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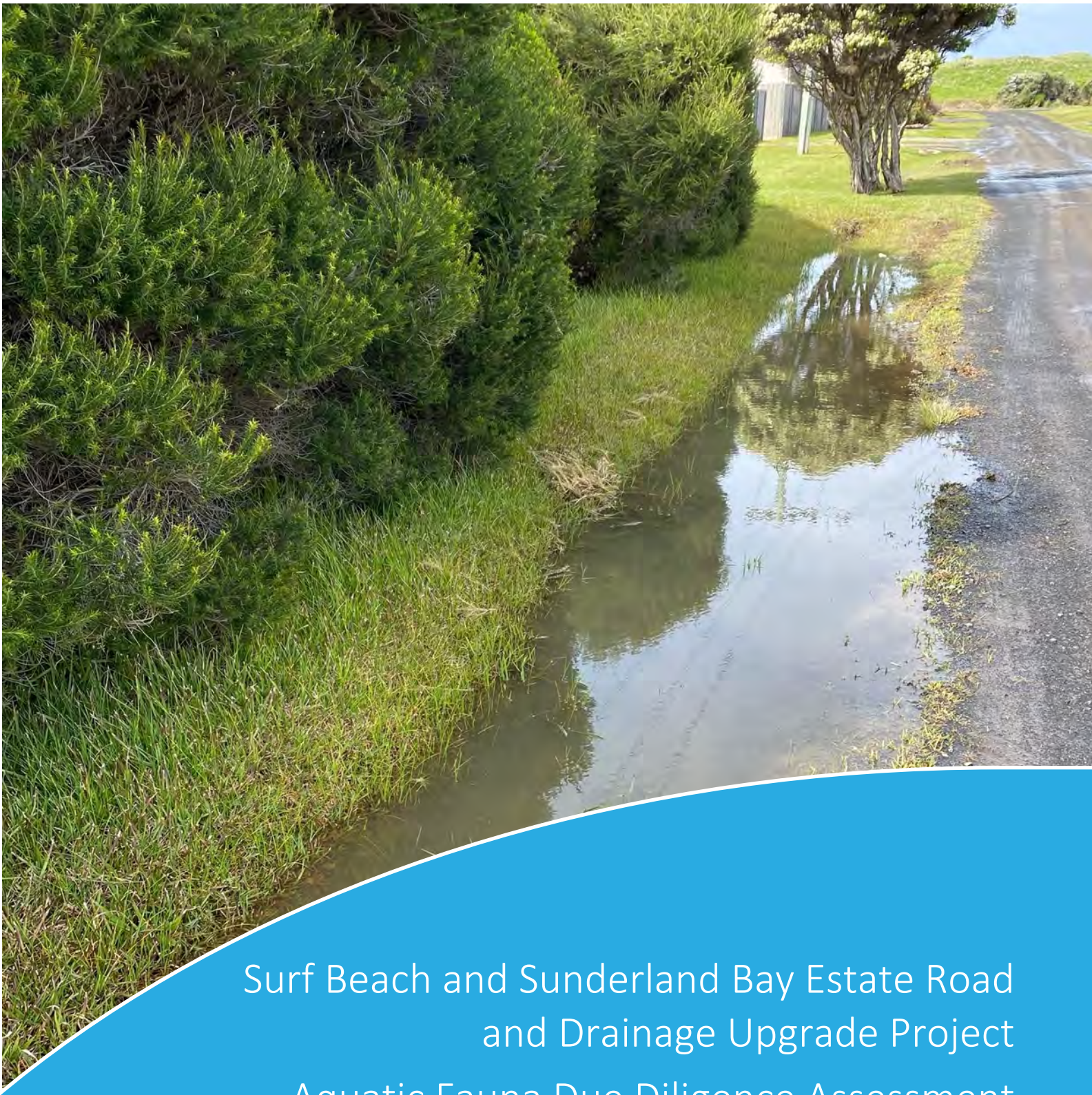

Surf Beach and Sunderland Bay Estate Road and Drainage Upgrade Project

Aquatic Fauna Due Diligence Assessment

Report Prepared for Bass Coast Shire

November 2022

AQUATIC ECOSYSTEM & ENVIRONMENTAL MANAGEMENT

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Cover Photograph: Roadside swale in the estate, 19 September 2022 (A Jenkin)

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1. EXECUTIVE SUMMARY

As part of the Council Urban Roads and Drainage Improvement Policy 2019, Bass Coast Shire Council (Council) is currently in the planning and investigation stage of a proposed road and drainage upgrade project for the Surf Beach and Sutherland Bay estate on Phillip Island (Figure 1).

The roads in the estate are mostly gravel with above ground drainage infrastructure (e.g. table drains), which often hold water following rain, providing habitat for mosquitoes, amphibians and other local fauna. The estate's drainage system currently has seven outfall locations (Figure 2). The proposed upgrade will seal the road, construct other associated infrastructure (e.g. footpaths and traffic management) and to replace most of the existing drainage/table drains with underground drainage pipes and concrete kerb and channel.

The outfalls to the north currently collect stormwater that has crossed under Phillip Island Road which then flows onto a private farm through natural gullies, storage dams and wetlands, before discharging into Western Port Bay. Council is working with the landowner to investigate the potential on-farm construction of new / upgraded water storages, additional stormwater treatment and habitat wetlands and associated infrastructure.

Aquatica Environmental was engaged by Council to undertake an aquatic fauna due diligence assessment for the project, focusing especially on amphibians, of which estate residents have expressed concern over. The purpose of the assessment was to provide sufficient information for Council to understand the potential presence of aquatic fauna species in the project area (particularly amphibians), the potential policy and legislation implications, develop initial mitigation measures to protect the aquatic environment and outline additional future studies that may be required to fill date gaps so that Council could allocate sufficient budget for those tasks.

The purpose of the assessment was to provide sufficient information for Council to understand the potential presence of aquatic fauna species (particularly amphibians), potential policy and legislation implications and assists Council to minimis impacts and allocate sufficient budget for any other future studies that may be required any identified date gaps. The assessment included a desktop review of available aquatic biodiversity information and a site inspection.

The desktop review returned 49 freshwater, estuarine or marine aquatic fauna species as either occurring, potentially occurring or potentially having habitat within 10 kilometres of the project area including 38 fish, eight amphibians, one aquatic mammal, one aquatic reptile and one aquatic invertebrate (Appendix A). Included in the results were the following freshwater state and/or commonwealth protected species:

Fish

- Australian Grayling (*Prototroctes maraena*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat likely to occur within area*".
- Dwarf Galaxias (*Galaxiella pusilla*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat may occur within area*".
- Yarra Pygmy Perch (*Nannoperca obscura*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat may occur within area*".
- Flatback Mangrovegoby (*Mugilogobius platynotus*) – Estuarine only, FFG Act Endangered with 1 record from 2007

Amphibians

- Growling Grass Frog (*Litoria raniformis*) – EPBC Act and FFG Act Vulnerable, records of the species from 1991, 2001 and 2008, but not recorded in 2019, approximately 10.5 kilometres west of the estate at Swan Lake (PINP 2019).

Of these five species only two have actual records associated with Phillip Island. Flatback Mangrovegoby has a single record from 2007 associated with a small intertidal tributary downstream of Cowes Golf Club (Figure 5) and

Growling Grass Frog were recorded at Swan Lake, approximately 10.8 kilometres west of the estate in 1991, 2001 and 2008, but were not detected during extensive surveys across Philip Island in summer 2019 (PINP 2019)(Figure 4).

The site inspection was undertaken on the 19th and 20th September 2022. Inspection of the estate fond that almost the entire road system is boarded by vegetated roadside swales, many of which appeared to hold water for lengthy periods, as evident by a range of macrophytic flora. Common Froglet (*Crinia signifera*) were heard calling across the entire estate and it was considered likely a range of other common frog species likely utilise the estate's roadside drains. There was no other more substantial aquatic habitat (i.e. streams, dams, wetlands, etc.), no aquatic fauna was observed, and it is highly unlikely there would be habitat that could support fish in the estate.

Inspection of the farm found a range of aquatic habitat across the three estate outfalls including drainage lines, constructed dams and wetlands. Downstream of the farm lies salt marsh, mangrove estuary and Western Port Bay. It was considered likely the on-farm water bodies provide habitat for a range of aquatic fauna including amphibians, fish and reptiles and that the vegetated drainage channels between the wetlands/dams and estuary particularly important. The landowner mentioned they had seen smaller torpedo shaped fish in the dam at outfall C and Common Froglet was heard calling across the farm during the inspection.

Based on the desktop review and site inspection the following protected species were assess as '*possibly*' present in or immediately downstream of the project aera:

- Growling Grass Frog: Unlikely in the estate, due to a lack of suitable habitat. There is suitable habitat on the farm in its dams, wetlands and drainage lines.
- Flatback Mangrovegoby: Unlikely to occur in the estate or on the farm. There is suitable habitat in the downstream receiving waterways (i.e. the mangrove estuary).

Assessment of potential impacts by the project included in the estate included:

- Injury and mortality of individuals that are resident at the time of earthworks, excavation, construction, dewatering, etc.
- Entrapment of individuals in works structures such as trenches, pits, etc.
- The loss of habitat due to the removal of the roadside swales.
- The loss of connectivity for movement and dispersal between retained habitat areas.

In addition to the potential impacts listed above, and specific to the waterways on the farm, potential impacts may also include:

- The extension of these already listed potential impacts to other resident aquatic fauna such as fish and reptiles (assuming present).
- The stranding of aquatic fauna in the dams should they require dewatering as part of any infrastructure construction.

Consideration will also need to be given to the potential for increased discharges of freshwater and urban pollutants the estuary and its impacts on the resident flora and fauna.

Based on the findings of the assessment and including the implementation of the suggested impact management and mitigation measures the following next steps should be given consideration by BCSC:

- Undertake an aquatic fauna survey in waterways on the farm to determine what species are currently present. The aim of the survey should be to further inform and guide the design of new infrastructure and habitat to suit those species currently or potentially.
- As part of the aquatic fauna survey undertake an amphibian survey to assess for the presence of Growling Grass Frog another species of amphibian. The ideal seasonal timing for Growling Grass Frog survey is between October and December when they are breeding and calling.

- Undertaker hydrological assessment to determine whether potential additional discharges of freshwater and pollutants may be an issue for the saltmarsh and estuary environments downstream.
- Prior to the commencing works engage a suitably qualified and licenced aquatic ecologist to review and provide feedback on concept designs with regards to avoiding and minimising potential impacts to aquatica flora and flora and to assist with guiding the designs to be environmentally sensitive through the development process.

  Prior to any aquatic habitat being directly impacted by the works (i.e. exaction, dewatering, etc.) BCSC should engage a suitably experienced and licenced ecologist to undertake a pre-work clearance, salvage and relocation of any resident impacted aquatic fauna. For the estate's roadside swales and any smaller drainage lines this would involve having the ecologist present during initial earth / clearance works to salvage any encountered aquatic fauna. For the larger water bodies that may require deep watering (i.e. the on-farm dams) this would involve initial netting and trapping prior to dewatering, to remove as many fauna possible, and salvaging of any remaining trapped fauna at the last ages of the dewatering.
- Prior to undertaking any salvage, suitable relocation sites should be identified and approval potentially sort from DELWP and/or the VFA. Generally, so long as aquatic fauna are released to a nearby and connected waterway, the works can be done under a licenced aquatic ecologist's permits and approvals. If no such waterway is present, project-specific approval may need to be sort from DELWP and the VFA TEP. This would typically require that a formal salvage and translocation plan is developed for approval by the VFA TEP.
- Stage construction so that works 'ideally' occur the lower rainfall and therefore lower surface water time of year when aquatic habitat is contracted and aquatic fauna less likely present in larger numbers. This can vary seasonally, however, BOM rainfall data from Rhyll indicated that December to March are historically the lower rainfall months. Mid-summer through to late winter (January to about July) is also the time of year when amphibians are generally less active. Accordingly, in consideration of both seasonal ranges and the least impact to amphibians, works should occur at the lower risk rainfall period between about January to May.
- Ensure that a suitably qualified and experienced aquatic ecologist is available and on call during the works in case aquatic fauna is encountered, injured or trapped in instream structures and requiring salvage.

2. INTRODUCTION

2.1 Background

As part of the Council Urban Roads and Drainage Improvement Policy 2019, Bass Coast Shire Council (Council) is currently in the planning and investigation stage of a proposed road and drainage upgrade project for the Surf Beach and Sutherland Bay estate on Phillip Island (Figure 1).

The roads in the estate are mostly gravel with above ground drainage infrastructure (e.g. table drains), which often hold water following rain, providing habitat for mosquitoes, amphibians and other local fauna. The proposed upgrade will seal the road, construct other associated infrastructure (e.g. footpaths and traffic management) and to replace most of the existing drainage/table drains with underground drainage pipes and concrete kerb and channel.

The estate's drainage system currently has seven outfall locations (Figure 2), including three to the north (A-C) and four to the south (D-G).

The outfalls to the south (ocean side) line up with the existing outfalls where they flow into the existing vegetation / wetlands, then over rock beaching, discharging to the ocean. Council propose to retain / enhance the outfalls with minimal impact to existing vegetation.

The outfalls to the north currently collect stormwater that has crossed under Phillip Island Road which then flows onto a private farm through natural gullies, two storage dams and wetlands, finally discharging into Western Port Bay. Council is currently working with the landowner to either have the proposed upgraded outfalls located in drainage easements or a lease agreement, but maintaining their current locations. Council's current proposal includes the potential installation of new and / or upgrading of existing farm wetlands to improve the water re-use quality for the farm. The proposal is also looking to potentially modify the existing farm dam at outfall A to allow for the wetlands or bypass structures and the construction two additional storages on outfalls B and C, also for on-farm use.

The Department of Transport (DoT) have indicated that they would prefer that any proposed outfall infrastructure, such as wetlands, not be installed within 40 metres of the existing road reserve to allow for future road widening or service relocations (Figure 3).

Aquatica Environmental was engaged by Council to undertake an aquatic fauna due diligence assessment for the project, focusing especially on amphibians, of which estate residents have expressed concern over.

Figure 1 Locality Plan (Source: Council)

Figure 2 Drainage outfalls (Source: Council)

Figure 3 40 metre buffer on north side of Phillip Island Rd (Source: Council)

2.2 The Project Area

The project area for the assessment encompassed the Surf Beach and Sutherland Bay estate which lie on the south-eastern side of Phillip Island, approximately 6.1 kilometres west of San Remo and 6.4 kilometres southeast of Cowes (Figure 2). This assessment has also given consideration to the privately owned farm located to the north of the estate, which is earmarked to potentially received stormwater infrastructure, treatment wetland/s and water storages as part of the project.

Stormwater outfall to the north of the estate (i.e. outfalls A, B and C in Figure 2) discharge into dams (outfalls A and C) and drainage lines (outfall B) on the farm, ultimately discharging into Swan Bay and Churchill Island Marine Park at Swan Corner. Stormwater outfalls to the south of the estate discharge directly to the ocean-side of the estate, into Sunderland Bay (outfall D) and Bass Strait (outfalls E, F and G)(Figure 2)

2.3 Scope Of Work

This project included the following scope of work:

> **Task 1: Project inception meeting** - the aim of the meeting was to clarify and confirm the scope of work, roles responsibilities and communication protocols; confirm the project timing and milestones; confirm site access, conditions, etc. for a site inspection and meetings; Council to hand over any relevant project information; and Aquatica Environmental to highlight any initial data/information gaps and/or clarifications.

Task 2: Desktop Review - A review of relevant databases, literature available information was undertaken to determine any recorded, mapped, or modelled information relating to aquatic fauna and/or rare or protected aquatic species and communities relevant to the project area, particularly any listed under relevant commonwealth or state policy and legislation

Task 3: Site Inspection - Completion of a two-day site inspection confirm and validate the results of the data and literature review, visually assess the quality and quantity of aquatic habitat in and near the bridge against the key habitat requirements of rare or protected species identified during the data and literature review, assist in assessing the requirement to undertake targeted surveys and to collect reference photographs of the project area, aquatic, and other relevant features.

Task 4: Reporting - Completion of this aquatic fauna due diligence assessment summary report.

2.4 Purpose

The purpose of the assessment was to provide sufficient information for Council to:

- Understand the potential presence of aquatic fauna species in the project area (particularly amphibians).
- Understand the potential policy and legislation implications.
- Develop initial mitigation measures to protect the aquatic environment.
- Outline additional future studies that may be required to fill date gaps so that Council could allocate sufficient budget for those tasks.

2.5 Assumptions and Limitations

This assessment and report are based on the following assumptions and limitations:

- This assessment and report have been developed based on publicly available desktop information and a single site inspection. No surveys or assessments were completed.
- The assessment effort, combined with information available from other sources, is considered suitable to assess the overall aquatic fauna values potentially present at bridge project area.
- Other sources of information concerning ecological and biodiversity values in the study area may exist (e.g. unpublished reports by private consultancies not available to Aquatica Environmental at the time of preparing this report). More detailed assessments of the study area (if required in the future) may require sourcing additional materials.
- The site inspection was undertaken from publicly accessible points near the bridge only. Privately owned land was only accessed were landowner permission was obtained by Council.
- The Likelihood of Occurrence Assessment (Section 4.3) is to be used as a guide and is not to be used as indicating actual species presence or absence.
- The absence of detection of the threatened species during the assessment does not mean absence of the species in the project area. Where possible we have assessed the 'likelihood of occurrence' of potential rare and threatened species that may occur in the project area.
- The information outlined in this report relies on the accuracy of biodiversity database information, GIS layers and spatial imagery. To minimise potential errors, the most current available data was obtained from relevant sources.

3. METHODOLOGY

3.1 Desktop Review

To gain an understanding of the aquatic fauna values of the project area Aquatica Environmental undertook a desktop review of the project area, plus a search buffer to cater for mobile/migratory species (the study area). The desktop review included a review of the following sources of information:

- The Commonwealth Department of Environment's Protected Matters Search Tool (PMST) for matters of national environmental significance (MNES) using a 10 kilometre search radius on the project area (DAWE 2022);
- The Department of Environment, Land, Water and Planning (DELWP) Victorian Biodiversity Atlas (VBA) using a 10 kilometre search radius on the project area (DELWP 2022a);
- Pest, diseases and weeds (including Cinnamon Fungus and Phylloxera) listed under either the *Fisheries Act 1995* (Fisheries Act), *Catchment and Land Protection Act 1994*, (CaLP Act), etc.;
- An internet resources search for reports or other sources of information relevant to the aquatic biodiversity of the project and study area, which included:
  - A Phillip Island Nature Parks social media post regarding records of Growling Grass Frog on Phillip Island (PINP 2019);
  - A Phillip Island Nature Parks biodiversity pamphlet (PINP 2014); and
  - Review of Google Earth and Nearmap historical aerial imagery.

3.2 Site Inspection

A two-day site inspection was undertaken with the aim being to:

- Confirm and validate the results of database searches and desktop investigations for aquatic fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or *Flora and Fauna Guarantee Act 1988* (FFG Act);
- Visually assess the quality and quantity of aquatic habitat in and near the bridge against the key habitat requirements of rare or protected species identified during the data and literature review;
- Assist in assessing the requirement to undertake targeted surveys, as indicated from the desktop data and literature review;
- Collect reference photographs of the project area, aquatic and other relevant features; and
- Meeting with Council and the owners of the farm property to the north for the project area to discuss possible on-site stormwater, drainage and water harvesting options.

3.3 Likelihood of Occurrence Assessment

The likelihood of occurrence for rare or threatened species was assessed using the categories and criteria listed in Table 1, which have been developed by Aquatica Environmental.

Table 1Likelihood of Occurrence Assessment criteria

Likelihood	Criteria
Known	Recorded in project area during current or recent surveys within past 5 years
	Aquatic species recorded in connected waterbodies within 10 km of the project area during current or recent surveys within past 5 years

Likelihood	Criteria
Likely	Suitable habitat present in project area
	Project area within species' natural distribution range
	Recorded in project area more than 5 years ago but less than 25
	Suitable good quality habitat present in connected waterbodies within 5 km of the project area
	Recorded within the local area within the past 5 years
Possible	Aspects of habitat present and / or habitat modified
	Aspects of aquatic habitat in connected waterbodies within 10 km of the project area
	Project area within species' natural distribution range
	Numerous records within the local area between 5 to 25 years
	Recorded in project area more than 25 years ago
Unlikely	Limited aspects of habitat present in project area or in connected waterbodies within 5km of project area and / or habitat highly modified
	Historical records within 10 km of project area greater than 25 years
	Project area on fringe or outside species natural distribution range
	No historical records in project area
Very Unlikely	Habitat not present in project area
	Habitat for aquatic species not present in connected waterbodies in proximity to project area (within 5 km)
	Project area is located outside of species natural range
	Considered locally extinct
	No records of the species within the local area in the last 25 years
Unable to determine	Insufficient data to make a determination

4. RESULTS

4.1 Desktop Review

4.1.1 Existing Records

The desktop review returned 49 freshwater, estuarine or marine aquatic fauna species as either occurring, potentially occurring or potentially having habitat within 10 kilometres of the project area. This included 38 fish, eight amphibians, one aquatic mammal, one aquatic reptile and one aquatic invertebrate (Appendix A).

Included in the fish were 27 marine or estuarine only species, which were only given further consideration with regards to possible impacts of the project on the downstream estuarine and marine environments. Of the remaining 11 predominantly freshwater only fish species, their occurrence in the estate is highly unlikely as there is no aquatic habitat in the estate (excepting the roadside swales). However, there is some potential for their occurrence in the dams and waterways on the farming property to the north of the estate. See Section 4.3 for the likelihood of occurrence assessment.

Included in the desktop review results were the following freshwater state and/or commonwealth protected species:

Fish

- Australian Grayling (*Prototroctes maraena*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat likely to occur within area*".
- Dwarf Galaxias (*Galaxiella pusilla*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat may occur within area*".
- Yarra Pygmy Perch (*Nannoperca obscura*) – EPBC Act Vulnerable and FFG Act Endangered, no records within 10 kilometres, PMST assessed as "*species or species habitat may occur within area*".
- Flatback Mangrovegoby (*Mugilogobius platynotus*) – Estuarine only, FFG Act Endangered with 1 record from 2007

Amphibians

- Growling Grass Frog (*Litoria raniformis*) – EPBC Act and FFG Act Vulnerable, records of the species from 1991, 2001 and 2008, but not recorded in 2019, approximately 10.5 kilometres west of the estate at Swan Lake (PINP 2019).

Of these five species only two have actual records associated with Phillip Island (Flatback Mangrovegoby and Growling Grass Frog).

Flatback Mangrovegoby has a single record from 2007 associated with a small intertidal tributary downstream of Cowes Golf Club (Figure 5).

Growling Grass Frog were recorded at Swan Lake, approximately 10.8 kilometres west of the estate in 1991, 2001 and 2008, but were not detected during extensive surveys across Philip Island in summer 2019 (PINP 2019)(Figure 4). Common species including Brown Tree Frog (*Litoria ewingii*), Whistling Tree Frog (*Litoria verreauxii*), Eastern Common Froglet (*Crinia signifera*) and the Eastern Banjo Frog (*Limnodynastes dumerelii*) where the only species recorded across Philip Island during the 2019 surveys (PINP 2014; 2019).

All remaining species returned in the desktop review were common species.

An assessment of the likelihood of these protected species and communities occurring in the project area is provided in Section 4.3.

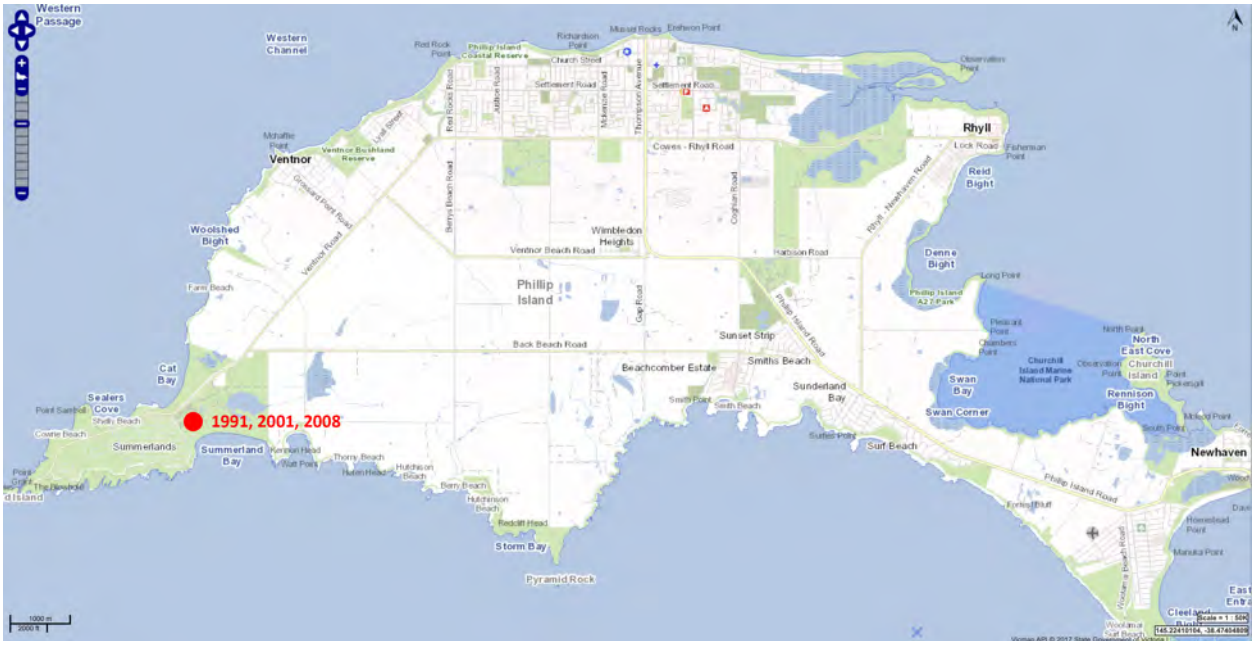

Figure 4 Growling Grass Frog record location (Source: VBA 2022)

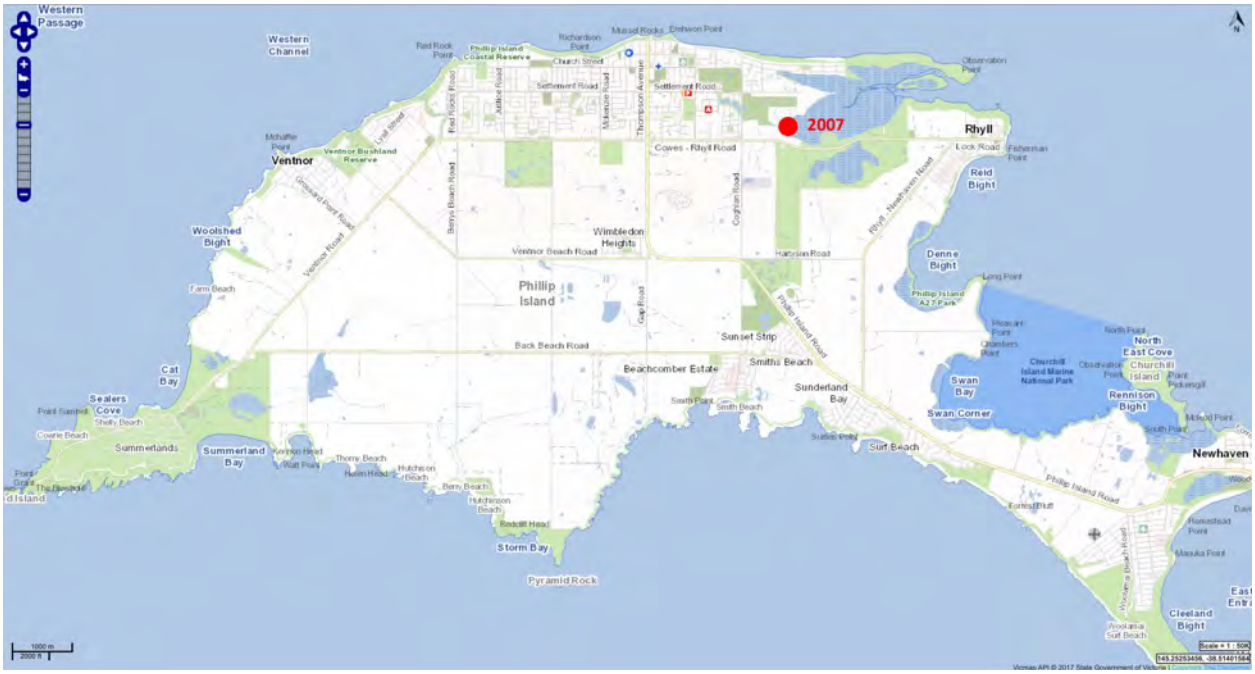

Figure 5 Mangrove Flatbackgoby records location (Source: VBA 2022)

4.1.2 Aquatic Habitat and Ecological Mapping

Although outside of the project area, the Western Port Ramsar Site lies to the immediate north (Figure 6) and receives stormwater from the outfalls A, B and C (Figure 2.) via the farm and into Swan Corner and Swan Bay and Churchill Island Marine Park.

DELWP's CoastKLit mapping shows a wide range of estuarine / marine biotopes[1] located in the vicinity of the estate's outfalls (Figure 7). Of particular relevance is the saltmarsh and reedbeds, mangrove and littoral zones to the north that will receive stormwater from the northern outfalls.

Figure 6 Western Port Ramsar Site boundary near the project area (Source: DSE 2013)

[1] Biotopes are recognisable assemblages of species that occur within particular environments and habitats. Each biotope has specific values and responses to environmental changes and their mapping and monitoring is useful for assessing the status of ecosystems.

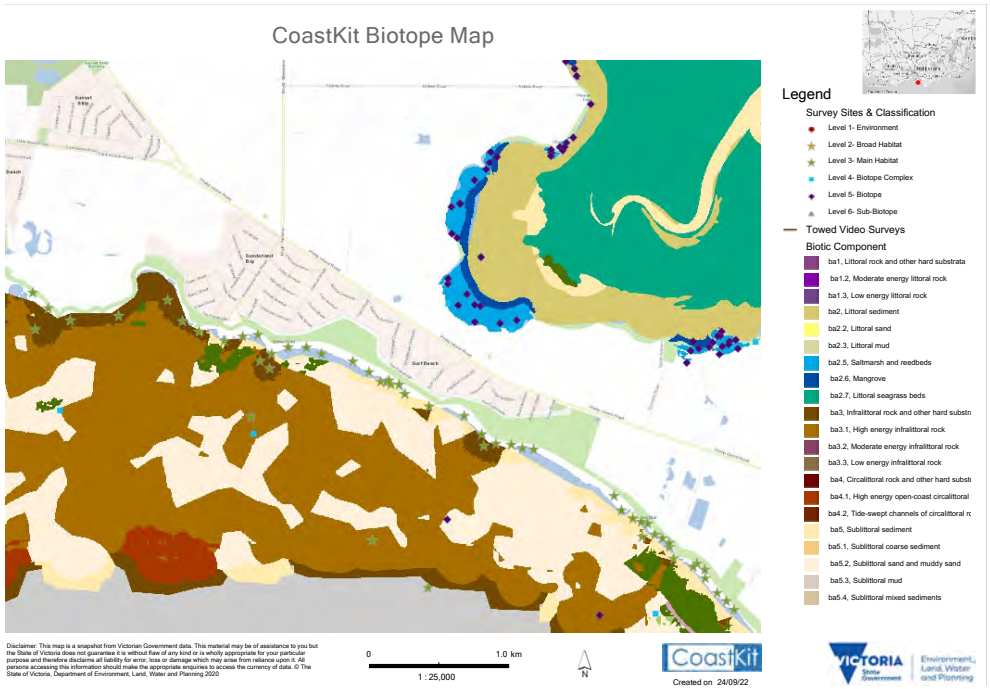

Figure 7 CoastKit biotope mapping (Source: CoastKit 2022)

4.2 Site Inspection

The site inspection was undertaken on the 19th and 20th September 2022. Weather conditions on the day of the inspection were cool, mild and mostly overcast, maximum daytime temperature of 19.9°C and night time low of 8.4°C. Winds were mostly westerly to 40km/h on the first day and east northeast to 28km/h on the second day. 6.6mm of rain fell over the tow days (BOM 2022).

The inspection included transecting all of the estate's roads by car, stopping at points where the swales were inundated and / or where amphibians were heard calling, and a landowner guided inspection of the farm. These two areas are covered separately over the following sections.

4.2.1 The Estate

The estate is built (residential), urbanised and transected by mostly unsealed roads. Almost the entire estate's road system is boarded by vegetated roadside swales, many of which appeared to hold water for lengthy periods, as evident by a range of macrophytic flora (Photo 1).

During the inspection, Common Froglet (*Crinia signifera*) were heard calling across the entire estate (Figure 8). Several local residents commented on the abundance of tadpoles and frogs in the swales, and on their properties, and that they had heard other species calling in addition to Common Froglet.

The outfall to the south / ocean side where short and steep, with limited aquatic habitat of any note (Photo 2). The outfall to the north, passed under Phillip Island Road via culvert before discharging onto the farm.

Overall the site inspection confirmed that aquatic habitat in the estate consisted only of the roadside swales. There was no other more substantial aquatic habitat (i.e. streams, dams, wetlands, etc.), no aquatic fauna was observed, and it is highly unlikely there would be habitat that could support fish in the estate.

Photo 1 Examples of inundated roadside swales what supported macrophytes and Common Froglet

Photo 2 Southern outfalls D, E and F (left to right)

Figure 8 Inspection transect (orange line) and points were Common Froglet was heard calling

4.2.2 The Farm

Each of the three outfall locations and their receiving water bodies and waterways on the farm were inspected.

Outfall A discharges to the largest dam on the farm and via a pair of weirs that control dam in / out flows from the outfall (Photo 3). Water discharging from the outfall or dam flows downstream through dense Melaleuca before discharging into the saltmarsh and estuary to the north (Photo 6). Aquatic habitat at the dam and the drain discharging to the estuary was dominated by pasture grasses and Melaleuca, was likely permanent and could suit a range of aquatic fauna including amphibians, fish and reptiles. Up and downstream passage between the dam and estuary, via the drain in particular, may be suitable for diadromous[2] fish such as Galaxiids, Gudgeons or eels. Common Froglet was hear calling.

Outfall B discharges to a shallow grassy gully through the middle of the farm (Photo 4), which also discharges to the saltmarsh and estuary to the north via dense Melaleuca. This waterway is likely ephemeral, drying during lower rainfall periods. Stock also had access to the drain, as was evident by substantial pugging. Common Froglet was heard calling in the gully.

Outfall C discharges to a less used and smaller dam set within a large wetland area. A shallow drain flows through the wetland area (Photo 5) however high flow events appear to overtop the drain entering the wider wetland. Similarly to outfall A up and downstream passage between the dam, wetland and estuary, via the drain in particular,

[2] *Migratory fishes which migrate between the sea and freshwater, potentially including catadromous, anadromous and amphidromic species.*

may be suitable for diadromous[3] fish. The landowner mentioned they had seen smaller torpedo shaped fish in the dam, suggestive of Galaxiids. Common Froglet was heard calling throughout the wetland area.

Photo 3 Outfall A looking at the storage dam (left) and weirs (right)

Photo 4 Outfall B looking upstream towards the estate (left)and downstream through the farm (right)

[3] *Migratory fishes which migrate between the sea and freshwater, potentially including catadromous, anadromous and amphidromic species.*

Photo 5 Outfall C looking upstream towards the dam and estate (left) and downstream (right)

Photo 6 Saltmarsh and estuary downstream of the farm and outfalls A, B and C

4.3 Likelihood of Occurrence Assessment

The results of the Likelihood of Occurrence Assessment for the state and/or commonwealth protected species identified in Section 4.1 are detailed in Appendix B.

It is important to note that the assessment is based on historical records and information only. As far as the desktop review was able to ascertain, there have been limited / no recent aquatic surveys undertaken at waterways in the estate or on the farm. Accordingly, it may be prudent to underate an aquatic biodiversity or targeted survey to gain a more current understanding of the aquatic biota (especially amphibians) present in the project area

In summary the initial assessment found the following:

- Species possibly present at times due to nearby records and suitable habitat:
  - Growling Grass Frog: Although unlikely in the estate, due to a lack of suitable habitat, there is suitable habitat on the farm in its dams, wetlands and drainage lines. With the species recorded on Philip Island at Swan Lake as recent as 2008 and no known amphibian surveys having been undertaken on the farm, the species could possibly be present.
  - Flatback Mangrovegoby: Although unlikely to occur in the estate or on the farm, there is a record on Philip Island and suitable habitat in the downstream receiving waterways (i.e. the mangrove estuary) and there appears to have been no recent surveys near the project aera. Possible that is present the species could be impacted if there are significant changes to hydrology due to the proposed works and further development of the estate.
- The remaining state or commonwealth protected species identified during the desktop review (Section 4.1) were assessed as highly unlikely or unlikely to occur due to a lack of recent or nearly records and suitable habitat.

Although not protected under the FFG Act or EPBC Act, there is a range of common amphibian species that are present or likely present within the estate. It is likely these common species are also widespread throughout the estate.

Similarly, it is likely fish are present within water bodies on the farm given there is suitable habitat And connectivity to the estuarine, marine environments downstream and the landowner noted they had seen fish in the dam at outfall C. It is unlikely these fish passage upstream beyond the farm into the estate, due to culverts and a lack of suitable habitat within the estate. However, the potential for aquatic fauna species protected under the FFT Act, EPBC Act, Fisheries Act or Wildlife Act. Particularly on the farm's water bodies, cannot be completely excluded due to a lack of records of recent or nearby surveys.

5. POTENTIAL IMPACTS

The potential impacts detailed herein are preliminary, nonspecific and broad in nature, and based on other similar projects. The actual impacts the project may resulting will be dependent on the actual works that are undertaken. I.e. whether the roadside swales are retained or removed, the overall area of impact and timing of works, the requirement for dewatering of the on-farm dams, etc.

Specific to the estate and upgrading of the roads and roadside swales, potential impacts to the resident common amphibian species population may include:

- Injury and mortality of individuals that are resident at the time of earthworks, excavation, construction, dewatering, etc.
- Entrapment of individuals in works structures such as trenches, pits, etc.
- The loss of habitat due to the removal of the roadside swales.
- The loss of connectivity for movement and dispersal between retained habitat areas.

In addition to the potential impacts listed above, and specific to the waterways on the farm, potential impacts may also include:

- The extension of these already listed potential impacts to other resident aquatic fauna such as fish and reptiles (assuming present).
- The stranding of aquatic fauna in the dams should they require dewatering as part of any infrastructure construction.

Further, outside of the area of potential construction and works (i.e. the estate and farm) consideration will need to be given to the potential impact of additional freshwater and pollutant discharges to the downstream receiving environment. Specifically, potential impacts to the saltmarsh and estuarine environments.

The following are an outline of more general impacts potential impacts that apply to any project that involves works on/in a waterway:

- Sedimentation and erosion from during construction and post works: Sedimentation/siltation and subsequently reduced water quality are a key threat to many aquatic biota and their habitat. Sediment can be discharged into downstream receiving waterways during construction from activities such as vegetation/structure removal, excavation, earthworks, etc. In particular higher rainfall / flow events during works, have the potential to dislodge and distribute project sediments further afield and impact upon surface water quality and aquatic habitat.
- Loss/removal of aquatic habitat and aquatic / riparian vegetation: Removal of aquatic and riparian habitat may result in a reduction in aquatic habitat quality (reduced cover/shading) and may contribute to the cumulative reduction in the estate's, swales, farm's waterways and dames and the saltmarsh and estuary.
- Unmanaged disturbance to retained aquatic habitat: Unmanaged works that impinge on retained aquatic may occur beyond the actual works area. If not appropriately protected/fenced, these works have the potential to result in further disturbance to waterways and water bodies.
- Contamination of waterway: Reduced water quality is recognised as a key threat to many aquatic biota. Spills or flood inundation of fuels, oils and other construction-related contaminants are possible during works and have the potential to impact water and habitat quality in the downstream waterways and nearby estuarine environment.
- Reduced downstream water quality: Construction poses a risk to water quality through the disturbance from earthworks, the removal of vegetation, suspension of sediments or the release of pollutants into the waterway. This has the potential to impact both immediate and downstream aquatic habitat areas and downstream estuarine environment.

5.1 FFG Act Potentially Threating Processes

Although unlikely that there are FFG Act-listed species within the estate there is the potential for their presence on the farm and / or the downstream receiving waterways of the estuary. Of particular concern for the salt marsh and mangrove components of the estuary is the potential for increasing pressure from the further urbanisation of the estate such as increased freshwater discharge and potential discharge of pollutants from the urban environment.

The following processes (i.e. impacts) have been listed as "*potentially threatening processes*" in accordance with Section 10 of the FFG Act (DELWP 2022b), most relevant to the downstream receiving environment , and have been given consideration in the relevant mitigation measures (see Section 6):

- Alteration to the natural flow regimes of rivers and streams.
- Input of organotins to Victorian marine and estuarine waters.
- Input of petroleum and related products into Victorian marine and estuarine environments.
- The discharge of human-generated debris into Victorian marine or estuarine waters.

6. MITIGATION MEASURES TO AVOID AND REDUCE IMPACTS

This section includes a range of possible avoidance and mitigation measures to address the potential impacts outlined in Section 5. Similarly to the potential impacts, the mitigation measures detailed herein are preliminary, nonspecific and broad in nature, and based on other similar projects. The actual mitigation measures the project may need to employ will be dependent on the actual works that are undertaken.

The potential impacts of most concern for aquatic biota are those related to habitat loss, water quality and passage, all of which could possibly occur during the construction phase of the project and should be incorporated into the contractor's Environmental Management Plan (EMP).

6.1 Design / Pre-construction Phase

- Design the upgrade, roads, stormwater drainage infrastructure to limit the loss / removal of existing roadside swales
- Design the project so that works area/s to have the smallest footprint possible.
- Water Sensitive Urban / Road Design is to be applied to the project.
- Water quality monitoring should be undertaken to collect baseline data at monitoring sites downstream of the works areas and / or each point source (or flow) discharging the project area to downstream receiving environments.
- 2-3 daily samples taken immediately prior to the commencement of constitution should be sufficient (i.e. taken during site setup) and should include those parameters outlined in Table 2 (this data may already be available from the current works).

Table 2 Water quality monitoring parameters and methods

Parameter	Units	Method
Turbidity	NTU	Measure with on-site meter
Electrical Conductivity	µS/cm	Measure with on-site meter
pH	pH units	Measure with on-site meter
Dissolved oxygen	% or mg/L	Measure with on-site meter
Temperature -	°C	Measure with on-site meter
Litter (definition, including solid inert waste)	Visual (prevent litter from entering waterways and drainage systems)	
Oils and Greases	Visual (No visible free oil or greases)	
Rainfall	mm per day	Measure with on-site meter capable of logging rainfall at a minimal interval of 10 minutes

6.1.1 Construction Phase

- Stage construction so that works 'ideally' occur the lower rainfall and therefore lower surface water time of year when aquatic habitat is contracted and aquatic fauna less likely present in larger numbers. This can vary seasonally, however, BOM rainfall data from Rhyll indicated that December to March are historically the lower rainfall months (Figure 9). Mid-summer through to late winter (January to about July) is also the time of year when amphibians are generally less active. Accordingly, in consideration of both seasonal ranges and the least impact to amphibians, works should in the lower risk rainfall period occur between about January to May.

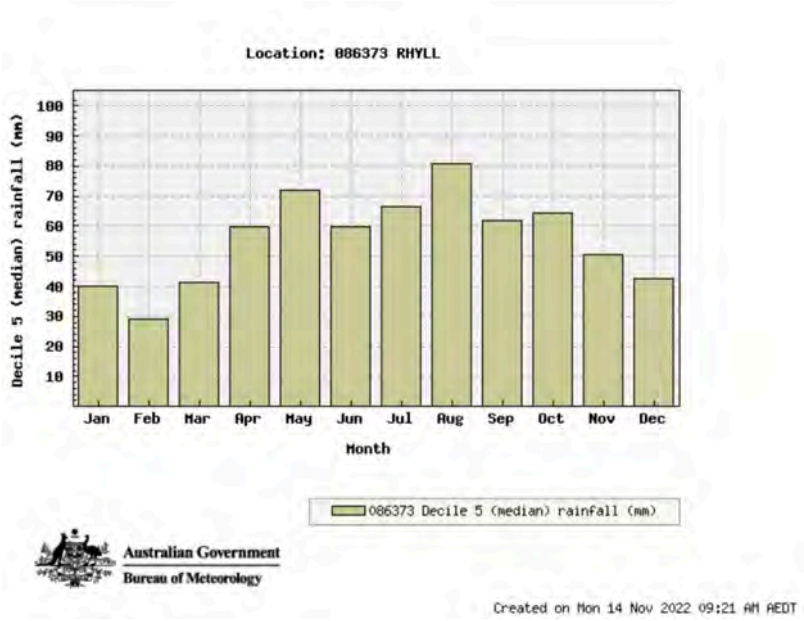

Figure 9 Median monthly rainfall between 1990 and 2022 at Rhyll (BOM 2022)

- Prior to any aquatic habitat being directly impacted by the works (i.e. exaction, dewatering, etc.) BCSC should engage a suitably experienced and licenced aquatic ecologist to undertake a pre-work clearance, salvage and relocation of any resident impacted aquatic fauna.

  For the estate's roadside swales and any smaller drainage lines this would involve having the aquatic ecologist present during initial earthworks or excavations to salvage any encountered aquatic fauna.

  For the larger water bodies that may require deep watering (i.e. the on-farm dams) this would involve initial netting and trapping prior to dewatering, to remove his many fauna possible, and active salvaging of any remaining trapped fauna at the last ages of the dewatering.

- Prior to undertaking any salvage, suitable relocation sites would need to be identified and approval potentially sort from DELWP and/or the Victorian Fisheries Authority (VFA). Generally, so long as aquatic fauna are released to a nearby and connected waterway, the works can be done under a licenced aquatic ecologist's permits and approvals. If no such waterway is present, project-specific approval may need to be sort from DELWP and the VFA's Translocation and Evaluation Panel (TEP). This would typically require that a formal salvage and translocation plan is developed for approval by the VFA TEP.
- Protect retained/unimpacted aquatic and riparian habitat by minimising the construction footprint and installing No Go Zone (NGZ) exclusion and sediment fencing to prevent ingress to protect areas.
- Stockpiles of soils, materials, and all fuels/oils/chemicals and equipment should be stored away from the swales, drainage lines or other water bodies.
- Fuels, oils and chemicals should be stored in a suitably bunded and protected location.
- The project's environmental management plan (EMP) should include provision for weather and rainfall monitoring using data from the Bureau of Meteorology and/or Corangamite Catchment Management Authority.
- Any construction works that occur in / near the estate or farm existing surface water and / or drainage infrastructure should include emergency measures within the project's EMP to as far as reasonably practical protect earthworks and works areas from inundation and/or protocols for site closure for predicted higher rainfall and stormwater flow.
- Implement disease/pest/hygiene controls for all plant and personal protective equipment (PPE, i.e. boots) entering site.
- Measures should be implemented to filter any onsite surface water before release to the receiving environment. Water discharged from any works area should not detrimentally impact the quality of water in the receiving waterways and water quality monitoring should occur to confirm the relevant

water quality requirements of the EPA's Environmental Reference Standard for "*Western Port segment, Entrances and North Arm"*(ERS Table 5.14; EPA 2021).

- For any temporary structure, erosion and sediment controls are to be in place to minimise the amount of erodible surfaces during construction.
- Ensure that a suitably experienced and qualified ecologist is available and on call during the works in case fauna is encountered, injured or trapped in structures and requiring salvage.
- Reinstate aquatic and riparian habitat (after completion of the works.

6.1.2 Operational Phase

- Following completion of all construction, monitoring of revegetation, weeds, earthworks/structures and any remaining controls should continue for a period of time until BCSC has deemed the project area stabilised and the risk of further impact/s negligible.

7. POLICY AND LEGISLATION IMPLICATIONS

One EPBC and FFG Act protected species (Growling Grass Frog) and one FFG Act only protected species (Flatback Mangrovegoby) were assessed as 'possibly' present in or downstream of the project area. Table 3 provides and brief outline of the policy and legislation that is relevant to those species and for the overall project relating to the protection of the waterway and its aquatic biota.

Table 3 Policy and legislation implications

Legislation / Policy	Criteria	Potential Implications for Project
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance. There are nine matters of national environmental significance (MNES) to which the EPBC Act applies, these are: • world heritage properties • national heritage places • wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed) • nationally threatened species and ecological communities • migratory species • Commonwealth marine areas • the Great Barrier Reef Marine Park • nuclear actions (including uranium mining) • a water resource, in relation to coal seam gas development and large coal mining development.	No EPBC Act listed species currently known to be present. The likelihood of occurrence assessment determined Growling Grass Frog is 'possibly' present in waterways on the farm (i.e. not in the estate). Should a survey determined that Growling Grass Frog was present BCSC would need to undertake a significance of impact assessment in accordance with the significant impact guidelines (Department of Environment 2013) to determine whether the proposed works would need to be referred to the federal minister.

Legislation / Policy	Criteria	Potential Implications for Project
State		
Flora and Fauna Guarantee Act 1988	The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and *FFG Amendment Act 2019* (FFGA Act) were established to provide a legal framework for enabling and promoting the conservation of all Victoria's native flora and fauna, and to enable management of potentially threatening processes. One of the main features of the FFGA Act is the listing process, whereby native species and communities of flora and fauna, and the processes that threaten native flora and fauna are listed in the schedules of the Act. This assists in identifying those species and communities that require management to survive and identifies the processes that require management to minimise the threat to native flora and fauna species and communities within Victoria.	The possibly present Growling Grass Frog and Flatback Mangrovegoby are both protected under the FFG Act. Schedule 3 of the FFG Act potentially threatening process relevant to the project that have been given consideration in Sections 5 and 6). In particular, the project will need to ensure that works do not impede aquatic biota passage up or downstream. Should any FFG Act protected fauna handling be required (i.e. salvage or relocation) a permit under the FFG Act to 'take protected fauna' will be required[4].
Wildlife Act 1975	The *Wildlife Act 1975* forms the procedural, administrative and operational basis for the protection and conservation of native wildlife within Victoria. The purposes of the Act are: 1. To establish procedures in order to promote: • The protection and conservation of wildlife; and • The prevention of taxa wildlife from becoming extinct; and • The sustainable us of and access to wildlife; and 2. To prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife. This Act often sits as the default reference for other associated policies regarding wildlife management or other Victorian legislation. For example, the operation of the FFG Act often needs to be considered in conjunction with the provisions and procedures of the Wildlife Act, as some wildlife will be both protected wildlife under the Wildlife Act and listed threatened species under the FFG Act. With the exception of 'pest animals' declared under the CaLP Act or wildlife declared to be 'unprotected wildlife', the Wildlife Act defines certain wildlife as 'protected wildlife'. It is an offence to hunt, take or destroy threatened or protected wildlife without authorisation.	In accordance with this Act, if any native wildlife is located within any area proposed for clearing / excavation / impact (e.g. amphibians in the roadside swales), a permit is required from DELWP to take or destroy it, including salvage and translocation. This will also apply to any works on/to waterways that may result in an impact to wildlife, including amphibians, reptiles, mammals, waterbirds, FFG Act listed invertebrates, etc, but excluding fish. If native vegetation is proposed to be impacted and may provide habitat for wildlife by the works, the specific impacts of these works should be considered on a case by case basis with reference to this legislation.

[4] Aquatica Environmental holds all of the require FFG Act, Wildlife Act, Fisheries Act, etc approvals and permits should aquatic fauna handling or salvage and relocation be required.

Legislation / Policy	Criteria	Potential Implications for Project
Fisheries Act 1995	One of the objectives of the *Fisheries Act 1995* (Fisheries Act) is to protect and conserve fisheries resources, habitats and ecosystems including the maintenance of aquatic ecological processes and genetic diversity. One of the provisions of this Act is that a person must not, except as permitted by or under the Fisheries Act or any other Act, create an obstruction across or within a bay, inlet, river or creek or across or around an inter-tidal flat that: "(a) fish will or could be blocked and left stranded; or (b) immature fish will or could be destroyed; or (c) the free passage of fish will or could be obstructed." This act is relevant if there is a likelihood that a development will impact on fish habitat and aquatic ecological processes. Similar to the FFG Act, action statements must outline the process that will be implemented to ensure the long-term protection of fish habitat and/or specific species In addition, Victoria has listed a number of species and genera as noxious under Section 75 of the Fisheries Act. By declaring a particular species noxious, the Victorian Government applies regulations to control the use and potential spread of such animals.	The project will need to ensure that works do not impede aquatic biota passage up or downstream. This is not relevant in the estate, but may apply on the farm if changes to the farm's waterways and water bodies are proposed. If fish handling, capture or translocation is required (i.e. capture and release of entrapped fish in any instream construction structures such an Application for a General Permit for the purpose of research (this includes capture and release or translocation) may be required from the VFA's TEP. Any noxious listed fish that may be encountered in a works area/structure, will require appropriate salvage and euthanising/disposal to prevent their re-release/spread.
Catchment and Land Protection Act 1994	The Catchment and Land Protection Act 1994 (CALP Act) is the principal legislation relating to the management of pest plants and animals in Victoria. Under this Act, landowners have a responsibility to avoid causing or contributing to land degradation, including taking all reasonable steps to conserve soil, protect water resources, eradicate regionally prohibited weeds, prevent the growth and spread of regionally controlled weeds and where possible, eradicate established pest animals, as declared under the Act. Under the CaLP Act it is prohibited to: • Carry out extractive activity unless an authority has been issued; • Move vehicles or machinery from land on to a road without first ensuring precautions are taken to ensure the equipment is free of noxious weeds; • Remove soil, sand, gravel or stone which comes from land on which noxious weeds grow. The Act outlines and guides the control of state and regionally prohibited weeds and prohibited pest animals.	Measures will need to be outlined in the project's EMP that detail how the spread of disease, weeds and pests will be managed during construction.
Environmental Protection Act 1970	*The Environmental Protection Act 1970* (EP Act) is Victoria's primary environment protection legislation, with a basic philosophy of preventing pollution and environmental damage by setting environmental quality objectives and establishing programs to meet them. Under the EP Act State environment protection policies (SEPPs) are established to provide more detailed requirements and guidance for the application of the Act to Victoria. The SEPPs administered by the Environment Protection Authority (EPA) cover air, land and groundwater, noise and water.	The EPA administers several regulations under this Act that include, but are not limited to, prescribed waste, noise, vehicle emissions, pollution of water by oil and noxious substances. Any works that may include a potential discharge to a waterway, emissions or noise may require additional consideration of this legislation.

Legislation / Policy	Criteria	Potential Implications for Project
Water Act 1989	The *Water Act 1989* (Water Act) provides the framework for allocating surface water and groundwater throughout Victoria. In Section 67 of the Act it states that works on waterways, such as the construction of dams, weirs and erosion control structures, are licensed in accordance with the Act. The Act allows conditions to be included in a works licence to protect the "environment, including the riverine and riparian environment". The purpose of the Water Act is to: • State the law relating to water in Victoria; • Maximise community involvement in the making and implementing for the use of conservation or management of water resources; and • Provide formal means for the protection and enhancement of the environmental qualities of waterways.	Under the Act approval must be sort from the local catchment management authority (CMA) and a "Works on Waterways Permit" is required to "construct, alter, operate, remove or decommission: • any works on a waterway a waterway; or • a bore.

8. CONCULSION AND RECOMMENDATIONS

The desktop review and site inspection found there was negligible aquatic habitat within the estate, with the exception of the constructed roadside swales that support a range of common frog species. During the site inspection large numbers of Common Froglet were heard calling in the roadside swales across the entire estate and it is likely there are other common species residing in the estate that we're not calling at the time. However, the estate is unlikely to support any other aquatic fauna such as fish or reptiles.

Conversely, the farm supports a wide range of aquatic habitat including two construct and vegetated the dams, wetlands, drainage channels, swampy saltmarsh and the downstream estuarine environment. It is probable the farm's dams support fish, with the land owners noting they had seen small torpedo shaped fish in the dam at outfall C, as well as a range of frogs and other aquatic fauna such as aquatic invertebrates and reptiles (i.e. turtles).

Overall, the desktop review returned 49 freshwater, estuarine or marine aquatic fauna species as either occurring, potentially occurring or potentially having habitat within 10 kilometres of the project area. This included 38 fish, eight amphibians, one aquatic mammal, one aquatic reptile and one aquatic invertebrate (Appendix A). Within the results were five state and/or commonwealth protected species (excluding all that were exclusively marine / oceanic) of which the following two were assessed as possibly present:

- Flatback Mangrovegoby – Estuarine only, FFG Act Endangered with 1 record from 2007. Suitable habitat occurs in the downstream receiving waterway (i.e. the estuary)
- Growling Grass Frog – Records of the species from 1991, 2001 and 2008, but not recorded in 2019, approximately 10.5 kilometres west of the estate at Swan Lake (PINP 2019). Suitable habitat occurs in the dams and drainage lines on the farm.

Upgrading of the estate's roads and stormwater Infrastructure should consider the potential retention of the roadside swales and/or the creation of new roadside aquatic habitat should storm water we moved underground. Design consideration should be given to the downstream implications from the proposal, namely the potential increasing volumes of freshwater and urban pollutants that may be discharged to the downstream receiving waterways on the farm and then estuary.

Additional water storages and surface water treatment infrastructure proposed for construction on the farm (i.e. gross pollutant traps, sediment basins, treatment wetlands, etc.) should be designed to mitigate any modelled increase in freshwater and pollutant discharges from the estate to protect the downstream receiving environment. This also presents opportune time to design and construct this infrastructure to also provide habitat for local aquatic fauna.

At the time of preparing this report there are unlikely to be any EPBC Act or FFG Act implications for the project, however, consideration will need to be given under the Wildlife Act for the humane salvage and relocation frogs within the estates roadside swales end any aquatic format that is currently resident in waterways on the phone (assuming those waterways why the watering as part of the works).

Based on the findings of the assessment and including the implementation of the suggested impact management and mitigation measures the following next steps should be given consideration by BCSC:

- Undertake an aquatic fauna survey in waterways on the farm to determine what species are currently present. The aim of the survey should be to further inform and guide the design of new infrastructure and habitat to suit those species currently or potentially.
- As part of the aquatic fauna survey undertake an amphibian survey to assess for the presence of Growling Grass Frog another species of amphibian. The ideal seasonal timing for Growling Grass Frog survey is between October and December when they are breeding and calling. Note, that while undertaking a frog survey on the farm it would be prudent and not additionally costly to also survey the estate, even if just to confirm the range of common species that are present.

- Undertaker hydrological assessment to determine whether potential additional discharges of freshwater and pollutants may be an issue for the saltmarsh and estuary environments downstream.
- Engage a suitably qualified and licenced aquatic ecologist to review and provide feedback on concept designs with regards to avoiding and minimising potential impacts to aquatica flora and flora and to assist with guiding the designs to be environmentally sensitive through the development process.
- Prior to any aquatic habitat being directly impacted by the works (i.e. exaction, dewatering, etc.) BCSC should engage a suitably experienced and licenced aquatic ecologist to undertake a pre-work clearance, salvage and relocation of any resident impacted aquatic fauna.

  For the estate's roadside swales and any smaller drainage lines this would involve having the aquatic ecologist present during initial earthworks or excavations to salvage any encountered aquatic fauna.

  For the larger water bodies that may require deep watering (i.e. the on-farm dams) this would involve initial netting and trapping prior to dewatering, to remove his many foreigners possible, and active salvaging of any remaining trapped fauna at the latest ages of the dewatering.
- Prior to undertaking any salvage, suitable relocation sites should be identified and approval potentially sort from DELWP and/or the VFA. Generally, so long as aquatic fauna are released to a nearby and connected waterway, the works can be done under a licenced aquatic ecologist's permits and approvals. If no such waterway is present, project-specific approval may need to be sort from DELWP and the VFA TEP. This would typically require that a formal salvage and translocation plan is developed for approval by the VFA TEP.
- Ensure that a suitably qualified and licenced ecologist is available and on call during the works in case aquatic fauna is encountered, injured or trapped in instream structures and requiring salvage.

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Appendix A Species records within 10km of the project area (the study area)

Common Name	Scientific Name	Status		Count of Sightings	Last Record	Source
		EPBC Status	FFG Status			
AMPHIBIANS						
Common Froglet	*Crinia signifera*			37	13/10/2020	VBA, PINP 2014/2019
Growling Grass Frog	*Litoria raniformis*	VU	VU	Unknown	2008	VBA, PMST, PINP 2014/2019
Pobblebonk Frog	*Limnodynastes dumerilii*			14	6/8/2012	VBA, PINP 2014/2019
Southern Brown Tree Frog	*Litoria ewingii*			83	13/10/2020	VBA, PINP 2014/2019
Southern Bullfrog (ssp. unknown)	*Limnodynastes dumerilii*			29	13/10/2020	VBA
Spotted Marsh Frog (race unknown)	*Limnodynastes tasmaniensis*			1	28/10/2003	VBA
Striped Marsh Frog	*Limnodynastes peronii*			1	28/10/2003	VBA
Whistling or Verreaux's Tree Frog	*Litoria verreauxii*			6	3/7/2012	VBA, PINP 2014/2019
FISH						
Australian Grayling	*Prototroctes maraena*	VU	EN			PMST
Black Bream	*Acanthopagrus butcheri*			1	6/10/1987	VBA
Blue Throated Wrasse	*Notolabrus tetricus*			35	20/6/2005	VBA
Blue-lined Leatherjacket	*Meuschenia galii*			1	8/3/2002	VBA
Brown Trout	*Salmo trutta*			1	1/1/1981	VBA
Common Galaxias	*Galaxias maculatus*			8	6/12/2007	VBA
Common Weedfish	*Heteroclinus perspicillatus*			2	6/3/2003	VBA
Dusky Morwong	*Dactylophora nigricans*			9	20/6/2005	VBA
Eastern Bluespot Goby	*Pseudogobius eos*			1	6/12/2007	VBA
Eastern Dwarf Galaxias	*Galaxiella pusilla*	VU	EN	-	-	PMST
Eastern Gambusia	*Gambusia holbrooki*			2	6/12/2007	VBA

Common Name	Scientific Name	Status		Count of Sightings	Last Record	Source
		EPBC Status	FFG Status			
Estuary Perch	*Percalates colonorum*			1	1/1/1975	VBA
Flatback Mangrovegoby	*Mugilogobius platynotus*		EN	1	3/5/2007	VBA
Flatheaded Gudgeon	*Philypnodon grandiceps*			2	6/12/2007	VBA
Globefish	*Diodon nicthemerus*			11	20/6/2005	VBA
Goldspot Mullet	*Liza argentea*			1	3/5/2007	VBA
Horse-shoe leatherjacket	*Meuschenia hippocrepis*			29	20/6/2005	VBA
Luderick	*Girella tricuspidata*			2	20/6/2005	VBA
Mado	*Atypichthys strigatus*			9	6/1/2003	VBA
Marblefish	*Aplodactylus arctidens*			13	20/6/2005	VBA
Old Wife	*Enoplosus armatus*			16	20/6/2005	VBA
Ornate Cowfish	*Aracana ornata*			1	19/6/2005	VBA
Purple Wrasse	*Notolabrus fucicola*			28	20/6/2005	VBA
Rough Leatherjacket	*Scobinichthys granulatus*			1	6/3/2003	VBA
Sea Sweep	*Scorpis aequipinnis*			30	20/6/2005	VBA
Shaw's Cowfish	*Aracana aurita*			3	8/3/2002	VBA
Sixspine Leatherjacket	*Meuschenia freycineti*			25	20/6/2005	VBA
Slender Ringtail	*Austrolestes analis*			1	4/12/2017	VBA
Smallmouthed Hardyhead	*Atherinosoma microstoma*			3	6/12/2007	VBA
Smooth Stingray	*Dasyatis brevicaudata*			2	4/4/2017	VBA
Smooth Toadfish	*Tetractenos glaber*			5	3/5/2007	VBA
Southern Shortfin Eel	*Anguilla australis*			10	6/12/2007	VBA
Spotted Galaxias	*Galaxias truttaceus*			1	6/12/2007	VBA
Toothbrush Leatherjacket	*Acanthaluteres vittiger*			15	20/6/2005	VBA

Common Name	Scientific Name	Status		Count of Sightings	Last Record	Source
		EPBC Status	FFG Status			
Yarra Pygmy Perch	*Nannoperca obscura*	VU	EN	-	-	PMST
Yellow-eye Mullet	*Aldrichetta forsteri*			1	3/5/2007	VBA
Yellowstriped Leatherjacket	*Meuschenia flavolineata*			18	20/6/2005	VBA
Zebra fish	*Girella zebra*			15	20/6/2005	VBA
INVERTEBRATES						
Riffle bug	*Microvelia (Austromicrovelia) peramoena*			1	23/11/1998	VBA
MAMMALS						
Water Rat	*Hydromys chrysogaster*			11	25/3/2007	VBA
REPTILES						
Eastern Snake-necked Turtle	*Chelodina longicollis*			4	6/12/2007	VBA

KEY

EPBC/FFG Act Status: CD = Critically endangered, VU = Vulnerable; EN = Endangered

Appendix B Likelihood of Occurrence Assessment of Protected Species

Common Name	Scientific Name	EPBC Act	FFG Act	Count of Signings	Last Record	Habitat Requirements	Habitat on Site?	Likelihood of Occurrence
Australian Grayling	*Prototroctes maraena*	VU	EN	None PMST – "Species or species habitat likely to occur within area"		A diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal estuaries or seas. Adults mostly inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones. Species is also associated with clear, gravel-bottomed habitats and muddy-bottomed, heavily silted habitats. Recorded over 100 km upstream from the sea (Department of the Environment 2021).	Yes	**Highly Likely** No records within 10 km and no suitable habitat in the estate or on the farm.
Dwarf Galaxias	*Galaxiella pusilla*	VU	EN	None PMST – "Species or species habitat may occur within area"		Occurs in slow flowing and still, shallow, permanent and temporary freshwater habitats such as swamps, drains and the backwaters of streams and creeks, often (but not always) containing dense aquatic macrophytes and emergent plants.	Neg[5]	**Unlikely** There are no records of this species within 10km of the area, though there are aspects of suitable habitat present.
Yarra Pygmy Perch	*Nannoperca obscura*	VU	EN	None PMST – "Species or species habitat may occur within area"		Generally occurs in slow-moving or still waters, such as pools in rivers and streams or in lakes, preferring waterways with abundant submerged and emergent aquatic vegetation, sometimes with wood debris.	Neg	**Unlikely** There are no records of this species within 10km of the area, though there are aspects of suitable habitat present.

[5] Neg = Negligible

Common Name	Scientific Name	EPBC Act	FFG Act	Count of Signings	Last Record	Habitat Requirements	Habitat on Site?	Likelihood of Occurrence
Flatback Mangrovegoby	*Mugilogobius platynotus*	-	EN	1	2007	Known to Inhabit soft silty areas in estuaries, usually amongst mangroves and is able to tolerate periods of freshwater.	No	**Possible** Suitable habitat occurs downstream of the farm in the saltmarsh / mangroves estuary stream of the farm.
Growling Grass Frog	*Litoria raniformis*	VU	VU	Multiple	2008	Prefer still or slow moving water with emergent vegetation around the edges and mats of floating and submerged plants. Can reside in artificial waterbodies, such as farm dams, irrigation channels and disused quarries.	No	**Possible (on the farm)** Only recorded on Philip Island at Swan Lake, however, suitable habitat is present and there no records of amphibian surveys on the farm. **Unlikely (in the estate)** due to lack of suitable habitat.

Key
EPBC/FFG Act Status: VU = Vulnerable; EN = Endangered

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