

Croskell PSP Proposed Drainage Strategy

Desktop Environmental Assessment

Prepared for Melbourne Water

Prepared by Water4Good

19 October 2022



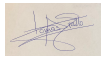
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List of Abbreviations

CaLP Act	<i>Catchment and Land Protection Act 1994</i>
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water.
DELWP	Department of Environment, Land, Water and Planning
DSS	Drainage Services Scheme
EE Act	<i>Environment Effects Act 1978</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVC	Ecological Vegetation Class
FFG Act	<i>Flora and Fauna Guarantee Act 1988</i>
GGF	Growling Grass Frog
LGA	Local Government Area
MNES	Matters of National Environmental Significance
MSA	Melbourne Strategic Assessment
MTM	Metro Trains Melbourne
NVPP	Native Vegetation Precinct Plan
PMST	Protected Matters Search Tool
P&E Act	<i>Planning & Environment Act 1987</i>
PSP	Precinct Structure Plan
SBB	Southern Brown Bandicoot
WSUD	Water Sensitive Urban Design

1 Introduction

Melbourne Water has commissioned Water4Good to complete a Desktop Environmental Assessment for the Croskell Precinct Structure Plan (PSP) Proposed Drainage Strategy Project (hereafter 'the project'). The project involves completing a drainage concept options assessment and functional design of major drainage assets (retarding basin, wetland and new waterway alignment) for the Croskell PSP. The functional design of the major assets will provide greater certainty to the land required for the assets, which will inform the PSP and schemes, and confirm the quantities and cost estimation to inform the scheme contribution rate.

As part of these works, an environmental study of the site will be undertaken to help guide the drainage design outcomes and endeavour to support ecological and landscape connectivity and provisioning for significant species that may use or move through this system.

This Desktop Environmental Assessment Report presents the environmental study component of the project.

1.1 Purpose and objectives

The objectives of this assessment are to:

- Identify significant or listed flora, fauna and/or ecological communities within the project area;
- Identify implications of significant or listed species found within the project area under National, State or local legislation and policy (noting the MSA area) as well as relevant Melbourne Water strategies;
- Provide recommendations on areas that should be protected because of high vegetation values;
- Provide recommendations for future field investigations; and
- Review connectivity of habitats within the surrounding precinct and potential fauna movement to consider opportunities to support habitat connectivity within the DSS assets. This includes high level reference to EVC selection and suitable flora species for drainage corridors.

1.2 Site description

The Croskell PSP area (hereafter 'the study area') is located within the suburbs of Cranbourne East and Clyde North, approximately 45 km south-east of Melbourne's CBD, within the southern-eastern growth corridor (Figure 1). The study area occurs in the City of Casey Local Government Area (LGA) and is bounded by Thompson's Rd in the north, Berwick-Cranbourne Rd in the east, Narre Warren Rd in the west and Linsell Blvd and mix of residential streets in the south.

The study area covers approximately 272 ha and is situated in the Port Phillip catchment, within the Gippsland Plain Bioregion. The majority of the study area is currently being used for grazing stock and consists of large open paddocks with rows of non-native trees. An elevated section in the central-northern part of the study area consists of former quarries and now contains a concrete batching plant, broiler farm and abattoir. A large drainage line transects the study area from south to north and drains into constructed wetlands north of Thompsons Rd. The future Croskell PSP will include a mix of residential and employment uses.

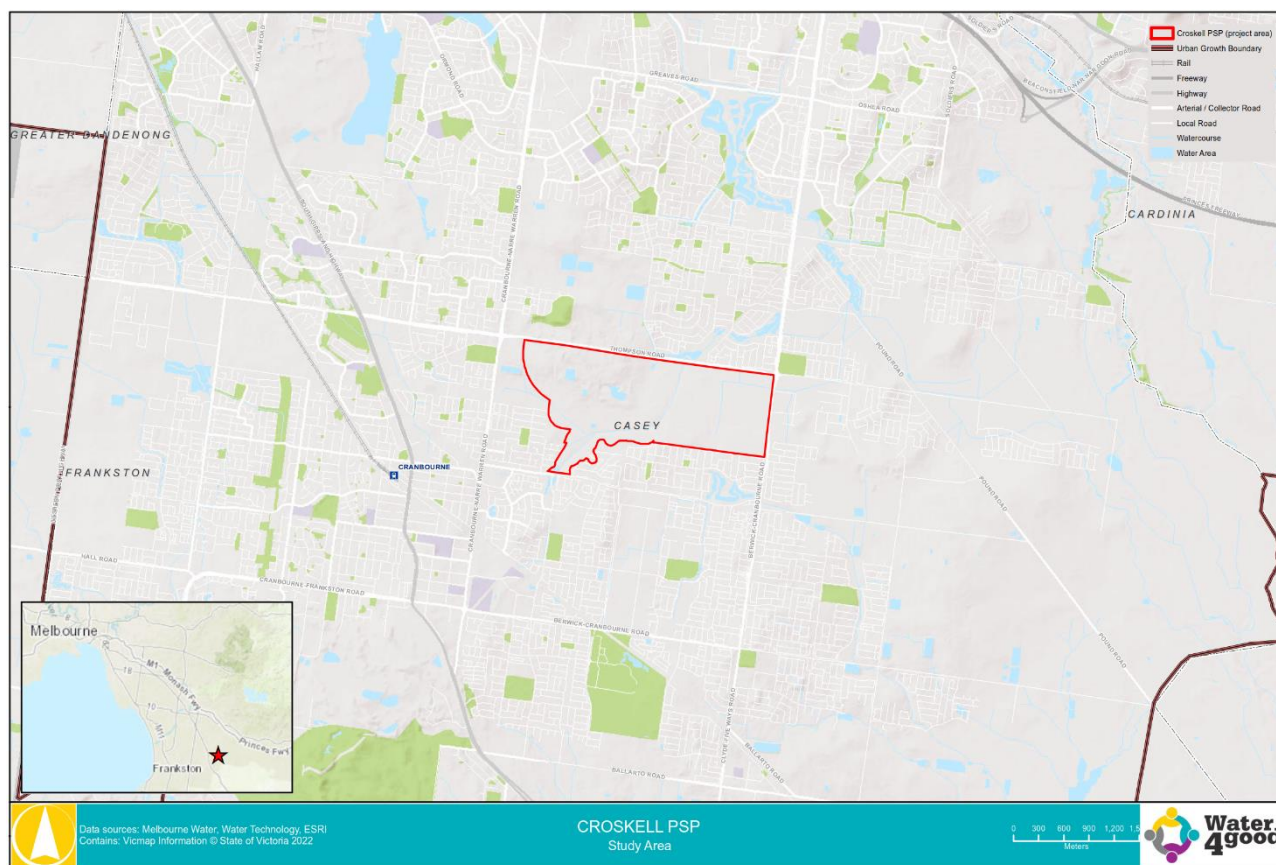


Figure 1. Croskell PSP project area.

2 Methodology

A desktop review of online databases, previous reports and relevant legislation and policy was undertaken to identify the potential presence of species and communities of conservation significance occurring within the project area. This review compiled of the following sources:

Databases reviewed include:

- Department of Climate Change, Energy, the Environment and Water (DCCEEW) *Environment Protection and Biodiversity Conservation Act 1994* (EPBC Act) Protected Matters Search Tool (PMST) database (DCCEEW 2022), within 5 km;
- DELWP NatureKit (DELWP 2022a) bioregion location, modelled Ecological Vegetation Class (EVC) distribution and bioregional conservation status within the site;
- DELWP Victorian Biodiversity Atlas (VBA) (DELWP 2022b), within 5 km;
- Native Vegetation Time Stamping Dataset - Melbourne Growth Areas (DELWP 2011); and
- Habitat Compensation Dataset for the Melbourne Strategic Assessment (DELWP 2013).

Relevant legislation reviewed include:

- DELWP Environmental Mitigation Levy Act;
- MSA policy;
- Melbourne Water Healthy Waterways Strategy 2018 and supporting Co-Designed Catchment Program for the Westernport and Mornington Peninsula Region;
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Flora and Fauna Guarantee Act 1988* (FFG Act);
- *Planning and Environment Act 1987* (P&E Act);
- *Environment Effects Act 1987* (EE Act);
- *Wildlife Act 1975*;
- *Catchment and Land Protection Act 1994* (CaLP Act); and
- *Water Act 1989*.

Documents reviewed include:

- Environmental and Cultural Review of the Ti-Tree Creek Drainage Scheme (SKM 2007); and
- Biodiversity Assessment Report, Investigation Area 42 (Practical Ecology 2011);
- City of Casey Biodiversity Strategy;
- Sub-regional Species Strategy for the Southern Brown Bandicoot (DEPI 2013);
- Sub-regional Species Strategy for the Southern Brown Bandicoot, supplement: Habitat Connectivity, Melbourne Strategic Assessment (DEPI 2014);
- Implementation Plan for the Southern Brown Bandicoot Sub-regional Species Strategy (DELWP 2016);
- Guidelines for best-practice management of modified habitats for Southern Brown Bandicoots (MTM 2019);
- Significant impact guidelines for the vulnerable Growling Grass Frog (*Litoria raniformis*) (Commonwealth of Australia 2009);
- Growling Grass Frog Masterplan for Melbourne's Growth Corridors, Melbourne Strategic Assessment (DELWP 2017a);
- Sub-regional species strategy for the Growling Grass Frog (DEPI 2013b);
- Growling Grass Frog Habitat Design Standards, Melbourne Strategic Assessment (DELWP 2017b);
- Growling Grass Frog Crossing Design Standards, Melbourne Strategic Assessment (DELWP 2017c); and
- Vision for Remaining Growth Areas (City of Casey 2021).

Other reviews:

- Desktop assessment for suitable Southern Brown Bandicoot (SBB) habitat with reference to the BCS;
- Desktop assessment for potential Growling Grass Frog (GGF) habitats covering waterways, mapped drainage lines and farm dams; and
- Desktop assessment of potential Dwarf Galaxias habitat suitability including connectivity of waterbodies, waterways, drains, dams and low-lying areas.

3 Results

The results of the desktop review and interrogation of ecological databases identified listed threatened species and communities and modelled EVCs within 5 km of the study area. The results can be found in Appendix A.

3.1 Native vegetation

3.1.1 Modelled native vegetation

The 2005 modelled EVCs and 2011 MSA time-stamped native vegetation datasets within the study area are displayed in the map in Appendix B.

Vegetation within the study area has been highly modified primarily due to:

- clearing for agriculture, including grazing and crops;
- the deepening and straightening of former waterways and wetlands to form distinct drainage lines and channels; and
- the removal of soil during the operation of sand mines (Practical Ecology 2011).

Despite this, there are eight remnant EVCs mapped within the study area. The majority of these native vegetation patches occur surrounding the dams south of the concrete batching plant, along some of the drainage lines, roadsides, and within a small reserve area directly north of Midnight Rise.

3.1.2 Mapped native vegetation

Native vegetation mapping was previously undertaken within the study area in 2011 by Practical Ecology, where they recorded approximately 23ha comprises of native vegetation. They identified and mapped eight EVCs, with the conservation status of five of these EVCs being endangered, two vulnerable and one of least concern.

This report outlined that a significant proportion of the native vegetation has recolonised following disturbance, and in general, wetland vegetation, Swamp Scrub (EVC 53) and native vegetation within the drainage lines has recolonised following the creation of dams, drainage channels and depressions. Similarly, native vegetation within 1520 Thompsons Road has recolonised following the removal of top-soil, with only some patches of remnant native vegetation remaining at this site within the former quarry buffer zones. Native vegetation patches within the former quarry site were generally larger and scored higher habitat hectare scores than the remaining patches within the study area.

3.1.3 Summary

Since the modelled EVCs are based off 2005 and 2011 data, and the mapped native vegetation was conducted in 2011, the remaining vegetation has likely degraded over the last decade due to development in the surroundings areas and ongoing grazing pressure. However, it is likely that a number of small patches may still exist within areas that have experienced less disturbance. This would be confirmed via a field assessment.

Any remaining higher quality areas of native vegetation should be considered for protection during the design of the major drainage assets. Additionally, weed management and revegetation around these areas could be implemented to greater improve the vegetation quality and landscape connectivity, which may provide habitat for threatened species (discussed below).

3.2 Threatened flora, fauna and ecological communities

The results of the predictive EPBC Act PMST, which includes threatened species and ecological communities predicted to occur within 5km of the study area, are provided in Tables 1 and 2 in Appendix A. A list of the VBA threatened flora and fauna species records within 5 km of the study area is recorded in Table 3 in Appendix A, and displayed in a map in Appendix C.

3.2.1 Threatened flora

There are 15 flora species listed as threatened under the EPBC Act (of which 12 are also listed under the FFG Act) that occur or have potential habitat within a 5km radius of the study area (DCCEEW 2022). Of these records, four are known to occur, and six are likely to occur within the study area. The four known to occur include:

- Maroon Leek-orchid (*Prasophyllum frenchii*)
- Matted Flax-lily (*Dianella Amoena*)
- River Swamp Wallaby-grass (*Amphibromus fluitans*)
- Swamp Everlasting (*Xerochrysum palustre*)

Of the above species, there are only records for the Swamp Everlasting, in 2017, within 5km of the study area.

Most of the VBA records are outside of the study area within adjacent habitat areas such as flora reserves and remnant vegetation that have been protected within the urbanised landscape. This includes within the Royal Botanic Gardens to the south-west and a large wetland at the corner of Cranbourne Rd and Golf Links Rd to the north.

Practical Ecology (2011) completed targeted surveys for threatened flora within the study area, including for the above know to occur species. They didn't detect any EPBC or FFG Act listed species, however, they recorded three flora species listed as rare or threatened under the DELWP advisory list:

- Floodplain Fireweed (*Senecio campylocarpus*);
- Veined Spear-grass (*Austrostipa rudis subsp. Australis*); and
- Wetland Blown-grass (*Lachnagrostis filiformis var. 2*).

3.2.2 Threatened ecological communities

The EPBC Act PMST indicated the following listed ecological community is likely to occur within the study area:

- Natural Damp Grassland of the Victorian Coastal Plains (Critically Endangered).

And the following may occur within the study area:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered).

It is unlikely that the Natural Damp Grassland of the Victorian Coastal Plains community occurs in the study area. This community is generally absent from the area between Yarram and Cranbourne as this region is elevated above the coastal plain and tends to be an undulating landscape (DAWE 2021a). However, isolated patches may occur throughout the Gippsland Plain Bioregion.

Neither of these communities were identified in the Practical Ecology Biodiversity Assessment Report (2011). It is also noted that none of the 2005 modelled EVCs or 2011 MSA time-stamped native vegetation correspond with these listed communities.

A field assessment would determine whether these communities exist within the study area.

3.2.3 Threatened fauna

There are 27 fauna species listed as threatened under the EPBC Act (of which 23 are also listed under the FFG Act) that occur or have potential habitat within a 5km radius of the study area. Of these records, 10 are known to occur, and seven are likely to occur within the study area. The 10 known to occur include:

- Australasian Bittern (*Botaurus poiciloptilus*);
- Australian Grayling (*Prototroctes maraena*);
- Dwarf Galaxias (*Galaxiella pusilla*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Greater Glider (*Petauroides volans*);
- Painted Honeyeater (*Grantiella picta*);
- Pilot Bird (*Pycnoptilus floccosus*);
- Southern Brown Bandicoot (*Isodon obesulus obesulus*);
- Swift Parrot (*Lathamus discolor*); and
- White-throated Needletail (*Hirundapus caudacutus*).

Of the above species, there are records for seven of the species within 5km of the study area. The most recent record is a Southern Brown Bandicoot in 2020, which was detected a few kilometres south-east of the study area within the rail corridor. None of the above species were recorded within the study area itself, only within nearby habitat areas.

Targeted species surveys for the Dwarf Galaxias (*Galaxiella pusilla*), Glossy Grass Skink (*Pseudemoia rawlinsoni*), Southern Toadlet (*Pseudophryne semimarmorata*) and Swamp Skink (*Lissolepis coventryi*) were undertaken by Practical Ecology in 2011. Out of these species only the Southern Toadlet was detected, however two additional threatened species were incidentally recorded - the Royal Spoonbill (*Platalea regia*) and Australasian Shoveler (*Anas rhynchotis*).

Although no Growling Grass Frogs were detected during these surveys, potential habitat was identified during the assessment along the drainage lines and within the existing waterbodies. Additionally, the Melbourne Strategic Assessment (MSA) Growling Grass Frog Strategically Important Area (Clyde Creek) is only approximately 5km south-east of the study area.

No threatened freshwater aquatic species records exist within the study area, however, for Dwarf Galaxias, it can be difficult to determine the likelihood of presence due to the potential widespread presence of low-moderately suitable connected habitat and limited survey effort in the study area and surrounding areas. Australian Grayling is considered not likely to be present due to the lack of suitable habitat within the study area, as this species requires larger and more perennially flowing habitats.

3.2.4 Summary

There are a number of threatened species records within 5km of the study area, however, the majority are concentrated within habitat areas such as flora reserves and remnant vegetation that has been protected within the urbanised landscape.

There is potential habitat for the Southern Brown Bandicoot, Growling Grass Frog and Dwarf Galaxias to occur within the study area, and this should be considered in the design of the major drainage assets for the PSP. This is discussed in more detail in Section 4 below.

4 Potential Habitat for Threatened Species

4.1 Southern Brown Bandicoot (SBB) habitat

The SBB is known to use a range of habitats ranging from sedgelands and heathlands through to open forests (see Figure 2 below) (DAWE 2021b). In Victoria, SBB habitat includes heathlands, shrublands, open forests and woodlands. Generally, these habitats are associated with well-drained soils and heath communities (Menkhorst and Seebeck 1990). The upper stratum of the habitat can be low or tall woodland, but the critical factor for good SBB habitat is a dense groundcover. Suitable habitat will contain an understory with 50–80% foliage density in the height range of 0.2–1 m. The distinction between native and non-native vegetation is not critical for the bandicoot, and often exotic species like Blackberry (*Rubus fruticosus* L. agg.) provides good habitat as it can form dense stands.

Much of the study area has been highly modified due to agricultural use. As a result, much of the remnant native vegetation has been removed. The Crookell PSP area is positioned between important SBB populations including the Royal Botanical Gardens Cranbourne in the south-west, and via agricultural land to Quail Island and North Westernport Nature Conservation Reserve in the south, and Koo Wee Rup in the east. However, these populations are becoming increasingly disconnected due to urbanisation within and surrounding these areas.



Figure 2. Remnant SBB habitat within the Devon Meadows Precinct (Photo Credit: Katy Marriott).

4.1.1 Sub-regional Species Strategy for the Southern Brown Bandicoot (DEPI 2014)

The Sub-regional Species Strategy for the Southern Brown Bandicoot (DEPI 2014) outlines the government commitment to improve connectivity for the SBB from urban areas to rural areas outside of the Urban Growth Boundary. Reference is made to create and enhance habitat drainage reserves and other areas unsuitable for development, to enhance movement corridors.

The majority of the Croskell precinct is an SBB levy area under the *MSA (Environmental Mitigation Levy) Act 2020*, which means funds must be paid by developers to support measures to mitigate the impact of urban development on SBB (Appendix D). This area denotes a broad-based possibility of SBB occurrence. The VBA show very few records in the area, and the databases suggest habitat is severely altered. Although clearing for agriculture has removed much of the overstory vegetation, it is difficult to assess the density of the lower strata. Dense low shrubs or graminoids will still provide very good habitat for SBB's. It is likely that these denser low strata vegetation will occur near drainage lines where agricultural use is typically more limited.

4.1.2 Enhancement of SBB habitat areas

Drainage lines such as the one transecting the study area from north-south, form one natural feature that could be enhanced as corridors for SBBs (see Figure 3 below). With a combination of revegetation, fencing and weed management, these areas can provide good corridors to connect patches of habitat through the Urban Growth Corridor.

A habitat corridor can be defined as a wide corridor capable of supporting a resident SBB population and maintaining gene flow over a long distance. Constructed corridors are designed to have three zones – a core zone, a buffer zone, and a defendable area. The core zone width should be a minimum of 50 m wide as guided by the SBB EPBC Referral Guidelines (DSEWPaC 2011). For corridors longer than 1.1 km, the width of the core corridor increases. The core area should be fenced with predator proof fencing to exclude potential predators. The buffer zone of about 30 m surrounds the core zone and should be fenced to exclude people, stock and pets. This zone provides a buffer against edge effects and 'insulates' the core zone from the impact of neighboring land-use. The defendable zone has a main function of fire protection. This zone should comprise areas of mown grass and scattered trees at least 6 m wide. This zone can be used for passive recreation.

The core section of the corridor may need to be restored with strategic planting of native vegetation suitable for SBB habitat. The structural components that provide good habitat – a dense low strata (50–80% average foliage density), some middle level strata (20%) and some larger canopy trees (5%) must be the cornerstone of the restoration process. Any planned works should minimize or avoid removal of native vegetation that forms part of the existing SBB habitat.

The buffer zone should be planted with medium to large shrubs and acts to screen the main fence from public view. A 2.5 m clear access area is required as a buffer next to all fence lines. The defendable space should be maintained as mown grass within fire management guidelines.

Metro Trains Melbourne (MTM) developed the 'Guidelines for best-practice management of modified habitats for SBB' in 2019, which are designed to assist land managers to protect and enhance populations of SBB, particularly when they occur in modified and/or linear habitat. The guidelines outline that corridors should have a minimum width >10m, but a width of 30m or greater is better. The guidelines also include the native plant species recommended for inclusion in revegetation projects. These guidelines should be considered for any proposed revegetation works designed to provide SBB habitat.



Figure 3. Dense plantings providing SBB habitat along a constructed waterway in the Botanic Ridge Precinct (Photo Credit: Katy Marriott).

4.1.3 Recommendations

The drainage line running through the centre of study area may provide a potential SBB corridor if the area was revegetated, fenced and weed management took place. Additionally, retention of native vegetation patches away from the drainage lines will be important to provide possible future habitat linkages and improve connectivity – see Habitat Connectivity Map in Appendix E.

However, on-ground assessments of the potential habitat will be needed to provide a better understanding of the quality of habitat available for the bandicoots. Significant structural habitat in the form of dense understory (native or non-native) provides the ideal habitat, and this is not possible to assess quantitatively with the use of desktop methods only.

Structural habitat assessments should involve assigning rankings (high, medium or low) to areas of contiguous habitat based on its ability to meet the habitat requirements of the species. In addition to this habitat assessment, it is recommended that targeted surveys for SBB be undertaken to confirm the presence or absence of the species within the study area and to determine if SBB are using any of the drainage lines or existing native vegetation as habitat corridors.

4.2 Growling Grass Frog (GGF) habitat

GGFs are associated with permanent or semi-permanent waterbodies that are either still or very slow flowing. Ideally these waterbodies contain a diverse range of aquatic vegetation including emergent, submerged, and floating vegetation. The range of aquatic vegetation is particularly important during breeding season. In addition to the aquatic requirements of the pools themselves, relatively open terrestrial habitat is required adjacent to waterbodies. The terrestrial habitat is used to overwinter or when temporary pools dry up. The terrestrial surrounds are also used for feeding.

GGF populations should be looked at as an interconnected metapopulation, where individual populations are connected through dispersal pathways. Dispersal pathways are mainly along drainage line or along other low-lying areas in the landscape. The ongoing persistence of the population is therefore strongly linked to the ability to shift between wetlands as the current wetland being used temporarily becomes less habitable.

GGFs can move up to 1 km during a single night, meaning that strong sub-populations can be found where suitable wetlands are within close proximity to each other.

Besides the damage to and removal of habitat for GGFs, secondary impacts may also play a part in the persistence of populations. Tadpoles of the GGF are susceptible to horticultural chemicals including fertilisers and pesticides. Within agricultural zones this may have a significant effect on potential wetland sites. In addition, Eastern Gambusia (*Gambusia holbrooki*) are a major predator of frog eggs and larvae. Where Eastern Gambusia are present frogs often struggle to establish a healthy population. Fish, both native and introduced, such as Redfin (*Perca fluviatilis*) also prey on eggs, tadpoles and adult frogs, and can influence the survival of future generations of frogs.

Where aquatic systems are interlinked, even if the link is only seasonal, native and non-native fish species are very likely to be present, particularly Eastern Gambusia. Populations of GGF will survive and potentially flourish in permanently disconnected wetlands. Should connectivity be available to nearby channels or other wetlands, the off-stream wetlands may be able to provide a source population to recolonise nearby wetlands.

4.2.1 Potential habitat within the study area

The Croskell PSP area has GGF overlays along the drainage lines and over the waterbodies near the old quarry and towards the central north part of the study area (see map in Appendix D). Still water connected through drainage lines provides ideal GGF habitat.

Despite being significantly altered, the drainage channel running through the centre of the study area may provide the means for frogs to move between this area and higher quality wetland habitats towards the north. There seems to be a continual expanse of waterways and wetlands traversing up through Narre Warren to Dandenong.

Water quality is also an important factor in maintaining GGF populations. It is likely that the drainage lines and waterbodies within the study area have a high level of nutrients and suspended solids due to agricultural activities surrounding, this can greatly reduce the quality of any potential habitat. However, with future urban development occurring within the surrounding areas, water quality may improve through urban stormwater management and Water Sensitive Urban Design (WSUD).

4.2.2 Recommendations

Although there are no recent records of GGF within the study area, there have been records in nearby areas and a site to the south-east is designated MSA GGF habitat. Therefore, it is recommended that targeted surveys for GGF take place during the breeding season (November to March) to confirm their presence in the area. Following the outcome of these surveys, it may be recommended that construction works avoid the breeding season to reduce impacts to the species.

Additionally, the design of the retarding basin, wetland and new waterway alignment should consider the creation of GGF habitat. The GGF Habitat Design Standards (DELWP 2017) provide guidance on protecting and creating the various types of habitat required to support metapopulations (multiple populations linked by migration) of GGFs over the long term. The standards do not provide design specifications for stormwater wetlands or other types of waterbodies such as lakes built for amenity purposes but may provide useful advice in cases where a project wishes to provide GGF habitat as a secondary objective.

For example, GGF wetlands require areas of shallow water, steep drop-offs and areas of deeper water to escape predators; aquatic vegetation for shelter; and staging site for calling and egg deposition (DELWP 2017). Rocks piles near and in the wetland margin are likely to assist with chytrid fungus control by providing basking sites and warming the shallows (DELWP 2017).

The GGF Habitat Design Standards also provides two sketches depicting GGF habitat design and ideal wetland attributes (see Figures 4 and 5 below). Aspects of the below GGF ponds could be used in the creation of the retarding basin and wetland.

Additionally, as the presence of Eastern Gambusia can negatively impact upon GGF populations, the proposed wetland will need to be monitored to ensure this species doesn't become overabundant. Drying out/drawing down of wetlands can be beneficial for controlling Eastern Gambusia populations. Control of Eastern Gambusia will also benefit Dwarf Galaxias, mentioned in section 4.3 below.

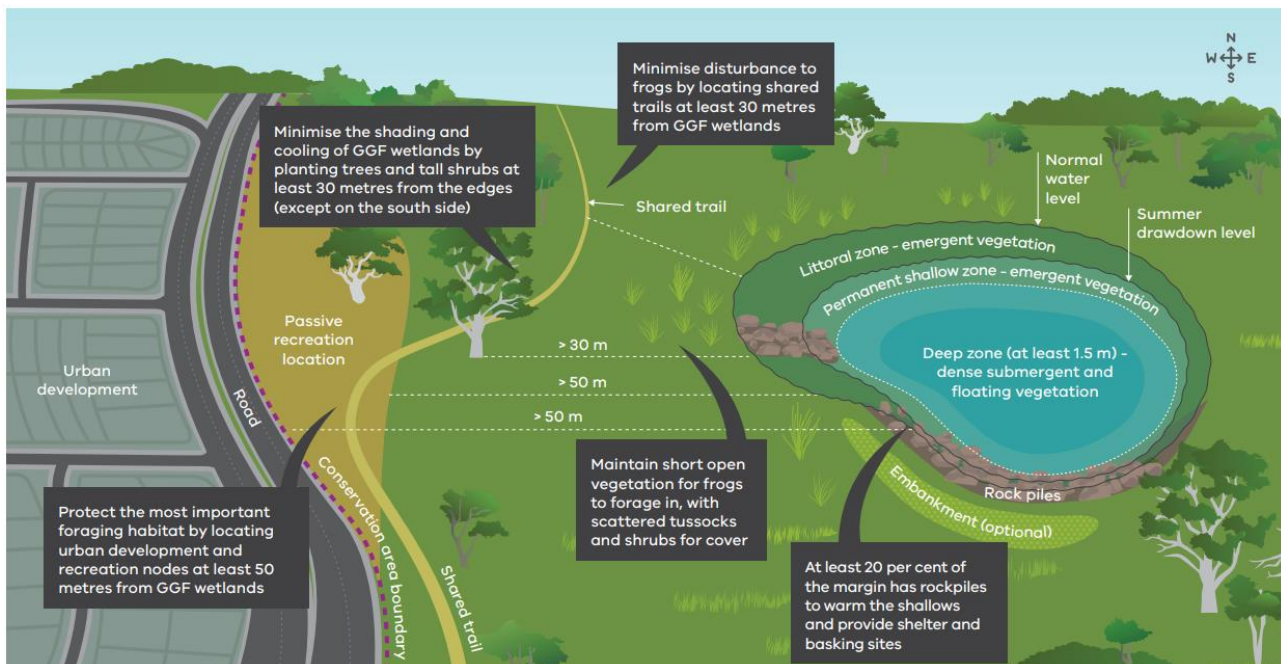


Figure 4. GGF habitat design (DELWP 2017).

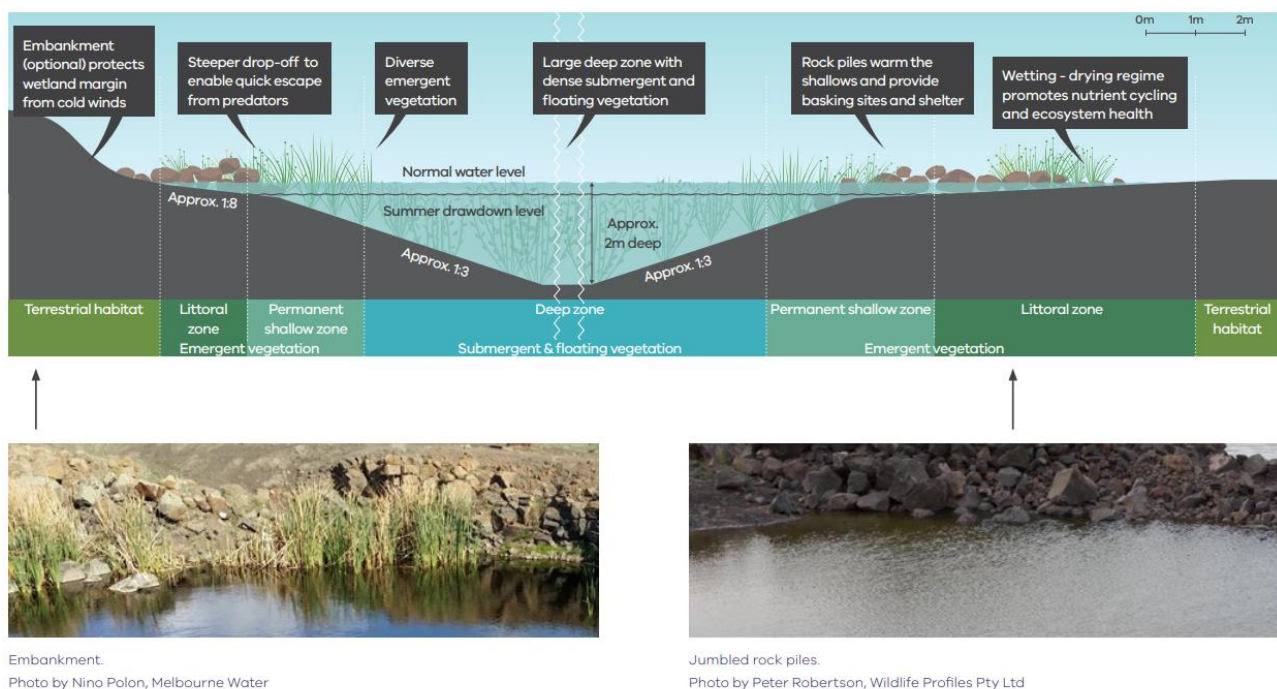


Figure 5. GGF wetland attributes (DELWP 2017).

4.3 Dwarf Galaxias habitat

Dwarf Galaxias have not been detected within the study area, however, there are numerous records within the large wetland at the corner of Cranbourne Rd and Golf Links Rd, which is connected to the Croskell PSP area through various drainage lines and wetland reserves. Therefore, there is potential for the species to be present.

The Dwarf Galaxias occurs in waters which have an array of native aquatic vegetation, typically preferring swampy floodplain environments, but can also be found in creeks and rivers (see Figure 6). Dwarf Galaxias can be found in two types of habitats, primary habitats which have permanent water, and secondary habitats which have intermittent or ephemeral water regimes. Primary habitats (permanent water sites) are responsible for the long-term survival of the species (McGuckin 2014).

As the Dwarf Galaxias has broad habitat requirements and is resilient to many forms of habitat degradation, it is difficult to rule out habitat as unsuitable unless it is devoid of aquatic vegetation, is estuarine or comprises offline dams with no flood connection.



Figure 6. Typical Dwarf Galaxias habitat (Credit: Daniel Stoessel, taken from https://www.swift.net.au/cb_pages/sp_dwarf_galaxias.php).

4.3.1 Recommendations

Due to the resilience of the Dwarf Galaxias and the presence of a number of potential habitats, it is recommended that targeted surveys for the species are undertaken within the waterways, waterbodies and drainage lines within the study area.

It is recommended that the major drainage assets be designed to support the connectivity of the species by avoiding blockages such as weirs and drop structures that will impede the species movement.

5 Relevant Policy and Legislation

The following section summarises the legislative and policy context for identifying and protecting values within the study area, particularly related to the environmental components of this project.

5.1 State policy and legislation

5.1.1 Melbourne Strategic Assessment

The study area falls within the Melbourne Strategic Assessment (MSA) for the urban expansion of Melbourne. The MSA is an agreement between the State and Federal governments whereby impacts on Matters of National Environmental Significance (MNES) have been defined and accounted for. The actions associated with urban development (the Program) within the MSA have therefore been approved under the EPBC Act.

The endorsed Program included a commitment by the Victorian Government to prepare a Biodiversity Conservation Strategy (BCS) for the four growth corridors that comprise the urban growth boundary.

The BCS has identified the south-eastern growth corridor as containing significant biodiversity values. The BCS outlined two conservation areas within the growth corridor, namely Conservation Area 35 (Clyde-Tooradin Rail Reserve, Clyde) and Conservation Area 36 (various Growling Grass Frog corridors). Both of these conservation areas exist approximately 6 kilometres to the east and south-east of Croskell PSP (see map in Appendix E). The Croskell PSP area is also not far from the ecologically significant Botanic Ridge precinct and the Royal Botanic Gardens Cranbourne (RBGC). The RBGC contains significant core habitat for threatened flora and fauna, including the SBB. Botanic Ridge PSP (surrounding the RBGC) has also been found to contain records of other species of state significance including Southern Toadlet, Swamp Skink, Pacific Gull (*Larus pacificus*) and Wetland Blowngrass (*Lachnagrostis palustris*).

Given the significant ecological values which have been recorded within the nearby precincts, it is likely that the waterways, drainage lines and waterbodies within the study area may have value as wildlife corridors. This is particularly relevant given their proximity to other features of significant value such as the Westernport and Edithvale-Seaford Wetlands Ramsar sites. Therefore, the proposed retarding basin, wetland and constructed waterway alignment should help to support wildlife movement between these precincts by ensuring they remain connected to existing corridors.

5.1.2 Flora and Fauna Guarantee Act 1988 (FFG Act)

The FFG Act provides protection for a wide range of threatened Victorian plants, animals and communities. Flora, fauna and ecological communities that are not considered significant at the federal level under the EPBC Act, may be considered significant by the State of Victoria. As such, any potential impact on these matters will need to be assessed and approval confirmed by the state regulatory authorities prior to any works being undertaken.

A permit to 'take protected flora' under the FFG Act would be required if protected flora cannot be avoided and are required to be removed on public land/Crown Land and freehold land that is managed by a public authority.

5.1.3 Environment Effects Act 1978 (EE Act)

The EE Act provides for assessment of proposed projects that are capable of having a significant effect on the environment. Specifically, it applies to effects of state significance and include potential impacts to ecological, heritage, cultural and social values. The Act enables the Minister administering the EE Act to decide that an Environment Effects Statement (EES) should be prepared.

A detailed review against the referral criteria has not been completed, however, given the small scale of the project, it is considered unlikely that the EE Act referral triggers will be met. Therefore, a referral under the Minister is unlikely to be required.

5.1.4 Catchment and Land Protection Act 1994 (CaLP Act)

The CaLP sets Victoria's objectives for the integrated management and protection of catchments, including control of noxious weeds and pest animals. Under the provisions of the CaLP Act, the landowner is required to control noxious weeds and pest animals on their land.

Key objectives of the CaLP Act in relation to the control of weeds and pest animals are:

- regulated and integrated management of noxious weeds and pest animals;
- prohibiting the movement and sale of noxious weeds of all categories anywhere in the state; and
- addressing weed seeds occurring as contaminants in seed lots or other plant products.

Under Section 20 of the CaLP Act, all landowners, including public authorities and licensees of Crown lands, must, in relation to their land, take all reasonable steps to:

- avoid causing or contributing to land degradation which causes or may cause damage to land of another landowner;
- conserve soil;
- protect water resources;
- eradicate regionally prohibited weeds;
- prevent the growth and spread of regionally controlled weeds; and
- prevent the spread of, and as far as possible eradicate, established pest animals.

The project will need to consider the requirements of the CaLP Act, including preventing the growth and spread of regionally controlled weeds and managing potential land degraded through construction, by protecting waterways and controlling sediment and land stability.

5.1.5 Wildlife Act 1975

The *Wildlife Act 1975* protects all Victorian native fauna, including reptiles, amphibians, mammals and invertebrates listed under the FFG Act. All native fauna are protected on all types of land tenure. The Act is administered by DELWP and a specific application for authorisation is required from DELWP to take or keep wildlife, whether the fauna is alive or dead and includes wildlife in any form such as eggs. The Act also provides for the protection and preservation of wildlife habitat in order to prevent its damage, loss or destruction.

A wildlife licence may be issued to 'take' wildlife for the purposes of the management, conservation, protection or control of wildlife. For the purposes of project delivery, a suitably qualified wildlife handler (who holds a wildlife license) should be engaged for the handling, capture and release of wildlife, including birds, during tree removal works.

5.1.6 Planning and Environment Act 1987 (P&E Act)

The P&E Act is the primary legislation that governs land use and development in Victoria. The P&E Act is administered by each local council through controls established in their respective planning schemes. Planning authorisation may occur in the form of either planning permits or a planning scheme amendment.

Depending on the final design of the major drainage assets, the project may require approvals under the P&E Act for impacts to native vegetation. The mapping indicates that no native vegetation is present where the proposed retarding basin and wetland will be constructed, however, there may be some native

vegetation existing along the north-south drainage line proposed to be altered. This would need to be confirmed via a field assessment.

Clause 52.17 – Native vegetation

Under Clause 52.17 of the City of Casey Planning Scheme, a permit is required to remove native vegetation, including dead native vegetation and is required to consider the *Guidelines for the removal, destruction and lopping of native vegetation* (DELWP 2017), referred to herein as ‘the Guidelines’. In accordance with the Guidelines, removal of patch vegetation and scattered trees will require offsets.

The Guidelines require consideration of indirect impacts to native vegetation, including impacts within a trees’ Tree Protection Zone (TPZ). This can be from excavation or compaction from stockpiling or machinery movement within the TPZ. Determination of impacts have been adapted from the Australian Standard on Protection of trees on development sites (AS 4970-2009).

Clause 52.16 – Native Vegetation Precinct Plan (NVPP)

If a NVPP is developed as part of the Croskell PSP, under Clause 52.16 of the City of Casey Planning Scheme, a permit is not required to remove, destroy or lop native vegetation if removal is in accordance with the NVPP.

5.1.7 Water Act 1989

The *Water Act 1989* governs water entitlements and establishes the framework for management of Victoria’s water resources. Under the Act, works and activities in, under, on or over the bed and banks of Designated Waterways in Victoria require a Works on Waterways permit from the relevant Catchment Management Authority (CMA). Designated waterways are named or unnamed, permanent or seasonal, and range in size from a river to a natural depression. Designated waterways are declared under the Water Act 1989.

The study area is within the Port Phillip and Westernport CMA. As of the 1st of January 2022, the Port Phillip & Westernport CMA integrated into Melbourne Water. Therefore, as this is a Melbourne Water project, no approvals or permits are required.

5.1.8 Melbourne Water Healthy Waterways Strategy 2018

The *Healthy Waterways Strategy 2018-28* sets a long-term vision for managing the health of rivers, wetlands and estuaries in the Port Phillip and Westernport region, in order to protect and improve their value to the community. It provides a a single framework for addressing community expectations and the obligations for waterway management, as outlined in relevant State, national and international legislation, policy and agreements.

The study area falls within the Port Phillip and Westernport major catchment area (now integrated into Melbourne Water). Within the Strategy, there are a number of goals, targets and performance objectives for the Port Phillip catchment. The below goals should be considered in the design of the major drainage assets for the Croskell PSP:

- Waterways provide important biolinks that support indigenous plants and animals, are weed free, protected from feral animals (including deer), and connected to the wider landscape.
- Natural and modified waterways across the catchment are managed for instream habitats, long term ecological resilience and fluvial processes; balancing the needs for flood mitigation, agriculture water diversion, and social values.
- Water quality and sediment impacts from urbanisation, forestry, agriculture, industry and transport are mitigated to reduce impacts on waterways and the receiving ecosystem of Port Phillip Bay.

5.2 National policy and legislation

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

The EPBC Act is the federal legislation and framework to protect and manage nationally and internationally significant flora, fauna, ecological communities, and heritage places. Under the EPBC Act, any action that could impact on matters of national significance including significant flora, fauna, ecological communities, or Ramsar wetland sites, need to be assessed and the impacts mitigated.

Impacts to matters of national significance have been defined and accounted within the MSA. As the project occurs within the MSA area, no further approvals are required under the EPBC Act provided the project proceeds in a way that protects matters of national environmental significance.

It is important to note that a small portion of the PSP along the western edge falls just outside of the MSA area (Appendix E). Further consideration by planning authorities will be required in relation to matters of national significance if this additional area is included in the precinct development.

6 Conclusions and Recommendations

The majority of the study area consists of large open paddocks of agricultural land, resulting in much of the remaining native vegetation being highly modified and degraded, or restricted to isolated patches. Despite this, there are areas of conservation value within the study area consisting of the remnant and regenerating woodlands and wetlands within and surrounding the old quarry sites at 1550 and 1520 Thompsons Road. Other areas of conservation value include:

- the major drainage-line transecting the study area from north to south;
- the small reserve area directly north of Midnight Rise; and
- scattered trees, remnant vegetation and exotic vegetation within road reserves.

These native vegetation patches are likely to provide habitat for threatened fauna species that have been recorded in nearby precincts, including the EPBC and FFG Act listed Southern Brown Bandicoot, Growling Grass Frog and Dwarf Galaxias.

6.1 Key recommendations for habitat retention and connectivity:

- Native vegetation patches should be retained where possible. There are also opportunities to enhance connectivity between retained patches to support connectivity for the species listed in Section 4 above.
- If a Native Vegetation Precinct Plan (NVPP) is prepared as part of the PSP, it should avoid isolating retained native vegetation patches by taking into consideration connectivity with existing and proposed waterways and habitat corridors.
- Retain existing wetlands, farm dams and drainage lines where possible areas of open water (Appendix E).
- Consider the creation of GGF habitat when designing the retarding basin and wetland system using the Growling Grass Frog Habitat Design Standards (DELWP 2017b).
- Consider revegetating the new waterway alignment with a vegetation structure that supports a habitat corridor for SBB and supports their movement through the surrounding precincts.

6.2 Recommendations for further investigations:

- Complete native vegetation assessments within the study area to confirm the areas of high value and priority for protection, and to identify potential areas for revegetation.
- Conduct targeted species surveys for SBB, GGF and Dwarf Galaxia to confirm their presence or absence within the study area.
- Depending on the outcomes of the targeted surveys, construction works may need to avoid the GGF breeding season from November to March.
- A qualified wildlife handler should be engaged to conduct pre-clearance checks for fauna prior to any vegetation removal.

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Appendix A – Database Desktop Results

Table 1. EPBC ACT PMST results within 5km of the study area.

Common name	Species name	Conservation status	Likelihood of occurrence
Threatened Ecological Communities			
Natural Damp Grassland of the Victorian Coastal Plains	N/A	Critically Endangered	Likely to occur
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	N/A	Critically Endangered	May occur
Fauna			
Australasian Bittern	<i>Botaurus poiciloptilus</i>	Endangered	Known to occur
Australian Fairy Tern	<i>Sternula nereis nereis</i>	Vulnerable	May occur
Australian Grayling	<i>Prototroctes maraena</i>	Vulnerable	Known to occur
Australian Painted Snipe	<i>Rostratula australis</i>	Endangered	Likely to occur
Broad-toothed Rat	<i>Mastacomys fuscus mordicus</i>	Vulnerable	May occur
Curlew Sandpiper	<i>Calidris ferruginea</i>	Critically Endangered	May occur
Dwarf Galaxias	<i>Galaxiella pusilla</i>	Vulnerable	Known to occur
Eastern Curlew	<i>Numenius madagascariensis</i>	Critically Endangered	May occur
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Endangered	Known to occur
Greater Glider	<i>Petauroides volans</i>	Vulnerable	Known to occur
Greater Sand Plover	<i>Charadrius leschenaultii</i>	Vulnerable	May occur
Grey Falcon	<i>Falco hypoleucos</i>	Vulnerable	Likely to occur
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Likely to occur
Growling Grass Frog	<i>Litoria raniformis</i>	Vulnerable	Likely to occur
Golden Sun Moth	<i>Synemon plana</i>	Vulnerable	May occur

Common name	Species name	Conservation status	Likelihood of occurrence
Painted Honeyeater	<i>Grantiella picta</i>	Vulnerable	Known to occur
Pilot Bird	<i>Pycnoptilus floccosus</i>	Vulnerable	Known to occur
Red Knot	<i>Calidris canutus</i>	Endangered	May occur
Regent Honeyeater	<i>Anthochaera phrygia</i>	Critically Endangered	Likely to occur
Smoky Mouse	<i>Pseudomys fumeus</i>	Endangered	May occur
Southern Brown Bandicoot	<i>Isoodon obesulus obesulus</i>	Endangered	Known to occur
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	Endangered	May occur
Swamp Antechinus	<i>Antechinus minimus maritimus</i>	Vulnerable	Likely to occur
Swift Parrot	<i>Lathamus discolor</i>	Critically Endangered	Known to occur
White-throated Needletail	<i>Hirundapus caudacutus</i>	Vulnerable	Known to occur
Yarra Pygmy Perch	<i>Nannoperca obscura</i>	Vulnerable	May occur
Yellow-bellied Glider	<i>Petaurus australis australis</i>	Vulnerable	Likely to occur

Flora

Clover Glycine	<i>Glycine latrobeana</i>	Vulnerable	Likely to occur
Dense Leek-orchid	<i>Prasophyllum spicatum</i>	Vulnerable	Likely to occur
Eastern Spider Orchid	<i>Caladenia orientalis</i>	Endangered	May occur
Green-striped Greenhood	<i>Pterostylis chlorogramma</i>	Vulnerable	Likely to occur
Leafy Greenhood	<i>Pterostylis cucullata</i>	Vulnerable	May occur
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	Endangered	Known to occur
Matted Flax-lily	<i>Dianella amoena</i>	Endangered	Known to occur
Metallic Sun-orchid	<i>Thelymitra epipactoides</i>	Endangered	May occur
River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	Vulnerable	Known to occur

Common name	Species name	Conservation status	Likelihood of occurrence
Round-leaf Pomaderris	<i>Pomaderris vacciniifolia</i>	Critically Endangered	May occur
Spiny Peppercreess	<i>Lepidium aschersonii</i>	Vulnerable	May occur
Strzelecki Gum	<i>Eucalyptus strzeleckii</i>	Vulnerable	Likely to occur
Swamp Everlasting	<i>Xerochrysum palustre</i>	Vulnerable	Known to occur
Swamp Fireweed	<i>Senecio psilocarpus</i>	Vulnerable	Likely to occur
Thick-lipped spider-orchid	<i>Caladenia tessellata</i>	Vulnerable	Likely to occur

Table 2. Database review of vegetation communities.

EVC	Conservation status
<i>NatureKit 2005 modelled EVCs (all within the Gippsland Plain Bioregion)</i>	
Heathy Woodland (EVC 48)	Least Concern
Plains Grassland/Plains Grassy Woodland Mosaic (EVC 897)	Endangered
<i>Native Vegetation Time Stamping Dataset (all within the Gippsland Plain Bioregion)</i>	
Damp Sands Herb-rich Woodland (EVC 3)	Vulnerable
Heathy Woodland (EVC 48)	Least Concern
Plains Grassy Woodland (EVC 55)	Endangered
Sedge Wetland (EVC 136)	Vulnerable
Swamp Scrub (EVC 53)	Endangered
Swampy Riparian Woodland (EVC 83)	Endangered
Tall Marsh (EVC 821)	Endangered

Table 3. Rare and threatened flora species recorded within 5 km of the study area.

Common name	Species name	EPBC Act	FFG Act	No. of sightings	*Most recent record
<i>Fauna</i>					

Common name	Species name	EPBC Act	FFG Act	No. of sightings	*Most recent record
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN	cr	7	2008
Australasian Shoveler	<i>Spatula rhynchotis</i>		vu	44	2020
Australian Grayling	<i>Prototroctes maraena</i>	EN	vu	3	1985
Barking Owl	<i>Ninox connivens</i>	CR	cr	1	2005
Black Falcon	<i>Falco subniger</i>		cr	1	199
Blue-billed Duck	<i>Oxyura australis</i>		vu	91	2019
Caspian Tern	<i>Hydroprogne caspia</i>		vu	4	2018
Chestnut-rumped Heathwren	<i>Calamanthus pyrrhopygius</i>		vu	4	2019
Common Sandpiper	<i>Actitis hypoleucos</i>		vu	1	1980
Curlew Sandpiper	<i>Calidris ferruginea</i>	CR	cr	9	1980
Dwarf Galaxias	<i>Galaxiella pusilla</i>	VU	en	88	2017
Eastern Curlew	<i>Numenius madagascariensis</i>	CR	cr	1	2009
Eastern Great Egret	<i>Ardea alba modesta</i>		vu	20	2019
Freckled Duck	<i>Stictonetta naevosa</i>		en	3	2019
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	EN	vu	4	2020
Grey Goshawk	<i>Accipiter novaehollandiae</i>		en	5	1990
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>		vu	3	1988

Common name	Species name	EPBC Act	FFG Act	No. of sightings	*Most recent record
Growling Grass Frog	<i>Litoria raniformis</i>	VU	vu	1	1980
Hardhead	<i>Aythya australis</i>		vu	121	2020
Hooded Robin	<i>Melanodryas cucullata</i>		vu	2	1981
Jewel Beetle	<i>Temognatha sanguinipennis</i>		vu	1	2017
Lewin's Rail	<i>Lewinia pectoralis</i>		vu	23	2020
Little Eagle	<i>Hieraaetus morphnoides</i>		vu	22	2019
Little Egret	<i>Egretta garzetta</i>		cr	4	2019
Magpie Goose	<i>Anseranas semipalmata</i>		vu	1	1987
Marsh Sandpiper	<i>Tringa stagnatilis</i>		en	2	2004
Musk Duck	<i>Biziura lobata</i>		vu	16	2018
Painted Honeyeater	<i>Grantiella picta</i>	VU	vu	2	1981
Plumed Egret	<i>Ardea intermedia plumifera</i>		cr	2	2006
Powerful Owl	<i>Ninox strenua</i>		en	4	2020
Southern Brown Bandicoot	<i>Isoodon obesulus obesulus</i>	EN	en	11	2020
Southern Toadlet	<i>Pseudophryne semimarmorata</i>		en	7	2009
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>		en	1	2008
Swamp Skink	<i>Lissolepis coventryi</i>		en	11	1997
Swift Parrot	<i>Lathamus discolor</i>	CR	cr	5	2009

Common name	Species name	EPBC Act	FFG Act	No. of sightings	*Most recent record
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		en	3	2018
White-throated Needletail	<i>Hirundapus caudacutus</i>		vu	31	2019
Wood Sandpiper	<i>Tringa glareola</i>		en	2	1980

Flora

Clustered Lily	<i>Thelionema umbellatum</i>		vu	6	2011
Dwarf Cypress-pine	<i>Callitris oblonga subsp. oblonga</i>	EN		1	2015
Floating Bladderwort	<i>Utricularia gibba</i>		en	1	2018
Floodplain Fireweed	<i>Senecio campylocarpus</i>		en	1	2010
Giant Honey-myrtle	<i>Melaleuca armillaris subsp. armillaris</i>		en	11	2014
Grampians Thryptomene	<i>Thryptomene calycina</i>		en	1	1981
Grey Billy-buttons	<i>Craspedia canens</i>		cr	3	1993
Large-fruit Yellow-gum	<i>Eucalyptus leucoxylon subsp. megalocarpa</i>		cr	1	2016
Naked Sun-orchid	<i>Thelymitra circumsepta</i>		en	5	2007
Orange-tip Finger-orchid	<i>Caladenia aurantiaca</i>		en	2	1999
Pale Swamp Everlasting	<i>Coronidium gunnianum</i>		cr	3	1993
Plains Yam-daisy	<i>Microseris scapigera</i> s.s.		cr	1	1993

Common name	Species name	EPBC Act	FFG Act	No. of sightings	*Most recent record
Powelltown Correa	<i>Correa reflexa</i> var. <i>lobata</i>		en	1	1981
Purple Blown-grass	<i>Lachnagrostis semibarbata</i> var. <i>filifolia</i>		en	3	1993
Purple Diuris	<i>Diuris punctata</i> var. <i>punctata</i>		en	1	2005
Riverina Bitter-cress	<i>Cardamine moirensis</i>		en	1	1998
River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	VU		4	2006
Snowy River Wattle	<i>Acacia boormanii</i>		en	2	1996
Spotted Gum	<i>Corymbia maculata</i>		vu	4	2020
Sticky Wattle	<i>Acacia howittii</i>		vu	1	2009
Swamp Everlasting	<i>Xerochrysum palustre</i>	VU	cr	7	2017
Velvet Apple-berry	<i>Billardiera scandens</i> s.s.		en	3	1981

EPBC Act: EX (Extinct), CR (Critically Endangered), EN (Endangered), VU (Vulnerable).

FFG Act: cr (critically endangered), e (endangered), v (vulnerable), r (rare), nt (near threatened).

*VBA records were limited to those occurring post-1980 as the intense development of the area after this point reduces the usefulness of older historic records.

Appendix B – Map of Native Vegetation



Data sources: Melbourne Water, Water Technology, MetroMap
Contains: Vicmap Information © State of Victoria 2022

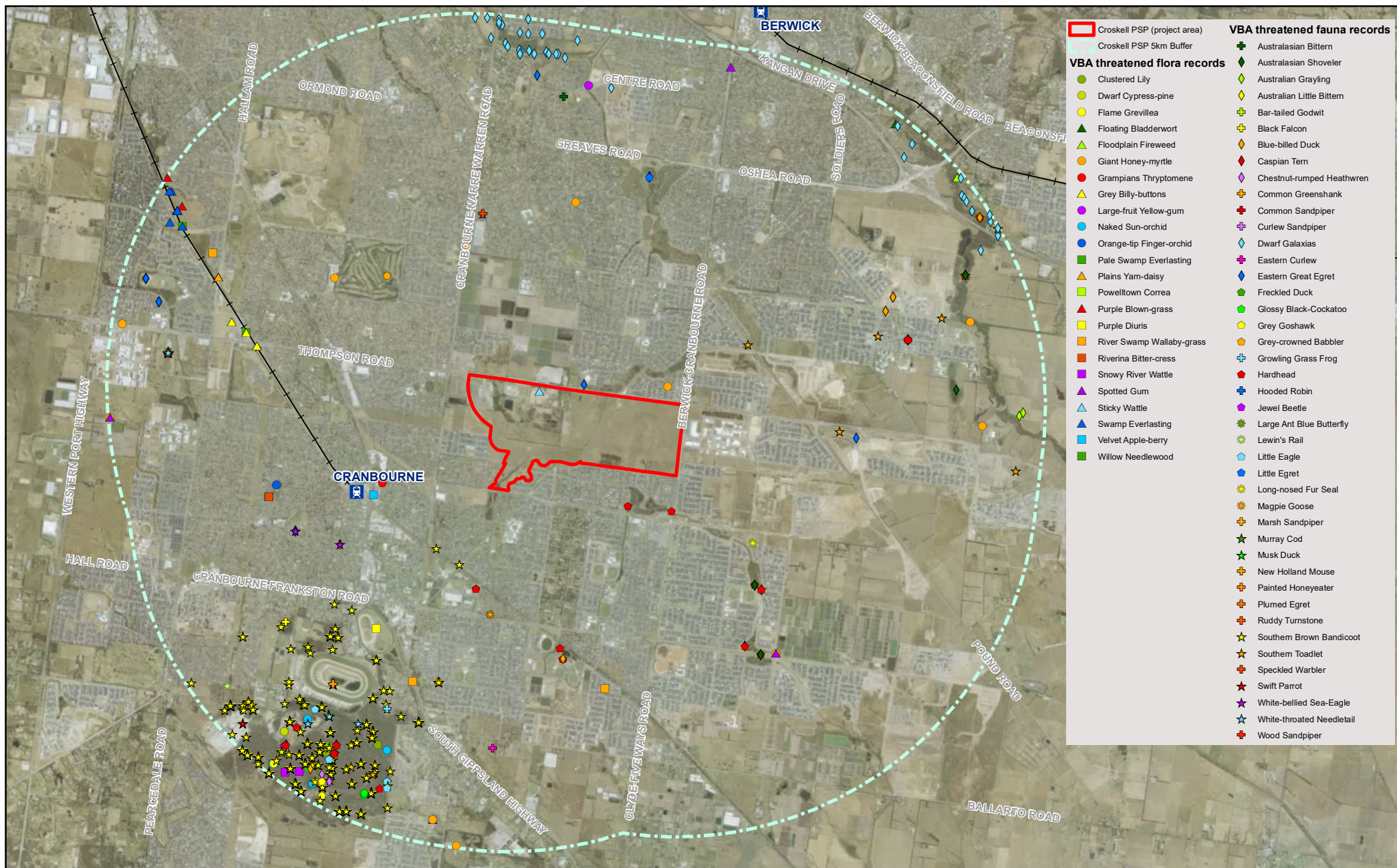
CROSKELL PSP

Mapped Native Vegetation

0 50 100 150 200 250
Meters



Appendix C – Map of VBA records



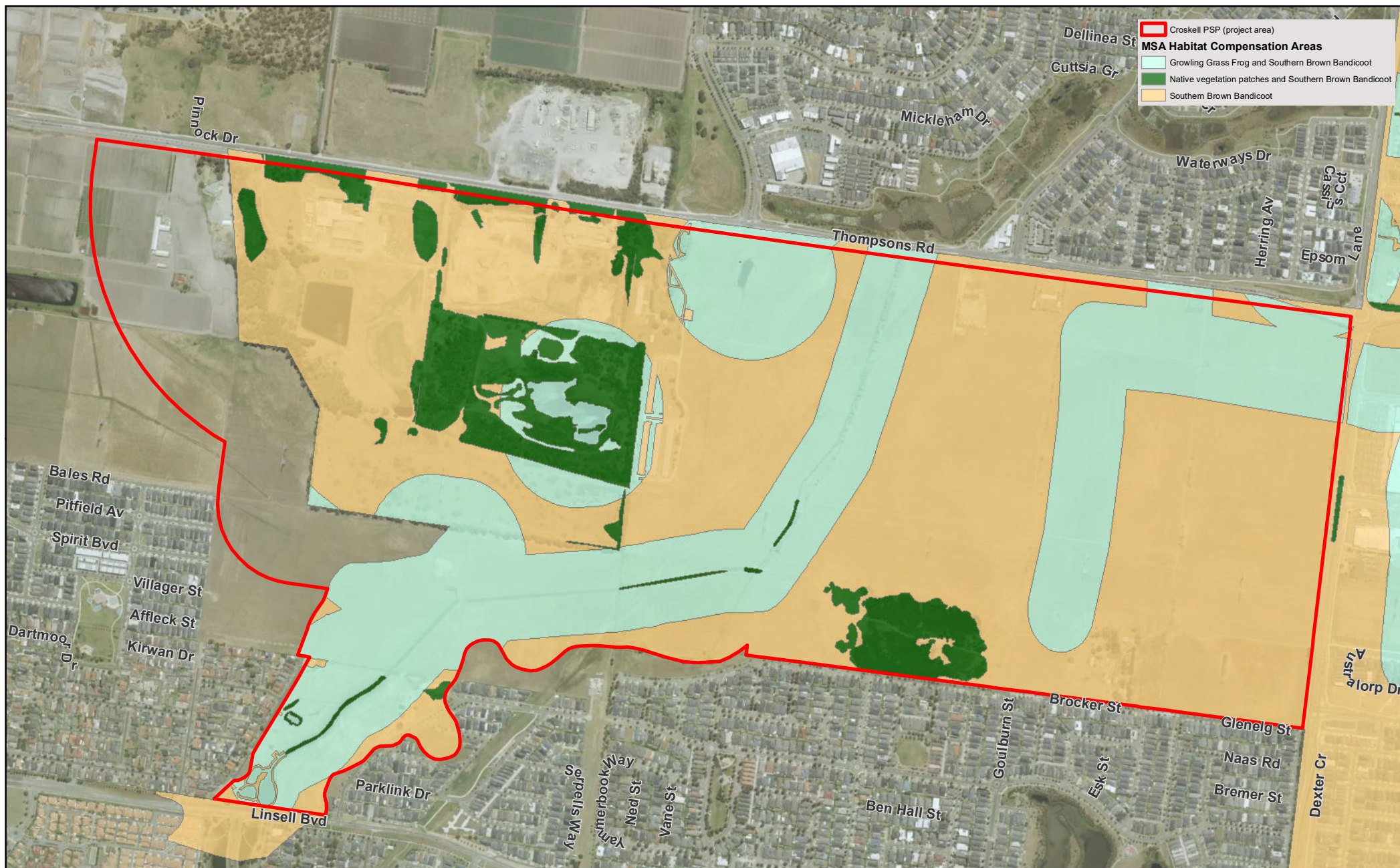
Data sources: Melbourne Water, Water Technology, MetroMap
Contains: Vicmap Information © State of Victoria 2022

CROKELL PSP

VBA threatened species records



Appendix D – Map of SBB and GGF Habitat Areas



Croskell PSP (project area)

MSA Habitat Compensation Areas

Growing Grass Frog and Southern Brown Bandicoot

Native vegetation patches and Southern Brown Bandicoot

Southern Brown Bandicoot

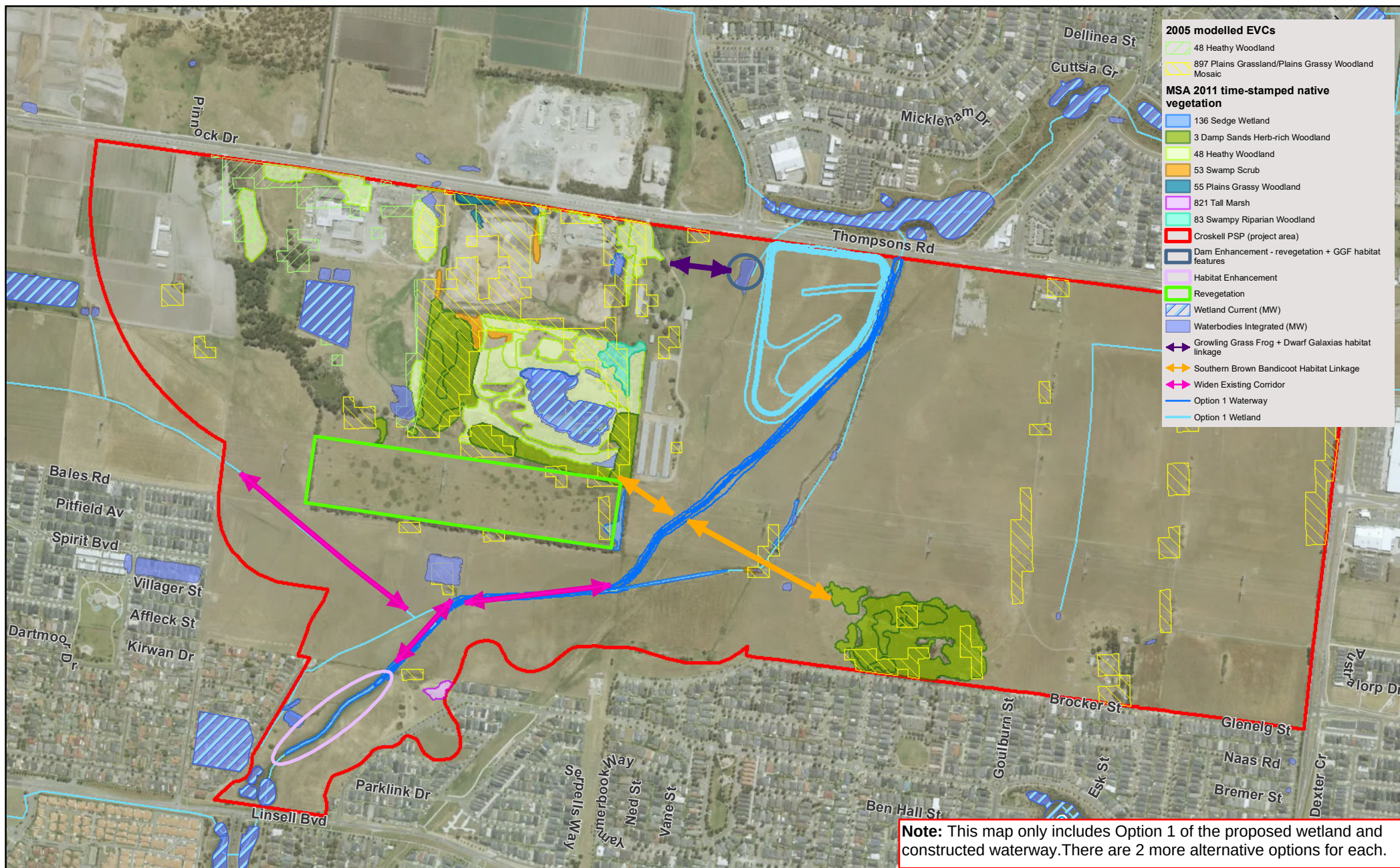


Data sources: Melbourne Water, Water Technology, MetroMap
Contains: Vicmap Information © State of Victoria 2022

CROSKELL PSP SBB & GGF habitat areas



Appendix E – Habitat Connectivity Map

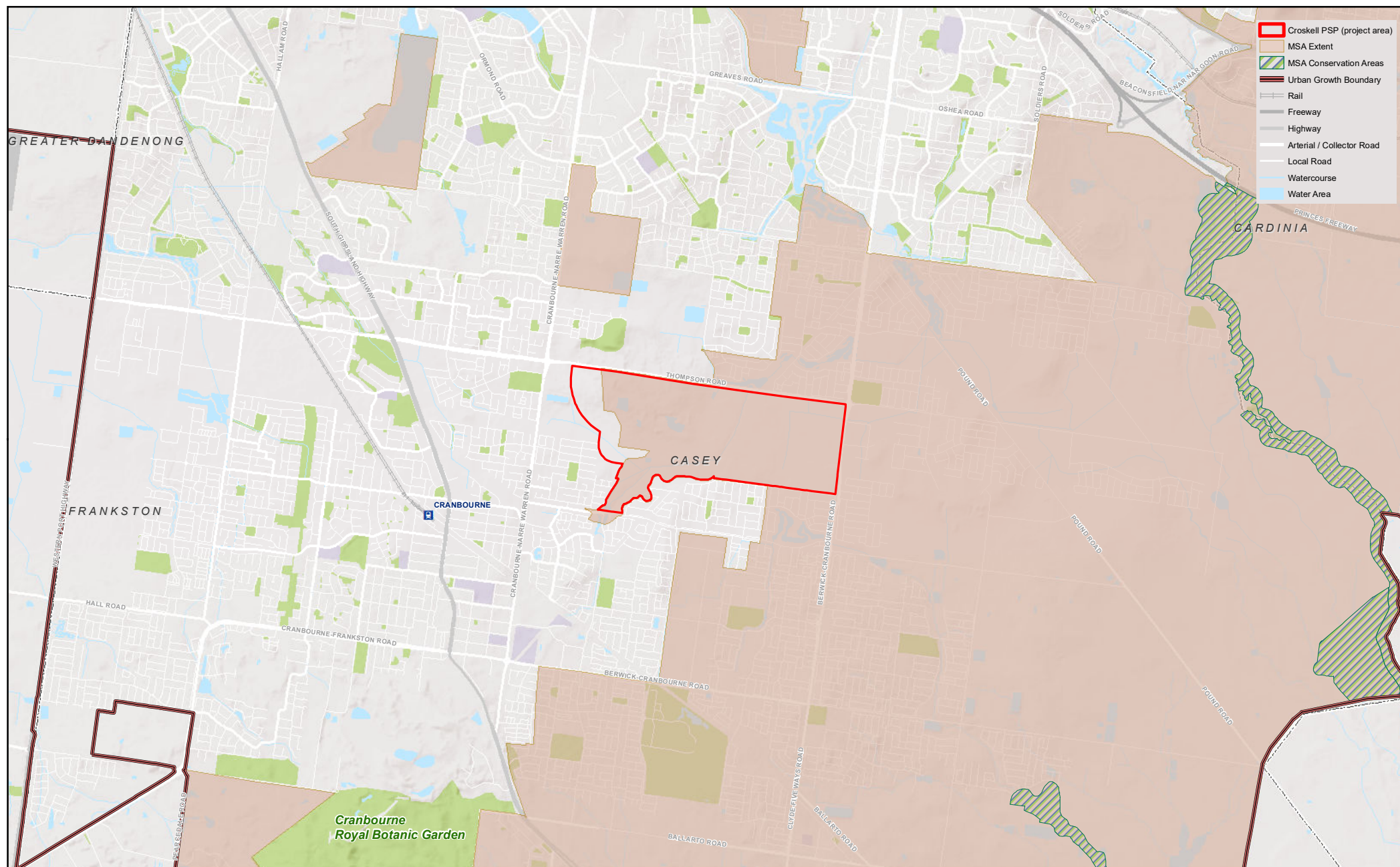


Data sources: Melbourne Water, Water Technology, MetroMap
Contains: Vicmap Information © State of Victoria 2022

CROKELL PSP Mapped Native Vegetation



Appendix F – MSA Context Map



Data sources: Melbourne Water, Water Technology, ESRI
Contains: Vicmap Information © State of Victoria 2022

CROSKELL PSP
MSA Context

