native Vegetation Framework requires that the avoidance of native vegetation is a priority. When vegetation cannot be avoided, vegetation loss and other detrimental impacts must be minimised.

Relatively little of this site's remnant vegetation remains within the contract area. This presents an opportunity, through appropriate (re)zoning, to protect what little remains and avoid future impacts to native vegetation through the integration of a precinct reserve system within the Planning Scheme.

Figures 7A, 7B and 7C display the location of native vegetation, including scattered trees within the contract area. Section 5.1 discusses the Net Gain three step process and opportunities to avoid and minimise native vegetation loss during the rezoning and design stages.

Port Phillip and Westernport CMA Native Vegetation Plan

Victoria's *Native Vegetation Management Framework* states that regional vegetation plans will provide regional guidelines for responsible authorities in determining permit applications to remove, destroy or lop native vegetation. The *Port Phillip and Westernport Native Vegetation Plan* (PPWCMA 2006) is to be used as a reference document for the conservation status of native vegetation communities in the region. The *Native Vegetation Plan* represents the minimum requirement for offsets and:

- Describes the overall policy response to clearing applications.
- Describes the requirements for offsetting the loss of remnant but relatively intact areas of native vegetation.

- Describes the requirements for offsetting the loss of scattered, individual trees of various ages, sizes and growth rates.
- Describes the requirements for offsetting the loss of scattered trees smaller than medium old trees and slow-growing tree species.
- Describes the requirements for offsetting grass trees and tree ferns.
- Describes the requirements for offsetting harvesting of timber from naturally established native forest on private land.

The *Native Vegetation Plan* applies where *parcels of land greater than 4ha with less than 8 scattered trees per hectare* or where *parcels of land less then 4ha with any number of scattered old trees per hectare* (DNRE 2002). This applies to very large, large and medium old trees and any trees less than medium trees.

Appendix 3.4 of the *Native Vegetation Plan* states that "where protection and recruitment is not required by Victoria's *Native Vegetation Management Framework* and there is no practical way to achieve protection, a *recruitment only offset* may be applied" (PPWCMA 2006). However, it is part of DSE Port Phillip Region's focus to require the *protection and recruitment* prescription in most planning applications (PPWCMA 2006). Table 3.4C of the *Native Vegetation Plan* sets out the offset requirements for the loss of trees of various ages and sizes.

Wildlife Act 1975 and associated regulations

The purpose of the *Wildlife Act 1975* is to establish procedures in order to promote the protection and conservation of wildlife, prevent wildlife from becoming extinct, and to prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife. The Act requires people engaged in wildlife research (such as fauna surveys, salvage or translocation activities) to obtain a permit in order to ensure that these activities are undertaken with appropriate conservation and protection measures.

Furthermore, the Act requires that a permit is obtained for the management of wildlife where:

- Wildlife is damaging any building, vineyard, orchard, crop, tree, pasture, habitat or other property.
- For the purposes of the management, conservation, protection or control of wildlife or for the purposes of education about wildlife, research into wildlife or scientific or other study of wildlife.
- For aboriginal cultural purposes.
- For the purposes of enabling the care, treatment or rehabilitation of sick, injured or orphaned wildlife.
- For the purposes of ensuring the health or safety of any person or class of persons.

- To support a recognised wildlife management plan.
- To make provision for the custody, care and management of wildlife, held under another authorisation or a license which has been suspended, during the period of that suspension.

Under the *Wildlife Act 1975* land can also be designated as State Game Reserves, State Game Refuges, State Faunal Reserves, Game Management Stations, or other classifications as specified, for the preservation and conservation of wildlife. A plan of management is to be developed as soon as practicable for each reserve once gazetted.

Wildlife Regulations 2002

The objectives of the *Wildlife Regulations 2002* are:

- To make further provision in relation to the licensing system established by section 22 of the Wildlife Act 1975.
- To prescribe fees, offences, royalties and various other matters for the purposes of the Wildlife Act 1975.
- To provide for exemptions from certain provisions of the Wildlife Act 1975.

Under *Wildlife Regulations 2002* a person, unless licensed, permitted or authorised to do so under the Act:

- Must not willfully damage, disturb or destroy any wildlife habitat.
- Must not use a bait, lure, poison, decoy, or live animal to attract wildlife for the purpose of taking that wildlife.
- Must not use a firearm from an aircraft, motor vehicle, boat, or any other vehicle to take wildlife.
- Must not use an artificial light, electronic device, or recorded sound to hunt or take wildlife.
- Must not use a gun, bow or other weapon, trap, or any other equipment or substance for the purpose of taking wildlife.

Authorisation to conduct wildlife research or wildlife management can be obtained under the Act, and is subject to any conditions, limitations or restrictions placed on that authorisation. Proponents must allow inspection by an authorised officer, at any reasonable time, for the purpose of monitoring compliance with this Act.

Water Act 1989

The *Water Act 1989* provides the framework for allocating surface water and groundwater throughout Victoria. The Act allows authorities and individuals, via various entitlement mechanisms, to use water for commercial or irrigation purposes. Some licenses enable withdrawals of water directly from streams, others from groundwater. The *Water Act 1989* also defines water that is set aside for the environment under the Environmental Water Reserve.

The purpose of the Act is to integrated management of all elements of the terrestrial phase of the water cycle. This includes promotion of orderly, equitable and efficient water use, greater community involvement, integration of surface and subsurface flow management, to promote conservation and environmental enhancement and provide for the protection of catchment conditions.

Port Phillip and Western Port Regional Catchment Strategy

A primary function of the Port Phillip and Westernport Catchment Management Authority is to prepare a catchment management strategy for its region and coordinate and monitor its implementation. The *Port Phillip and Western Port Regional Catchment Strategy* describes the natural assets of the region, how natural assets are related, and provides a management framework for their conservation and sustainable use. The *Regional Catchment Strategy* focuses on four main groups of catchment assets – water resources (sustainable water use and healthy waterways), land (appropriate land management and sustainable productivity), biodiversity (healthy, diverse and enduring ecosystems) and the people of the region (community participation working to achieve sustainability).

The *Regional Catchment Strategy* is an important planning and working document for all organisations and people involved in natural resource management in the region, including government agencies and councils, water authorities and Landcare and community groups. It provides a framework for effort, an investment guide, a means of integrating policy, and an action plan for catchment works. It allocates tasks and defines roles for many stakeholders in the delivery of environmental programs across the region. It is also a regional investment guide, informing the allocation of Victorian and Australian Government investment in natural resource management in the region.

Port Phillip and Western Port Regional River Health Strategy

The *Port Phillip and Westernport Regional River Health Strategy* was developed by Melbourne Water in consultation with the Port Phillip and Westernport Catchment Management Authority, their local community and key stakeholders. The *River Health Strategy* provides a five year blueprint for the stakeholders to work together to improve our rivers and creeks. It identifies waterway values (catchment based), threats to waterway values, and actions to address these threats. The Strategy identifies river health related objectives, activities and targets for rivers located within the Maribyrnong, Werribee, Bunyip and Yarra river basins.

The *Port Phillip and Westernport Regional River Health Strategy* also covers drainages within the Westernport, Werribee and Maribyrnong catchments which, until now, had no designated regional management authority. Under the new arrangements, Melbourne Water is now the regional drainage, waterways and floodplain manager for the entire region, and is responsible for river health, management and maintenance of regional drains as well as identifying and maintaining areas subject to flooding. This arrangement will also provide more consistent and coordinated delivery of waterway health and improvement programs.

Victoria's Biodiversity Strategy

Victoria's Biodiversity Strategy set out guidelines for achieving broad biodiversity objectives as set out below:

- There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain with the first target being no net loss by the year 2001.
- The ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments are maintained and, where necessary, restored.
- The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion.
- There is no further preventable decline in the viability of any rare species or of any rare ecological community.
- There is an increase in the viability of threatened species and in the extent and quality of threatened ecological communities.

Victoria's Biodiversity Strategy is achieved through adherence to the Acts and policy guidelines aforementioned.

Local policy and legislation

Local Government Planning Schemes

Local Government Planning Schemes set out policies and provisions for the use, development and protection of land for municipalities in Victoria. These are legal documents prepared by the local council or the Minister for Planning, and approved by the Minister.

The development of the Planning Schemes is based on a comprehensive set of planning provisions for Victoria outlined in the Victorian Planning Provisions (VPPs). VPPs were introduced as part of a planning reform process in 1996 to simplify and standardise the planning process.

Provision 52.17 of the VPP outlines objectives for the protection and conservation of native vegetation. The purpose of 52.17 is to protect and conserve native vegetation, to reduce the impact of land and water degradation and provide habitat for plants and animals, to avoid, minimise or offset vegetation loss, and to manage vegetation near buildings to reduce the threat to life and property from wildfire.

Before deciding on an application, in addition to the decision guidelines in Clause 65, the responsible authority must consider, as appropriate:

- Victoria's Native Vegetation Management – A Framework for Action (DNRE 2002).
- Whether the proposed development can be located and designed to avoid the removal of native vegetation.
- Whether the proposed development is located and designed to minimise the removal of native vegetation.
- The need to offset the loss of native vegetation having regard to the conservation significance of the vegetation.
- The conservation and enhancement of the area.
- The preservation of, and impact on the natural environment or landscape values.
- Any relevant approved Regional Vegetation Plan.
- Whether the proposed development is in accordance with any property vegetation plan that applies to the site.
- The cumulative impact of native vegetation removal on biodiversity conservation and management.

Exemptions apply in certain circumstances, as outlined in Clause 52.17-6, Table of exemptions.

Almost the entire Precinct is covered by an Urban Growth Zone, a very small section of Public Park and Recreation Zone is present in the south western corner of the contract area. A small part of the contract area along Cardinia Creek and surrounding the wetlands is covered by a Land Subject to Inundation Overlay.

Clause 52.16 applies to land where a native vegetation precinct plan, corresponding to that land, is incorporated into this scheme. Where an NVPP applies, a permit is required to remove destroy or lop native vegetation, except where it is in accordance with that NVPP and Clause 52.16. Though an NVPP can stand alone, it may form part of a more general strategic or precinct structure plan. The purpose of an NVPP is to protect and conserve native vegetation to reduce the impact of land and water degradation and provide habitat for plants and animals, and to enable other areas of native vegetation to be removed in accordance with the NVPP. The NVPP may require specified works to be provided or specified payments to be made to offset the removal, destruction or

lopping of native vegetation. No permit is required under clause 52.17 where an NVPP is incorporated and listed in the schedule to clause 52.16 Native Vegetation Precinct Plan.

Local Planning Policies/Strategies

The City of Casey has published at least two strategy statements relevant to biodiversity conservation in the Casey municipality which aim to identify biodiversity assets and outline conservation measures:

- *City of Casey Biodiversity Strategy*. Report prepared for the City of Casey by Ecology Australia, Fairfield, Victoria (McMillan et al. 2003).
- *Casey Revegetation Strategy*. Report for the City of Casey by Brett Lane and Associates, North Carlton, Victoria (Brett Lane and Associates 2008).

KEY BIODIVERSITY ISSUES AND IMPLICATIONS

It is estimated that only 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Patterns of vegetation clearance within the contract area are consistent with those undertaken historically throughout the City of Casey, whereby, the majority of the contract area has been cleared for agriculture, and remaining native vegetation has been modified to varying degrees. All remnant vegetation and all remaining habitat, both indigenous and non-indigenous, is therefore significant as a local source of biodiversity and should be prioritised for retention and on-going ecological management as part of the any future development.

Roadsides within the City of Casey are often the only remaining indigenous habitat within an area and are therefore important as habitat corridors for fauna throughout the municipality (Brett Lane and Associates 2008). Native vegetation distribution within the contract area is consistent with general patterns of vegetation distribution within the City of Casey, in that roadsides comprise greater biodiversity compared to surrounding agricultural land. All roadsides, regardless of native vegetative cover, are important habitat within the contract area, given the occurrence of threatened species, including Southern Toadlet and Glossy Grass Skink in these areas.

Careful consideration should be given to wetlands and drainage lines within the contract area and the potential for the development to alter hydrology. Drainage-lines within the contract area are considered important habitat, including breeding habitat, for threatened species within the region. Any rezoning and subsequent precinct design should therefore avoid impacts to drainage-lines and aim to incorporate additional wetland and drainage-line habitat into the precinct design.

The regions of highest conservation priority within the contract area consists of the remnant Swamp Scrub, Swampy Riparian Woodlands and aquatic vegetation patches, the majority of which lie within roadside reserves and drainage lines within the contractcontract area.

Land-use change within the contractcontract area, such as residential, business or industrial developments have the potential to significantly impact existing native vegetation, ecosystem function, water quality, threatened species habitat and local and regional biodiversity, primarily through the direct removal of native vegetation and habitat. However, very little of the contractcontract area comprises indigenous vegetation. contract area Furthermore, most areas of existing or potential habitat for threatened species coincide with native vegetation patches within the contractcontract area.

Potential habitat links within the contract area and the neighbouring Contract Area 42, can play an important role in linking core habitats between Western Port Bay and the foothills of the Great Dividing Range. Furthermore, a *Land Subject to Inundation Overlay* (LSIO) occupies approximately half of the contract area (DPCD 2009). This area represents potential habitat for wetland birds during times of flood.

Opportunities to reduce potential impacts

The following impact minimisation options should be considered for the contract area:

- The avoidance and therefore retention of native vegetation through careful placement of roads, infrastructure, building lots and open space during the design phase.
- The retention and enhancement of farm dams as wetland habitat.
- Avoid removal of existing roadside vegetation through the purchase of adjacent cleared private land when planning for road duplication.
- The retention of scattered trees within the contract area.
- The retention and minimisation of direct and indirect disturbance to drainage line habitat and connectivity with other waterways.
- The staged removal of drainage-line habitat at the construction phase when unavoidable habitat losses are incurred.
- The minimisation of alterations to hydrological regime and runoff water quality through the use of water sensitive designs.
- The salvage and re-location of Southern Toadlet and Swamp Skink during breeding season prior to the construction phase if unavoidable drainage-line habitat losses are incurred.
- The adoption of conservation aims in the rezoning and PSP planning process.

• There is potential within the Precinct Structure Planning process to provide for the best possible ecological outcomes during and after the rezoning and subsequent development of the contract area.

- **Creation of habitat within constructed wetlands**

Drainage-lines and farm dams within the contractcontract area currently support threatened species, and hold greater floristic diversity and habitat value compared to surrounding grazing land. Drainage lines of particular note include drainage lines of 1100 Pound Road (land parcel 208514974). There is potential to incorporate these into habitat corridors across the Precinct 43 area, establishing and improving waterway habitat connectivity with Precinct 11 to the east and habitat remnants to the west (see also Section 5.1.4 below).

Drainage-line modification may need to be undertaken to provide for increased stormwater run-off as a result of possible development of the contractcontract area. Unavoidable loss of aquatic habitat may result after existing drainage-lines are widened and deepened to create wetlands and retarding basins. In order to mitigate this potential habitat loss, it may be appropriate to consider staging the removal of habitat and/or creating constructed wetlands adjacent to drainage-lines and allowing the drainage-lines to remain in place.

If newly constructed wetlands are to be created, significant opportunities exist for the addition of aquatic habitat. Constructed wetlands could be planted with a variety of indigenous aquatic and semi-aquatic vegetation, such as sedges, rushes and herbs, to create habitat for many types of fauna including amphibians, reptiles and birds.

Many wetland birds, including threatened and migratory species were observed nesting on islands within wetlands during recent fauna survey undertaken by Practical Ecology at the C21 Business Park (Shepherd, Henry and Gannon 2010). Islands could be considered for incorporation into the constructed wetland design within Contract Area 43 in order to provide predator-free habitat for threatened species. Islands create a higher ephemeral zone to open water ratio, by increasing the lineal shore-line distance which provides additional shore-line habitat. Islands can buffer winds and reduce wave action, thereby improving water quality by reducing erosion of revegetated banks. Constructed islands can also play a role in fluid dynamics by reducing and dispersing input flows, thereby allowing sediments to settle (Wong et al. 1999). Revegetation may be difficult to establish and maintain on islands due to the impacts of high density bird populations. Artificial nest-boxes and perches could therefore be considered to allow vegetation to establish and persist on constructed islands.

Artificial nest-boxes, perches and erected hollow trunks and logs could therefore be considered for introduction to allow vegetation to establish and persist on constructed islands.

Domestic animals and feral predators

The development of the contract area may also result in the need for designated passive recreation areas. Wetland habitats and associated passive recreation areas, including public open space, should be designed to exclude domestic pets, especially cats and dogs, which have the potential to become predators of native birds and bird's eggs, and disrupt their breeding, foraging and nesting patterns.

Both foxes and feral cats have been recorded within the contract area and may increase in numbers after development due to the increase in available food and shelter resources. Fox and cat control within the contract area should be undertaken as a regionally coordinated program in order to protect and enhance biodiversity values, including habitat values for threatened wetland birds.

Protection and enhancement of existing biodiversity assets

It is estimated that only 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Native vegetation within Investigation Area 43 is therefore an especially important biodiversity asset given the little native vegetation that remains within the region. The majority of this native vegetation occurs within the roadside reserves. Other areas of native vegetation such as drainage-line habitat throughout the precinct also have significant value.

The management of retained vegetation and habitat should aim to control threatening processes currently underway with the contract area, including:

- weed invasion;
- lack of habitat connectivity; and
- feral animal predation on native fauna.

Woody weed control

Many woody weed species occur at significant densities within remnant vegetation in the contract area, including:

- Hawthorn *Crataegus monogyna*; and
- Blackberry *Rubus fruticosus* spp. agg.

Most woody weeds could be relatively easily controlled using a 'cut and paint' method.

Many weed species provide habitat for fauna, and widespread weed removal may reduce available habitat. A program of staged weed removal in conjunction with revegetation of appropriate native vegetation to provide habitat should be considered.

Rehabilitation and conservation

There is potential to improve the habitat values through implementation of rehabilitation and conservation programs, and through improved land and water use practices that promote natural regeneration of these site's wetland and riparian EVCs.

There are a number of drainage lines within the contract area. A large part of the area is covered by a land subject to inundation overlay (LSIO), within which drainage lines occur. If these areas flood they would provide important habitat and resources for wetland birds, amphibians and other species for feeding, moving through the landscape and breeding. An opportunity exists to improve this habitat through water-sensitive urban design principles. Storm water run-off should be contained off-line from existing waterways, wetlands and drainage lines and filtered/cleaned before excess can enter any water ways or wetlands. Recolonisation and revegetation of indigenous aquatic, semi-aquatic and terrestrial vegetation may increase habitat for amphibians and wetland birds and may also offer resources for a number of species.

Buffer zones and habitat links

While the majority of native vegetation within the contract area occurs along the roadsides, several other smaller areas of native vegetation and habitat occur within the contract area, such as:

- Swamp Scrub at 1100 Pound Road (PFI: 208514974);
- drainage-lines throughout the contract area, especially within PFI: 208514974; and
- scattered trees, especially within 1865 Thompsons Road (PFI: 636937).

These remnants constitute habitat for a range of indigenous fauna. There is potential to increase the viability of existing habitat within the contract area by linking this to habitat beyond the investigation area. This can be achieved through the creation of revegetated habitat links.

Habitat links should also be designed with the aim of linking habitat beyond the contract area in the foothills of the Great Dividing Range and Western Port Bay. A recent study commissioned by DSE explores existing and potential habitat connectivity and associated issues in the south-eastern region of Melbourne (McCaffrey and Henry 2010) and should be referred to when designing habitat links within and beyond the contract area.

A reserve system design for the contract area should consider to the following principles:

- The retention and conservation of all areas of remnant vegetation.
- The retention of roadside remnant areas and drainage lines offering aquatic habitat values to the region's significant fauna (in particular sites known to support Glossy Grass Skink and Southern Toadlet).
- The retention of all areas of habitat for threatened fauna species (including areas dominated by exotic or non-indigenous flora).
- The establishment of habitat links between remnant vegetation and habitat.
- The establishment of buffers surrounding important habitat to control pedestrian access, facilitate regeneration and expansion of remnant areas, and reduce disturbance to fauna.
- The rehabilitation of existing highly modified habitat to link areas of existing higher quality habitat within the contract area.
- The establishment of habitat links which integrate habitat within the contract area to habitat within neighbouring precincts and beyond.

There are several scattered Large and Medium Old Trees in the southeast corner of the precinct (PFI: 636937) that should be incorporated into a scattered tree reserve. The reserve area should be at least twice the current canopy area and weeds should be removed (to less than 1% cover) to allow for the regeneration of Plains Grassy Woodland EVC at the site. Ground logs and litter from the trees should be retained for ground habitat.

Areas of non-indigenous vegetation defined as public open space within the potential PSP area, should also be incorporated into buffer zones to protect and enhance areas of fauna habitat. There is also potential to utilise roads and footpaths wherever possible to separate reserves from developable areas.

CONCLUSION

Native vegetation and fauna habitat within the contractcontract area is confined primarily to the roadsides along Thompsons and Pound Roads and drainage lines that bisect the precinct. Much of this habitat consists of Swamp Scrub and Swampy Riparian Woodland, with a small portion of Sedge Wetland. The remainder of thecontract area is dominated by pasture used for grazing livestock and has limited value as habitat, with the exception of drainage-lines, farm dams and marshy areas of pasture that may be utilised by fauna species, including wetland birds (Pizzey and Knight 2007).

Seventy flora species were recorded within the contract area (Appendices 1 & 2). Twenty-one (43%) of these species were indigenous. No threatened flora species were recorded during the current assessment. Thirty-eight threatened flora species have been recorded within 10 kilometres of the contract area (DSE 2009a) or are predicted to occur by DEWHA (2010b). Two of these species are considered to have at least a moderate likelihood of occurrence, based on nearby records and some suitable habitat within the contract contract area.

A total of **2.47 hectares** of native vegetation comprising **0.52 habitat hectares** was defined as meeting DSE's (2004) native vegetation cover thresholds within the contractcontract area. Three EVCs were recorded within the contractcontract area, mostly within roadsides and constructed drainage-lines.

Sixty-three indigenous vertebrate fauna species were recorded within the contractcontract area, comprising seven amphibians, five reptiles, 43 birds, and eight mammals. Three fauna species listed as rare, threatened or migratory species under state and federal legislation were recorded within the contractcontract area during the current assessment, including one bird, one reptile and one amphibian:

- Southern Toadlet *Pseudophryne semimarmorata*, was recorded within the precinct and is listed as vulnerable in Victoria (DSE 2009b).
- Glossy Grass Skink *Pseudemoia rawlinsoni* is listed as near threatened in Victoria (DSE 2007a).
- White-throated Needletail is listed as migratory under the EPBC Act 1999.

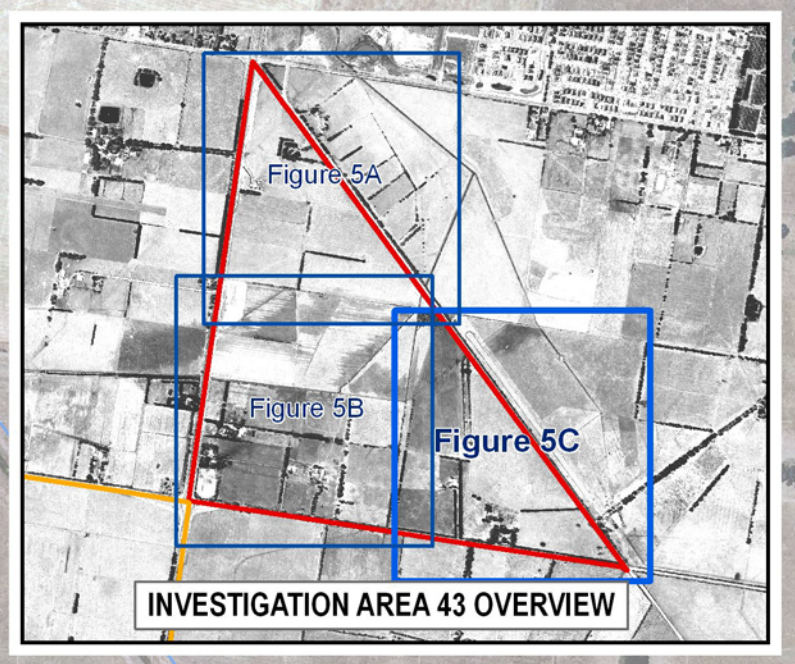
Fifty-nine fauna species of state or national significance have been recorded within ten kilometres of the contractcontract area or are predicted to occur by DEWHA (2010b) (Appendix 11), including many threatened wetland birds. Three species recorded on AVW and EPBC searches are considered to have a high likelihood of occurrence within the contractcontract area. A further six species are considered to have at least a moderate likelihood of occurrence within the contractcontract area (Appendix 11).

There are other areas of native (non-indigenous) and exotic (introduced) vegetation, including areas of regenerating Swamp Scrub and other native vegetation that do not meet the DNRE (2002) threshold for consideration under Victoria's *Native Vegetation Management Framework*. Most of these areas occur within roadsides and drainage-lines within the contract area. Whilst highly modified or immature, some of these areas comprise relatively complex vegetation structures and

floristic diversity and could be habitat for threatened fauna species, such as threatened wetland birds and amphibians. Non-indigenous planted Eucalypts and other established tree species occur along fence-lines and roadsides. Areas of non-indigenous trees and plantings may also be important for habitat connectivity within the contract area.

Large trees containing hollows and canopy habitat are present as scattered indigenous trees and as planted exotic and non-indigenous Eucalypts along fence-lines and roadsides. Established trees, especially Eucalypts could be retained for their value as habitat for threatened woodland birds and microbats. All other areas of habitat, both indigenous and non-indigenous, including roadsides, wetlands, drainage-lines and areas of woodland could also be considered for retention.

Areas of non-indigenous vegetation defined as public open space within the Precinct development, should also be incorporated into buffer zones to protect and enhance areas of fauna habitat. There is also potential to utilise roads and footpaths wherever possible to separate reserves from development areas.



208516228
HZ7
HZ5
HZ11
HZ6
HZ3
HZ12
HZ1
HZ4
208514974
HZ20
HZ19
Pound Road
40E.ov
39E.ov
38E.ca
HZ2
636847
636936
HZ18
636937
41E.ca
42E.ca
43E.ca
37E.ca
23E.ov
45E.ca
44E.ca
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VERSION 02 | DATE: 04/10/10

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

DATUM: GDA 94 VICGRID 94

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0 50 100 150
Metres
1:4,000 when printed at A3

MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Access Constraints - Survey not completed
- Degraded Treeless Vegetation
- Non Native Vegetation

Modelled Vegetation

- Highly likely native vegetation - woody

Ecological Vegetation Class

- EVC 53: Swamp Scrub
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland

Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*
- E.ca River Red Gum *Eucalyptus camaldulensis*

FIGURE 5C

ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES Contract Area 43

Biodiversity Mapping Project 2009-2011

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Appendix 1. Indigenous Flora Species Recorded Within the Contract area

Life Form	Scientific Name	Common Name	EPBC	FFG	VROTS	Regional
Trees	**Mimosaceae**					
	Acacia melanoxylon	Blackwood				
	Myrtaceae					
	Eucalyptus camaldulensis	River Red-gum				Reg
	Eucalyptus ovata	Swamp Gum				Reg
Shrubs	**Myrtaceae**					
	Melaleuca ericifolia	Swamp Paperbark				
Herbs	**Cyperaceae**					
	Isolepis cernua var. *platycarpa*	Broad-fruit Club-sedge				Reg
	Geraniaceae					
	Geranium sp. 5	Naked Crane's-bill				Reg
	Lythraceae					
	Lythrum hyssopifolia	Small Loosestrife				
	Onagraceae					
	Epilobium billardierianum subsp. *billardierianum*	Smooth Willow-herb				
	Oxalidaceae					
	Oxalis perennans	Grassland Wood-sorrel				Reg
	Polygalaceae					
	Persicaria decipiens	Slender Knotweed				
	Veronicaceae					
	Veronica gracilis	Slender Speedwell				Reg
Graminoids (grass-like plants)	**Cyperaceae**					
	Carex appressa	Tall Sedge				
	Eleocharis acuta	Common Spike-sedge				
	Juncaceae					
	Juncus amabilis	Hollow Rush				
	Juncus bufonius	Toad Rush				
	Poaceae					
	Austrodanthonia spp.	Wallaby Grass				
	Glyceria australis	Australian Sweet-grass				
	Hemarthria uncinata var. *uncinata*	Mat Grass				Reg
	Microlaena stipoides var. *stipoides*	Weeping Grass				
	Phragmites australis	Common Reed				
	Typha domingensis	Narrow-leaf Cumbungi				

Appendix 2. Exotic flora species within the contract area

Life Form	Origin	Scientific Name	Common Name		CaLP Act listing
NON-INDIGENOUS NATIVE SPECIES					
Trees		**Myrtaceae**			
	#	*Melaleuca armillaris subsp. armillaris*	Giant Honey-myrtle	Myrtaceae	
EXOTIC SPECIES					
Shrubs		**Fabaceae**			
	*	*Ulex europaeus*	Gorse	Fabaceae	C
		Rosaceae			
	*	*Crataegus monogyna*	Hawthorn	Rosaceae	C
Herbs		**Asteraceae**			
	*	*Arctotheca calendula*	Cape Weed	Asteraceae	
	*	*Aster subulatus*	Aster-weed	Asteraceae	
	*	*Cirsium vulgare*	Spear Thistle	Asteraceae	C
	*	*Cotula coronopifolia*	Water Buttons	Asteraceae	
	*	*Helminthotheca echioides*	Ox-tongue	Asteraceae	
	*	*Hypochoeris radicata*	Flatweed	Asteraceae	
	*	*Sonchus oleraceus*	Common Sow-thistle	Asteraceae	
		Boraginaceae			
	*	*Echium plantagineum*	Paterson's Curse	Boraginaceae	C
		Brassicaceae			
	*	*Lepidium africanum*	Common Peppercress	Brassicaceae	
		Caryophyllaceae			
	*	*Stellaria media*	Chickweed	Caryophyllaceae	
		Chenopodiaceae			
	*	*Chenopodium murale*	Sowbane	Chenopodiaceae	
		Fabaceae			
	*	*Lotus spp. (naturalised)*	Trefoil	Fabaceae	
	*	*Trifolium repens var. repens*	White Clover	Fabaceae	
	*	*Trifolium spp.*	Clover	Fabaceae	
	*	*Vicia sativa subsp. sativa*	Common Vetch	Fabaceae	
		Geraniaceae			
	*	*Erodium spp.*	Heron's Bill		
	*	*Geranium dissectum*	Cut-leaf Crane's-bill	Geraniaceae	
		Malvaceae			
		**Malva spp.*	Mallow	Malvaceae	
		Polygonaceae			
	*	*Polygonum aviculare s.l.*	Prostrate Knotweed	Polygonaceae	
	*	*Rumex crispus*	Curled Dock	Polygonaceae	
	*	*Rumex spp. (naturalised)*	Dock (naturalised)	Polygonaceae	
		Primulaceae			
	*	*Anagallis arvensis*	Pimpernel	Primulaceae	
		Rubiaceae			
	*	*Galium aparine*	Cleavers	Rubiaceae	

Life Form	Origin	Scientific Name	Common Name		CaLP Act listing
		Veronicaceae			
	*	*Plantago lanceolata*	Ribwort	Veronicaceae	
Graminoids (grass like plants)		**Alliaceae**			
	*	*Allium triquetrum*	Angled Onion	Alliaceae	R
		Cyperaceae			
	*	*Cyperus eragrostis*	Drain Flat-sedge	Cyperaceae	
		Iridaceae			
	*	*Gladiolus spp.*	Gladiolus	Iridaceae	
	*	*Romulea rosea*	Onion Grass	Iridaceae	
		Poaceae			
	*	*Agrostis capillaris*	Brown-top Bent	Poaceae	
	*	*Anthoxanthum odoratum*	Sweet Vernal-grass	Poaceae	
	*	*Avena spp.*	Oat	Poaceae	
	*	*Bromus catharticus*	Prairie Grass	Poaceae	
	*	*Bromus hordeaceus subsp. hordeaceus*	Soft Brome	Poaceae	
	*	*Ehrharta erecta var. erecta*	Panic Veldt-grass	Poaceae	
	*	*Festuca arundinacea*	Tall Fescue	Poaceae	
	*	*Holcus lanatus*	Yorkshire Fog	Poaceae	
	*	*Hordeum spp.*	Barley Grass	Poaceae	
	*	*Hordeum vulgare s.l.*	Barley	Poaceae	
	*	*Lolium perenne*	Perennial Rye-grass	Poaceae	
	*	*Paspalum dilatatum*	Paspalum	Poaceae	
	*	*Phalaris aquatica*	Toowoomba Canary-grass	Poaceae	
	*	*Phleum pratense*	Timothy Grass	Poaceae	
	*	*Poa annua*	Annual Meadow-grass	Poaceae	
	*	*Poa pratensis*	Kentucky Blue-grass	Poaceae	
	*	*Setaria parviflora*	Slender Pigeon Grass	Poaceae	
Scramblers/Climbers		**Rosaceae**			
	*	*Rubus fruticosus* spp. agg.	Blackberry	Rosaceae	C

Appendix 3 Threatened flora species within 10km

Flora species recorded within a ten kilometres from the contract area boundary on DSE's *Flora Information System* (2009a). Relevant species listed on EPBC Protected Matters Search Tool (DEWHA 2010b) also included.

Likelihood of Occurrence:

Low: Few aspects of habitat requirements are met on site.
Moderate: Some aspects of habitat requirements are met on site.
High: Optimal habitat present.

Conservation Status Codes (EPBC and FFG Acts):

EN – Endangered under the National EPBC Act (very high risk of extinction in the wild)

VU – Vulnerable under the National EPBC Act (high risk of extinction in the wild)

f–Listed as threatened under the Flora and Fauna Guarantee Act

Victorian Conservation Status Codes (DSE 2005b):

e – Endangered (at risk of becoming extinct);
v – Vulnerable (at risk of becoming endangered);
r –Rare (rare but not considered otherwise threatened);
k –poorly known (accurate distribution information is inadequate to allocate to one of the conservation status categories);

Life Form	Scientific Name	Family Name	Common Name	Conservation Status			Database	Other Sources	Current Survey	Total Number of Documented Records	Likelihood of Occurrence	Likelihood Reasoning	Habitat
				FFG	EPBC	DSE							
Shrub	*Acacia howittii*	Mimosaceae	Sticky Wattle			r	FIS			3	Low	This is a probably a record of planted stock.	Confined to Eastern Victorian moist forests in areas from the upper Macalister River south to Yarrum (Walsh and Entwisle 1996)
Shrub	*Acacia leprosa (Dandenong Range variant)*	Mimosaceae	Dandenong Range CinnamonWattle			r	FIS			2	Low	No suitable habitat within the contract area. Nearest records in foothills of Great Divide.	Moist, well drained soils of damp and valley sclerophyll forests (Gray and Knight 2001).
Graminoid	*Amphibromus fluitans*	Poaceae	River Swamp Wallaby-grass		VU		FIS/EPBC			5	Med	Nearest record from Lynbrook and close to RBGC. All records on the former south-gippsland railway. Potential habitat within wetland and drainage-line habitats within the contract area, although this habitat is highly modified and low diversity.	Mostly confined to the north-central Victorian reach of the Murray River and is uncommon in southern Victoria. Occurs in natural and constructed wetlands such as farm dams, lagoons and swamp margins (DEWHA 2010a; Walsh and Entwisle 1994).
Graminoid	*Austrostipa rudis* subsp. *australis*	Poaceae	Veined Spear-grass			r	FIS			6	Low	No suitable remnant woodland habitats within the contract area	Dry open forest, grassy low open forest on sandy soils. Uncommon with scattered populations across southern victoria (Walsh and Entwisle 1994).
Graminoid	*Burnettia cuneata*	Orchidaceae	Lizard Orchid			r	FIS			1	Low	One record at Guys Hill (Foothills of the Great Dividing Range) ~10km away. No suitable habitat within the contract area (No M. squarrosa)	Occurs in dense, wet heathy vegetation in near-coastal areas from near Portland in the west to Mallacoota area in the east. Has a disjunct occurrence in the Grampians (Walsh and Entwisle 1994).
Graminoid	*Caladenia aurantiaca*	Orchidaceae	Orange-tip Finger-orchid			r	FIS			2	Low	1 record from 1971. Other most recent rec 1999 from RBGC. Low-moderate likelihood of occurrence within 1520 Thompsons Road.	Southern Victoria, east of Melbourne in open forests, heathlands and heathy woodlands (Walsh and Entwisle 1994).
Graminoid	*Caladenia fragrantissima* subsp. *orientalis*	Orchidaceae	Cream Spider-orchid		EN		EPBC			0	Low	No records within 10km. No high quality suitable habitat within the contract area. Extremely rare plant.	Populations limited to a small area of coastal far western Victoria and Southern G ippsland. Found in coastal heathlands and heathy woodlands on sandy soils (Walsh and Entwisle 1994).
Graminoid	*Caladenia oenochila*	Orchidaceae	Wine-lipped Spider-orchid	f	VU	v	FIS			1	Low	Unlikely - record from 1939 - north of Pakenham bypass. Now extremely rare in the Melbourne area.	Uncommon populations across southern Victoria. Occurs in Foothill and heathy Forests in low hill areas (Jeanes and Backhouse 2006).

Life Form	Scientific Name	Family Name	Common Name	Conservation Status FFG	EPBC	DSE	Database	Other Sources	Current Survey	Total Number of Documented Records	Likelihood of Occurrence	Likelihood Reasoning	Habitat
Herb	*Cardamine paucijuga s.s.*	Brassicaceae	Annual Bitter-cress			v	FIS			1	Low	Unlikely - limited habitat in the contract area. Occurs in high quality habitats	Scatterd populations, primarily in southern Victoria including Portland, Grampions and Wilsons Promontory (Walsh and Entwisle 1996). Occurs in riparian and swamp scrub in rich soil in dry or moist conditions (Gray and Knight 2001).
Herb	*Cardamine tenuifolia*	Brassicaceae	Slender Bitter-cress			k	FIS			1	Low	One record north of the Pakenham bypass adjacent to Cardinia Creek	Swamp margins, plains grassland, valley sclerophyll forest in populations scattered across southern Victoria (Walsh and Entwisle 1996).
Graminoid	*Carex alsophila*	Cyperaceae	Forest Sedge			r	FIS			1	Low	One record in the foothills of the Great Dividing Range in 1980. No suitable habitat within the contract area.	Endemic in Victoria where occuring in mountain gullies and swamps between Alexandra and Erica, but locally rather common (Walsh and Entwisle 1994).
Shrub	*Correa reflexa* var. *lobata*	Rutaceae	Powelltown Correa			r	FIS			1	Low	Record from RBGC. No suitable habitat within the contract area.	Locally common in areas south-east of Melbourne. Moist, open forests, often heathy. Also heathy woodlands (Walsh and Entwisle 1999).
Graminoid	*Corybas aconitiflorus*	Orchidaceae	Spurred Helmet-orchid			r	FIS			1	Low	Record North of Beaconsfield Nature Conservation Reserve along Cardinia Creek. No suitable habitat within the contract area.	Localized and uncommon colonies in the south-east of Victoria. Prefering sheltered, damp positions in shrubby vegetation (Walsh and Entwisle 1994).
Herb	*Craspedia canens*	Asteraceae	Grey Billy-buttons	f		e	FIS			6	Low	Unlikely - 3 records from intact wetland north of cranbourne in 1993. No intact wetlands within the contract area.	Few populations in south-east Victoria between Cranbourne and Traralgon. Grasslands, often around margins of swamps (Walsh and Entwisle 1999).
Graminoid	*Dianella amoena*	Hemerocallidaceae	Matted Flax-lily	EN		e	FISEPBC			10	Moderate	Records on former South Gippsland Hwy and in Officer, both >5kms away. No grassy woodland or Plains Grassy Woodland remanants in the contract area.	Confined to southern Victoria in vegetation types such as lowland grasslands, grassy woodlands and grassy wetlands. The species can tolerate well drained to seasonally wet soils (DEWHA 2010a).
Graminoid	*Diuris punctata* var. *punctata*	Orchidaceae	Purple Diuris	f		v	FIS			15	Low	Nearest records from early 1980's, east of Cardinia Creek approximately 5km away. No suitable habitat within the stduy area.	Formerly widespread and common in Victoria, occuring throughout the fertile lowlands, now much reduced through clearing (Walsh and Entwisle 1994, p. 858). Found in grassland, grassy woodland and less commonly in open forest (Jeanes and Backhouse 2006, p. 235).
Graminoid	*Eleocharis macbarronii*	Cyperaceae	Grey Spike-sedge			k	FIS			2	Low	Last records from Mid-90s in Lyndhurst. Unlikely.	Infrequent populations in areas of western and northern victoria. Found in heavy soils in waterlogged areas around wetlands and drainage lines (Walsh and Entwisle 1994).
Graminoid	*Entolasia stricta*	Poaceae	Upright Panic			k	FIS			1	Low	Recorded close to Botanic Drv in RBGC. No suitable habitat within the contract area.	Sandy soils in grassy low open forests. Distribution uncertain however recorded east of Bairnsdale and near Frankston and Stradbroke (Walsh and Entwisle 1994).
Tree	*Eucalyptus fulgens*	Myrtaceae	Green Scentbark			r	FIS			9	Low	Most records from southern highlands fall bioregion, occasional plants on the plains. Few Eucalypts within the contract area.	Open forest areas, tollerating damp conditions. Found in areas east of Healseville and Woori Yallock to the Latrobe Valley. (Walsh and Entwisle 1996).

Life Form	Scientific Name	Family Name	Common Name	Conservation Status FFG	EPBC	DSE	Database	Other Sources	Current Survey	Total Number of Documented Records	Likelihood of Occurrence	Likelihood Reasoning	Habitat
Tree	*Eucalyptus* X *studleyensis*	Myrtaceae	Studley Park Gum			e	FIS			2	Low	3 records within 10km. Recent record in 2007 >5kms away. Few Eucalypts within the contract area.	A naturally occuring hybrid (E. ovata × E. camaldulensis) found in Studley Park/Yarra Bend and along the Yaraa Valley (Gray and Knight 2001).
Herb	*Geranium solanderi* var. *solanderi s.s.*	Geraniaceae	Austral Crane's-bill			v	FIS			1	Low	No grassland or dry woodland habitats within the contract area.	An uncommon species of damp to dryish, usually sheltered sites in grassy woodlands. Often along drainage line or in seepage areas (Walsh and Entwisle 1999).
Scrambler/climber	*Glycine latrobeana*	Fabaceae	Clover Glycine	f	VU	v	EPBC/FIS			1	Low	Unlikely - closest record in Beaconsfield in the dividing range. No intact habitat or suitable habitat within the contract area.	Widespread, infrequent populations in southern Victoria (Walsh and Entwisle 1996). Plains Grassland and Woodlands in moist well drained soils (Gray and Knight 2001).
Herb	*Helichrysum* aff. *rutidolepis (Lowland Swamps)*	Asteraceae	Pale Swamp Everlasting			v	FIS			5	Low	Unlikely - no suitable habitat. Records from intact wetland at Lynbrook and former south-Gippsland Railway	Moist well drained sites in open grassy forest or woodland. Frequent, widespread populations across much of Victoria, excluding the north-west (Walsh and Entwisle 1999).
Graminoid	*Lachnagrostis filiformis* var. 2	Poaceae	Wetland Blown-grass			k	FIS			2	Moderate	Possible - recorded by Practical Ecology in 2009 in adjacent Area 42 contract area. Could occur in drainage-lines, however these are highly modified and comprise low floristic diversity.	Grows on the edges of wetlands
Graminoid	*Lachnagrostis punicea* subsp. *filifolia*	Poaceae	Purple Blown-grass	f		r	FIS			7	Low	Unlikely - All records from former South-Gippsland Railway including an intact wetland at Lynbrook. No intact wetlands within the contract area.	Scattered populations across the Victorian Volcanic plains in wet depressions, marshes and slightly saline swamps.
Shrub	*Leionema bilobum*	Rutaceae	Notched Leionema			r	FIS			1	Low	Unlikely. 1 record from foothills of the Great Divide ~10km away.	Wet and damp forests
Herb	*Microseris* sp. 1	Asteraceae	Plains Yam-daisy			v	FIS			3	Low	Three records from former south-gippsland railway including from remnant near Lynbrook. No suitable habitat within the contract area.	Rare in Plains Grassland and Woodlands in damp depressions in the Basalt soils of Victorias Western Plains (Walsh & Entwistle 1999).
Shrub	*Olearia asterotricha*	Asteraceae	Rough Daisy-bush			r				1	Low	1 record near Fountain Gate from 1914. No suitable habitat within the contract area.	Occurs in moist forest and swampy heathland in a few disjunct areas of southern Victoria (e.g. Portland area, Grampians, Emerald, Gembrook and Tonimbuk). Generally uncommon (Walsh and Entwisle 1999).
Herb	*Potamogeton perfoliatus s.l.*	Potamogetonaceae	Perfoliate Pondweed			k	FIS			1	Low	Recorded in 2005 in Cardinia Creek. It is a wetland plant which could disperse easliy through water. However, waterways highly modified within contract area.	Flowing or still, fresh or brackish, creeks and rivers. On Sandy, stoney or muddy substrates (Walsh and Entwisle 1994).
Graminoid	*Prasophyllum frenchii*	Orchidaceae	Maroon Leek-orchid	f	EN	e	FIS/EPBC			12	Low	Recent records (1985) <5km away in former South Gippsland rainlway. unlikely to occur due to lack of suitable habitat.	Infrequent, widespread populations in south western Victoria. Grasslands heathlands and grassy woodlands on moist well drained soils, including roadsides or rail reserves (Jeanes and Backhouse 2006).
Graminoid	*Prasophyllum pyriforme s.s.*	Orchidaceae	Silurian Leek-orchid			e	FIS			1	Low	Last record from 1932. Lack of suitable habitat.	Few known populations, occuring to the north-east of Melbourne in dry open forest with shrubby understory (Jeanes and Backhouse 2006).

Life Form	Scientific Name	Family Name	Common Name	Conservation Status FFG	EPBC	DSE	Database	Other Sources	Current Survey	Total Number of Documented Records	Likelihood of Occurrence	Likelihood Reasoning	Habitat
Graminoid	*Pterostylis grandiflora*	Orchidaceae	Cobra Greenhood			r	FIS			1	Low	Last record from 1940. Lack of suitable habitat.	Few widely distributed populations in Eastern Victoria. Moist shady slopes in heath and grassy open forests (Jeanes and Backhouse 2006).
Graminoid	*Pterostylis* sp. aff. *parviflora (Southern Victoria)*	Orchidaceae	Red-tip Greenhood			r	FIS			1	Low	One record near Beaconsfield in foothills of Great Dividing Range. No suitable habitat within the contract area.	In well drained loams of valley sclerophyll forests, sclerophyll woodland and swamp scrub (Gray and Knight 2001).
Graminoid	*Pterostylis* X *ingens*	Orchidaceae	Sharp Greenhood			r	FIS			1	Low	Last record from 1940's. Lack of suitable habitat and lack of parent plants.	Infrequent, widespread colonies accros Victoria. Occuring in areas of moist open forest (Walsh and Entwisle 1994).
Shrub	*Tetratheca stenocarpa*	Elaeocarpaceae	Long Pink-bells			r	FIS			1	Low	Last record in 1935	Tall open forest areas with populations limited to the Healesville area, the Pyrete Ranges and French Island (Walsh and Entwisle 1999).
Graminoid	*Thelymitra circumsepta*	Orchidaceae	Naked Sun-orchid			v	FIS/EPBC			4	Low	1999 was the last record on FIS, there is a stable pop at RBGC. Unlikely to occur due to very specific habitat requirements.	Found around the margins of swamps, along sub-alpine streams and sphagnum bogs. Often in disturbed areas and exposed positions in woodlands, open forests and wet heathlands (Jeanes and Backhouse 2006).
Graminoid	*Thelymitra epipactoides*	Orchidaceae	Metallic Sun-orchid	EN	EPBC					0	Low	No records within 10 kms. Very rare plant. No high quality habitat within the contract area.	Uncommon small colonies in areas of southern Victoria, particularly near the coast (Walsh and Entwisle 1999). Greatly reduced populations due to decline in suitable habitat. Grows in coastal heathlands, grasslands and woodlands and in swampy depressions (Jeanes and Backhouse 2006).
Herb	*Xerochrysum palustre*	Asteraceae	Swamp Everlasting	VU	EPBC/FIS					3	Low	3 records. Nearest record in Lyndhurst. Others on railway. Lack of suitable habitat in the contract area	Occurs in swamps usually found on basalt derived soils

Appendix 4. Habitat hectare results

Habitat Zone			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
PFI			636847	636936	208514974	208514974	208516228	R208514974	R208516228	R208516228	R208516228	R208516228	R208516228	R636847	R636934	R636934	R636935	R636936	R636937	R636937	R636937	R636937	THOMSONS	THOMSONS
Site ID			1	1	2	2	1	1	2	4	5	7	1	1	4	2	2	1	3	4	8	10	1	2
Habitat Zone ID			A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
EVC Name (Initials)			SS	SW	SS	SW	SW	SS	SS	SS	SS	SS	SS	SS	SRW	SRW	SRW	SRW	SS	SS	SS	SS	SRW	SRW
EVC Number			GipP0053_61	GipP0136	GipP0053_61	GipP0136	GipP0136	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0083	GipP0083	GipP0083	GipP0083	GipP0053_61	GipP0053_61	GipP0053_61	GipP0053_61	GipP0083	GipP0083
Total Area of Habitat Zone (ha)		**(#.#)**	0.04	0.05	0.45	0.66	0.04	0.01	0.12	0.14	0.05	0.04	0.01	0.06	0.20	0.05	0.03	0.08	0.02	0.03	0.08	0.01	0.10	0.20
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	**Large Old Trees**	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
	Canopy Cover	**5**	4	0	0	0	0	0	0	0	0	0	0	0	1	5	3	2	0	0	0	0	4	4
	Lack of Weeds	**15**	0	4	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Understorey	**25**	5	15	5	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Recruitment	**10**	0	6	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5
	Organic Matter	**5**	2	5	2	5	5	2	2	4	2	2	2	2	2	2	2	2	2	2	3	2	4	4
	Logs	**5**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2
	Total Score	**75**	14	41	9	34	34	9	9	11	9	9	9	9	8	12	10	9	9	9	10	9	22	25
Landscape Score		**25**	3	2	2	1	1	1	1	1	1	1	1	1	2	2	2	2	1	1	1	1	2	2
Habitat Score#		**100**	17	43	11	35	35	10	10	12	10	10	10	10	10	14	12	11	10	10	11	10	24	27
Habitat Score as above = #/100		**0.##**	0.17	0.43	0.11	0.35	0.35	0.10	0.10	0.12	0.10	0.10	0.10	0.10	0.10	0.14	0.12	0.11	0.10	0.10	0.11	0.10	0.24	0.27
Habitat Hectares		**(#.#)**	**0.01**	**0.02**	**0.05**	**0.23**	**0.01**	**0.001**	**0.01**	**0.02**	**0.005**	**0.004**	**0.001**	**0.01**	**0.02**	**0.01**	**0.004**	**0.01**	**0.002**	**0.003**	**0.01**	**0.001**	**0.02**	**0.05**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			E	V	E	V	V	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating Flora		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
	Threatened Species Rating Fauna		High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High	High
	Other Site Attribute Rating																							
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**	**High**
Trees within patches	**VLOT**																							
	LOT																							2
	MOT																1	1					3	3

Appendix 5. Scattered Trees

ID	Scientific Name	Common Name	Tree Size	Conservation Status	best or remaining 50% habitat for TS	Other attributes	Conservation Significance	Latitude	Longitude	Location ref. (Maps 5 A - C)
1	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08962459320	145.33654830700	F9
2	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08970055900	145.33673253700	F9
3	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08968492030	145.33677860600	F9
4	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08972373420	145.33736754000	G9
5	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08975024520	145.33747293200	G9
6	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08977019590	145.33754352500	G9
7	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08977904220	145.33756233100	G9
8	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08978428010	145.33781007000	H9
9	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08984536930	145.33822250500	H9
10	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08984225710	145.33830092900	H9
11	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08991064820	145.33872681000	I9
12	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08994650080	145.33914092400	I9
13	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08996473540	145.33932883800	J10
14	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08997920650	145.33939692900	J10
15	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08998877200	145.33947118200	J10
16	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09000334770	145.33950216900	J10
17	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08999339790	145.33956396700	J10
18	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09001284330	145.33960116000	J10
19	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09002251330	145.33963830800	J10
20	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09003654820	145.33986100200	J10
21	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09005096670	145.33994764600	J10
22	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09007021910	145.34005286500	K10
23	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09089047600	145.34684065800	H9
24	*Eucalyptus ovata subsp ovata*	Swamp Gum	LT	Endangered	Low	Low	High	-38.09113554970	145.34888913400	J9
25	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09114656910	145.34920729800	K9
26	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09115483210	145.34927288400	K9
27	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09125856800	145.35006161800	L9
28	*Eucalyptus ovata subsp ovata*	Swamp Gum	LT	Endangered	Low	Low	High	-38.09130133520	145.35031389800	L9
29	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09130942000	145.35042566800	L9
30	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09133859140	145.35051625500	L9
31	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09134670690	145.35061738400	L9
32	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.09132967060	145.35069179300	M9
33	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09135884180	145.35078237900	M9
34	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09135033910	145.35081426300	M9
35	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09137961780	145.35086760600	M9
36	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.07780952500	145.33843496400	G4
37	*Eucalyptus camalduensis*	River Red gum	LT	Endangered	Low	Low	High	-38.09022739710	145.34662811200	G9
38	*Eucalyptus camalduensis*	River Red gum	VL	Endangered	Low	Low	High	-38.08729269050	145.34460416100	E6
39	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08701635280	145.34472351300	E5
40	*Eucalyptus ovata subsp ovata*	Swamp Gum	ST	Endangered	Low	Low	Low	-38.08663109820	145.34451519900	E5
41	*Eucalyptus camalduensis*	River Red gum	LT	Endangered	Low	Low	High	-38.09006737970	145.34924251000	K8
42	*Eucalyptus camalduensis*	River Red gum	LT	Endangered	Low	Low	High	-38.09007722030	145.34985125800	K8
43	*Eucalyptus camalduensis*	River Red gum	MT	Endangered	Low	Low	High	-38.09011289970	145.34985673900	K8
44	*Eucalyptus camalduensis*	River Red gum	MT	Endangered	Low	Low	High	-38.09081376970	145.35041859000	L9
45	*Eucalyptus camalduensis*	River Red gum	LT	Endangered	Low	Low	High	-38.09083842840	145.35015359800	L9
46	*Eucalyptus camalduensis*	River Red gum	LT	Endangered	Low	Low	High	-38.09089590730	145.35009039500	L9
47	*Eucalyptus ovata subsp ovata*	Swamp Gum	LT	Endangered	Low	Low	High	-38.09100149800	145.35014512600	L9
48	Dead	n/a	LT	Endangered	Low	Low	High	-38.09100860910	145.35030832100	L9
49	Dead	n/a	MT	Endangered	Low	Low	High	-38.09103779090	145.35070676500	M9
50	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08955530430	145.33471185500	D9
51	Dead	n/a	ST	Endangered	Low	Low	Low	-38.08956252240	145.33478378300	D9
52	*Eucalyptus ovata subsp ovata*	Swamp Gum	LT	Endangered	Low	Low	High	-38.08961622690	145.33500953000	D9
53	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.08966341410	145.33528343400	E9
54	Dead	n/a	ST	Endangered	Low	Low	Low	-38.08972065000	145.33574651600	E9
55	*Eucalyptus ovata subsp ovata*	Swamp Gum	MT	Endangered	Low	Low	High	-38.09004819500	145.33877392500	I10

APPENDIX 6. Methodology for defining faunal significance

This section outlines the assessment methods or criteria used to determine the significance of species, plant communities, fauna habitats and sites. Criteria are consistent with government policies, legislation and publications.

Table Key						
Last rec.	Year fauna taxa was last recorded.					
No. recs	Number of sites in which the species is recorded in					
EPBC	Species listed as threatened in Australia under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC)					
		EX	Extinct			
		CR	Critically Endangered			
		EN	Endangered			
		VU	Vulnerable			
		CD	Conservation Dependent			
		m	Migratory			
Mig.	Birds listed under bilateral migratory bird agreements listed below:					
		J	JAMBA (Japan-Australia Migratory Bird Agreement 1974)			
		C	CAMBA (China-Australia Migratory Bird Agreement 1986)			
		R	ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement 2006)			
		CMS	Convention on Migratory Species or Bonn Convention. Birds listed under the Agreement on the Conservation of Albatrosses and Petrels (ACAP) 2006			
Vic. cons. status	Conservation status under DSE's *Advisory List Of Threatened Vertebrate Fauna in Victoria 2007 (DSE 2007a)*					
		ex	Extinct			
		r	Regionally Extinct			
		w	Extinct in the Wild			
		c	Critically Endangered			
		e	Endangered			
		v	Vulnerable			
		n	Near Threatened			
		d	Data Deficient			
		*	introduced species. Not listed in the advisory list above.			
FFG	Status under the Flora and Fauna Guarantee Act 1988 (FFG)					
		L	species listed as threatened			
		N	species nominated for listing as threatened but has not yet completed the listing process			
		I	Invalid or ineligible listing			
Sig.	Biological Significance					
	This is a rating of the contribution that biological assets of a site or species make towards the conservation of Australia's native biodiversity.					
		N	National	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.		
		S1	State	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988*		

				Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria* – (DSE 2007a)		
		R1	Regional	Regional according to Table 4. *Rare and restricted species in the greater Gippsland Plains* in (Radford and Bennett 2005)– birds only.		
		R2	Regional	Regional according to Malcolm Legg (pers. comm.). Region is defined as the Mornington Peninsula and surrounding Western Port area.		
		R3	Regional	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria – 2007* (DSE 2007a)		
				Birds listed under migratory bird agreements		
				Species not listed in the above categories that have a limited range in a bioregion		
		L	Local	Local. All other native species are considered at least local significance due to the level of habitat depletion in the City of Casey.		
Common Name	According to Atlas of Victorian Wildlife					
Scientific Name	According to Atlas of Victorian Wildlife					
International Significance	Migratory species protected under international treaties (JAMBA, CAMBA, ROKAMBA and Bonn) or listed on the IUCN Red Data List 2006 as threatened					
National Significance	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.					
State Significance	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988*					
	Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria* (DSE 2007a)					
Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria* – (DSE 2007a)					
	Species not listed in the above categories that have a limited range in a bioregion					
Local Significance	Species considered rare, threatened or uncommon within the local area (5km radius from the contract area) by the authors with consideration given to previous studies. Many native species are considered to be locally significant within urban areas due to typically high levels of habitat alteration.					

Appendix 7. Indigenous fauna records: general & targeted surveys

Investigation Area 43 assessment period: September 2009 to April 2010. Fauna taxa recorded incidentally and during targeted searches for threatened fauna from within the contract area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne Henry, Annabelle Stewart, Zorza Goodman and David Nance of Practical Ecology.

		Conservation Status					
Scientific Name	**Common Name**	**EPBC**	**FFG**	**DSE (2007a)**	**Regional**	**Type of record**	**Comments**
AMPHIBIANS							
Crinia signifera	Common Froglet				L	Spotlighting/Incidental/Dip net	In swampy areas, pasture habitat and along roadside drainage lines.
Litoria ewingii	Southern Brown Tree Frog				L	Spotlighting/Incidental	In swampy areas and along roadside drainage lines.
Limnodynastes dumerilii	Southern Bullfrog				L	Spotlighting/Incidental	In swampy areas and along roadsides.
Limnodynastes tasmaniensis	Spotted Marsh Frog				L	Spotlighting/Incidental/Dip net/Baited fish trap	In swampy areas and along roadside drainage lines.
Limnodynastes peronii	Striped Marsh Frog				L	General observations/Spotlighting	Found along roadsides and drainage lines.
Pseudophryne semimarmorata	Southern Toadlet			v	R3	Vocalisation Id	In drainage lines
Unidentified frog	Unidentified frog				L	Dip net	
REPTILES							
Lampropholis delicata	Delicate skink				R2	Tin census	
Lampropholis guichenoti	Garden Skink				L	Tin census	
Pseudemoia rawlinsoni	Glossy Grass Skink			n	R3	Tin census	
Notechis scutatus	Tiger Snake				L	General observation	
Saproscincus mustelinus	Weasel skink				R2	Tin census	
BIRDS							
Anthus novaeseelandiae	Australasian pipit				R2	General observations	
Gymnorhina tibicen	Australian Magpie				L	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Pelecanus conspicillatus	Australian pelican				L	General observations	
Corvus coronoides	Australian Raven				L	Timed bird census	Found along roadsides.
Threskiornis molucca	Australian White Ibis				L	Timed bird census	Found in pastured habitat.
Chenonetta jubata	Australian Wood Duck				L	Incidental	Found along roadsides.
Coracina novaehollandiae	Black-faced Cuckoo-shrike				L	General observations/Timed bird census	Found along roadsides.
Elanus axillaris	Black-shouldered Kite				L	General observation	Hunting over farmland
Falco berigora	Brown Falcon				L	General observation	Hunting over farmland
Acanthiza pusilla	Brown Thornbill				L	General observations/Timed bird census	Found along roadsides.
Ocyphaps lophotes	Crested Pigeon				R1	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Platycercus eximius	Eastern Rosella				L	Timed bird census	Found along roadsides.
Hirundo ariel	Fairy Martin				L	Timed bird census	
Petroica phoenicea	Flame Robin				R2	General observations	Found along roadsides.
Eolophus roseicapilla	Galah				L	General observations	
Pachycephala pectoralis	Golden Whistler				L	General observations	Found at a creek.
Cracticus torquatus	Grey Butcherbird				L	Timed bird census	Found along roadsides.
Rhipidura fuliginosa	Grey Fantail				L	General observations/Timed bird census	Found along roadsides.
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo				L	General observations	Found at a creek.
Cacatua sanguinea	Little Corella				L	Timed bird census	

Scientific Name	Common Name	Conservation Status EPBC	FFG	DSE (2007a)	Regional	Type of record	Comments
Megalurus gramineus	Little Grassbird				L	General observations/Timed bird census	Found in pastured habitat.
Corvus mellori	Little Raven				L	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Grallina cyanoleura	Magpie-lark				L	General observations/Timed bird census	Found in pastured habitat.
Falco cenchroides	Nankeen Kestrel				L	Timed bird census	Found in pastured habitat.
Phylidonyris novaehollandiae	New Holland Honeyeater				L	Timed bird census	
Manorina melanocephala	Noisy Miner				L	General observation	
Falco peregrinus	Peregrine Falcon				L	General observations	
Trichoglossus haematodus	Rainbow Lorikeet				L	Timed bird census	Found along roadsides.
Anthochaera carunculata	Red Wattlebird				L	General observations/Timed bird census	Found along roadsides.
Cincloramphus mathewsi	Rufous Songlark				R1,R2	General observations/Timed bird census	Found along roadsides.
Pachycephala rufiventris	Rufous whistler				L	General observations	
Zosterops lateralis	Silvereye				L	Timed bird census	
Threskiornis spinicollis	Straw-necked Ibis				L	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Cacatua galerita	Sulphur-crested Cockatoo				L	Timed bird census	
Malurus cyaneus	Superb Fairy-wren				L	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Podargus strigoides	Tawny Frogmouth				L	Spotlighting	Found in roadside vegetation.
Hirundo neoxena	Welcome swallow				L	Timed bird census	
Sericornis frontalis	White-browed Scrubwren				L	Timed bird census	Found in pastured habitat and along roadsides.
Lichenostomus penicillatus	White-plumed Honeyeater				L	Timed bird census	Found along roadsides.
Hirundapus caudacutus	White-throated Needletail						
Rhipidura leucophrys	Willie Wagtail				L	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Acanthiza chrysorrhoa	Yellow-rumped thornbill				R2	General observations/Timed bird census	Found in pastured habitat and along roadsides.
Calyptorhynchus funereus	Yellow-tailed Black-Cockatoo				L	Timed bird census	
INVERTEBRATES							
	Fluke Snail					Dip net	
	Freshwater macro-invertebrates					Baited fish trap/Dip net	
MAMMALS							
Trichosurus vulpecula	Common Brushtail Possum				L	Spotlighting/Incidental	Found in roadside vegetation.
Pseudocheirus peregrinus	Common Ringtail Possum				L	Sotlighting	Found in roadside vegetation.
Chalinolobus gouldii	Gould's Wattled Bat				L	Spotlighting/Bat detector	
Rattus lutreolus	Swamp Rat				R2	Elliott trap/Incidental	Runways and mounds observed
Chalinolobus gouldi, Mormopterus sp2 or sp4	Unidentified bat				L	Bat detector	
Mormopterus sp2 or sp4	Unidentified bat				L	Bat detector	
Vespadelus sp.	Forest Bat sp				L	Bat detector	
Tadarida australis	White-striped Freetail Bat				L	Spotlighting/Bat detector	

Appendix 8. exotic fauna species recorded: general and targeted surveys

Investigation Area 43 assessment period: September 2009 to April 2010. Fauna taxa recorded incidentally and during targeted searches for threatened searches from within the contract area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services and Joanne Henry, Annabelle Stewart and David Nance of Practical Ecology.

Scientific Name	Common Name	Status	Type of record	Comments
BIRDS				
**Turdus merula*	Common blackbird		General observations/Timed bird census	Found in pastured habitat and along roadsides.
**Acridotheres tristis*	Common Myna		General observations/Timed bird census	Found in pastured habitat and along roadsides.
**Sturnus vulgaris*	Common Starling		General observations/Timed bird census	Found in pastured habitat and along roadsides.
**Carduelis carduelis*	European Goldfinch		Timed bird census	Found in pastured habitat and along roadsides.
**Alauda arvensis*	European Skylark		General observations/Timed bird census	Found in pastured habitat and along roadsides.
**Passer domesticus*	House Sparrow		Timed bird census	Found in pastured habitat and along roadsides.
**Streptopelia chinensis*	Spotted turtle-dove		General observations/Timed bird census	Found in pastured habitat and along roadsides.
FISH				
**Gambusia holbrooki*	Eastern Gambusia		Baited fish trap/Dip net	
MAMMALS				
**Rattus rattus*	Black Rat		Elliott trap	
**Rattus norvegicus*	Brown Rat		Elliott trap	
**Felis catus*	Cat		Incidental/Spotlighting	Found in pastured habitat and along roadsides.
**Oryctolagus cuniculus*	European Rabbit		Incidental/Spotlighting	Found in pastured habitat and along roadsides. Scats and diggings found throughout the precinct.
**Mus muscus*	House Mouse		Elliott trap/Tin census	
**Vulpes vulpes*	Red Fox		Incidental/Spotlighting	Found along roadsides. Scats found throughout the precinct.

Appendix 9. Fauna recorded during targeted and general fauna survey: results for each property

Common Name	Scientific Name
Site 1 - 1100 Pound Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Southern Bullfrog	*Limnodynastes dumerilii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
Unidentified frog	
REPTILES	
Delicate Skink	*Lampropholis delicata*
Garden Skink	*Lampropholis guichenoti*
Tiger Snake	*Notechis scutatus*
Weasel Skink	*Saproscincus mustelinus*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian Raven	*Corvus coronoides*
Australian White Ibis	*Threskiornis molucca*
Australian Wood Duck	*Chenonetta jubata*
Black-shouldered Kite	*Elanus axillaris*
Brown Falcon	*Falco berigora*
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alaudia arvensis*
Fairy Martin	*Hirundo ariel*
Galah	*Eolophus roseicapilla*
Grey Butcherbird	*Cracticus torquatus*
Grey fantail	*Rhipidura albiscarpa*
House Sparrow	**Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Nankeen Kestrel	*Falco cenchroides*
Noisy Miner	*Manorina melanocephala*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattlebird	*Anthochaera carunculata*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
Welcome Swallow	*Hirundo neoxena*
White-throated Needletail	*Hirundapus caudacutus*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
INVERTEBRATES	
Freshwater macro-invertebrates	
FISH	
Eastern Gambusia	**Gambusia holbrooki*

Common Name	Scientific Name
Site 1 - 1100 Pound Road	
MAMMALS	
Common Brushtail Possum	*Trichosurus vulpecula*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Gould's Wattled Bat	*Chalinolobus gouldi*
Swamp Rat	*Rattus lutreolus*
Unidentified bat	*Chalinolobus gouldi, Mormopterus sp2 or sp4*
Unidentified bat	*Mormopterus sp2 or sp4*
Forest Bat sp	*Vespadelus sp.*
White-striped Freetail Bat	*Tadarida australis*
INTRODUCED MAMMALS	
Brown Rat	**Rattus norvegicus*
Cat	**Felis catus*
European Rabbit	**Oryctolagus cuniculus*
House Mouse	**Mus domesticus*
Red Fox	**Vulpes vulpes*
Site 2 - 1775 Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Crested Pigeon	*Ocyphaps lophotes*
Eastern Rosella	*Platycercus eximius*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alaudia arvensis*
Flame Robin	*Petroica phoenicea*
Golden Whistler	*Pachycephala pectoralis*
Grey Butcherbird	*Cracticus torquatus*
Grey Fantail	*Rhipidura fuliginosa*
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*
Little Corella	*Cacatua sanguinea*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Red Wattlebird	*Anthochaera carunculata*
Rufous Songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Sulphur-crested Cockatoo	*Cacatua galerita*
Superb Fairy-wren	*Malurus cyaneus*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
MAMMALS	
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*
Site 3 - 1785 Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern brown tree frog	*Litoria ewingi*

Common Name	Scientific Name
Site 3 - 1785 Thompsons Road	
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Eastern Rosella	*Platycercus eximius*
European Skylark	**Alaudia arvensis*
Grey Butcherbird	*Cracticus torquatus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
New Holland Honeyeater	*Phylidonyris novaehollandiae*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red wattlebird	*Anthochaera carunculata*
Rufous Songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie Wagtail	*Rhipidura leucophrys*
MAMMALS	
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*
Site 4 - 1825 Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
Eastern Rosella	*Platycercus eximius*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alaudia arvensis*
House Sparrow	**Passer domesticus*
Little Grassbird	*Megalurus gramineus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Red Wattlebird	*Anthochaera carunculata*
Rufous Songlark	*Cincloramphus mathewsi*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
White-plumed Honeyeater	*Lichenostomus penicillatus*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
MAMMALS	
INTRODUCED MAMMALS	

Common Name	Scientific Name
Site 4 - 1825 Thompsons Road	
Red Fox	**Vulpes vulpes*
Site 5 - 1845 Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
Crested Pigeon	*Ocyphaps lophotes*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alaudia arvensis*
Grey Butcherbird	*Cracticus torquatus*
Grey fantail	*Rhipidura fuliginosa*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Nankeen Kestrel	*Falco cenchroides*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
MAMMALS	
Common Brushtail Possum	*Trichosurus vulecula*
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*
Site 6 - 1865 Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian White Ibis	*Threskiornis molucca*
Black-faced cuckoo-shrike	*Coracina novaehollandiae*
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*
European Skylark	**Alaudia arvensis*
House Sparrow	**Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Red wattlebird	*Anthochaera carunculata*
Silvereye	*Zosterops lateralis*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Superb Fairy-wren	*Malurus cyaneus*
White-browed Scrubwren	*Sericornis frontalis*
White-plumed Honeyeater	*Lichenostomus penicillatus*

Common Name	Scientific Name
Site 5 - 1845 Thompsons Road	
Willie Wagtail	*Rhipidura leucophrys*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
MAMMALS	
Swamp rat	*Rattus lutreolus*
INTRODUCED MAMMALS	
Cat	**Felis catus*
European Rabbit	**Oryctolagus cuniculus*
Red Fox	**Vulpes vulpes*
Site 8 - 700 Berwick-Cranbourne Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Australian White Ibis	*Threskiornis molucca*
Brown Thornbill	*Acanthiza pusilla*
Common Blackbird	**Turdus merula*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Skylark	**Alaudia arvensis*
Grey Butcherbird	*Cracticus torquatus*
House Sparrow	**Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Nankeen kestrel	*Falco cenchroides*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattlebird	*Anthochaera carunculata*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Willie Wagtail	*Rhipidura leucophrys*
REPTILES	
Weasel skink	*Saproscincus mustelinus*
MAMMALS	
Common Brushtail Possum	*Trichosurus vulecula*
Unidentified bat	
White-striped Freetail Bat	*Tadarida australis*
INTRODUCED MAMMALS	
Red Fox	**Vulpes vulpes*
Site 9 - 97R Grices Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Bullfrog	*Limnodynastes dumereli*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australian Magpie	*Gymnorhina tibicen*
Common Myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Goldfinch	**Carduelis carduelis*

Common Name	Scientific Name
Site 9 - 97R Grices Road	
European Skylark	**Alaudia arvensis*
House Sparrow	**Passer domesticus*
Little Raven	*Corvus mellori*
Magpie-lark	*Grallina cyanoleura*
Spotted Turtle-Dove	**Streptopelia chinensis*
Straw-necked Ibis	*Threskiornis spinicollis*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*
FISH	
Eastern Gambusia	**Gambusia holbrooki*
INVERTEBRATES	
Fluke Snail	
Site 10 - Culvert on Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Site 11 - Grices Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Southern Bullfrog	*Limnodynastes dumerilii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Site 12 - Pound Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*
BIRDS	
Australian magpie	*Gymnorhina tibicen*
Common myna	**Acridotheres tristis*
Common Starling	**Sturnus vulgaris*
European Skylark	**Alaudia arvensis*
Grey fantail	*Rhipidura albiscarpa*
Little Grassbird	*Megalurus gramineus*
Magpie-lark	*Grallina cyanoleuca*
Superb fairy-wren	*Malurus cyaneus*
Willie wagtail	*Rhipidura leucophrys*
REPTILES	
Delicate skink	*Lampropholis delicata*
Garden Skink	*Lampropholis guichenoti*
Striped Marsh Frog	*Limnodynastes peronii*
Weasel skink	*Saproscincus mustelinus*
MAMMALS	
Common Ringtail Possum	*Pseudocheirus peregrinus*
Unidentified bat	
INTRODUCED MAMMALS	
Cat	**Felis catus*
European Rabbit	**Oryctolagus cuniculus*
House Mouse	**Mus domesticus*

Common Name	Scientific Name
Site 12 - Pound Road	
Red Fox	**Vulpes vulpes*
Site 13 - Thompsons Road	
AMPHIBIANS	
Common Froglet	*Crinia signifera*
Southern Brown Tree Frog	*Litoria ewingii*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
BIRDS	
Australasian pipit	*Anthus novaeseelandiae*
Australian magpie	*Gymnorhina tibicen*
Australian pelican	*Pelecanus conspicillatus*
Black-faced cuckoo-shrike	*Coracina novaehollandiae*
Common blackbird	**Turdus merula*
Common myna	**Acridotheres tristis*
Crested pigeon	*Ocyphaps lophotes*
Flame Robin	*Petroica phoenicea*
Golden Whistler	*Pachycephala pectoralis*
Grey fantail	*Rhipidura albiscarpa*
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*
Little raven	*Corvus mellori*
Peregrine Falcon	*Falco peregrinus*
Red wattlebird	*Anthochaera carunculata*
Rufous songlark	*Cincloramphus mathewsi*
Rufous whistler	*Pachycephala rufiventris*
Straw-necked ibis	*Threskiornis spinicollis*
Superb fairy-wren	*Malurus cyaneus*
Tawny Frogmouth	*Podargus strigoides*
Willie wagtail	*Rhipidura leucophrys*
Yellow-rumped thornbill	*Acanthiza chrysorrhoa*
REPTILES	
Delicate skink	*Lampropholis delicata*
Garden Skink	*Lampropholis guichenoti*
Glossy Grass Skink	*Pseudemoia rawlinsoni*
Weasel skink	*Saproscincus mustelinus*
MAMMALS	
Common Brushtail Possum	*Trichosurus vulpecula*
Common Ringtail Possum	*Pseudocheirus peregrinus*
Gould's Wattled Bat	*Chalinolobus gouldii*
Swamp rat	*Rattus lutreolus*
Unidentified bat	
White-striped Freetail Bat	*Tadarida australis*
INTRODUCED MAMMALS	
Black Rat	**Rattus rattus*
European Rabbit	**Oryctolagus cuniculus*
House Mouse	**Mus domesticus*
Red Fox	**Vulpes vulpes*

*Denotes introduced species

Appendix 10. Invertebrate species recorded: general and targeted surveys

Invertebrate species recorded during the current assessment, surveys carried out between November 2009 and January 2010. Field work and identification undertaken by Zorza Goodman.

CLASS	ORDER	COMMON NAME	FAMILY or SPECIES	Number of individuals
Arachnida	Araneae	Spider 3	Unknownn	1
Arachnida	Araneae	Spider 4	Aranenae	1
Arachnida	Araneae	Spider 5	Lycosidae	5
Arachnida	Araneae	Spider 6	Aranenae	1
Arachnida	Araneae	Spider 7	Zoridae	2
Arachnida	Araneae	Spider 8	Unknownn	2
Arachnida	Araneae	Spider 9	Thomisidae	1
Arachnida	Araneae	Spider 10	Unknownn	2
Arachnida	Araneae	Spider 11	Lycosidae	1
Arachnida	Araneae	Spider 13	Lycosidae	17
Insecta	Coleoptera	Ladybug 1	Superfamily Coccinellidae	1
Insecta	Coleoptera	Ladybug 2	Superfamily Coccinellidae	1
Insecta	Coleoptera	Ladybug 3	Superfamily Coccinellidae	2
Insecta	Coleoptera	Beetle 2	Unknown	1
Insecta	Coleoptera	Beetle 3	Unknown	1
Insecta	Coleoptera	Beetle 4	Unknown	2
Insecta	Coleoptera	Beetle 5	Unknown	1
Insecta	Coleoptera	Beetle 6	Unknown	2
Insecta	Coleoptera	Beetle 15	Unknown	6
Insecta	Diptera	Mosquito 1	Unknown	1
Insecta	Diptera	Mosquito 2	Unknown	2
Insecta	Diptera	Mosquito 3	Unknown	1
Insecta	Diptera	Fly 1	Unknown	7
Insecta	Diptera	Fly 4	Unknown	2
Insecta	Diptera	Fly 6	Unknown	4
Insecta	Diptera	Fly 7	Unknown	2
Insecta	Diptera	Fly 8	Unknown	1
Insecta	Diptera	Fly 9	Unknown	7
Insecta	Diptera	Fly 10	Unknown	2
Insecta	Diptera	Fly 11	Unknown	4
Insecta	Diptera	Fly 12	Unknown	2
Insecta	Diptera	Fly 13	Unknown	4
Insecta	Diptera	Fly 14	Unknown	1
Insecta	Diptera	Fly 16	Unknown	1
Insecta	Diptera	Fly 17	Unknown	8
Insecta	Diptera	Fly 18	Unknown	3
Insecta	Diptera	Fly 19	Unknown	1
Insecta	Diptera	Fly 20	Unknown	1
Insecta	Diptera	Fly 21	Unknown	2
Insecta	Diptera	Fly 33	Unknown	22
Insecta	Hemiptera	Sheildbug 3	Unknown	3
Insecta	Hemiptera	Bug 1	Unknown	6
Insecta	Hemiptera	Bug 2	Unknown	9
Insecta	Hemiptera	Bug 3	Unknown	1
Insecta	Hemiptera	Bug 4	Unknown	2
Insecta	Hemiptera	Bug 10	Unknown	40
Insecta	Hymenoptera	Ant 3	Unknown	9
Insecta	Hymenoptera	Ant 5	Unknown	34
Insecta	Hymenoptera	Wasp 1	Unknown	1
Insecta	Hymenoptera	Wasp 2	Unknown	1
Insecta	Hymenoptera	Wasp 3	Unknown	1
Insecta	Hymenoptera	Wasp 4	Unknown	1
Insecta	Hymenoptera	Wasp 5	Unknown	10
Insecta	Hymenoptera	Wasp 7	Unknown	1
Insecta	Hymenoptera	Wasp 8	Unknown	1
Insecta	Hymenoptera	Wasp 9	Unknown	6
Insecta	Hymenoptera	Wasp 10	Unknown	1
Insecta	Hymenoptera	Wasp 11	Unknown	2

CLASS	ORDER	COMMON NAME	FAMILY or SPECIES	Number of individuals
Insecta	Hymenoptera	Wasp 13	Unknown	1
Insecta	Hymenoptera	Wasp 15	Unknown	30
Insecta	Hymenoptera	Wasp 29	Unknown	5
Insecta	Hymenoptera	Wasp 35	Unknown	4
Insecta	Hymenoptera	Bee 7	Unknown	1
Insecta	Lepidoptera	Moth 1	Unknown	1
Insecta	Lepidoptera	Moth 3	Unknown	1
Insecta	Lepidoptera	Moth 4	Unknown	1
Insecta	Lepidoptera	Moth 5	Unknown	1
Insecta	Lepidoptera	Butterfly 1	Nymphalidae	4
Insecta	Lepidoptera	Butterfly 2	Pieridae	32
Insecta	Lepidoptera	Butterfly 3	Nymphalidae	13
Insecta	Lepidoptera	Butterfly 4	Lycaenidae	9
Insecta	Lepidoptera	Butterfly 5	Hesperiidae	60
Insecta	Lepidoptera	Caterpillar 1	Unknown	21
Insecta	Lepidoptera	Caterpillar 2	Unknown	2
Insecta	Lepidoptera	Caterpillar 4	Unknown	20
Insecta	Neuroptera	Lacewing 1	Unknown	1
Insecta	Odonata	Dragonfly 2	Unknown	15
Insecta	Odonata	Dragonfly 3	Unknown	2
Insecta	Odonata	Dragonfly 4	Unknown	31
Insecta	Orthoptera	Cricket 1	Unknown	38
Arachnida sub. Acarina	Superorder Parasitiformes	Mite 1	Unknown	24
Arachnida sub. Acarina	Superorder Parasitiformes	Mite 2	Unknown	13
Diplopoda	Unknown	Millipede 1	Unknown	1
Entognatha	Poduromorpha	Springtail 1 - oval	Unknown	102
Entognatha	Entomobryomorpha	Springtail 2 - long & slim body	Unknown	6
Entognatha	Unknowns	Unknowns	Unknown	115

Appendix 11. Threatened fauna species recorded and/or predicted to occur within a radius of 10km of the contract area

Threatened fauna species recorded during the current assessment and those detected within ten kilometres of the contract area boundary on DSE's Victorian Fauna Database (VFD) (DSE 2009b). Species listed on EPBC Protected Matters Search Tool also included, except for Listed Marine Species (not relevant). A likelihood of occurrence is given to each species based on year of last record, number of records and habitat requirements.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Other Sources	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance							
Anas rhynchotis	Anatidae	Australasian Shoveler			v	R2	AVW			The Australasian Shoveler occurs mainly on large well vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water. This species nest in grass nests on the ground, usually in dense cover and near water (Marchant and Higgins 1990; Pizzey and Knight 2007).	13	Low	This species was last recorded in 2005 within 10km, however there is no habitat present on site
Prototroctes maraena	Prototroctidae	Australian Grayling	f	V	v		EPBC/AVW			This species only spends part of its life in freshwater streams. Australian Graylings migrate between freshwater streams and the ocean. Streams where this species occur tend to be clear with gravel bottoms and a variety of instream habitat such as pools and riffles. The upstream migration of this species has been effectively terminated in some rivers by dams (Allen, Midgley and Allen 2002; DPI 2006).	2	Low	Last recorded in 1985. Has been recorded in nearby creek, however no habitat on site
Rostratula australis	Rostratulidae	Australian Painted Snipe	f	V / m	c		EPBC/AVW			Listed as vulnerable under the EPBC Act. This species is migratory. They usually occur in the lowlands on shallow freshwater swamps with emergent vegetation, and flooded saltmarshes. They do not form flocks but loose groups are sometimes seen, either alone or with Latham's Snipe. Painted Snipe forage on mud among dense swamp vegetation. Their nests are depressions or well made nest of twigs and reeds surrounded by shallow water and dense vegetation (Marchant and Higgins 1993; Pizzey and Knight 2007).	1	Low	Last recorded in 1989. No habitat present.
Porzana pusilla	Rallidae	Baillon's Crake	f		v		AVW			This species returns to northern Victoria in spring, but few there are details on its migration. It inhabits freshwater wetlands and floodwaters usually containing floating plants or tall emergent vegetation. The Baillon's Crake feeds in shallow water, mud and emergent aquatic plants. It has been found to nest in clumps or tussocks of vegetation surrounded by water (Marchant and Higgins 1993; Pizzey and Knight 2007).	4	Low	Last recorded in 2003. No habitat present.
Monarcha melanopsis	Dicruridae	Black-faced Monarch		m			EPBC			Black-faced Monarch is a summer migrant to the south-east coastal areas. It is found mainly in rainforest, often in wet sclerophyll forests, and occasionally in mangroves. Sometimes in dry sclerophyll forests or woodlands, especially if they are open and near rainforests (Higgins, Peter and Cowling 2006; Pizzey and Knight 2007).		Low	No habitat present. Not been recorded previously.
Falco subniger	Falconidae	Black Falcon			v	R1	AVW			The Black Falcon has a stronghold in inland Australia. Most Victorian records come from the lowlands and only occasionally from the foothills. It occurs mainly over croplands, grasslands and wooded farmlands. To catch flushed prey, they sweep low over croplands and grasslands and are often attracted by smoke from grassfires and late-summer burning off. This species nests in trees in old stick-nests of other birds (Marchant	1	Moderate	Last recorded in 1999. Potential hunting throughout farmland.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Other Sources	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance							
										and Higgins 1993; Pizzey and Knight 2007).			
Oxyura australis	Anatidae	Blue-billed Duck	f		e	S, R2	AVW			This species inhabits deep, permanent, well-vegetated swamps, but at times (especially in winter) may occur in large numbers on large open wetlands. The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds/rushes, often over water or on small islands (Marchant and Higgins 1990; Pizzey and Knight 2007).	11	Low	Last recorded in 2002. No habitat present.
Coturnix ypsilophora	Phasianidae	Brown Quail			n	R1,R3	AVW			The Brown Quail is widespread in Victoria, however suitable habitats are quite localised. It occupies mainly well watered areas and it has been reported from grass and sedge flats, often adjacent to rivers and swamps. Along major rivers in northern Victoria they occur in grassy River Red Gum forests and in eastern Victoria they inhabit wet woodlands and forests containing grasses, sword-sedges and gahnias. It has also been observed in bracken, lucerne pastures, and potato crops. It feeds and nests on the ground (Marchant and Higgins 1993).	8	Low	Last recorded 2000. Habitat not present.
Climacteris picumnus victoriae	Climacteridae	Brown Treecreeper (south-eastern ssp.)			n	R3	AVW			Occurs in eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups. Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Higgins, Peter and Steele 2001).	1	Low	Last recorded in 2000. Habitat not present.
Cereopsis novaehollandiae	Anatidae	Cape Barren Goose			n	R2,R3	AVW			The Cape Barren Goose occurs on coastal islands or on open wetlands and pastures on the mainland. Although some breeding birds remain throughout the year on islands off Wilsons Promonitory (where they nest on the ground in tussock grsslands), young geese move away after the breeding seasons due to diminished food supply. These usually form feeeding flocks in improved pastures on the neighbouring mainland but some individuals may move farther afield (Marchant and Higgins 1990).	1	Low	Last recorded in 1999. Habitat not present.
Ardea ibis	Ardeidae	Cattle Egret		m			EPBC			Cattle Egret is a migratory species. The species has a high likelihood of occurrence within the contract area. Cattle Egret occurs in many types of wetlands; from tidal flats in estuaries and bays to the margins of inland lakes, swamps and rivers. They also use farm dams, mangroves, flooded areas, and artificial wetlands created by irrigation. Cattle Egret are often seen foraging away from water in crops and pasture, they build stick-nests in trees, usually surrounded by water or dense treed cover, or occasionally in reed-beds. The species nests colonially, often with other waterbirds. Egrets are threatened due to		Low	Not previously recorded. Habitat not present.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Other Sources	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance							
										restricted nesting sites (Marchant and Higgins 1990; Pizzey and Knight 2007).			
Calamanthus pyrrhopygius	Pardalotidae	Chestnut-rumped Heathwren	f		v	R1	AVW			This species mainly inhabit heathy woodlands, or wet heaths and scrubs with emergent eucalypts or banksias in the lowlands and foothills. It isoccasionally seen in samphire shrublands with adjacent eucalyptus woodlands. May also occur locally in box-ironbark, stringybark and peppermint forests, where there is scattered shrubs and sparse tree cover. Occasionally recorded in peppermint forests and Snow Gum woodlands at high elevations but do not generally occur in treeless heaths or dense forests. They feed on bare ground, in low shrubs and occasionally low trees, especially where abundant fallen branches or rocks are present. Their nests are built near the ground in shrubs or grass tussocks (Marchant and Higgins 1993).	3	Low	Last recorded in 1999. Habitat not present.
Galaxiella pusilla	Galaxiidae	Dwarf Galaxias	f	V	v		EPBC/AVW			Occurs in vegetated margins of slow-flowing coastal creek backwaters, drains and swamps, often with dense aquatic macrophytes. Ephemeral sites require seasonal flooding and linkages to other more permanent populations for population replenishment; therefore wetland connectivity may be critical to survival. Rare in Victoria, however more abundant in the south-east of the state in Mornington Pennisula & Western Port areas (Allen, Midgley and Allen 2002; Saddlier, Jackson and Hammer 2010; Victoria 2006).	9	Moderate	Last recorded in 2010 (McGuckin 2010). Could utilise drainage lines throughout contract area for movement and spawning.
Numenius madagascariensis	Scolopacidae	Eastern Curlew		m	n	R3	AVW			This species is a summer migrant to Victoria from Siberian breeding grounds. Small numbers will over winter in coastal areas. During summer they occur regularly on tidal mudflats in Corner Inlet, Western Port and Port Phillip Bay. Small numbers occur elsewhere on coastal mudflats and, rarely, birds appear on muddy edges of inland saline lakes. They feed by probing in mudlfats, in rock pools and among seagrass and roost on spits, islets or in saltmarshes (Higgins and Davies 1996; Pizzey and Knight 2007).	2	Low	Last recorded in 1909.
Ardea modesta	Ardeidae	Eastern Great Egret	f	m	v		AVW			Eastern Great Egret is widespread in Australia and has been observed in a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (DEWHA 2010a).	6	Low	Last recorded in 2001. Habitat not present.

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			FFG	EPBC	DSE	Regional Signficance							
Apus pacificus	Apodidae	Fork-tailed Swift		m		R1	EPBC			The Fork-tailed Swift is a migratory species occurring throughout Australia. This insectivorous species is almost entirely aerial. Occur over inland plains, often over cliffs or beaches, also over settled areas. They feed aerially, and probably also roost aerially, although rarely seen to land (Higgins 1999; Pizzey and Knight 2007).		High	Could utilise airspace above contract area.
Stictonetta naevosa	Anatidae	Freckled Duck	f		e		AVW			This species can occur on fresh water swamps, creeks, ponds, dams, reservoirs, sewage ponds and other ephemeral wetlands. It needs a thick cover of vegetation such as bulrush, lignum or tea-tree for nesting, which always occurs over water and usually with easy access from the water amongst shelter. This species is a specialist filter feeder, limiting foraging to aquatic habitats (Marchant and Higgins 1990).	1	Low	Last recorded in 2002. Habitat not present.
Pseudemoia rawlinsoni		Glossy Grass Skink			n				Present	The Glossy Grass Skink is found in dense vegetation around the margins of lakes and in swamps and bogs. Is also found around creeks and in salt marsh (Wilson and Swan 2008).		High	Recorded during the current assessment.
Plegadis falcinellus	Threskiornithidae	Glossy Ibis		m	n	R3	AVW			This species is a partial summer migrant to Victoria from northern Australia. They inhabit vegetated or muddy margins of freshwater wetlands and nearby grasslands and pastures. They forage in shallow water or mud on the margins of wetlands and occasionally from low vegetation and nest colonially, usually with other ibises. They build stick-nests in trees and shrubs low over water, in reedbeds or on islands (Marchant and Higgins 1990; Pizzey and Knight 2007).	1	Low	Last recorded in 1976. Habitat not present in contract area.
Synemon plana	Unknown Insect	Golden Sun Moth	f	C	c		EPBC/AVW			It is generally found in temperate grasslands and open grassy woodlands where the ground layer is dominated by native Wallaby Grass. Optimal habitat is dominated by wallaby grasses *Austrodanthonia* spp. with an open tussock structure (O'Dwyer and Attiwill 2000). It has also been recorded in grasslands dominated by Kangaroo Grass *Themeda triandra* and exotic dominated grasslands (ie Chilean Needlegrass).	1	Low	Habitat not present in contract area.
Accipiter novaehollandiae	Accipitridae	Grey Goshawk	f		v	R1	AVW			The Grey Goshawk has a stronghold in Victoria, particularly the white form, in the Otway Ranges, where wet forests and gullies containing Mountain Grey Gum adjoin partly cleared farmlands. They occur in lower densities in similar habitats in the Strzelecki Ranges, Gippsland Plains and Otway Plains. Elsewhere in the State they are occasionally seen in woodlands, dry forests, suburban parks and wooded farmlands (Marchant and Higgins 1993).	4	Low	Last recorded in 1990. No habitat present within contract area.
Pomatostomus temporalis	Pomatostomidae	Grey-crowned Babbler	f		e		AVW			This species inhabit dry forests and open woodlands, roadside trees, and wooded farmlands and can be associated with river floodplains. The Grey-crowned babbler feed in leaf and branch litter, bark and branch crevices and from foliage of shrubs and trees. They live in groups and build a series of large domed nests in shrubs or small trees (Higgins and Peter 2002; Pizzey and Knight 2007).	1	Low	Last recorded in 1988. Habitat not present in contract area.

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			FFG	EPBC	DSE	Regional Signficance							
Pteropus poliocephalus	Pteropodidae	Grey-headed Flying-fox	f	V	v		EPBC/AVW			The Grey-headed Flying-fox occurs in various forest habitats in close proximity to plentiful supplies of nectar producing flowers and fleshy fruit. Large camps can be found roosting in the branches of tall trees in a range of vegetation, including rainforest patches, Melaleuca stands, mangroves, riparian woodland and modified vegetation in urban areas (Richards 1983).	1	Low	Last recorded in 2003. Habitat not present within contract area.
Litoria raniformis	Hylidae	Growling Grass Frog	f	V	e		EPBC/AVW			The species often inhabitant water bodies with a diverse assemblage of aquatic vegetation, including emergents such as sedges, submergent species such as curly pondweed, floating species such as water ribbon and filamentous algae . The aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and for relatively safe development, food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Hamer and Organ 2006; Heard, Robertson and Moysey 2004; Heard, Robertson and Scroggie 2004).	94	Moderate	Last recorded in 2010 (Renowden et al. 2010) within 10kms some potential present on site.
Aythya australis	Anatidae	Hardhead			v		AVW			Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation (e.g. reeds, lignum, cumbungi), usually over water (Halse et al. 2005; Rogers 1990). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds do visit Victoria from these areas in spring and summer, returning as the northern wetlands is replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of the wetland (Pizzey and Knight 2007).	22	Low	Habitat requirements not met in contract area. Last recorded in 2005 within 10km of contract area.
Lichenostomus melanops cassidix	Meliphagidae	Helmeted Honeyeater	f	E / m	c		AVW			Inhabits open Eucalypt forest or woodland, Subspecies *cassidix* confined to Yellingbo area of Yarra Ranges. Nest in colonies along creeks and nests built in low shrubs (Higgins, Peter and Steele 2001).	1	Low	Last recorded in 1915.
Ardea intermedia	Ardeidae	Intermediate Egret	f		c		AVW			The Intermediate Egret occurs in the shallows of mainly grassy inland wetlands, flooded pastures or grasslands. They only occasionally visit coastal wetlands and are generally rare in Victoria. They are sometimes seen foraging in pastures with grazing cattle. This species builds platform nests which are built in trees in riverine forest, swamp woodland and mangroves (Pizzey and Knight 2007).	1	Low	Habitat not present in contract area.
Acrodipsas brisbanensis	Lycaenidae	Large Ant Blue	f		e		AVW			The caterpillar of this species appears to spend its enitre life within an ant nest and is suspected of being carniverous, eating the ants. Adult butterflies tend to fly high near the tops of trees (Braby 2004). They are mostly found around coastal areas.	1	Low	Last recorded in 1941.

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			FFG	EPBC	DSE	Regional Signficance							
Gallinago hardwickii	Scolopacidae	Latham's Snipe		m	n	R3	EPBC/AVW			Latham's Snipe is a migratory species. The species migrates to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands (Pizzey and Knight 2007). Also occurs in small ephemeral wetlands such as wet depressions after floods recede. Generally roosts in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen feeding during the day. This species feeds by probing in soft mud and rarely moves far from concealing vegetation (Higgins and Davies 1996).	16	Low	Last recorded in 2006 within 10kms however, no habitat present on site.
Lewinia pectoralis	Rallidae	Lewin's Rail	f		v		AVW			The Lewin's Rail is secretive, and inhabits areas of heavily vegetated swamps, such as coastal saltmarshes, rushy ditches and swampy streams, it occasionally ventures quite far from water. It feeds from the surface of wet mud, usually among dense woody-stemmed vegetation. Nests are generally found near the ground in dense cover (Marchant and Higgins 1993).	1	Low	Last recorded in 1997 within 10kms, habitat not present in contract area.
Ixobrychus minutus	Ardeidae	Little Bittern	f		e		AVW			This species occurs mainly in northern Victoria in wetlands and floodplains along the Murray River. It tends to inhabit emergent vegetation and reedbeds. It also utilises floating masses of aquatic vegetation in freshwater wetlands. This species is rarely seen due to it using dense vegetation as preferred habtiat. The Little Bittern will feed in shallow water in dense vegetation and their platform nests are built in low dense swampy vegetation (Marchant and Higgins 1990).	2	Low	Last recorded in 2002, however no habitat present in contract area.
Potorous tridactylus tridactylus	Potoroidae	Long-nosed Potoroo (SE mainland)	f	VU	e		EPBC			The Long-nosed Potoroo is most commonly found in heathy coastal vegetation, dry and wet sclerophyll forests with a dense understorey with a sandy loamy soil. Their habitat tends to have some open areas with a grassy understorey for foraging. Preferred habitat has an understorey that may feature grass-trees, sedges, ferns or heath, or low shrubs of tea-trees or melaleucas (Johnston 2008).		Low	No habitat present. Not been recorded previously.
Anseranas semipalmata	Anseranatidae	Magpie Goose	f		n	R3	AVW			Most of the populations of this species have been re-introduced. They breed colonially and build platform nests over water, usually among tall rushes or reedbeds. The Magpie Goose feeds by digging in mud or by up-ending in shallow water, they have also been see grazing and digging well away from water (Marchant and Higgins 1990).	1	Low	Last recorded in 1987.
Biziura lobata	Anatidae	Musk Duck			v		AVW			Usually seen in small numbers on the deep waters of well vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests formed in low vegetation in areas sheltered by surrounding vegetation (Marchant and Higgins 1990; Pizzey and Knight 2007).	3	Low	Last recorded in 1992 within 10kms of contract area. No habitat present.
Pseudomys novaehollandiae	Muridae	New Holland Mouse	f		v		AVW			The New Holland Mouse is found in dry heath and open forest where the understorey is low growing and leaf-litter sparse They are nocturnal, gregarious, and shelter in burrow systems up to	2	Low	Last recorded in 1976. Habitat not present in contract area.

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			FFG	EPBC	DSE	Regional Signficance							
										several metres long (Kemper 1995).			
Neophema chrysogaster	Psittacidae	Orange-bellied Parrot	f	CR / m	cr		EPBC			Breed in south-west Tasmania and are winter migrants to Victoria where they are are usually present from late March to early Nov, inhabiting coastal habitats such as bays and estuaries in saltmarshes, herbland or low shrublands (Higgins 1999). Much of their winter habitat has been altered and saltmarshes in low low rainfall areas have been developed for uses such as salt extraction. Illlegal trapping has also reduced numbers.		Low	Not previously recorded. Habitat not present.
Larus pacificus pacificus	Laridae	Pacific Gull			n	R3	AVW			The Pacific Gull is one of the largest gulls within the Australian and New Zealand territories, confined to the coast where flocks occur on intertidal mudflats and nearby rubbish tips in Port Phillip Bay, Western Port and Corner Inlet, with smaller numbers elsewhere on estuaries, along beaches and on other intertidal habtiats (Higgins and Davies 1996). This species breeds mainly on islands in Bass Strait and off Tasmania. Some smaller numbers breed on islands off Wilsons Promontory. Their nests are built on the ground on the tops of steep-sided islands (Higgins and Davies 1996).	52	Low	last recorded in 2006 within 10kms however, no habitat present on site.
Grantiella picta	Meliphagidae	Painted Honeyeater	f		v		AVW			The Painted Honeyeater is a summer migrants to Victoria. They are generally found to inhabit box-ironbark, Broad-leaved Peppermint and Red Stringybark forests and box-buloke woodlands in the northern foothills of the great Divide. May also occur in Red Ironbark and Red Box forests in southern Victoria. They are occasionally found along the Murray River valley to Hattah-Kulkyne NP where they inhabit Black Box woodlands. This species is usually found in open stands of old eucalypts that are infested with mistletoes (Higgins, Peter and Steele 2001).	1	Low	Last recorded in 1981.
Phalacrocorax varius	Phalacrocoracidae	Pied Cormorant			n	R3	AVW			This species is most often found along the coast, however they are known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Marchant and Higgins 1990; Pizzey and Knight 2007).	3	Low	Last recorded in 1997. No habitat present on site.
Ninox strenua	Strigidae	Powerful Owl	f		v	R1	AVW			The Powerful Owl is widespread in foothill and coastal forests where they tend to favour gullies with peppermint and manna gum forests. They are occasionally seen in wetter mountain forests, drier box-ironbark forests, open woodlands, and softwood plantations. This species requires very large hollows for breeding (Higgins 1999).	2	Low	Last recorded in 2003. No habitat present.
Merops ornatus	Meropidae	Rainbow Bee-eater		m			EPBC			The Rainbow Bee-eater is a migratory species. It occurs in many types of habitat including woodland, shrubland, semi-cleared land and farmland, however it mainly occurs where eucalyptus species are dominant (Higgins 1999). It is almost entirely insectivirous and mostly occurs near to permanent water (Higgins 1999).		Low	Not previously recorded. Habitat not present.

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			FFG	EPBC	DSE	Regional Signficance							
Anthochaera phrygia	Meliphagidae	Regent Honeyeater	f	EN / m	c		EPBC			Occurs mainly in box-ironbark forests and woodlands north of the Great Divide. This species is highly nomadic and their movements are determined by the flowering of eucalypts (Higgins 1999; Pizzey and Knight 2007).		Low	Not previously recorded. Habitat not present.
Platalea regia	Threskiornithidae	Royal Spoonbill			v		AVW			The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands; these birds are gregarious in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick-nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Rogers 1990).	7	Low	Last recorded in 2005. No habitat in contract area.
Rhipidura rufifrons	Dicruridae	Rufous Fantail		m		R2	EPBC			The Rufous Fantail is migratory and can be found in a variety of habitats including swampy woodland, rainforest, mangrove, dense wet forests. It is generally found where there is dense shande and thick understorey shrubs and bushes and is often seen close to the ground. It can be found in less dense habitats during migration and has been seen in many urban sites (Higgins, Peter and Cowling 2006).		Moderate	Not previously recorded. Habitat not present.
Myiagra cyanoleuca	Dicruridae	Satin Flycatcher		m		R2	EPBC			The Satin Flycatcher is a migrant to southern parts of Victoria during the spring/summer months. It is generally found in many habitat types including wet schlerophyl and woodland particularly along watercourses (Higgins, Peter and Cowling 2006).		Low	Not previously recorded. Habitat not present.
Pseudomys fumeus	Muridae	Smoky Mouse	f	EN	c		EPBC			The Smoky Mouse occurs mainly in in dry sclerophyll forest on ridges with heath and tussock-grass understorey, coastal heath and subalpine heath. It shelters communally in a nest on the surface of the ground. Its preferred haibtat is dense heath, and its diet consists of fungi, seeds and flowers. It has a patchy distribution and may have a successional pattern of occurence relating to time since fire (Ford 2008; Menkhorst and Knight 2001).		Low	Not previously recorded. Habitat not present.
Tyto tenebricosa	Tytonidae	Sooty Owl	f		v		AVW			Inhabit mainly old growth forests including gullies and escarpments, rainforests and Mountain Ash forests in large areas of continuous forest. They are absent or rare in some areas where the habitat seems suitable such as Otway Ranges, Wilsons Promontory and Strzelecki Ranges. This may be because the forests are too small or fragmented. They catch prey from branches of trees and shrubs or from the ground. They nest and roost in large holes in eucalypts; occasionally they also roost on low tree branches or tops of tree-ferns. These owls are sedentary and territorial (Marchant and Higgins 1990).	1	Low	Last recorded in 1992. No habitat present in contract area.
Isoodon obesulus obesulus	Peramelidae	Southern Brown Bandicoot	f	E	n	R3	EPBC/AVW			The Southern Brown Bandicoot is both active during the day and night. It is found in forest, heath and shrub communities. It shelters in a nest of vegetation beneath dense cover, it eats fungi, tubers and arthropods (Menkhorst and Knight 2001; Paull 2008).	32	Low	Last recorded in 2005. No habitat in contract area.
Pseudophryne semimarmorata	Myobatrachidae	Southern Toadlet			v		AVW		Present	The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low	59	High	Recorded during the current assessment.

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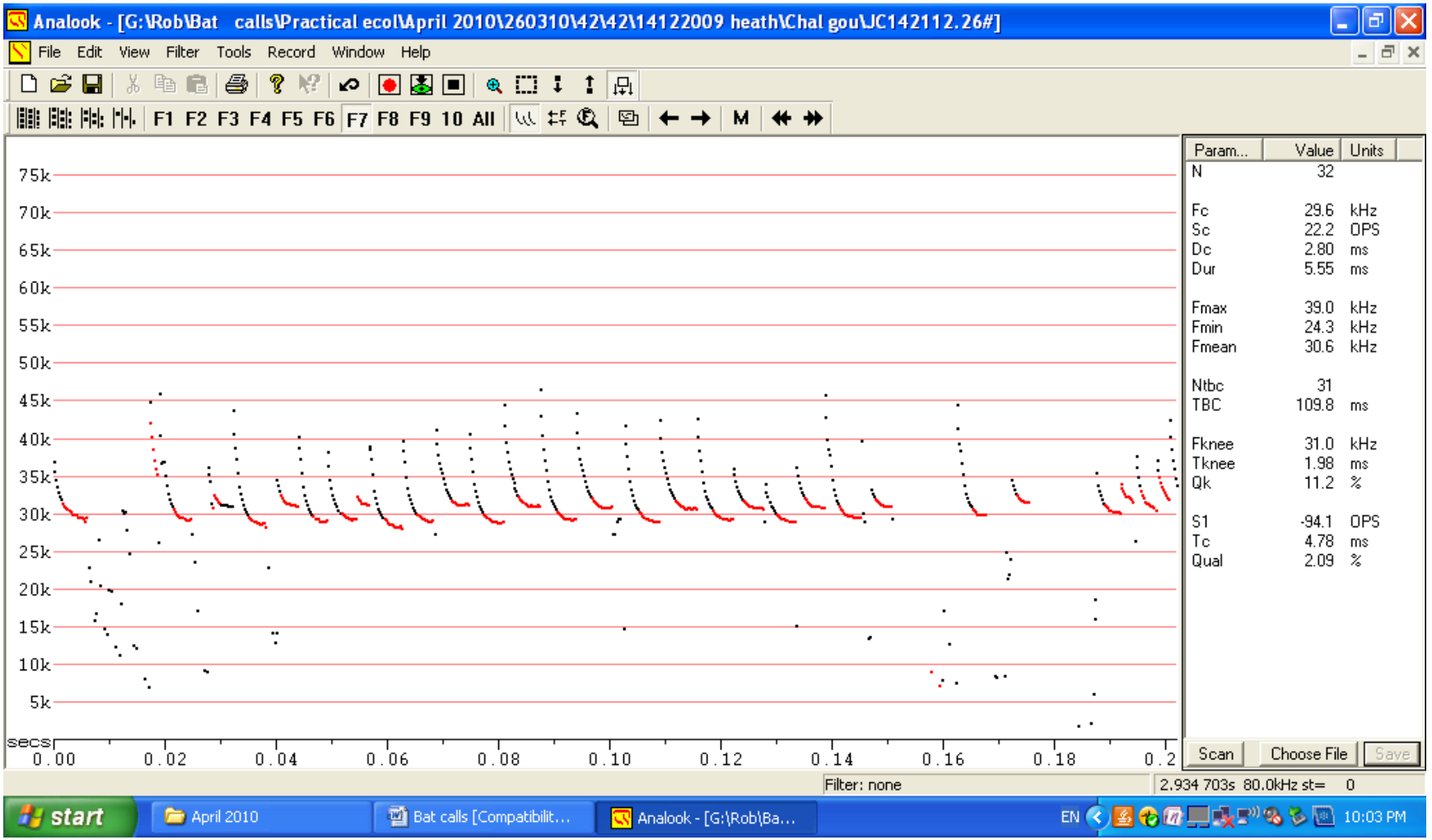
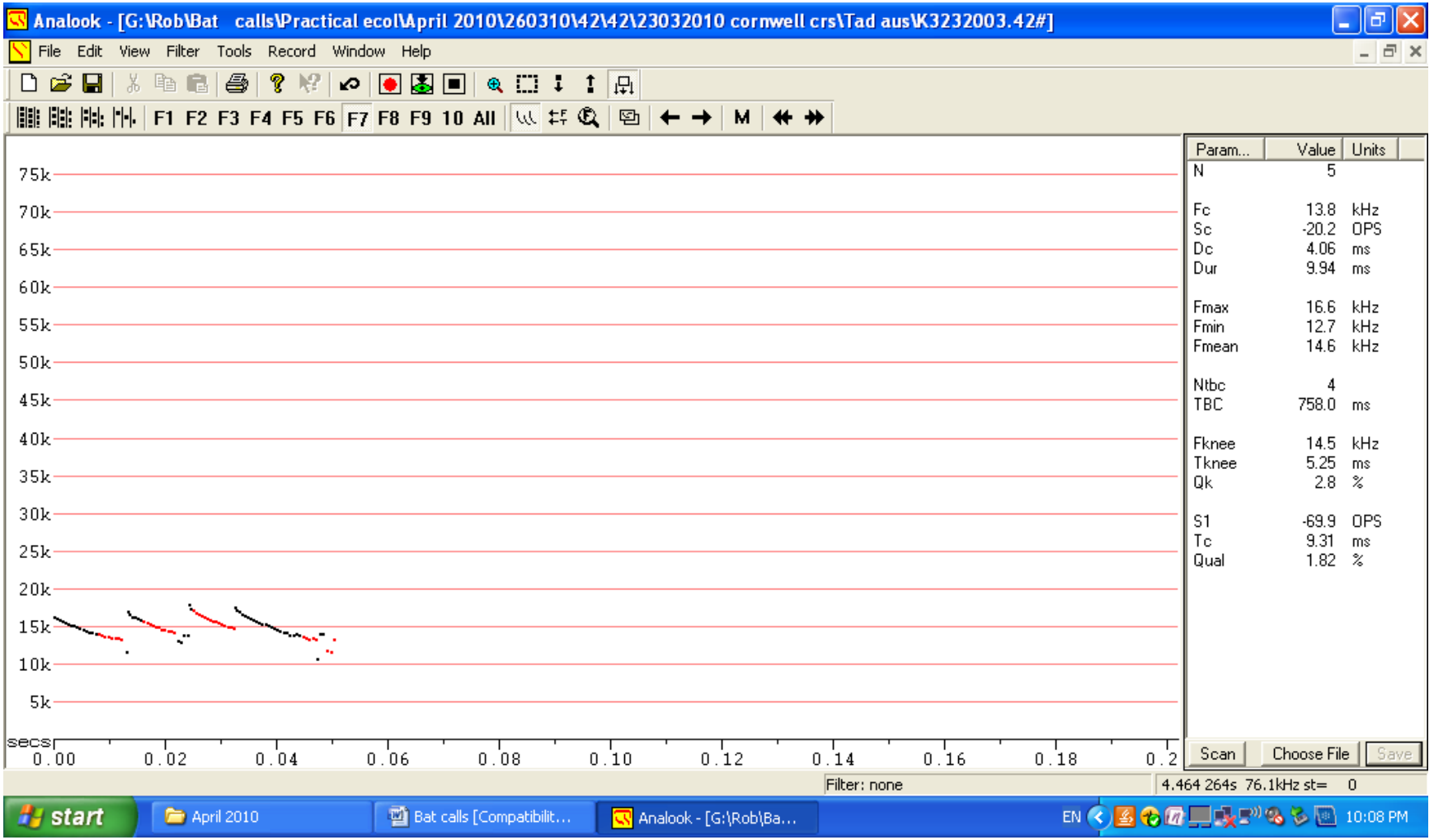
			FFG	EPBC	DSE	Regional Signficance							
										areas close to water (Hero, Littlejohn and Marantelli 1991).			
Dasyurus maculatus maculatus (SE mainland population)	Dasyuridae	Spot-tailed Quoll	f	EN	e		EPBC			The Spot-tailed quoll is a carnivorous marsupial found in many different treed habitats including rainforest, wet and dry sclerophyll forest and woodland. In parts of Tasmania it is also found in coastal heath and scrub (Belcher, Burnett and Jones 2008; Menkhorst and Knight 2001).		Low	Not previously recorded. Habitat not present.
Circus assimilis	Accipitridae	Spotted Harrier			n	R3	AVW			This species occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allow hunting. Their stick nests are built in low trees (Pizzey and Knight 2007).	3	Moderate	Last recorded in 2004. Could utilise farmland for hunting.
Polytelis swainsonii	Psittacidae	Superb Parrot	f	V	e		AVW			This species is generally only found in the Upper Murray Valley, mainly in the riverine forests and woodlands of Barmah Forest in Victoria. All other sightings have been made along or within 10 km of the Murray, Ovens and Goulburn Rivers. Their nests are located in hollows of very large riparian trees in River Red Gum forests. They feed mainly in Black Box, Grey Box, Yellow Box woodlands and sometimes in open woodland. They forage in their nesting forests and may also forage on the ground, in eucalypts and in mistletoes (Higgins 1999; Pizzey and Knight 2007).	1	Low	Not previously recorded. Habitat not present.
Egernia coventryi	Scincidae	Swamp Skink	f		v		AVW			The Swamp Skink can be found in cool temperate, low-lying wetlands including swamp margins, tea-tree thickets and tidal salt-marshes. This species is secretive, and often found in dense low vegetation. It shelters in burrows (Wilson and Swan 2008).	11	Moderate	There is some potential habitat within the contract area. Last recorded in 1997 within 10kms.
Lathamus discolor	Psittacidae	Swift Parrot	f	E	e	R1	EPBC/AVW			The Swift Parrot is a winter migrant to Victoria, arriving from their breeding areas in Tasmania; however small numbers of non-breeding birds may remain here during summer. They are nomadic, and follow the flowering trees and psyllid infestations. They are often seen in box-ironbark forests, and can be seen in urban parks and occur sporadically elsewhere in forests and woodlands but are rarely seen in treeless areas, rainforests or wet forests (Higgins 1999; Pizzey and Knight 2007).	2	Low	Last recorded in 1989. No habitat present.
Chlidonias hybridus	Laridae	Whiskered Tern			n	R3	AVW			This is mainly a summer migrant to Victoria, although some remain here over winter. They inhabit shallow freshwater swamps and fresh or brackish lakes, favouring areas with emergent vegetation. The Whiskered Tern build nests on the water in colonies among flooded or emergent vegetation (Pizzey and Knight 2007).	2	Low	Last recorded in 2004 within 10kms, no habitat present in contract area.
Haliaeetus leucogaster	Accipitridae	White-bellied Sea-Eagle	f	m	v		EPBC/AVW			The White-bellied Sea-eagle mainly occurs along the coast, but may travel along some inland rivers and lakes (Pizzey and Knight 2007).	6	Low	No habitat present. Last recorded in 1997 within 10kms of contract area.
Hirundapus caudacutus	Apodidae	White-throated Needletail		m			EPBC		Present	White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).		High	Was recorded during the current assessment.

Scientific Name	Family Name	Common Name	Conservation Status				Database	Other Sources	Current Survey	Habitat Notes	No. of Records (AVW)	Likelihood of Occurrence	Likelihood Reasoning
			FFG	EPBC	DSE	Regional Signficance							
Nannoperca obscura	Percichthyidae	Yarra Pygmy Perch	f	VU	n		EPBC			The Yarra Pygmy Perch occurs in slow moving or still water bodies with abundant cover of aquatic vegetation permanent habitat (Allen, Midgley and Allen 2002).		Low	Not previously recorded, however has been recorded near the Dandenong/Eumemmerring creeks. However habitat not present.

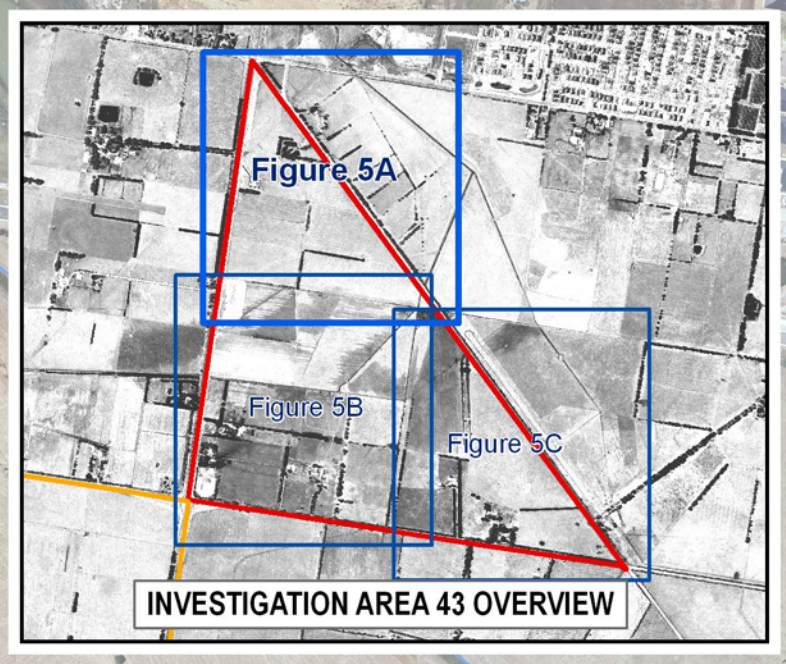
Appendix 12. Time vs frequency graphs for bat species recorded during current assessment



Gould's Wattled Bat *Chalinolobus gouldii*



White-striped Freetail Bat *Austronomus australis*



206233635

209204078

208516228

208514974

636847

636937

36E.ov

HZ10

HZ9

HZ8

HZ7

HZ11

HZ5

HZ6

HZ3

HZ12

HZ4

HZ1

HZ20

Berwick-Cranbourne Road

Pound Road

A B C D E F G H I J K L M N O

1 2 3 4 5 6 7 8 9 10

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VERSION 02 | **DATE: 04/10/10**

NOTES:
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DATUM: GDA 94 VICGRID 94

N

0 50 100 150

Metres

1:4,000 when printed at A3

MAP AND SURVEY DETAILS
Surveyed by: Mark Shepherd, Sep09 - Feb10
Mapping by: Staci Timms, Mar10
Generated from: Data collected in the field using Juno PDAs and DSE's Habitat Hectares Application for ArcPAD. Aerial Imagery and GIS base layers supplied by DSE and GAA.

LEGEND

- Roads
- Watercourse
- Contract Area 43 Site Boundary
- Other Contract Areas and Precincts
- Property Access Constraints - Survey not completed
- Degraded Treeless Vegetation
- Non Native Vegetation

Modelled Vegetation

- Highly likely native vegetation - woody

Ecological Vegetation Class

- EVC 53: Swamp Scrub
- EVC 83: Swampy Riparian Woodland
- EVC 136: Sedge Wetland

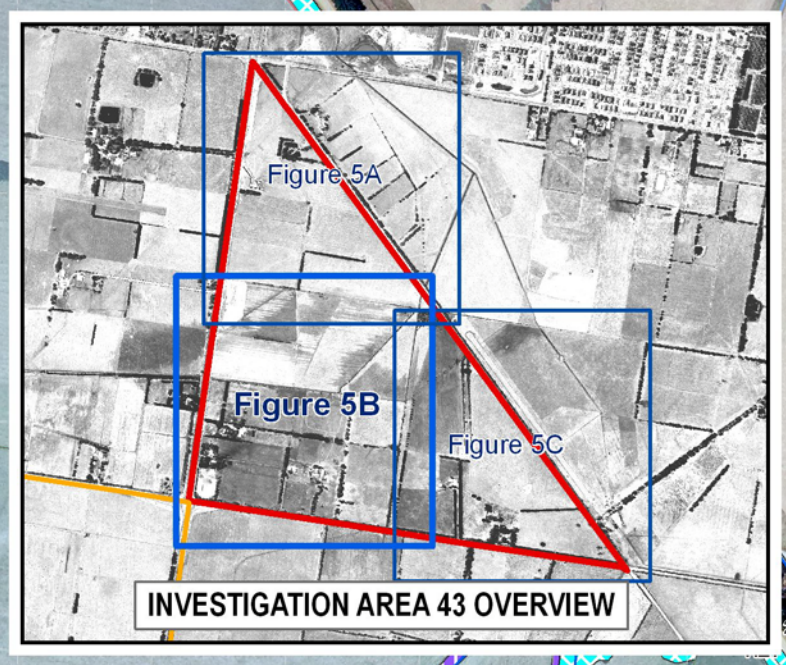
Scattered Trees

- Small Tree
- Medium Old Tree
- Large Old Tree
- Very Large Old Tree
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*

FIGURE 5A

ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES Contract Area 43

Biodiversity Mapping Project 2009-2011



208516228
208514974
208514983
636847
636935
636936
636934
Berwick-Cranbourne Road
HZ4
50m buffer
HZ2
HZ13
HZ14
HZ21
HZ15
HZ22
HZ16
52E.ov
53E.ov
54Dead
50E.ov
51Dead
3E.ov
1E.ov
2E.ov
5E.ov
7E.ov
8E.ov
9E.ov
10E.ov
11E.ov
12E.ov
15E.ov
17E.ov
18E.ov
19E.ov
20E.ov
21E.ov
22E.ov
4E.ov
6E.ov
55E.ov
13E.ov
14E.ov
16E.ov

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- Watercourse
- Contract Area 43 Site Boundary
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- Large Old Tree
- Very Large Old Tree
- E.ov Swamp Gum *Eucalyptus ovata* ssp. *ovata*

FIGURE 5B

ECOLOGICAL VEGETATION CLASSES AND SCATTERED TREES Contract Area 43

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