

Stage 1: Pipeline Options Analysis: Golden Beach Gas Project



June 2019



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# **EXECUTIVE SUMMARY**

Practical Ecology Pty Ltd was commissioned by CNC Project Management Pty Ltd (on behalf of GB Energy) to undertake a two-staged ecological assessment of three gas pipeline alignment options for the Golden Beach Gas Project, located between Golden Beach and Longford, Victoria. This report addresses Stage 1 of the project, a Pipelines Options Analysis, which provides a desktop and literature review of existing information and the findings of a preliminary site reconnaissance and targeted fauna surveys. The site reconnaissance was undertaken predominantly to assess fauna habitat and to commence targeted fauna surveys. No current detailed flora and/or vegetation surveying has been undertaken for this report. It relies upon ecological information collected in 2006, initial site reconnaissance and modelled database information. Detailed vegetation assessments are scheduled to occur at Stage 2 of the project.

A desktop and literature review was undertaken to review information relevant to the study area and likely flora and fauna species, ecological communities and any other relevant ecological values or issues pertaining to these areas. Eight Ecological Vegetation Classes are listed as occurring or have a high likelihood of occurring within the study area. One *Flora and Fauna Guarantee Act 1988* (FFG Act) listed community also has the potential to occur in the study area. A search was conducted for *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Matters of National Environmental Significance using the Department of Environment and Energy Protected Matters Search Tool, which identified one Wetland of International Importance, three listed threatened ecological communities and a total of 63 listed threatened species, 45 listed migratory species, and 80 listed marine species predicted to occur within 5 km of the Study area.

The project was referred under the EPBC Act in 2003 and was determined to be 'not a controlled action'. It is the intent of GB Energy to self-assess any material changes in the proposed action and to undertake seasonal ecology survey in accordance with applicable Federal survey guidelines to ensure that we have knowledge on the presence or absence of MNES within the proposed disturbance corridor. As this referral was made in 2003, the Stage 2 surveys to be undertaken in 2019 are to ensure that any potential impacts upon MNES are investigated and considered with regards to the alignment of the onshore pipeline. Detailed flora and fauna assessments will be undertaken during this stage of the project, including assessments for potentially occurring EPBC Act listed vegetation communities and targeted surveys for EPBC Act listed threatened flora and fauna fauna species.

Preliminary targeted surveys were undertaken for threatened shorebirds, waterbirds, Southern Toadlets and Dwarf Galaxias. None of these species were detected during the initial Stage 1 surveys. Stage 2 surveys commenced in late May but did not detect any further threatened species. Further Stage 2 surveying and updated results may reflect changes in species detection. However four species listed on the Victorian Advisory List of Threatened Vertebrate Fauna were recorded during the site reconnaissance.

After the initial site reconnaissance and preliminary targeted fauna surveys, it appears that the section of pipeline between Shoreline Drive and Signboard Lane (which encompasses all options) presents the greatest constraints in terms of its vicinity to Ramsar wetlands, the potential presence of threatened communities and the large number of threatened species previously recorded in the study area. However, this proposed section of the pipeline also appears to be mostly unavoidable, as it meets the shoreline directly west of the off-shore gas field. Providing the shortest route between the gas field and the shoreline will contribute to minimising impacts to marine flora and fauna, if strict assessment, construction and monitoring parameters are followed.

While it appears that all options are valid provided appropriate avoidance / minimisation are considered and adopted, it appears that Option 2b presents the route that will encounter the least impacts from an ecological perspective. It is the section of the Option 2b alignment between Shoreline Drive and Signboard Lane that is



likely to have the greatest ecological impacts, as determined from this initial ecological analysis. These are impacts that may be unavoidable based on other planning considerations.

Further significant flora and fauna investigations will be completed to satisfy the required standards of environmental assessment under the various Legislation such as the *Planning and Environment Act 1987* (State) FFG Act 1988 (for public land only) and EPBC Act 1999 (Commonwealth). The intent is to do a self-assessment using targeted survey for EPBC listed species in 'Stage2'. Assessment will be consistent with State and Federal survey guidelines.

The findings of these investigations would then need to inform a route that avoids, minimises and /or offsets native vegetation and significant flora and fauna values.



# 1. INTRODUCTION

Practical Ecology Pty Ltd was commissioned by CNC Project Management Pty Ltd (on behalf of GB Energy) to undertake a two-staged ecological assessment of the onshore gas pipeline alignment options for the Golden Beach Gas Project, located between Golden Beach and Longford, Victoria.

Stage 1 is a preliminary site assessment of the three potential onshore gas pipeline alignment options, and targeted autumn frog and shorebird surveys (undertaken during the site reconnaissance work to meet seasonal survey timelines). Stage 2 is the detailed site assessment that will only be undertaken along the preferred alignment. The detailed site assessment will involve habitat, native vegetation, flora species and targeted mammal surveys.

This report addresses Stage 1 of the project, a Pipelines Options Analysis, which provides a desktop and literature review of existing information and the findings of a preliminary site reconnaissance and some targeted fauna surveys. The site reconnaissance was undertaken predominantly to assess fauna habitat and to commence targeted fauna surveys, with flora data provided by previous reports until the detailed flora surveying occurs as part of Stage 2 of the project. The objective of Stage 1 is to inform the preferred alignment so that further, detailed studies can be undertaken to determine areas of sensitive native vegetation and/or habitat; and avoid and minimise its removal.

GB Energy acquired the Golden Beach gas field, held under a Retention Lease, within the Gippsland Basin in 2017; that is located approximately three kilometres from the shoreline of Ninety Mile Beach between the towns of Golden Beach and Glomar Beach. GB Energy are currently assessing the gas reservoir, with a view to developing the field for gas production in 2021. The development would include offshore well(s), an offshore pipeline, shore crossing (via Horizontal Directional Drilling or HDD), an onshore pipeline and a Gas Processing Facility (GPF). GB Energy has identified three route options for the onshore pipeline, which is the focus of this report.

Previous works for the project considered a wider survey area (Pipeline Study Corridor), which encompassed a broader parcel of land, including the known and proposed offshore gas reserve and indicative well location (Stewart 2018). Prior to this, Brett Lane and Associates Pty Ltd (2006a;b) undertook flora and fauna assessments of a pipeline option and wellsite between Delray Beach and the Alinta Compressor Station near Longford, Victoria. In their Environmental Constraint Report, based on these previous assessments, CNC (2018) recommended that:

'the matters of environmental significance identified in our report be assessed in detail, including field survey, to inform the project's environmental risk assessment and be given consideration throughout the design of the project, particularly the final pipeline alignment, where possible'.

Currently there are three route options for the onshore pipeline that have been identified by GB Energy. Each route is approximately 18.5 kilometres in length and the routes partially overlap one another. All three potential routes extend from a shore crossing 1.5 km southwest of Golden Beach, through Lake Reeve (a Ramsar wetland), to terminate at one of two possible gas plant sites near Longford.

The three option routes share a common corridor/alignment for 12.3km (from the shoreline to just east of Sandy Camp Road), and then the options diverge, with one option (Option 2a) diverging to the south of the common corridor/alignment, the second option (Option 2b) diverging to the north of the common



corridor/alignment, and the third option (Option 2c) continuing along the same alignment of the common corridor.

More detailed descriptions of these three routes are provided below and depicted in Figure 1 on the next page. The descriptions of the three Options/alignments below are provided from the east (the shoreline) to the west. All three options will connect with the offshore gas field.

- Option 2a is an 18.71km alignment that shares the common corridor/alignment for 12.3km and then shares a common alignment for a further 1.51km with Option 2c. After the further 1.51km, this alignment diverges to the south before heading north and sharing the last 0.85km of the alignment also with Option 2c.
- Option 2b is an 18.74km alignment that shares the common alignment for 12.3km, and then diverges north for 6.45km. This Option does not share any of the alignment with Options 2a and 2c, beyond the initial 12.3km of common corridor.
- Option 2c is an 18.41km alignment which mostly continues in a straight line from the shoreline to the end of the corridor. Option c shares a common corridor with Options 2a and 2b for 12.3km, then it shares a further 1.51km with Option 2a before continuing in a horizontal direction for 3.75km. For the final 0.85km of the alignment, the corridor is also shared with Option 2a.
- Gas Processing Facility Option 1 is an area of approximately 10ha located at the most western end of the pipeline study corridor, south of Murtnaugh Road.
- Gas Processing Facility Option 2 is an area of approximately 9ha located on the western side of Signboard Lane, on the southern side of the pipeline alignment.

This report focuses solely on the land mass within the proposed pipeline options footprint and additional land associated with proposed pipeline infrastructure (herein referred to as the Study Area and encompassing a total area of 607.5ha). The report provides a desktop and literature review, which summarises findings of previous works, as well as an update of ecological values and constraints determined via review of governmental database sources. It also provides the results of the site reconnaissance and an initial stage of targeted fauna survey work undertaken for frogs, shorebirds and aquatic species.





Figure 1. Three pipeline options under assessment for the Golden Beach Gas Project (Green-Option 2A, Blue - Option 2B, Red-Option 2C), including the two Gas Processing Facility (GPF) options.



# 1.1 Study Area

## 1.1.1 Site description

The Study Area occurs between Shell Back Way, Golden Beach and Murtnaugh Road, Longford (Map 1). The proposed pipeline options generally run in an east-west direction, passing through a mix of public and private land. Collectively, the study area covers 28.9km and an area of 607.5ha. This report refers only to the terrestrial component of the project.

## 1.1.2 Landscape

Bioregions are a landscape-scale approach to classifying the environment using a range of attributes such as climate, geomorphology, geology, soils and vegetation. There are 28 bioregions identified within Victoria, the study area falls within the Gippsland Plain Bioregion (DELWP 2018b).

Under the Catchment and Land Protection Act 1994 (the CaLP Act), Victoria is divided into ten catchment regions with a Catchment Management Authorities (CMA) established for each region (Victorian Water Industry Association Inc 2015). The study site occurs within the West Gippsland Catchment Management area (DELWP 2018b)

## 1.1.3 Zoning and Overlays

There are several zones and overlays within the study area. A brief overview of the overlays relevant for each onshore pipeline option is presented in Table 1. More detailed information on the zones and/or overlays that intersect each potential route option and their extent (in hectares) is presented in 0 through to Table 6. This information was provided by CNC Project Management.

The study area also encompasses areas of Aboriginal Cultural Heritage Sensitivity, which is not addressed in this report.

	Wellingt	on Shire Cound	;il			
Zones	Code	Option 2a	Option 2b	Option 2c	GPF 1	GPF 2
Farm Zone	FZ	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
Public Conservation and Resource Zone	PCRZ	$\checkmark$	$\checkmark$	$\checkmark$		
Public Use Zone-Service and Utility (Schedule 1)	PUZ1	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$
Rural Conservation Zone (Schedule 1)	RCZ1	$\checkmark$	$\checkmark$	$\checkmark$		
Rural Conservation Zone (Schedule 2)	RCZ2	✓	~	~		
Overlays						
Bushfire Management Overlay	BMO	~	$\checkmark$	✓	✓	✓
Design and Development Overlay – Schedule 6	DDO6	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	
Environmental Significance Overlay – Schedule 1	ESO1	$\checkmark$	$\checkmark$	$\checkmark$		
Environmental Significance Overlay – Schedule 2	ESO2	✓	$\checkmark$	$\checkmark$		
Floodway Overlay	FO	~	✓	$\checkmark$		
Land Subject to Inundation Overlay	LSIO	~	$\checkmark$	$\checkmark$		
Restructure Overlay	RO	$\checkmark$	$\checkmark$	$\checkmark$		
Significant landscape Overlay – Schedule 1	SLO1	$\checkmark$	$\checkmark$	$\checkmark$		

Table 1.	Zones and Overlay	s associated with	the pipeline options
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Name Crown Land Use Cro		Crown Land Descriptor	Crown Land Manager	Area (Ha)
Dutson Downs Waste Disposal	Services And Utilities	Other Public Land	Water Authority	12.14
Gippsland Lakes Coastal Park	Npa Schedule 3 Other Park	National Parks Act And Nature Conservation Reserves	Parks Victoria	1.50

### Table 2. Crown land intersects (all options) assuming a 30m wide disturbance corridor

#### Table 3. GPF Land Zone overview table

ZONE NAME	GPF Option 1 (Ha)	GPF Option 2 (Ha)	GPF Option 3 (Ha)
Farming Zone	12.25		12.25
Public Use Zone		12.25	

#### Table 4. Crown land intersects (all options) assuming a 30m wide disturbance corridor

ZONE NAME	Pipeline Option 2a		Pipeline Option 2b		Pipeline Option 2c	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Farming Zone	24.27	42.55	24.34	42.62	23.36	41.61
Public Conservation & Resource Zone	1.30	2.29	1.30	2.28	1.30	2.32
Public Use Zone 1	27.68	48.53	27.68	48.46	27.68	49.32
Road Zone - Category 2	0.06	0.11	0.06	0.11	0.063	0.11
Rural Conservation Zone 1	1.31	2.29	1.31	2.29	1.31	2.33
Rural Conservation Zone 2	2.42	4.24	2.42	4.23	2.42	4.30
Total	57.11	100	57.11	100	56.13	100

#### Table 5. Pipeline GPF Planning overlay intersects

Scheme Code	Planning Overlay	GPF Option 1 (Ha)	GPF Option 2 (Ha)	GPF Option 3 (Ha)
DDO6	Design & Development Overlay 6	12.25		12.25
WMO	Wildfire Management Overlay	5.36	12.25	11.9

#### Table 6. Pipeline GPF Planning overlay intersects

Scheme Code	Planning Overlay	Pipeline Option 2a (Ha)	Pipeline Option 2b (Ha)	Pipeline Option 2c (Ha)
DDO6	Design & Development Overlay 6	24.16	24.24	23.25
ESO1	Environmental Significance Overlay 1	4.31	4.31	4.31
ESO2	Environmental Significance Overlay 2	2.29	2.29	2.29
FO	Flood Overlay	2.05	2.05	2.05
LSIO	Land Subject to Inundation Overlay	2.78	2.78	2.78
RO	Restructure Overlay	3.00	3.00	3.00
SLO1	Significant Landscape Overlay	0.12	0.12	0.12
WMO	Wildfire Management Overlay	32.82	31.40	35.10
Total (Ha)		71.53	70.19	72.9



# 2. METHODS

# 2.1 Desktop and Literature Review

A desktop and literature review was undertaken to review information relevant to the study area and likely flora and fauna species, ecological communities and any other relevant ecological values or issues. No current detailed flora and/or vegetation surveying has been undertaken for this report. It relies upon ecological information collected in 2006, and modelled database information.

The information obtained during the desktop and literature review was used to inform the site reconnaissance; including the identification of values and constraints in the study area; and involved a review of the following resources:

- Relevant legislation and planning permit requirements
- Published written and mapped material relevant to the flora, fauna and habitat values of the study area(s) including:
  - Environmental Constraint Report GB Development Project (CNC 2018)
  - Golden Beach Environment Report Gas Plant and Onshore Pipelines [VIC/RL1 (V)] (Cape Energy Victoria Pty Ltd 2008).
  - Golden Beach Gas Project, Flora and Fauna Assessment (Brett Lane & Associates 2006)
  - o Golden Beach Gas Project, Wellsite Flora and Fauna Assessment (Brett Lane & Associates 2006)
- Biodiversity, Flora and Fauna Databases and mapping including:
  - the Victorian Biodiversity Atlas (VBA)
  - DELWP's NatureKit, including information to determine the site's Location Category; modelled strategic biodiversity value and whether the site is associated with a wetland of importance as required by the *Guidelines for the removal, destruction or lopping of native vegetation* (2017)
  - the Federal *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool
  - the Native Vegetation Information Management (NVIM) tool (DELWP)
  - other relevant government databases to identify any land management or topographic values to which on-site native vegetation may contribute.

It should be noted that the BL&A (2006) report is no longer current; as this report is now over five years old, and there have been many updates to databases, Victorian legislation and reviews of the pipeline alignment since that time. Detailed flora and fauna surveys are scheduled to occur during Stage 2 of this project, starting in May 2019 and occurring within applicable flora species survey guidelines. A schedule of Stage 2 studies is presented in Section 5.



## 2.2 Site reconnaissance and habitat assessment

Prior to undertaking targeted fauna surveys, a reconnaissance of the sites and assessment of fauna habitats occurring along the three routes was conducted from 1–3 April 2019. This enabled determination of the availability and extent of habitats for each of the threatened species, so that particular areas could be targeted for fauna surveys. This streamlined approach aimed to increase the likelihood of detecting each species by focussing survey effort on areas of suitable habitat. Aerial photography was used to identify potential habitats for the initial reconnaissance, prior to going into the field. Following the initial reconnaissance, survey sites were identified for the targeted fauna surveys. Flora surveys are still required but will occur as part of the detailed site assessments undertaken during Stage 2 of the project. This is presented in Section 5.

The three route options were traversed in daylight hours by vehicle and on foot to help identify appropriate survey sites and access points and to ensure safety during the subsequent targeted surveys that involved both daytime and night survey work. This was undertaken by Practical Ecology's two senior zoologists, who were accompanied by CNC's Engagement Officer, who facilitated access to both private and public land, in which the study area occurs. Particular attention was paid to commencing targeted fauna assessments at waterbodies and wetlands (both freshwater and saline), and throughout areas containing remnant vegetation (woodland, shrubland and heathland). A review of fauna habitat, location of waterbodies and other landscape features was also undertaken during the initial site reconnaissance. Incidental observations of fauna were also recorded during the assessment. These are presented in Appendix 1.

## 2.3 Targeted fauna species surveys

#### Analysis of Database Records

A list of fauna species with the potential to occur within habitats along the three route options was compiled using:

- Records in the Victorian Biodiversity Atlas (DELWP 2018a) for a 5-kilometre radius around the route options, obtained on 15/01/2019.
- Previous survey reports including *Golden Beach Gas Project Pipeline and Gas Plant Flora and Fauna Assessment* (Brett Lane & Associates Pty Ltd 2006).
- Species predicted to occur under an EPBC Act Protected Matters Search Tool.
- Records included in databases maintained by Gippsland Water.

This list of fauna species likely to occur in the Study Area is presented in Appendix 3, with the following information provided for all species listed on: the Migratory Bird Convention (Treaty), threatened species status (EPBC, FFG or VROTs), scientific and common name, habitat notes, the date (Year) of the last database record, the number of records (this does not equate to the number of sightings), the likelihood of occurrence for each option, and then an overall likelihood summary for the entire project area.

In determining the likelihood of occurrence and potential use of the study area by national or state significant flora and fauna species, the following factors were considered:

- Previous recordings of species in the local area.
- Date of last record.
- The habitat requirements of individual species.
- The physical attributes of the site, such as topography, geology, soils, aspect and other habitat features such as trees with hollows, the presence of rocks or boulders, logs on the ground.



- The history of land use at the study site.
- The ecological landscape context; i.e. the degree of connectivity, modification and fragmentation across the landscape.

A basic matrix that describes the justification for the likelihood of occurrence is presented below. This matrix is utilised to determine the likelihood of occurrence of the database species listed in both Appendix 2 and Appendix 3.

Likelihood of occurrence	Criteria
Nil	Species known to be extinct in local area and/or absent from the site.
Low	Unsuitable habitat at study site; or habitat conditions intermediate and records very limited and dated; or if it were present, it is highly likely to have been observed on site.
Medium	Habitat conditions are intermediate, and/or optimal habitat conditions for species but local records limited or dated and/or if it were present, it is not likely to have been observed on site.
High	Optimal habitat conditions for species or species recorded at site, or intermediate habitat conditions but extensive local records and/or if it were present, it is not likely to have been observed on site.

#### Table 7. Criteria for potential occurrence of significant species

#### Actual Fauna Species Surveyed based on Habitat and Database Records

The matrices presented in Appendix 2 and Appendix 3 are used for determining likelihood of significance for database records as an initial due diligence step of what might be present on site, based on relevance of recent records, location of records to the Study Area, and potential presence of suitable habitat (based on modelled extent of EVC mapping). Actual fauna surveys are then undertaken to retain or eliminate species from the list and make a more accurate determination of habitat available. Therefore the fauna species targeted during the preliminary Stage 1 surveys included:

#### SHOREBIRDS

All shorebird species that may be present and utilise the Golden Beach stretch of coastline, including:

- Hooded Plover *Thinornis cucullatus*, Curlew Sandpiper *Calidris ferruginea*, and Eastern Curlew *Numenius madagascariensis*. The survey was opportunistic and was not focused upon a particular species; only what was still present during the survey period. The full list of shorebird species that may be present (but is not limited to) is provided in Appendix 3.
- Shorebirds generally were selected for the Stage 1 survey period, as the term describes a suite of mostly international (and some local) migratory species that migrate from the northern to the southern hemisphere summer, with some species foraging and other species breeding here or in the northern hemisphere. The southern hemisphere migratory season is generally from October/November to February/March with some early-comers and late-leavers every season.
- April is the tail end of the migration season, and another opportunity for survey would not be available until the end of 2019. Therefore, whilst the end of the migration season is not the ideal shorebird survey period, it did provide the opportunity to obtain some limited information, which can then be built upon in the next migration season at the end of the year.



#### WETLAND BIRDS

- Australasian Bittern *Botaurus poiciloptilus*;
- A suite of waterbirds likely to be present (the database list is provided in Appendix 3) including Freckled Duck *Stictonetta naevosa* and Blue-billed Duck *Oxyura australis;* and
- Emu *Dromaius novaehollandiae*.

All of these species are considered to be resident populations that can be surveyed at any time of the yearalthough the breeding season is considered to be the best survey season (spring/early summer).

#### FROGS

- Southern Toadlet *Pseudophryne semimarmorata*;
- Martin's Toadlet *Uperoleia martini;*
- Autumn is the best survey season for the Southern Toadlet, as it is their breeding season when the male frogs are calling;
- The survey season for Martin's Toadlet is better in spring (their breeding season), although they can call opportunistically in autumn- the survey for them was opportunistic and not targeted.

#### FISH

- Eastern Dwarf Galaxias *Galaxiella pusilla*.
- This survey was sub-contracted to an expert aquatic ecologist (John McGuckin).
- The timing of the Dwarf Galaxias study deliberately targeted the end of summer before winter rain occurred. With less water around it was easier to identify permanent waters which could potentially be primary habitat for the long term survival of localised dwarf galaxias populations. Drought refuge habitats occupied by dwarf galaxias are extremely important, as they allow for movement of the species into other less permanent waterways during wetter periods.

Fauna surveys were conducted over three separate survey days in April 2019 during the initial reconnaissance fauna surveys; in order to ensure they were undertaken during appropriate conditions for each species. As outlined below, further surveys will also be undertaken later in the year. The survey dates and methods utilised in the reconnaissance surveys are described in Section 2.4 below.

# 2.4 Targeted fauna surveys

## 2.4.1 Shorebirds and Waterbirds

Two initial targeted shorebird survey days were undertaken on the 2<sup>nd</sup> and 4<sup>th</sup> of April 2019, during peak high tide, to further identify the presence, or likelihood of occurrence of shorebirds that fall into one of the following categories: 1) have not migrated to boreal breeding grounds, 2) overwintering in the region (i.e. juvenile migratory birds), 3) residential species, 4) longitudinal migrants (only Double-banded Plover *Charadrius bicinctus*, which visits SE Australia during their non-breeding season from New Zealand).

As the bulk of boreal migratory shorebirds, which may be present in the region during their austral nonbreeding season, have already departed, further surveys to target these birds will also be undertaken at a later stage (i.e. late Spring, onwards).



On the morning of 2nd April 2019, three waterbody sites were surveyed (Map 4), during high-tide, on foot, with the use of binoculars and a spotting scope on a tripod. A full scan of the nominated salt pans/waterbodies (Sites X and Y, on Lake Reeve; currently dry), and the ocean beach shoreline (Site Z) was undertaken, in both directions. All birds observed were recorded, including any birds observed flying overhead, or offshore (at Golden Beach). On the morning of 4th April 2019, a second high-tide survey was undertaken only at Golden Beach. A second survey was not undertaken at Lake Reeve, as it was completely dry at the time of the first survey; therefore not providing suitable habitat for waterfowl.

## 2.4.2 Toadlet Surveys

The Southern Toadlet frequents dry forest, woodland, shrubland, grassland and heaths, sheltering under leaf litter and other debris in moist soaks and depressions (Hero, Littlejohn and Marantelli 1991). Breeding sites including shallow burrows under leaf litter that will later be flooded in winter including boggy flood-prone areas or beside water in swamps (Anstis 2007).

Habitat features were recorded at each site including: water levels and apparent water permanence or ephemerality, presence of coarse woody debris such as logs and leaf litter, the presence of ditches or depressions adjacent to the sites, and the structure and composition of vegetation surrounding the sites, particularly sedges and tussocks.

Habitat attributes assessed included:

- Size and site type (e.g. dam, dam soak or boggy zone, drainage line, depression, ditch, swampy area);
- Waterbody hydroperiod (ephemeral: dries out regularly; semi-permanent: retains water most years, but may dry out during drought summers; permanent: waterbody holds water constantly even during drought years);
- Analysis of percentage cover of emergent and fringing vegetation and terrestrial vegetation;
- Percentage cover of terrestrial refugia (e.g. rocks, logs, debris);
- Information regarding water levels and flows at sites;
- Type of surrounding habitat within 30 metres of each site; and
- Habitat connectivity, especially with large remnants of native vegetation.

Targeted surveys for Southern Toadlets were undertaken within areas of potential habitat including waterbodies, depressions and wet boggy areas in heathland and woodland. There is a high detectability rate for the Southern Toadlet; where under suitable weather conditions there is a 90% chance of detecting the species within two minutes (Howard, Cleeland and Clemann 2010). Two surveys were undertaken at sites supporting potential suitable habitat over two separate nights in April 2019. Surveys were conducted during the autumn calling season (March to May) to maximise detection, over a minimum of two surveys during ideal weather conditions: little to no wind, air temperature above 8°C, and rain within the previous 24 hours.

Calls of Southern Toadlet were broadcast via a smartphone at a low volume for several minutes following an initial quiet listening period of 5 minutes per site. Following the call survey, active searching for these species



was undertaken by two zoologists within suitable calling microhabitats, such as waterbody banks, areas of leaf litter and under fringing vegetation particularly rushes and sedges.

## 2.4.3 Dwarf Galaxias Surveys

Streamline Research P/L were subcontracted to undertake field work during April 2019 to determine the status the Dwarf Galaxias (*Galaxiella pusilla*) within the proposed study area for the Golden Beach Gas Project.

In accordance with the Commonwealth Dwarf Galaxias sampling protocols, dip netting and the setting of bait traps overnight was done at targeted locations from 8–11 April 2019. Dip netting is the most suitable technique for the sampling of a waterway for Dwarf Galaxias, particularly in the hands of a skilled operator that is aware of the type of habitats typically occupied by the species. The catch made with a dip net can often determine whether a waterway has permanent water, depending on the species present – which is essential to establishing primary habitat for the Dwarf Galaxias.

At three locations additional surveying was made by setting five bait traps overnight. Two locations outside of the study area (Boundary Creek and Flooding Creek) were also surveyed, as Dwarf Galaxias have previously been captured in these creeks. The survey sites are presented in Appendix 4, Map 5.

The separate report prepared by Streamline Research provides further details on the methodology and results of these surveys. This report is presented in Appendix 6.

## 2.4.4 Targeted Fauna Surveys

Fauna surveys were conducted from 27th -31st May 2019 to target the following species:

- New Holland Mouse (NHM) Pseudomys novaehollandiae;
- Eastern Pygmy Possum (EPP) Cercartetus nanus;
- Southern Brown Bandicoot (SBB) Isoodon obesulus obesulus;

The following equipment was set out at 13 survey sites along the preferred alignment. Their locations are presented in Appendix 4, Map 6. The locations were selected during fauna habitat assessments and chosen for their increased likelihood of detecting threatened species, based on habitat condition and previous records within the study area.

- Eighteen camera monitoring plots were set out in strategic locations, consisting of one centrally placed camera and 4 hair traps set out for 14 days. Each station, and each hair tube, was baited with a mixture of peanut butter, rolled oats and truffle oil to attract animals and increase the probability of detection.
- Eighty Elliott traps (both Elliott A traps along the ground and Elliott B traps in trees or large shrubs) were set along trap-line transects in potential habitats traps were baited with the same peanut butter mixture and left in situ over three days where each trap was checked each morning (Wed-Fri). Traps were closed during the day after being checked in the morning and reopened in the early evening.
- An additional 40 ceramic tiles were set out in three locations. These will be checked for small mammals and reptiles in spring 2019.



• Scat of species known to prey on targeted species within the monitoring area were opportunistically collected and will be analysed for hair samples and will continue to be collected during the course of the study.

Once cameras are collected, the analysis of camera footage will be done via desktop computer, using the associated motion-sensor camera software with all footage of species to be sorted with species identification. For each day of deployment, for each camera, a list of species recorded will be collated, if it is possible to determine more than one individual, and/or sex, this will also be noted. All hair and scat samples collected will be sent to Barbara Triggs (of 'Dead Finish', Genoa, Vic.) for identification.

# 2.5 Mapping

Spatial data collection was carried out using a combination of Personal Digital Assistants (PDAs), and handheld GPS enabled device and aerial photography. Determination of the extent of fauna habitat was undertaken using a combination of GPS data and ground-truthing with aerial photography. A Garmin 76 GPS hand held unit was used to accurately record the site locations. GPS data and mapping should be considered approximate only (e.g. +/-1-5m).



# 3. **RESULTS**

As outlined in the results below, no threatened shorebirds or toadlets were detected during the initial Stage 1 surveys. The schedule for Stage 2 surveys is detailed in Section 5.

# 3.1 Desktop and Literature Review

The site is located within the Gippsland Plains Bioregion. Remnants of several Ecological Vegetation Classes (EVCs) are modelled within the study area (DELWP 2019). The Flora and Fauna Guarantee Act 1988 (FFG Act) listed community, Coastal Moonah Woodland, has been also been modelled within the study area.

A site environment report was produced by Cape Energy Pty Ltd ((Cape Energy (Victoria) Pty Ltd no date), which provided an impact assessment for various environmental aspects associated with the proposed pipeline. This included a flora and fauna assessment undertaken by BL&A (2006), which did not record any state or nationally listed threatened species or communities.

The previous assessment undertaken by BL&A (2006) confirmed areas of the following Ecological Vegetation Classes, as modelled by DELWP (2019):

EVC	Cons. Status	Approx. location	Modelled data (DELWP 2019)	BL&A (2006)
Coast Banksia Woodland (EVC 2)	Vulnerable	Option 2b	Approx. 2ha	Lake Reeve
Coastal Dune Scrub (EVC 160)	Least Concern	N/A	N/A	Wellsite to Lake Reeve (north of Option 2b)
Coastal Saltmarsh (EVC 9)	Least Concern	Option 2b	Approx. 2ha	Lake Reeve
Damp-sands Herb-rich	Vulnerable	Option 2a	Approx. 27ha	Woodland Crossing 1
Woodland (EVC 3)		Option 2b	Approx. 40ha	(Flints Road)
		Option 2c	Approx. 24ha	
Estuarine Swamp Scrub (EVC	Endangered	N/A	N/A	West of Lake Reeve
53_62)				(north of 2b)
Estuarine Wetland (EVC 10)	Least	Option 2b	Approx. 1ha	Lake Reeve
	Concern			
Lowland Forest (EVC 16)	Vulnerable	Option 2b	Approx 1 ha	Alinta compressor
				station (terminates at
				all options)
Heathy Woodland (EVC 48)	Least	Option 2a	Approx.6ha	Woodland Crossing 2
	Concern	Option 2b	Approx. 40ha	(Flints Road)

# Table 8. Ecological Vegetation Classes (EVCs) modelled on site (DELWP 2019) and recorded by Brett Lane and Associates (2006)

Existing flora and fauna species data provided by Gippsland Water has been incorporated into Appendix 2 and Appendix 3; and has been considered within the context of this assessment.



## 3.1.1 EPBC Act 1999 Matters of National Environmental Significance

A search was conducted for Matters of National Environmental Significance (MNES) using the DoEE Protected Matters Search Tool (PMST), for a 5-km buffered area around the Study area, including all three route option alignments. This section details the results of the search for matters protected by the EPBC Act.

One Wetland of International Importance occurs in the Study area. Lake Reeve forms part of Gippsland Lakes which is listed as a wetland of international importance under the Ramsar convention. The Gippsland Lakes is a particularly good representative example of a natural or near-natural wetland, supporting several nationally threatened wetland fauna and flora species. The wetland also supports outstanding habitat for waterbirds including migratory species, and provides important fish habitat.

There are three listed threatened ecological communities predicted to occur in the Study area: Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland (Critically Endangered), Natural Damp Grassland of the Victorian Coastal Plains (Critically Endangered), and Subtropical and Temperate Coastal Saltmarsh (Vulnerable). Coastal Saltmarsh was recorded in the Study area within Option 2b during reconnaissance surveys in April 2019 and there is potential for the other two communities to be present.

A total of 33 birds, five fish species, two frog species, four terrestrial mammals, three whale species, three marine turtle species and eleven flora species are predicted to occur in the Study area. A further suite of migratory and listed marine birds and other marine fauna species, and five migratory terrestrial bird species, are also predicted to occur. In total, there are 63 listed threatened species, 45 listed migratory species, and 80 listed marine species predicted to occur within 5 km of the Study area, as listed in Appendix 2 and Appendix 3.

## 3.1 Site Reconnaissance and habitat assessment

The landscape along the shared option/common corridor section of pipeline from the shoreline to just east of Sandy Camp Road, is characterised by the beach and dune vegetation at Golden Beach, grading into coastal heathland/shrubland in the hind-dunes leading down to Lake Reeve. The lake is an estuarine wetland supporting saltmarsh, mudflats and grassland vegetation. There is an area of disturbed shrubland between two arms of Lake Reeve that is dominated by Wattles *Acacia* spp. and Banksia's *Banksia* spp. To the west of Lake Reeve there is a Tea-tree swamp (that was dry at the time of assessment) fringed by heathy woodland/shrubland.

There is a large patch of heathy woodland/shrubland extending along the Option 2b route alignment, bordering open pasture and the bottom edge of a large freshwater treatment pond complex at Dutson Downs. The landscape along the route also includes pine plantations and open grazing farmland. Freshwater waterbodies are generally restricted to farm dams, many of which were dry, and blocks of remnant heathy woodland/shrubland. Options 2a and 2c also traverse large blocks of woodland, generally along the edge adjacent to open pasture and other cleared areas.

# 3.2 Flora

Detailed vegetation assessments are scheduled to occur at Stage 2 of the project. Therefore the following information is a summary compiled via desktop research, review of historical records and previous reports.



## 3.2.1 Rare or threatened flora

A search for state or nationally significant flora species recorded within 5 km of the site area in the VBA revealed 24 species, most of which have a 'low' likelihood of occurring on site. Details of these species are given in Appendix 2.

The following species were identified during the desktop review as having a medium-high likelihood of occurrence within the study area.

Targeted surveys for these species are proposed to be undertaken as part of Stage 2 of the project, during their prescribed survey timelines. This includes surveys for the following species that have been recorded or are likely to occur in the study area:

- Trailing Hop-bush *Dodonaea procumbens*
- Wellington Mintbush *Prostanthera galbraithiae*
- Orchids: Maroon Leek-orchid *Prasophyllum frenchii*, Metallic Sun-orchid *Thelymitra epipactoides* and the Shy Sun-Orchid *Thelymitra planicola*
- Dwarf Kerrawang Commersonia prostrata
- Variable Bossiaea, *Bossiaea heterophylla*
- Pink Zieria, Zieria veronicea subsp. veronicea
- Blue Mat-rush, *Lomandra glauca* s.s.
- Gippsland Lakes Peppermint, Eucalyptus arenicola
- Promontory Peppermint, *Eucalyptus willisii* s.s.
- One additional species, Ribbed Thryptomene *Thryptomene micrantha* is given a high likelihood of occurrence, as it was previously recorded within the study area.

## 3.2.2 Vegetation communities

Based on the modelled Ecological Vegetation Class (EVC) data provided by DELWP, the following EVCs have been mapped as potentially occurring along the three gas pipeline options. The extent of cover of each modelled EVC has been calculated in Table 9 below for each pipeline option. The data presented below is only modelled extent data, it does not represent the actual amount of native vegetation that maybe impacted by the proposal. The actual extent of impacts will be determined during the Stage 2 assessments.

The following extents presented in Table 9 were determined based on a 50m wide pipeline corridor by the length of each option, including the shared alignment. While all options have a similar potential total vegetation loss (46-47 ha), Option 2b would have the least impact on the Vulnerable EVC Damp-sands Herb-Rich Woodland with 22.4 ha. The GPF Option 1 would also have the least impact on the extent of native vegetation (approx. 3ha of the Vulnerable EVC Damp-sands Herb-Rich Woodland, as opposed to 7.65ha for Option 2).



EVC	Cons. Status	Option 2a (ha)	Option 2b (ha)	Option 2c (ha)	GPF1 (ha)	GPF2 (ha)
Coast Banksia Woodland (EVC 2)	Vulnerable	0.91ha	0.91ha	0.91ha		
Coastal Saltmarsh (EVC 9)	Least Concern	1.2ha	1.2ha	1.2ha		
Damp-sands Herb- rich Woodland (EVC 3)	Vulnerable	33.014ha	22.4ha	32ha	3.01ha	7.65ha
Estuarine Wetland (EVC 10)	Least Concern	2.29ha	2.29ha	2.29ha		
Lowland Forest (EVC 16)	Vulnerable	0.07ha	0.07ha	0.07ha		
Heathy Woodland (EVC 48)	Least Concern	10.1ha	19.79ha	10.1ha	1.53ha	

#### Table 9. Ecological Vegetation Classes (EVCs) modelled on site (DELWP 2019)

## 3.3 Fauna

## 3.3.1 Targeted Toadlet survey

The Southern Toadlet was not detected at the seven sites where targeted surveys were undertaken (see Appendix 5). One frog species was detected calling, the Southern Brown Tree Frog *Litoria ewingii*, it was heard calling from woodland near Sites D and G (Map 4).

Weather conditions during the survey period were ideal for detecting toadlets; relatively warm and calm. However, six of the seven sites were dry, including a tea-tree swamp, indicating that the prolonged drought is reducing breeding conditions for the Southern Toadlet and other frog species in the Gippsland region. The only waterbodies containing water at the time of the surveys were farm dams with reduced water levels (generally <50% capacity) and the large water treatment ponds at Dutson Downs which are not habitat for the Southern Toadlet.

## 3.3.2 Targeted Bird Surveys

Table 10 below lists the shorebird and seabird species that were detected during the two initial targeted shorebird surveys. Other bird species were recorded as incidental observations (see Appendix 1). It should be noted that the optimal time for undertaking migratory shorebird surveys is between December and February, at the time when shorebirds have migrated to Australia. Further targeted surveys will be undertaken later in 2019 during the migratory season.



Common name	Scientific name	Cons. status	Sites / notes
SHOREBIRDS			
Masked Lapwing	Vanellus miles		X, Y, within saltmarsh habitat
SEABIRDS			
Crested Tern	Thalasseus bergii		Z, roosting and foraging on/off beach
Silver Gull	Chroicocephalus novaehollandiae		Z, roosting and foraging on/off beach
Pacific Gull	Larus pacificus	nt (VROT)	Z, roosting and foraging on/off beach
Fluttering Shearwater	Puffinus gavia		Z, foraging offshore
Australasian Gannet	Morus serrator		Z, foraging offshore
Total no. of shorebird species recorded 1			
Total no. of seabird species recorded 5			
Total no. of shorebird and seabird species recorded 6			

#### Table 10. Summary of seabird and shorebird species recorded during targeted shorebird surveys

## 3.3.3 Targeted Dwarf Galaxias Survey

A total of 48 locations were visited within the study area by Streamline Research to determine if they provided potential habitat for Dwarf Galaxias. These locations included natural wetlands and channels, areas of low land depression, farm dams, irrigation channels and sewerage ponds.

Many of the survey locations were dry. These locations were documented by taking a photograph and a grid reference. For the locations where water was present, dip netting with a very fine meshed net was conducted. The Dwarf Galaxias was not captured at any survey point and is unlikely to occur within the study area, as determined by streamline Research.

As outlined in the Streamline Research report: Priority waters for the preservation of Dwarf Galaxias populations and habitat can be divided into two types of waters:

- Waters which currently support populations; and,
- Waters which have habitat which could potentially support the species.

For the Golden Beach Longford study area there are no waters that currently support a population of Dwarf Galaxias. In addition, there is not even one natural wetland habitat that could support the species on the proposed GB Energy pipeline route. The only aquatic habitats that were found to hold water on the alignment were farm dams (sites 37 and 38), which had little natural attributes that would be suitable for the Dwarf Galaxias.

Two wetlands (sites 4 and 5) in the vicinity of the Study Area that were dry in this investigation could potentially provide habitat for Dwarf Galaxias (if a flood event moved fish from a primary habitat), as they have characteristics that would suit the species. By using basic standard erosion controls during pipeline installation these wetlands will be protected.



## 3.3.4 Incidental Fauna Observations

The results of the incidental fauna survey are presented in Appendix 1. There were 91 species recorded during the site reconnaissance and habitat assessment, and targeted surveys. A summary of species (and their origins) from each lifeform is present in Table 11. The majority of species recorded were birds, with 68 species observed (75 %), followed by mammals, with 14 species recorded (16 %), however, seven of these were introduced pest animal species (mouse, rat, fox, cat, rabbit and two species of deer). Two amphibians and three species of reptiles were recorded, with most reptile observations being of Eastern Long-necked Turtles within farm dams.

1:6-6		No. of species	
Lifeform	Native	Introduced	TOTAL
AMPHIBIAN	2	0	2
BIRD	62	6	68
INVERTEBRATE	3	1	4
MAMMAL	7	7	14
REPTILE	3	0	3
TOTAL	77	14	91

# Table 11. Summary of fauna species and lifeforms recorded during the site reconnaissance and initial targeted fauna surveys

Some species were identified through indirect, incidental means – burrows, scats, tracks and diggings, or remains (i.e. skeletal or roadkill). An example is The Bare-nosed Wombat, identified as present across much of the site, via the presence of wombat burrows. Figure 2, below, shows an example of an observed wombat burrow.



Figure 2. Example of one of the many wombat burrows observed across the study area.



## 3.3.5 Fauna habitat assessment

The main focus with regards to fauna during the assessment was the consideration of the survey area's potential to provide fauna habitat. The habitat observed within the survey area included:

- leaf litter and logs
- wetland / riparian habitat (including farm dams)
- moist depressions and drainage lines
- ocean beach / shoreline habitat
- tree canopies, and trees with hollows
- dense understorey vegetation
- grassy understorey vegetation

The vegetation throughout the study area provides varied fauna habitat of different qualities, as the area is comprised of a mixture of agricultural land, remnant habitat, dense regrowth of tea-tree scrub, and smaller areas of saltmarsh, coastal dune and scrub habitat. However, the stretches of remnant vegetation form important habitat corridors across the area.

### **Terrestrial Habitat**

These patches are generally comprised of low, open eucalypt woodland with varying mid-storey and groundstorey density and complexity (Figure 3). Within more intact habitat, there are large trees containing hollows, mature Coast Banksia *Banksia integrifolia*, shrubby midstorey, and a varied groundstorey including Saw-sedge *Gahnia spp.*, native grasses and herbs, and patchy open groundcover with leaf litter and organic matter, including logs (Figure 4). Such habitat provides shelter, nesting, and foraging opportunities for a wide variety of fauna species, with hollows being particularly important for hollow-dependent birds, mammals and reptiles.

The understorey is relatively thick in some areas, providing habitat for smaller birds. Areas with a high cover of leaf litter provide habitat for smaller fauna species such as lizards, amphibians and invertebrates. Open, operational agricultural land (cropping and/or pastoral) provides habitat for many open rangeland, ground-foraging, or aerial-foraging bird species, or grassland specialists. For example, a flock of Emu were observed moving over open pasture at Dutson Downs.



Figure 3. Example of open eucalypt canopy and varying density within understorey.



Figure 4. Example of more open, grassy/herbaceous woodland with logs.



#### Wetland Habitat

Wetland habitat, including farm dams, water treatment lagoons, drainage lines and moist depressions provide habitat for a range of fauna, particularly wetland birds, reptiles and amphibians (Figure 5). Deep, well-vegetated lagoons support a larger number and variety of wetland birds and waterfowl. These lagoons occur at the Dutson Downs treatment plant where they also provide habitat for the threatened Green and Golden Bell Frog *Litoria aurea* (Figure 6). Farm dams provide frog habitat but most dams were dry at the time of the site assessment. Tea-tree swamps and boggy areas around swamps and farm dams provide potential habitat for ephemeral pond-breeding frog species such as the Southern Toadlet. These swamps were dry during the surveys and will only support breeding if they become inundated with autumn/winter rainfall.



Figure 5. Example of a farm dam with some fringing vegetation, currently with no water present.



Figure 6. Example of deep, permanent wetland, with extensive fringing / emergent vegetation – as at water treatment lagoons.

#### Coastal and Shoreline Habitat

The shoreline, coastal dune and adjacent scrub habitat potentially supports a suite of ground-foraging birds, and mammals, including rodents and bandicoots (Figure 7). High energy sandy beaches provide roosting sites for a variety of seabirds, and, to a lesser extent, shorebirds. Coastal saltmarsh and associated saltpans/ephemeral wetlands (i.e. Lake Reeve, Figure 8), provide habitat for a range of fauna, particularly small birds and reptiles, and when water is present, is likely to support a greater variety of wetland birds including migratory shorebirds, rails and crakes, in addition to a range of invertebrates.

Estuarine grassland and shrubland provides potential habitat for reptiles such as the Swamp Skink and Glossy Grass Skink (Figure 9 and Figure 10).





Figure 7. The open, high energy sandy ocean beach at Golden Beach, showing some of the edge of coastal dune and scrub vegetation.



Figure 8. The tussock grass and saltmarsh vegetation edging (a dry) Lake Reeve (in early April 2019).



Figure 9. Estuarine habitats around Lake Reeve.



Figure 10. Shrubland adjacent to Lake Reeve.

## 3.3.6 Rare or threatened fauna

No rare or threatened fauna of national significance were recorded during the site reconnaissance. However three fauna species listed on the Advisory List of Threatened Vertebrate Fauna (DSE 2013a) were observed during the assessment. These species were Hardhead *Aythya australis* (listed as Vulnerable), Pacific Gull *Larus pacificus* (listed as Near Threatened) and Emu *Dromaius novaehollandiae* (listed as Near Threatened). It should also be noted, that whilst not listed as a threatened species, the Eastern Long-necked Turtle *Chelodina longicollis* is listed as Data Deficient on the Advisory List (DSE 2013a).

A total of 72 state or nationally significant fauna species are recorded within a 5 kilometre radius of the study area in the VBA. The following species were identified during the desktop review as having a medium-high likelihood of occurrence within the study area (primarily in Option 2b). Targeted surveys for these species are due to be undertaken as part of Stage 2 of the project, during their prescribed survey timelines. This includes surveys for the following species that have been recorded or are likely to occur in the study area

• Green and Golden Bell Frog *Litoria aurea* 



- Growling Grass Frog *Litoria raniformis*
- Martin's Toadlet Uperoleia martini
- New Holland Mouse (NHM) Pseudomys novaehollandiae
- Eastern Pygmy Possum (EPP) Cercartetus nanus
- Southern Brown Bandicoot (SBB) *Isoodon obesulus obesulus*
- Swamp Skink Lissolepis coventryi
- Glossy Grass Skink Pseudemoia rawlinsoni
- Lace Monitor Varanus varius
- Shorebirds (e.g. Hooded Plover *Thinornis cucullatus*, Curlew Sandpiper *Calidris ferruginea*, Eastern Curlew *Numenius madagascariensis*)
- Waterbirds (e.g. Freckled Duck Stictonetta naevosa, Blue-billed Duck Oxyura australis)
- Australasian Bittern Botaurus poiciloptilus

The fauna assessment undertaken by BL&A (2006a) also identified potential habitat for the Orange-bellied Parrot *Neophema chrysogaster* within the salt marshes at the eastern end of Option 2b. Given the lack of records within the study area and the current status of the species (Critically Endangered), with less than 50 individuals thought to exist in the wild, it is unlikely to occur within the study area. However the potential for it to occur will be noted during the Stage 2 bird surveys.

## 3.3.7 Targeted Fauna Surveys

Three morning checks were made of both the ground and tree-installed Elliott traps between the hours of 6am and 9am, but no native fauna were found at any time (only a few domestic mice and a black rat). Data are presented in Appendix 1.

The results of the camera monitoring plots and hair traps will be presented at a later date, once equipment has been collected and data analysed.



# 4. RELEVANT POLICY AND LEGISLATION

The following section explores relevant policy and legislation pertaining to ecology from the national level through to the local level.

# 4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) applies to sites where proposed developments or projects may have a significant impact on Matters of National Environmental Significance (MNES). There are currently seven Matters of National Environmental Significance:

- World Heritage properties
- National Heritage places
- Nationally listed threatened species and ecological communities
- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine areas
- Nuclear actions (including uranium mining).

Under the EPBC Act, a proponent must refer proposed actions that may have a significant impact on Matters of National Environmental Significance (MNES) to the Australian Government Environment Minister (or delegate).

## Relevance to proposal

The following information has been supplied by CB Energy regarding the EPBC Act:

The project was referred under the EPBC Act in 2003 and was determined to be 'not a controlled action'. It is the intent of GB Energy to self-assess any material changes in the proposed action and to undertake seasonal ecology survey in accordance with applicable Federal survey guidelines to ensure that we have knowledge on the presence or absence of MNES within the proposed disturbance corridor.

As this referral was made in 2003, and to meet the intent of CB Energy, the Stage 2 surveys undertaken in 2019: are to ensure that any potential impacts upon MNES are investigated and considered with regards to the alignment of the onshore pipeline, detailed flora and fauna assessments will be undertaken during Stage 2 of the project, including assessments for potentially occurring EPBC Act listed vegetation communities and targeted surveys for EPBC Act listed threatened flora and fauna species.

A desktop assessment of the likelihood of occurrence of EPBC Act database listed threatened species for a 5km radius around the three potential pipeline options, which includes species listed in the EPBC PMST is presented



in Appendices 2 and 3. The following threatened vegetation communities and species will also be (targeted) surveyed for during the detailed site assessments:

- Undertake targeted surveys for the following EPBC/FFG listed species that are considered likely to
  occur:
  - o Gippsland Red Gum Grassy Woodland and Associated Native Grassland Community
  - o Temperate Coastal Saltmarsh Community
  - o Maroon Leek-orchid, Metallic Sun-orchid and the Shy Sun-Orchid
  - New Holland Mouse
  - o Dwarf Kerrawang
  - Trailing Hop-bush
  - Wellington Mintbush
  - o Eastern Dwarf Galaxias
  - o Green and Golden Bell Frog
  - o Growling Grass Frog
  - o Eastern Pygmy Possum
  - o Southern Brown Bandicoot
  - Shorebirds (e.g. Hooded Plover *Thinornis cucullatus*, Curlew Sandpiper *Calidris ferruginea*, Eastern Curlew *Numenius madagascariensis*)
  - Waterbirds (e.g. Freckled Duck *Stictonetta naevosa*, Blue-billed Duck *Oxyura australis*)
  - Australasian Bittern *Botaurus poiciloptilus.*

Detailed flora and fauna assessments will be undertaken during Stage 2 of the project, including assessments for potentially occurring EPBC Act listed vegetation communities and targeted surveys for EPBC Act listed threatened flora and fauna species. If EPBC Act listed vegetation communities and/or species are detected during the assessments, then steps would be undertaken to avoid impacts upon them if possible. As potential impacts are unknown at this stage, further information regarding impacts (or the lack of them) will be provided in the reporting that accompanies the detailed/Stage 2 assessments.

# 4.2 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. The FFG Act provides a number of ways to help achieve its objectives including:

- listing of threatened taxa, communities of flora or fauna and potentially threatening processes, and creation of Action Statements and Management Plans for all listed taxa communities of flora or fauna and processes
- declaration of a Critical Habitat if the habitat is critical for the survival of a species or a community of flora or fauna, if listed as Critical Habitat, the Minister for Environment may then make an Interim Conservation Order (ICO) to conserve the Critical Habitat (NB: no Critical Habitat has been declared in the State)
- protection of flora and fauna through listing offences such as penalties relating to not following an ICO and taking, trading in, keeping, moving or processing protected flora without a licence. (NB: this does not apply to taking protected flora from private land (other than land which is part of the critical



habitat for the flora) except for taking tree-ferns, grasstrees or sphagnum moss for the purpose of sale.

• The Department of Environment, Land, Water and Planning (DELWP) is the referral authority for matters under the FFG Act.

The FFG Act also provides for the listing of communities of flora and fauna which are threatened. The Scientific Advisory Committee (SAC) has produced a set of descriptions of Victorian Threatened Communities. The purpose of the descriptions is to help field recognition of the various communities of flora and fauna currently listed as 'threatened' under the *Flora and Fauna Guarantee Act* 1988.

Under the FFG Act a permit from DELWP is required to 'take' (to kill, injure, disturb or collect) listed flora and/or fauna species that are members of protected taxa from public land. The requirement for a permit does not apply to private land unless listed species are present and the land is declared 'critical habitat' for the species. To date no land has been declared as 'critical habitat' within Victoria.

#### Relevance to proposal

As outlined previously, detailed flora and fauna assessments will be undertaken during Stage 2 of the project, including assessments for potentially occurring FFG Act threatened communities and species. If FFG Act listed vegetation communities and/or species are detected during the assessments, then steps would be undertaken to avoid impacts upon them if possible. Further information on impacts (or the lack of them) will be provided in the reporting that accompanies the detailed/Stage 2 assessments.

## 4.2.1 Key Threatening Processes

The *Flora and Fauna Guarantee Act 1988* also provides for potentially threatening processes upon threatened vegetation communities and species. A list of threatening processes is provided under the FFG Act.

#### Relevance to proposal

An initial review of the key threatening process listed under the FFG Act (as at December 2016) has identified several threatening processes that have the potential to be exacerbated by the project. These identified processes have been listed in Table 12 below. After the detailed Stage 2 assessments, the processes listed below and their potential project impacts will be re-reviewed.

Potentially Threatening Processes	Relevance to the proposed Project impact
Degradation of native riparian vegetation	Pipeline corridor contains several minor drainage lines and unnamed watercourses
	Lake Reeve crossing section has the potential to contain riparian vegetation
Habitat fragmentation as a threatening process for fauna in Victoria.	Pipeline corridor represents a lineal disturbance corridor and may dissect fauna transit corridors
Invasion of native vegetation by 'environmental weeds'.	Construction and operation of the pipeline and GPF has the potential to introduce environmental weeds into the project extent via the following
	Disturbance of the soil profile by machinery and equipment encouraging

#### Table 12. Key Threatening Process and Relevance to Potential project Impacts



Potentially Threatening Processes	Relevance to the proposed Project impact
	the germination of dormant weed seeds beneath the ground surface, creating the opportunity for pioneer weed species to establish. Importation of weed seed contained within material on vehicles, machinery, equipment and personal clothing/ boots Intra-project transfer of weed seed due to unknown weed location(s) and binding soil conditions Importation of weed seed in fill material
Prevention of passage of aquatic biota as a result of the presence of instream structures.	Pipeline corridor contains several minor drainage lines and unnamed watercourses
The spread of <i>Phytophtohora cinnamomi</i> from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority	Construction and operation of the pipeline and GPF has the potential to introduce cinnamon fungus into the project extent via the following means: Importation of the fungus within material on vehicles, machinery, equipment and personal clothing/ boots Intra-project transfer of the fungus due to unknown fungus location(s) Importation of the fungus in fill material
Wetland loss and degradation as a result of	Lake Reeve crossing section has the potential to contribute to 'wetland
change in water regime, dredging, draining, filling and grazing	loss' through soil disturbance and insufficient reinstatement/ rehabilitation

# 4.3 Planning and Environment Act 1987

The *Planning and Environment Act 1987* establishes the framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians. This includes providing the structure for and administering the implementation of Planning Schemes in each municipality through the Victorian Planning Provisions (VPPs). Planning Schemes are legal instruments outlining provisions for land use, development and protection. They are constructed and sourced from the VPPs.

## 4.3.1 State Planning Policy Framework

## **Clause 12 Environmental and Landscape Values**

Clause 12 of the planning scheme recognises that planning:

- should help to protect the health of ecological systems and the biodiversity they support (including ecosystems, habitats, species and genetic diversity) and conserve areas with identified environmental and landscape values.
- must implement environmental principles for ecologically sustainable development that have been established by international and national agreements.
- should protect sites and features of nature conservation, biodiversity, geological or landscape value.

Clauses of particular relevance include:

• Clause 12.01-1 Protection of biodiversity



• Clause 12.01-2 Native vegetation management

#### Clause 13.05-1 Bushfire

This clause seeks to assist to strengthen community resilience to bushfire. The overarching strategy is to 'prioritise the protection of human life over other policy considerations in planning and decision-making in areas at risk from bushfire and to apply the precautionary principle in decision making'. The clause is not addressed in this component of the report.

#### Clause 52.17 - Native Vegetation

Under Clause 52.17 a permit is required to remove, destroy or lop native vegetation on sites greater than 0.4 hectares. Clause 52.17 requires a planning permit for the removal of native vegetation (exemptions apply). The purpose of the clause (amongst others) is to minimise impacts on Victoria's biodiversity from the removal of native vegetation and to manage native vegetation to minimise land and water degradation.

Application requirements and decision guidelines are listed within the Clause. Applications may fall into a basic, intermediate or detailed assessment pathway depending on the location and extent of vegetation removed. The application requirements and decisions depend on the relevant assessment pathway. Referral to DELWP under Clause 66.02 may be required for an application to remove native vegetation; e.g. if clearing is greater than 0.5 ha or the application follows the detailed pathway.

#### Relevance to proposal

Whilst Clause 52.17 exists, as outlined in Section 4.4 below, one exemption that can apply is the *Pipelines Act 2005*. The objectives of these clauses will be considered in the body of future reporting that relates to avoiding and minimising impacts to biodiversity.

## 4.4 Pipelines Act 2005

In Victoria, onshore natural gas pipelines with an operating pressure above 1,050kPa require licensing under the *Pipelines Act 2005* (Pipeline Act), which is administered by DEWLP together with Energy Safe Victoria. Section 85 of the Pipeline Act provides that a pipeline issued with a licence under the Act is exempt from the requirements for a permit in a planning scheme under the *Planning and Environment Act 1987*.

#### Relevance to proposal

The *Pipelines Act 2005* provides an exemption for clearing native vegetation under the *Planning and Environment Act 1987* but does require the principles of sustainable development (being 'biological diversity should be protected and ecological integrity maintained') to be applied (Clause 4(2)c). Given this link back to sustainable development in the *Pipelines Act 2005*, the Victorian permitted clearing guidelines (DELWP 2017) will likely apply to this project.

There is also a prescribed requirement for Environmental Risk Assessment and an Environment Management Plan as detailed in The Pipeline Regulations (2017).



# 4.5 Wildlife Act 1975 and Wildlife Regulations 2013

The *Wildlife Act 1975* provides for the protection and conservation of native wildlife (fauna) within Victoria. It also provides the basis for the majority of wildlife permit/licensing requirements within the state. Under the Act a person must not hunt, take or destroy endangered, notable or protected wildlife; this includes all native vertebrate animals, all kinds of deer, non-indigenous quail, pheasants, and partridges, and all terrestrial invertebrate animals listed under the Flora and Fauna Guarantee Act 1988.

The *Wildlife Regulations 2013* provide further detail relating to the act, including that a person not to damage, disturb or destroy any wildlife habitat (s42), although this does not apply if the person is authorised to do so under any other Act such as the *Planning and Environment Act 1987*.

#### Relevance to proposal

It is unlikely a separate permit is required under this Act as damage should only be to wildlife habitat and not wildlife. However, if any wildlife is located within the habitat proposed for clearing, which is possible as there were numerous hollows observed on site, the salvage and translocation of such wildlife may be required as part of the pipeline licence approval. This should also ensure wildlife is not damaged during construction works.

Provision will be made by the proponent to have adequately trained and experienced wildlife handlers/personnel on site during ground clearing activity and construction works to remove and translocate fauna.

# 4.6 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act) intends to manage land degradation including detrimental environmental or economic impacts of declared noxious weeds and pest animals.

Under section 20 of the (Catchment and Land Protection Act 1994) CaLP Act, all land owners, including the Crown, 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 land owner;
- eradicate regionally prohibited weeds;
- prevent the growth and spread of regionally controlled weeds on their land;
- prevent the spread of, and as far as possible, eradicate established pest animals.

There are also provisions within the Act to prevent the spread of declared noxious weeds, through regulating the purchase, sale, possession for the purposes of sale, display, propagation or transport of these species into or within Victoria.

Declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories are:



- State Prohibited Weeds (S) are either currently absent in Victoria or are restricted enough to be eradicated. The Victorian Government is responsible for their control.
- Regionally Prohibited Weeds (P) are weeds are not necessarily widespread but have the potential to become widespread. It is expected that weeds that meet this criteria can be eradicated from the region. For weeds considered to be Regionally Prohibited it is the responsibility of the land owner to control these weeds on their land but not on adjacent roadside reserves.
- Regionally Controlled Weeds (C) are usually widespread but it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property and on adjacent roadside reserves.
- Restricted Weeds (R) include plants that pose unacceptable risk of spreading in the State or other Australian states and are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria. Trade in these weeds and there propagules, either as plants, seeds or contaminants in other material is prohibited.

#### Relevance to proposal

Numerous weed species have been previously recorded within the study area, as detailed in BL&A (2006a). Some of these are weeds listed under the CaLP Act (e.g. African Boxthorn *Lycium ferocissimum* and Spear Thistle *Cirsium vulgare*) and will require management during construction. Stage 2 of the project will involve weed mapping as part of the on-ground vegetation assessments.


# 5. **DISCUSSION**

The Stage 1 Pipelines Options Analysis was undertaken to assess the proposed pipeline options and determine the route that would present the least environmental constraints. Modelled mapped data showed that the site may contain remnant patches of national and state listed EVCs, and that patches of these EVCs occurred throughout each of the three pipeline options.

Potential habitat for threatened species may also occur on site; however further targeted surveys (to be undertaken in the Stage 2 works) would be required to confirm this. It also likely provides moderate to good habitat for common native flora and fauna species. Targeted surveys mostly have species-specific survey requirements with seasonal constraints on the timing of these surveys.

The results of the initial site reconnaissance, preliminary targeted fauna surveys (Stage 1) and Stage 2 Elliott Trapping surveys indicate that Option 2b is the potential pipeline alignment that would have the least impacts upon Vulnerable EVCs and is less likely to fragment patches of habitat as its alignment is located on the edge of native vegetation.

As all three potential alignments share a common route for the first 18.4km from the shore line to just east of Sandy Camp Road, the choice of least impact alignment was determined through a brief inspection along the three potential alignments from Sandy Camp Road east to the location of the Gas Processing Facility (GPF).

Whilst the Option 2b alignment mostly skirts patches of native vegetation to the east of Sandy Camp Road, the area of most potential impacts is the common route between the shoreline and Sandy Camp Road. Along this 18.4km common route alignment, the alignment will cross Lake Reeve (a RAMSAR wetland) and will skirt patches of native vegetation and/or habitat. Whilst considerable design work has already been undertaken to minimise impacts along the common route alignment, more detailed assessments are required to assess the quality of the vegetation through this section, the presence/ absence of threatened species or communities, and to investigate Lake Reeve's connectivity to the rest of the Gippsland Lakes.

The 18.4km common route alignment meets the shoreline directly west of the off-shore gas field. Providing the shortest route between the gas field and the shoreline will contribute to minimising impacts to marine flora and fauna, if strict assessment, construction and monitoring parameters are followed.

At this stage of the project it appears that the portion of Option 2b located to the west of Signboard Lane presents the route that will encounter the least impacts from an ecological perspective. It is the section of the Option 2b alignment between Shoreline Drive and Signboard Lane that is likely to require the greatest focus during the Stage 2 assessments, to determine the quality of vegetation, habitat and connectivity values to accurately map and describe the ecological values present; and how impacts upon them can be avoided and/or minimised.

The Stage 2 detailed assessments will comprise of general and targeted significant flora and fauna species and vegetation communities (EVCs) investigations, which are needed to be completed to satisfy the required standards of environmental assessment under the various Legislation such as the *Planning and Environment Act 1987* (State), *Environmental Effects Act 1978* (State), FFG Act 1988 (for public land only) and EPBC Act 1999 (Commonwealth). The results of the detailed and targeted assessments will then determine what further design and planning is required to further minimise potential impacts along the length of the Option 2b alignment.

The results of the Stage 2 detailed assessments will also determine what State and Commonwealth planning applications may be required, depending upon the extent and/or significance of the proposed pipeline impacts. As outlined previously:



The project was referred under the EPBC Act in 2003 and was determined to be 'not a controlled action'. It is the intent of GB Energy to self-assess any material changes in the proposed action and to undertake seasonal ecology survey in accordance with applicable Federal survey guidelines to ensure that we have knowledge on the presence or absence of MNES within the proposed disturbance corridor.

However considering the time lapse, when the extent of any impacts is fully ascertained, the need for a further EPBC Act referral may need to be re-visited.

### 5.1.1 Fauna

Stage 1 of the Pipelines Options Analysis has produced a preliminary assessment of fauna species and habitat within each of the proposed alignments. Stage 2 surveys commenced with the installation of Elliott traps, but no native fauna was detected at any time. Further targeted surveys are scheduled to take place during Stage 2 of the project to determine if the preferred pipeline alignment (from an ecological impacts perspective) provides habitat for significant species and native vegetation. While no threatened shorebirds or toadlets were detected during the Stage 1 surveys, more targeted seasonal survey for these species will also form part of Stage 2 detailed assessments.

Dwarf Galaxias were not captured at any survey point during the assessment. The timing of the Dwarf Galaxias study (undertaken by Streamline Research) deliberately targeted the end of summer before winter rain occurred. With less water around it was easier to identify permanent waters which could potentially be primary habitats for the long term survival of localised Dwarf Galaxias populations.

The Streamline Research survey, which encompasses a wider study area than the three potential pipeline alignments, determined that none of the three proposed pipeline options are likely to impact the species. However, attention should still be made to protect habitats that could occasionally be occupied by the Dwarf Galaxias, especially the dry habitats identified in the study, as these can provide temporary habitats for the species after flood events, provided that fish can disperse through suitable waterways from more permanent waterbodies.

Four species listed on the Victorian Advisory List of Threatened Vertebrate Fauna were observed during the surveys and these were located predominantly within the common route shared by all the potential pipeline alignments. Eastern Long-necked Turtles were detected in areas along the three potential alignments. To the west of Sandy Camp Road from the initial results, it is possible that turtles occupy broader habitat within the area, and that this should be taken into account if any dams are proposed to be removed for pipeline construction.

### 5.1.2 Native vegetation

The desktop review, modelled EVC data and Stage 1 reconnaissance assessment determined that there is native vegetation along all three potential pipeline options, with Option 2b appearing to have the smallest extent of native vegetation along its alignment.

The extent and condition of native vegetation will be identified and mapped across the site (Option 2b) during the detailed on-ground Stage 2 assessments. Stage 2 will also involve targeted flora surveys for a range of different species that have the potential to occur within the proposed pipeline option, as determined through the desktop review. Once the extent of vegetation and flora species is known, recommendations for avoiding



and minimising vegetation losses can be developed during Stage 2 of the project to ensure minimal impact to the environment.

## 5.1.3 Weeds and pathogens

As discussed in Section 4.6, weed mapping of high threat weed infestations will be conducted across the pipeline alignment.

The Stage 2 report will provide detailed weed and pathogen management recommendations, to minimise the risk of introducing weeds and pathogens onto the site, which can be utilised as part of a Construction Environment Management Plan. This will include an assessment of likelihood of the presence/ absence of the pathogens Chytrid Fungus and Cinnamon Fungus *Phytophthora cinnamomi* and recommendations to minimise their potential introduction and/or spread to the site.

### 5.1.4 Further biodiversity assessments and targeted surveys

As outlined previously, the Stage 2 detailed assessments will involve both general and targeted vegetation, and flora and fauna surveys, for a 50m wide corridor along the route of the preferred pipeline alignment- Option 2b (18.74km).

The previous ecological surveys (2003 and 2006) undertaken in the general project area that were documented in the desktop review identified several threatened species and vegetation communities that could occur along the preferred pipeline alignment, that would need to be surveyed in Stage 2. The Stage 1 reconnaissance surveys also determined the need for these surveys. The recent database searches (and likelihood of occurrence analysis) undertaken for this report, also determined a few other Victorian Advisory list threatened species that should be surveyed.

### Surveys Identified from previous ecological surveys (2003 and 2006)

Targeted surveys will be undertaken for the following EPBC/FFG listed species that are considered likely to occur in the project area:

- o Gippsland Red Gum Grassy Woodland and Associated Native Grassland Community
- o Temperate Coastal Saltmarsh Community
- o Maroon Leek-orchid, Metallic Sun-orchid and the Shy Sun-Orchid (spring survey required)
- Green and Golden Bell Frog
- Southern Toadlet (undertaken during Stage 1 but in dry conditions, so further surveying would be ideal)
- New Holland Mouse
- Dwarf Kerrawang (spring survey required)
- o Trailing Hop-bush
- Wellington Mintbush
- Eastern Dwarf Galaxias (undertaken separately by Streamline Research)

These targeted surveys will all be undertaken in accordance with applicable species survey guidelines.

### Targeted flora surveys and Threatened Vegetation Communities



Targeted flora surveys for two EPBC/FFG listed flora species that are considered likely to occur within the survey area, will be completed during Stage 2 of the on-ground survey of the preferred alignment:

- Trailing Hop-bush Dodonaea procumbens
- Wellington Mintbush Prostanthera galbraithiae

The following five plants require targeted surveys to occur in spring: Maroon Leek-orchid *Prasophyllum frenchii*, Metallic Sun-orchid *Thelymitra epipactoides* and the Shy Sun-Orchid *Thelymitra planicola*, Ribbed Thryptomene *Thryptomene micrantha*, Dwarf Kerrawang *Commersonia prostrata*. Given they will not be considered during the Stage 2 assessments, separate surveys may be required to be undertaken for these species in the appropriate survey season.

In addition to these species, other flora identified as having a moderate of higher likelihood of occurrence during the database searches, that are each listed as 'rare' on the Victorian Advisory list for Rare or threatened flora; will also be noted during the survey. These include:

- Variable Bossiaea, *Bossiaea heterophylla*
- Pink Zieria, Zieria veronicea subsp. veronicea
- Blue Mat-rush, *Lomandra glauca* s.s.
- Gippsland Lakes Peppermint, *Eucalyptus arenicola*
- Promontory Peppermint, Eucalyptus willisii s.s.

As these species are shrubs or trees and perennial groundstorey plants, the assessment will include active searching utilising the Random Meander survey method (as per Cropper, 1993) focussing on all potential areas of habitat. This method is further described in the *Flora Survey Guidelines – Protected Plants* (2016) prepared by the Department of Environment and Heritage Protection for the Queensland Government.

The presence of any threatened vegetation communities will be determined and mapped during the general site assessments.

### Targeted Fauna Surveys

Targeted fauna surveys for the EPBC/FFG listed flora species that are considered likely to occur within the survey area, will be completed as Stage 2 of the on-ground survey for the preferred alignment:

- Green and Golden Bell Frog *Litoria aurea*
- Southern Toadlet- continued surveying would be ideal due to the dry conditions during the Stage 1 assessments
- New Holland Mouse (NHM) *Pseudomys novaehollandiae*

In addition to these species, other fauna identified as a moderate or higher likelihood of occurrence during the database searches, will also be surveyed for, these include:

- Growling Grass Frog *Litoria raniformis*
- Martin's Toadlet *Uperoleia martini*



- Southern Brown Bandicoot (SBB) Isoodon obesulus obesulus
- Swamp Skink Lissolepis coventryi
- Glossy Grass Skink *Pseudemoia rawlinsoni* |
- Lace Monitor Varanus varius
- Shorebirds (e.g. Hooded Plover *Thinornis cucullatus*, Curlew Sandpiper *Calidris ferruginea*, Eastern Curlew *Numenius madagascariensis*)
- Waterbirds (e.g. Freckled Duck *Stictonetta naevosa*, Blue-billed Duck *Oxyura australis*)
- Australasian Bittern *Botaurus poiciloptilus*
- Eastern Pygmy Possum (EPP) Cercartetus nanus
- Emu Dromaius novaehollandiae (added can survey during all other surveys).

Further information on these species, including survey methodology and results will be provided after the surveys have been undertaken in the Stage 2 detailed assessments report.



# 5.1.5 Stage 2 Schedule of Works

Stage 2 survey	Activities	Timing	Status
	Habitat assessment over approx. 19 km - 2 days of fieldwork		
Fauna habitat	– Fauna habitat assessment/inventory	Woold beginning 29th May 2010	Complete
assessment	– Incidental fauna survey	week beginning 28th May 2019	Complete
	- Onsite mapping using handheld GPS		
	*includes general fauna observations		
	Field installation of 10 cameras & 80 Elliot traps & 40 hair tubes at		
	10 sites (2 zoologists):		
Targeted New	- Set up equipment over two days		
Holland	- Includes time to prepare and clean equipment		Elliott trapping surveys complete
Mouse/Southern	- Leave cameras in field for 14 days	Week beginning 28th May 2019	
Brown	<ul> <li>Onsite mapping using handheld GPS</li> </ul>		
Bandicoot/	Daily trap check over three days		
Eastern Pygmy	<ul> <li>includes morning checks and re-setting traps in late</li> </ul>		
Possum	afternoon/early evening		
	*Includes general fauna observations		
	Collect Fauna Cameras and hair tubes	Week beginning 17th June 2019	Not complete
	Determination of EVCs		
	Determination of threatened vegetation communities		
	Habitat Hectare assessments		
Field	Scattered tree assessments and Large tree assessments		
Assessment –	Assessment of potential to support significant species		
Flora and Native	Targeted surveys for:	Week beginning 17th June 2019	Not complete
Vegetation	- Wellington Mint Bush		
Assessment	- Trailing Hop Bush		
Assessment	Other threatened flora including		
	– Peppermints,		
	– Lomandra glauca,		
	- Variable Bossiaea		



Stage 2 survey	Activities	Timing	Status
	– Pink Ziera		
	Documentation general condition of vegetation, including land		
	management issues		
	Analysis of potential impacts upon ecological values by the		
	proposed works		
	Identification of site-specific avoidance or minimisation options		
	and design/management recommendations		
	*Includes general fauna observations		
Targeted	Four nights of survey per site with two zoologists plus travel and	Beginning September 2019–	
	equipment preparation.	December 2019. Timing	Not complete
	Survey approx 10 waterbodies (approx 5 sites per night)	dependent on suitable weather	Not complete
surveys	- total of two nights surveys x 2	and climate conditions.	
	Up to three days of bird surveys in wetlands (focus on Lake Reeve	December 2019, January 2020,	
Rind surveys -	and hinterdune system), larger lakes in study area and along the	February 2020. Timing	
shorehirds	coast.	dependent on suitable weather	Not complete
waterbirds	- Two zoologists survey each day	and climate conditions.	Not complete
waterbirds	- Target Large freshwater wetlands and mudflats/saltmarsh		
	- Target potential roost sites along beaches including at high tide		
Extras/variations			
	Tailored species survey program for three orchid species	Spring 2019 (extent of survey	
	- Maroon Leek-Orchid	area to be determined following	
	- Metallic Sun Orchid	native vegetation assessment	
Orchid surveys	– Shy Sun–Orchid		Not complete
	Also:		
	Dwarf Kerrawang		
	Ribbed Thryptomene.		
Swamp Skink /	Tile checks for Swamp Skink and Glossy Skink (to meet appropriate	Late Spring 2019	Not complete
Glossy Skink	seasonal conditions)		



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# Appendix 1. Fauna recorded in study area

Conservation status under EPBC Act 1999:	Conconvision status under EEC Act 1088:	Victorian Rare or Threatened Species (VROT) (DEPI 2014)
EX: Extinct, CR: Critically endangered, EN: Endangered,	Listed N: Nominated P: Rejected D: Delicted I: Invalid	x: Presumed extinct, e: Endangered, v: Vulnerable, r: rare, dd:
VU: Vulnerable and CD: Conservation dependant	L. Listeu, N. Nommateu, K. Rejecteu, D. Densteu, I. mvanu	data deficient and k: poorly known

The following table provides a list of fauna recorded in the study area during the site reconnaissance and targeted surveys.

Lifeform	Family	Scientific Name	Common Name	Record Type	EPBC	FFG	VROT	TREATY	Notes
AMPHIBIAN	Hylidae	Litoria ewingii	Southern Brown Tree Frog	Н					
AMPHIBIAN	Myobatrachidae	Crinia signifera	Common Eastern Froglet	н					
BIRD	Accipitridae	Aquila audax	Wedge-tailed Eagle	S					
BIRD	Accipitridae	Circus approximans	Swamp Harrier	S					
BIRD	Accipitridae	Elanus axillarus	Black-shouldered Kite	S					
BIRD	Accipitridae	Haliaeetus leucogaster	White-breasted Sea- eagle	S		L	v	CAMBA	
BIRD	Accipitridae	Haliastur sphenurus	Whistling Kite	S					
BIRD	Accipitridae	Hieraaetus morphnoides	Little Eagle	S					
BIRD	Alcedinidae	Dacelo novaeguinae	Laughing Kookaburra	S					
BIRD	Anatidae	Anas castanea	Chestnut Teal	S					
BIRD	Anatidae	Anas gracilis	Grey Teal	S					
BIRD	Anatidae	Anas superciliosa	Pacific Black Duck	S					
BIRD	Anatidae	Aythya australis	Hardhead	S			v		Within water treatment lagoons
BIRD	Anatidae	Chenonetta jubata	Australian Wood Duck	S					
BIRD	Anatidae	Tadorna tadornoides	Australian Shelduck	S					
BIRD	Artamidae	Artamus cyanopterus	Dusky Woodswallow	S					



Lifeform	Family	Scientific Name	Common Name	Record Type	EPBC	FFG	VROT	TREATY	Notes
BIRD	Artamidae	Cracticus tibicen	Australian Magpie	S					
BIRD	Artamidae	Cracticus torquatus	Grey Butcherbird	S					
BIRD	Cacatuidae	Cacatua sanguinea	Little Corella	S					
BIRD	Cacatuidae	Calyptorhynchus funereus	Yellow-tailed Black- Cockatoo	S					
BIRD	Cacatuidae	Eolophus roseicapilla	Galah	S					
BIRD	Campephagidae	Coracina novaehollandiae	Black-faced Cuckoo- shrike	S					
BIRD	Casuariidae	Dromaius novaehollandiae	Emu	S			nt		Two groups seen within study area
BIRD	Charadriidae	Vanellus miles	Masked Lapwing	S					In saltmarsh of L. Reeve
BIRD	Cinclosomatidae	Psophodes olivaceus	Eastern Whipbird	Н					
BIRD	Columbidae *	Columba livia	Rock Dove	S					
BIRD	Columbidae *	Streptopelia chinensis	Spotted Turtle-dove	S					
BIRD	Columbidae	Ocyphaps lophotes	Crested Pigeon	S					
BIRD	Columbidae	Phaps chalcoptera	Common Bronzewing	S					
BIRD	Corvidae	Corvus coronoides	Australian Raven	S					
BIRD	Corvidae	Corvus mellori	Little Raven	S					
BIRD	Cuculidae	Cacomantis flabelliformis	Fan-tailed Cuckoo	Н					
BIRD	Dicruridae	Grallina cyanoleuca	Magpie-lark	S					
BIRD	Dicruridae	Rhipidura albiscapa	Grey Fantail	S					
BIRD	Falconidae	Falco berigora	Brown Falcon	S					
BIRD	Falconidae	Falco cenchroides	Nankeen Kestrel	S					
BIRD	Falconidae	Falco longipennis	Australian Hobby	S					
BIRD	Fringillidae *	Carduelis carduelis	European Goldfinch	S					
BIRD	Hirundinidae	Hirundo neoxena	Welcome Swallow	S					



Lifeform	Family	Scientific Name	Common Name	Record Type	EPBC	FFG	VROT	TREATY	Notes
BIRD	Laridae	Chroicocephalus novaehollandiae	Silver Gull	S					Golden Beach - roosting on beach
BIRD	Laridae	Larus pacificus	Pacific Gull	S			nt		Golden Beach - roosting on beach
BIRD	Maluridae	Malurus cyaneus	Superb Fairy-wren	S					
BIRD	Meliphagidae	Lichenostomus leucotis	White-eared Honeyeater	S					
BIRD	Meliphagidae	Manorina melanocephala	Noisy Miner	S					
BIRD	Meliphagidae	Phylidonyris novaehollandiae	New Holland Honeyeater	S					
BIRD	Muscicapidae *	Turdus merula	Common Blackbird	S					
BIRD	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	S					Group of about six
BIRD	Pachycephalidae	Colluricincla harmonica	Grey Shrike-thrush	S					
BIRD	Pachycephalidae	Pachycephala pectoralis	Golden Whistler	S					
BIRD	Pardalotidae	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	S					
BIRD	Pardalotidae	Acanthiza pusilla	Brown Thornbill	S					
BIRD	Pardalotidae	Pardalotus sp.	Pardalote sp.	S					
BIRD	Petroicidae	Petroica boodang	Scarlet Robin	S					
BIRD	Petroicidae	Petroica phoenicea	Flame Robin	S					
BIRD	Phalacrocoracidae	Microcarbo melanoleucos	Little Pied Cormorant	S					
BIRD	Phalacrocoracidae	Phalacrocorax varius	Pied Cormorant	S			nt		
BIRD	Podargidae	Podargus strigoides	Tawny Frogmouth	S					
BIRD	Procellariidae	Puffinus gavia	Fluttering Shearwater	S					Offshore off Golden Beach
BIRD	Psittacidae	Platycercus elegans	Crimson Rosella	S					
BIRD	Psittacidae	Platycercus eximius	Eastern Rosella	S					
BIRD	Psittaculidae	Psephotus haematonotus	Red-rumped Parrot	S					



Lifeform	Family		Scientific Name	Common Name	Record Type	EPBC	FFG	VROT	TREATY	Notes
BIRD	Rallidae		Fulica atra	Eurasian Coot	S					
BIRD	Rallidae		Porphyrio melanotus	Australasian Swamphen	S					
BIRD	Sternidae		Thalasseus bergii	Crested Tern	S					Golden Beach - roosting on beach
BIRD	Sturnidae	*	Acridotheres tristis	Common Myna	S					
BIRD	Sturnidae	*	Sturnus vulgaris	Common Starling	S					
BIRD	Sulidae		Morus serrator	Australasian Gannet	S					Offshore off Golden Beach
BIRD	Threskiornithidae		Threskiornis molucca	Australian White Ibis	S					
BIRD	Threskiornithidae		Threskiornis spinicollis	Straw-necked Ibis	S					
BIRD	Tytonidae		Tyto javanica	Eastern Barn Owl	S					
INVERTEBRATE	Apidae	*	Apis (Apis) mellifera	European Honey Bee	S					
INVERTEBRATE	Insecta		Heteronympha merope	Common Brown Butterfly	S					
INVERTEBRATE	Insecta		Pieris rapae	Cabbage White Butterfly	S					
MAMMAL	Canidae	*	Vulpes vulpes	Red Fox	S					
MAMMAL	Cervidae	*	Axis porcinus	Hog Deer	S					
MAMMAL	Cervidae	*	Dama dama	Fallow Deer	S					
MAMMAL	Cervidae	*	Hyelaphus porcinus	Hog Deer	S, I					
MAMMAL	Felidae	*	Felis catus	Cat	S					
MAMMAL	Leporidae	*	Oryctolagus cuniculus	European Rabbit	S					
MAMMAL	Macropodidae		Macropus giganteus	Eastern Grey Kangaroo	S					
MAMMAL	Macropodidae		Wallabia bicolor	Black-tailed Wallaby	S,I					
MAMMAL	Microchiropteridae		Tadarida australis	White-striped Freetail Bat	н					
MAMMAL	Microchiropteridae		Unidentified microbat spp.	unidentified microbat species	S					
MAMMAL	Muridae	*	Mus musculus	House Mouse	С					Elliott trap



Lifeform	Family	Scientific Name	Common Name	Record Type	EPBC	FFG	VROT	TREATY	Notes
MAMMAL	Muridae	* Rattus rattus	Black Rat	С					Elliott trap
MAMMAL	Phascolarctidae	Phascolarctos cinereus	Koala	Ι					Road kill, near bridge over Lake Reeve
MAMMAL	Tachyglossidae	Tachyglossus aculeatus	Short-beaked Echidna	S					
MAMMAL	Vombatidae	Vombatus ursinus	Bare-nosed Wombat	S, I					Multiple burrows across study area
REPTILE	Chelidae	Chelodina longicollis	Eastern Long-necked Turtle	S				dd	At several farm dams
REPTILE	Scincidae	Lampropholis guichenoti	Garden Skink	S					
REPTILE	Scincidae	Tiliqua scincoides	Common Bluetongue Skink	S					

\*Denotes exotic species

# Appendix 2. Potentially occurring rare or threatened database flora species

Conservation status under EPBC Act 1999: Victorian Rare or Threatened Species (VROT) (DEPI 2014) Conservation status under FFG Act 1988: EX: Extinct, CR: Critically endangered, EN: Endangered, x: Presumed extinct, e: Endangered, v: Vulnerable, r: rare and L: Listed, N: Nominated, R: Rejected, D: Delisted, I: Invalid VU: Vulnerable and CD: Conservation dependant k: poorly known

EPBC	FFG	VROT	Origin	Scientific name	Common name	Habitat/species notes	Last record	No of surveys	No. individuals	Likelihood occurrence Option 2A	Likelihood occurrence Option 2B	Likelihood occurrence Option 2C
		r		Bossiaea heterophylla	Variable Bossiaea	Uncommon in Victoria and now confined to Gippsland east of Rosedale. Favours sandy soils in a variety of habitats including heath and open woodland.	2012	10	12	Low-Medium. Found in Deep Sands Woodland	Medium – Heathlands	Low-Medium. Found in Deep Sands Woodland
		k		Caladenia dilatata s.s.	Green-comb Spider-orchid	In Victoria, this species is mainly near–coastal or coastal in distribution, but is also found in the far–west region. It grows in heathland and open forest (Walsh and Entwisle 1994, p. 777).	2012	1	1	Low - found in heathlands	Low-medium found in heathlands. Low records	Low – found in heathlands
VU		v		Caladenia tessellata	Thick-lip Spider-orchid	Apparently confined to eastern Victoria from near-coastal heathy woodlands to open forests on well-drained sandy soils.	2013	2	2	Low – found in heathlands	Low-medium found in heathlands. Low records	Low – found in heathlands
		r		Calochilus imberbis	Naked Beard-orchid	Coextensive with C. robertsonii but much rarer and occurring as odd individuals within populations of that species. Possibly merely a growth form of C. robertsonii. C. robertsonii. is found mainly in dryish open woodlands and heaths throughout and is widespread across Victoria. Flowers October to December (Walsh and Entwisle 1994, pp. 856-57).	1979	1	1	Low – older record and quite rare	Low - older record and quite rare	Low – older record and quite rare
EN	L	e		Commersonia prostrata	Dwarf Kerrawang	Very rare, confined in Victoria to swampy land and lake margins in the Rosedale-Stradbroke-Providence Ponds area.	2011	1	173	Low-medium found in heathlands. Low records	High- found within study area	Low-medium found in heathlands. Low records
_		r		Corybas aconitiflorus	Spurred Helmet-orchid	Localized and uncommon colonies in the south–east of Victoria. Preferring sheltered, damp, shady places in coastal scrubs, heath, heathy woodland and moist foothill forest (Jeanes and Backhouse 2006; Walsh and Entwisle 1994).	1995	1		Low-medium found in heathlands. Low records	Low–medium found in heathlands. Low records	Low-medium found in heathlands. Low records
VU		v	#	Dodonaea procumbens	Trailing Hop-bush	Largely confined in Victoria to the south-west (Penola-Dergholm area, Grampians, Lake Fyans) with disjunct occurrences near Castlemaine, Avoca, Skipton and Camperdown. A 1900 record from near Sale in the east has not been confirmed by recent collections. Grows in low-lying, often winter wet areas in woodland, low open-forest and grassland on sands and clays. Flowers Summer. (Walsh and Entwisle 1999).	2012	1	883	Low – Medium mainly present in heathlands	High – high number of records in Heathy Woodland	Low – Medium mainly present in heathlands
		r		Eucalyptus arenicola	Gippsland Lakes Peppermint	Occurs in coastal and near-coastal areas in the Gippsland Lakes region in sandy soils. Distinguished from Eucalyptus willisii by its narrower juvenile leaves, somewhat broader and glossy adult leaves, and slightly larger fruits.	2012	16	8	Medium – present in heathlands	High- found within study area	Medium – present in heathlands



EPBC	FFG	VROT	Origin	Scientific name	Common name	Habitat/species notes	Last record	No of surveys	No. individuals	Likelihood occurrence Option 2A	Likelihood occurrence Option 2B	Likelihood occurrence Option 2C
		r		Eucalyptus willisii s.s.	Promontory Peppermint	Apparently restricted to sandy areas and granite hills in Wilsons Promontory. Plants previously included in this species from the Gippsland Lakes region are now recognised as a distinct species (see E. arenicola).	2011	4	4	Medium – present in heathlands	High- found within study area	Medium – present in heathlands
		r		Grevillea chrysophaea	Golden Grevillea	Flowers mostly JunNov. Growing usually in eucalypt woodland or heath in silty sand to sandy loam in the Brisbane Ranges (Anakie- Steiglitz area), and Gippsland in the area roughly enclosed by Traralgon, Woodside and Sperm Whale Head-Licola. {VicFlora, 2015 #11694}	2009	1	1	Low – one record	Low – one record	Low – one record
		r		Lachnagrostis rudis subsp. rudis	Rough Blown-grass	Uncommon, occurs in moist, shaded forests and swamp margins near the coast, scattered from near the South Australian border to Lake Tyers area in Gippsland.	2011	1	1	Low – one record	Low – one record	Low – one record
		r		Lawrencia spicata	Salt Lawrencia	An occasional component of saltmarsh communities along the coast, rare in saline depressions and around salt lakes of south- western Victoria (e.g. Polkemmet near Horsham, Harrow district, Camperdown, Lake Corangamite). Flowers January to April (Walsh and Entwisle 1996, p. 353).	2008	1	3	Low – one record	Low – low number of records	Low – one record
		k		Lomandra glauca s.s.	Blue Mat-rush	Recorded from heathland and heathy woodland in the Yarram-Sale area and from dryish, rocky sites inland and further to the east (e.g. Avon Wilderness, Buchan and Orbost areas, Howe Range).	2012	6	3	Low – Medium mainly present in heathlands	Low-medium found in heathlands. Low records	Low – Medium mainly present in heathlands
		r		Platysace ericoides	Heath Platysace	Confined to the Coastal Plain and foothills mostly between Moe and Orbost, usually occurring in dryish forest, often with shallow, rocky soils. Flowers August to December (Walsh and Entwisle 1999).	2008	1	6	Low – found in heathlands	Low-medium found in heathlands. Low records	Low – found in heathlands
EN	L	e		Prasophyllum aff. frenchii (Wilsons Promontory)	Promontory Leek–orchid	Widespread across southern Victoria, but rare. Occurs in grassland, heathland and open forest on well-drained or water- retentive sand or clay loams.	2007	1	80	Low – one	location within 5km o	of study site
EN	L	e		Prasophyllum frenchii	Maroon Leek-orchid	Infrequent, widespread populations in south western Victoria. Grasslands heathlands and grassy woodlands on moist well drained soils, including roadsides or rail reserves (Jeanes and Backhouse 2006).	2012	4	8	Medium – present in heathlands	High- found within study area	Medium – present in heathlands
VU	L	v		Prostanthera galbraithiae	Wellington Mint–bush	Endemic in the Holey Hill-Dutson area (south of Sale), in heathy open-forest, usually on gravelly sand.	2011	7	1114	Medium – present in heathlands	High- found within study area	Medium – present in heathlands
		r		Schoenus imberbis	Beardless Bog-sedge	Occasional in near-coastal heathland and woodland eastward from about Sale.	2012	1	1		Low – one record	
		r		Senecio diaschides	Shingle Fireweed	In Victoria apparently confined to river valleys in the east, with records from along the Avon, Macalister, Murrindal, Buchan and Snowy Rivers, commonly occurring in sand or amongst rocks near the watercourse. Flowers NovApr.(Walsh and Entwisle 1999)	2011	1	1		Low – one record	



EPBC	543	VROT	Origin	Scientific name	Common name	Habitat/species notes	Last record	No of surveys	No. individuals	Likelihood occurrence Option 2A	Likelihood occurrence Option 2B	Likelihood occurrence Option 2C
EN	L	e		Thelymitra epipactoides	Metallic Sun-orchid	Heath, grassland and woodland. Flowering enhanced by summer fires. Highly endangered (Jeanes and Backhouse 2006).	2008	2	607	Low-Medium. Found in Deep Sands Woodland	Medium – Found in Deep Sands Woodlands parallel to coastline.	Low-Medium. Found in Deep Sands Woodland
		k		Thelymitra planicola	Shy Sun-orchid	Distribution mainly in the Gippsland Lakes area, growing in grassland, woodland, and heath (Jeanes and Backhouse 2006, p. 206).	1999	6	1	Low-Medium. Found in Deep Sands Woodland	Low -found in deep sand woodlands. Low records	Low-Medium. Found in Deep Sands Woodland
		r		Thryptomene micrantha	Ribbed Thryptomene	In Victoria found mostly in heath or heathy woodland on sandy soils near the Gippsland Lakes (e.g. Sperm Whale Head), but with isolated occurrences in low shrubland on exposed rocky slopes north of Licola. Old records from the Grampians, and a 2003 collection from the lower Glenelg River area link the eastern Victorian occurrences to those of South Australia, but the status of these intervening populations requires further investigation.	2008	5	4	Low – found in heathlands	High- found within study area	Low – found in heathlands
		r		Viola fuscoviolacea	Dusky Violet	Grows in damp alpine herb fields of the alps (e.g. Buffalo Plateau, Bogong High Plains, Mt Wellington, Nunniong Plateau) with isolated occurrences in near-coastal Lepidosperma longitudinale sedgeland between Wilsons Promontory and Sale. The South Gippsland occurrences appear to be genuine V. fuscoviolacea, but the very different habitat and altitude suggests these populations warrant further investigation.	2008	2	1	Low – low number of records	Low – low number of records	Low – low number of records
		r		Zieria veronicea subsp. veronicea	Pink Zieria	Widespread in sandy mallee and mallee-heath communities of western Victoria with a southerly outlier near Casterton, and disjunct populations in sandly lowland heaths around the Gippsland Lakes. Often cryptic unless recently after fires or other disturbance when flowering may be prolific.	2012	6	5	Low – low number of records	Low – low number of records	Low – low number of records



# Appendix 3. Potentially occurring rare or threatened database fauna species

International TreatyFFG Act 1988 statusB: Bonn Convention; C: CAMBA; J: JAMBA; R: ROKAMBA.L: Listed, N: Nominated, I: Invalid or ineligible, R: Rejected, D: DelistedEPBC Act 1999 conservation statusVictorian Rare or Threatened Species (VROTS) (DSE 2013)EX: Extinct, CR: Critically endangered, EN: Endangered, VU: Vulnerable and CD: Conservation dependant.ex: Extinct, rx: Regionally Extinct, wx: Extinct in the Wild, cr: Critically Endangered, en: Endangered, vu: Vulnerable, nt: Near Threatened, dd: Data Deficient

Treaty	EPBC	FFG	Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
		L	v Accipiter novaehollandiae	Grey Goshawk	The Grey Goshawk has a stronghold in Victoria; particularly the white form in the Otway Ranges, where wet forests and gullies containing Mountain Grey Gum adjoin partly cleared farmlands. They occur in lower densities in similar habitats in the Strzelecki Ranges, Gippsland Plains and Otway Plains. Elsewhere in the State they are occasionally seen in woodlands, dry forests, suburban parks and wooded farmlands (Marchant and Higgins 1993).	1999	1	Low	Low	Low	May occur at low density or forage occasionally throughout wooded habitat within the study area
BONNA2H,ROKAM BA,JAMBA,CAMBA			v Actitis hypoleucos	Common Sandpiper	Regular, widespread but mostly uncommon summer migrant to Australia (Aug- May) (Pizzey and Knight 2007). Wide range of coastal or inland wetlands, with varying levels of salinity. Mainly muddy margins of rocky shores of wetlands; often around estuaries and deltas of streams; also lakes, pools, billabongs, reservoirs, dams and claypans; associated with mangroves. Large coastal mudflats are not favoured (Higgins and Davies 1996).	1912	1	Low	Low	Low	Uncommon in Victoria, may occasionally occur as a vagrant at wetlands, well vegetated dams, and Lake Reeve (when inundated)
		R	Arctocephalus pusillus doriferus	Australian Fur-seal	Offshore islands	2017	1	Nil	Low	Nil	May occur as a rare visitor to Golden Beach
			v Arctophoca forsteri	New Zealand Fur-seal	Offshore islands	2015	1	Nil	Low	Nil	May occur as a rare visitor to Golden Beach
	EN		Arctophoca tropicalis	Subantarctic Fur-seal	Offshore islands	2014	1	Nil	Low	Nil	May occur as a rare visitor to Golden Beach
САМВА,ЈАМВА		L	v Ardea alba	Great Egret	Habitat includes terrestrial wetlands, estuarine, littoral and moist grass habitats. Forages in open, shallow water and generally avoids dry or deeply flooded areas. Breed in wetlands with fringing or flooded trees, or other tall vegetation in which nests are built. Are known to use mangroves along the coast. Roosts in trees or near wetlands (Marchant and Higgins 1990).	1981	1	Medium	High	Medium	Whilst there is only one (older) record, it is possible that the species is underreported, as it frequently visits farm dams and estuarine habitats throughout its normal range.
			v Aythya australis	Hardhead	Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation (e.g. reeds, lignum, cumbungi), usually over water (Halse <i>et al.</i> 2005; Rogers 1990). These birds are most common in the wetland systems of inland Australia (Halse <i>et al.</i> 2005). Birds do visit Victoria from these areas in spring and summer, returning as the northern wetlands are replenished by rain (Halse <i>et al.</i> 2005). However, some birds are present in Victoria all year round depending on the suitability of the wetland (Pizzey and Knight 2007).	2007	310	Medium	High	Medium	Most likely to occur at Dutson Downs treatment ponds, and larger farm dams when water is present
			v Biziura lobata	Musk Duck	Usually seen in small numbers on the deep waters of well-vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests are formed in low vegetation in areas sheltered by surrounding vegetation (Marchant and Higgins 1990; Pizzey and Knight 2007).	2000	59	Low	High	Low	Most likely to occur at Dutson Downs treatment ponds



Treaty	EPBC	FFG VROTS	Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
	EN	Le	Botaurus poiciloptilus	Australasian Bittern	This species is part nocturnal and forages over water in dense cover, sometimes from platforms in wetland vegetation. Habitat is usually tall reedbeds, sedges, rushes, cumbungi or lignum. Also occurs on rice fields, drains in tussocky paddocks and occasionally on saltmarshes and brackish wetlands. Nests are shallow saucers on trampled water plants (Pizzey and Knight 2007).	1976	1	Low	Medium	Low	Most likely to occur in reedland around Dutson Downs treatment ponds
		Lv	Calamanthus pyrrhopygius	Chestnut-rumped Heathwren	Found in heathy woodlands, scrublands and box/ironbark forests in coastal south east Australia (Pizzey and Knight 2007).	1981	1	Low	Medium	Low	Only one old record. Cound potentially occur in suitable habitat.
BONNA2H,ROKAM BA,JAMBA,CAMBA		n t	Calidris alba	Sanderling	Summer migrants to Vic from their tundra breeding grounds north of the Arctic Circle. Some non-breeding birds may remain in Vic over winter (e.g. over 100 have been reported during winter in the Corner Inlet-Wilsons Promontory area). Flocks occur on sandy ocean beaches (especially those protected by offshore reefs), with regular populations of a few hundred birds along the south- western coast and in the Corner Inlet-Wilsons Promontory area. Occasionally individuals and small flocks occur in similar habitat elsewhere along the coast as well as in Port Phillip Bay and Western Port. Sanderlings feed from the wave- washed zone of beaches and among piles of accumulated seaweed.	1912	1	Nil	Low	Nil	Uncommon in Victoria, may occasionally occur as a vagrant along Golden Beach surf beach.
BONNA2H,ROKAM BA,JAMBA,CAMBA	CR	e	Calidris ferruginea	Curlew Sandpiper	Summer migrants to Victoria from Arctic breeding grounds (Aug-April). This species is found in a range of wetland habitats: tidal mudflats, saltmarsh, saltfields, fresh to saline wetlands, both coastal (most) and inland. Also visits sewage ponds (Pizzey and Knight 2007).	1981	8	Low	Medium	Low	Most likely to occur around Dutson Downs treatment ponds and Lake Reeve (when inundated)
		R t	Cercartetus nanus	Eastern Pygmy- possum	Sparse to locally common in wide range of vegetation on the Great Dividing Range, including western slopes and coastal plains. Found in wet and dry eucalypt forest, subalpine woodland, coastal banksia woodland and wet heath (Menkhorst and Knight 2001).	2014	15	High	High	High	Suitable woodland/shrubland/heat hland present, particularly within Coast Banksia habitat
		d d	Chelodina longicollis	Common Long– necked Turtle	Distributed throughout south eastern Australia including coastal rivers of Victoria. Occurs in a broad range of habitats including permanent riverine waterholes, lakes, farm dams and shallow temporary ponds. Found in greatest abundance in shallow, ephemeral waterholes or in bodies of water that are remote from remnant rivers, often in the absence of other turtle species. Able to distribute overland (Kennet <i>et al.</i> 2009).	2018	25	High	High	High	<b>PRESENT</b> : Recorded in three dams during the site assessment. Suitable freshwater habitats present
		n t	Chlidonias hybridus	Whiskered Tern	This is mainly a summer migrant to Victoria, although some remain here over winter. They inhabit shallow freshwater swamps and fresh or brackish lakes, favouring areas with emergent vegetation. The Whiskered Tern build nests on the water in colonies among flooded or emergent vegetation (Pizzey and Knight 2007).	1910	1	Low	Medium	Low	Only one old record, but has higher potential to visit estuarine habitat when Lake Reeve is inundated, may visit Dutson Downs water treatment lagoons.
		Lν	Chthonicola sagittatus	Speckled Warbler	Mainly grassy ground layer of dry sclerophyll forests and woodlands, often with scattered shrubs in under-storey.Mainly found in forests dominated by eucalyptus, especially box-ironbark forests and woodlands e.g. near Chiltern, NE. Victoria. found near Bendigo recorded in red Stringybark, red box and long leaved box with a grassy ground layer and well-spaced shrubs in understorey, but not in red ironbark or yellow gum forests. Occasionally occur in mallee habitats, sometimes with native pine; in Victoria, mostly confined to N. foothills of great divide but scattered on S. slopes of great divide (Higgins and Peter 2002).	1978	1	Low	Low	Low	Only one old record, limited suitable habitat present. Not a common species away the northern foothills of the Great Dividing Range



Treaty	CARTING SCIENTIFIC NAME	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
	n <i>Dromaius</i> t <i>novaehollandiae</i>	Emu	Found in plains, scrublands, open woodlands, coastal heaths, alpine pastures, semi–deserts, margins of lakes, pastoral and cereal growing areas. Mostly absent from closely settled parts, common in pastoral and cropping regions, state forests and national parks (Pizzey and Knight 2007)	2000	26	High	High	High	<b>PRESENT</b> : Recorded at Dutson Downs. Likely to move through all options
	L e <i>Egretta garzetta</i>	Little Egret	Inhabits terrestrial wetlands and shallow margins of tidal estuaries and inland lakes and rivers. Feed in shallow water and nest colonially, often with other waterbirds. Stick–nests are usually built in trees over water, although occasionally in reedbeds (Marchant and Higgins 1990).	1981	1	Medium	Medium	Medium	Whilst there is only one (older) record, it is possible that the species is underreported, as it frequently visits farm dams and estuarine habitats throughout its normal range, not as common as Great Egret.
BONNA1	EN L <sup>C</sup> <i>Eubalaena australis</i> e	Southern Right Whale	The Southern Right Whale is a strictly marine species which has a southern circumpolar distribution. This species migrates to the southern coastlines, including Australia, to breed and calve in the austral winter–spring (Van Dyck and Strahan 2008).	1991	8	Nil	Nil	Nil	No offshore marine habitats are assessed in this report
	VU L e <i>Galaxiella pusilla</i>	Dwarf Galaxias	Typically occur in slow flowing and still, shallow, permanent and temporary freshwater waterways including swamps, the backwaters of streams and creeks, drains and ditches, usually with dense aquatic, emergent or flooded vegetation. Ephemeral sites require seasonal flooding and linkages to other more permanent populations for population replenishment, therefore wetland connectivity may be critical to survival. They occur across most of southern Victoria, however are sparse in the landscape and more abundant in the south– east of the state, most specifically in Mornington Peninsula & Western Port areas (Allen, Midgley and Allen 2002; Museum Victoria 2006).	1993	4	Low	Low	Low	Not recorded during initial targeted surveys. Sub- optimal habitat with most waterbodies being currently dry
BONNA2H,ROKAM BA,JAMBA,CAMBA	n <i>Gallinago hardwickii</i> t	Latham's Snipe	Latham's Snipe is a migratory species. The species migrates to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands (Pizzey and Knight 2007). Also occurs in small ephemeral wetlands such as wet depressions after floods recede. Generally roosts in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen feeding during the day. This species feeds by probing in soft mud and rarely moves far from concealing vegetation (Higgins and Davies 1996).	2001	4	Medium	High	Medium	Likely to occur in wetlands at Dutson Downs, and at well-vegetated farm dams, as well as Lake Reeve (when water is present)
САМВА	L v <i>Haliaeetus leucogaster</i>	White-bellied Sea- Eagle	Occurs along the coast (especially the forested coasts of the East Gippsland Plains), on coastal islands, around coastal lakes and along some inland rivers and lakes. Catches prey on, or near the water's surface and also takes refuse from fishing boats. On land they feed from the ground on carrion or occasionally catch live prey. Builds stick-nests in tall eucalypts, particularly River Red Gum, Forest Red Gum and Southern Mahogany. Clearing of forests and woodlands along the coast, near coastal lakes, and along the Murray River, threatens this species. In the Gippsland Lakes region more than half of the known nest sites are on private lands (DSE 2003). Occurs across a range of forests and woodlands throughout Victoria (DSE 2003).	2010	9	Low	High	Low	Likely to forage over Golden Beach and wetlands at Dutson Downs, may roost/nest in larger trees near wetlands/shoreline
CAMBA,ROKAMBA, JAMBA	v Hirundapus caudacutus	White-throated Needletail	In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable. In Australia, White-throated Needletails almost always forage aerially, at heights up to 'cloud level', above a wide variety of habitats ranging from heavily treed forests to open habitats, such as farmland, heathland or mudflats (Higgins 1999).	2008	3018	High	High	High	Likely to forage aerially over study area



Treaty	Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
CAMBA,JAMBA	n L <i>Hydroprogne caspia</i> t	Caspian Tern	Mostly found in sheltered coastal embayments, including harbours, lagoons, inlets, bays, estuaries and river deltas, usually with sandy or muddy margins. Will use artificial wetlands, including reservoirs, sewage ponds and saltworks (Higgins and Davies 1996).	1993	2	Low	Medium	Low	Most likely to occur at Dutson Downs treatment ponds, Lake Reeve and Golden Beach, breeds nearby on the Corner Inlet barrier islands.
	n <i>Larus pacificus</i> t	Pacific Gull	The Pacific Gull is one of the largest gulls within the Australian and New Zealand territories. Confined to the coast where flocks occur on intertidal mudflats and nearby rubbish tips in Port Phillip Bay, Western Port and Corner Inlet, with smaller numbers elsewhere on estuaries, along beaches and on other intertidal habitats (Higgins and Davies 1996). This species breeds mainly on islands in Bass Strait and off Tasmania. Some smaller numbers breed on islands off Wilsons Promontory. Their nests are built on the ground on the tops of steep-sided islands (Higgins and Davies 1996).	2007	16	Low	High	Low	<b>PRESENT:</b> Recorded at Golden Beach, unlikely to occur elsewhere within the study area other than while on passage.
	VU R v <i>Litoria aurea</i>	Green and Golden Bell Frog	Usually found close to, or in water or very wet areas in forests, woodlands shrublands and open or disturbed areas. The eggs and tadpoles can be found in permanent lakes, swamps and dams with still water.	2018	71	Medium	High	Medium	Recent records from wetlands at Dutson Downs. May also occur in farm dams in other options
	VU L e <i>Litoria raniformis</i>	Growling Grass Frog	The species often inhabits water bodies with a diverse assemblage of aquatic vegetation, including emergent species such as sedges (Gahnia spp.), submergent species such as curly pondweed (Potamogeton spp.), floating species such as water ribbon (Triglochin spp.) and filamentous algae (Hamer and Organ 2006; Heard, Robertson and Scroggie 2004). The aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and relatively safe development, and food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Heard, Robertson and Scroggie 2004). However, it is also known to occur in ditches, dams and swamps or sheltering under discarded debris near those sites (Tyler and Knight 2009, pp. 38–39).	2017	6	Low	Medium	Low	Recent records from wetlands at Dutson Downs
	VU Mirounga leonina	Southern Elephant Seal	Circumpolar in Southern Ocean, mostly north of pack ice. Breeds on Macquarie and Herd Is; former breeding colonies in Bass Strait were hunted to extinction in the early 1800's. Births have occurred on beaches in Tas, Vic and SA during spring and early summer (Menkhorst and Knight 2001).	1969	4	Nil	Low	Nil	May rarely come ashore at Golden Beach: infrequently recorded on the mainland – last record within vicinity is 50 years old
	v Nannoperca sp. 1	Flinders Pygmy Perch	Freshwater wetlands, rivers, streams	1993	2	Nil	Low	Nil	May occur in treatment ponds at Dutson Downs
	L v <i>Ninox strenua</i>	Powerful Owl	Widespread in foothill and coastal forests where they especially favour gullies with Peppermint-Manna Gum forests. Occasionally seen in wetter mountain forests, drier box-ironbark forests and woodlands, and softwood plantations. Hunts at night by flying through the forest canopy catching prey from tree branches. They nest in large holes in trees (DSE 2004).	2007	1	Medium	Medium	Medium	May forage over woodland/shrubland and roost in large trees if available
BONNA1,ROKAMB A,JAMBA,CAMBA	Numenius CR v madagascariensis	Eastern Curlew	Common summer migrant to Australia (Aug-May) (Pizzey and Knight 2007). Found in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats. Mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation, also on saltflats and in saltmarsh (Higgins and Davies 1996).	1901	1	Nil	Low	Nil	Only one old record, limited suitable habitat present; estuarine habitat of Lake Reeve



Treaty	SCientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
	L e <i>Oxyura australis</i>	Blue-billed Duck	This species inhabits deep, permanent, well-vegetated swamps, but at times (especially in winter) may occur in large numbers on large open wetlands. The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds/rushes, often over water or on small islands (Marchant and Higgins 1990; Pizzey and Knight 2007).	2007	184	Low	High	Low	Most likely to occur at Dutson Downs treatment ponds
	v Pachyptila turtur	Fairy Prion	The Fairy Prion is a pelagic species of the subtropic and subantarctic seas. It is abundant in south-eastern Australian waters, and is commonly seen offshore over the continental shelf. This species has a few small breeding colonies on Australian shores, near Portland, Wilson's Promontory, and on some Bass Strait islands (Marchant and Higgins 1990).	1976	1	Nil	Low	Nil	Largely marine in habit. Observations would largely be offshore, species may occasionally get beached at Golden Beach
	n <i>Phalacrocorax varius</i> t	Pied Cormorant	This species is most often found along the coast, however are known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Marchant and Higgins 1990; Pizzey and Knight 2007).	1978	1	Low	Medium	Low	This species is largely marine in habit, but may occasionally visit freshwater and estuarine waterbodies. Some suitable habitat is present, especially Dutson Downs water treatment plant, but also larger farm dams in other options and Lake Reeve (when inundated)
	n <i>Platalea regia</i> t	Royal Spoonbill	The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands, these birds are gregarious in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick–nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Marchant and Higgins 1990).	1999	1	Low	Medium	Low	Most likely to occur at shallow Dutson Downs treatment ponds, and occasionally at farm dams and would likely visit Lake Reeve when inundated
	v Pseudemoia rawlinsoni	Glossy Grass Skink	Inhabits swamp and lake edges, salt-marshes and boggy creeks with dense vegetation (Wilson and Swan 2008).	2007	1	Low	High	Low	Recorded at Dutson Downs
	Pseudomys VU L v novaehollandiae	New Holland Mouse	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations show a preference for sandy substrates with a heath understorey, leguminous shrubs less than 1 m high and sparse ground litter. Habitat for burrowing is likely to be an important factor in species distribution (Van Dyck and Strahan 2008).	2018	170	Medium	High	Medium	Recorded recently at Dutson Downs. May occur in other options in woodland/shrubland
	<i>Pseudophryne</i> v <i>semimarmorata</i>	Southern Toadlet	The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low areas close to water (Hero, Littlejohn and Marantelli 1991).	2007	41	Medium	High	Medium	Suitable ephemeral wetland habitat present in all three options, but quality is higher around Dutson Downs
	L d <i>Saccolaimus flaviventris</i> d	Yellow-bellied Sheathtail Bat	Summer migrants to southern Australia, between January and April; the Yellow-bellied Sheathtail Bat is found in a wide variety of habitat types, including wet and dry sclerophyll forests, open woodland, Acacia shrubland, mallee, grasslands and deserts. They generally roost in large tree hollows (Churchill 2008). Common in N. Australia but rare late-summer autumn visitors to South. Occurs in most environments from wet forests to deserts, roosts singly or in small groups in tree hollows; in treeless areas they are known to roost in burrows of terrestrial mammals (Menkhorst and Knight 2001)	2007	1	Medium	Medium	Medium	Not a common species in Victoria. May forage over woodland/shrubland and roost in large trees if available



Treaty	EPBC	FFG	2 Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
		v	Spatula rhynchotis	Australasian Shoveler	The Australasian Shoveler occurs mainly on large, well-vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water. This species nests in grass nests on the ground, usually in dense cover and near water (Marchant and Higgins 1990; Pizzey and Knight 2007).	2007	1001	Medium	High	Medium	Most likely to occur at Dutson Downs treatment ponds, and likely would visit Lake Reeve when inundated, may occasionally visit farm dams
		L e	Stictonetta naevosa	Freckled Duck	Found in terrestrial wetlands with shallow productive waters or soft mud at wetland edges. In breeding range (Lake Eyre and Murray–Darling Basin) found in densely vegetated waters, particularly flood water swamps and creeks vegetated with lignum. In coastal region, prefers swamps and lakes with dense thickets of Melaleuca, Casuarina or Leptospermum (Marchant and Higgins 1990).	1983	8	Low	Medium	Low	Most likely to occur at Dutson Downs treatment ponds
BONNA2SR	VU	v	Thalassarche melanophris	Black-browed Albatross	#N/A	1978	1	Nil	Nil	Nil	Most likely would only be recorded offshore of Golden Beach, as the species is largely marine in habit
	VU	Lv	Thinornis cucullatus	Hooded Plover	The Hooded Plover is endemic to south-eastern and western Australia. This species is mainly a bird of open sandy ocean beaches, and is occasionally found on bay beaches and coastal/inland saltlakes. It prefers broad, flat beaches with wide wash zone, with seaweed wrack and jetsam, and backed by sparsely vegetated dunes. It sometimes uses tidal flats and estuaries, rocky or sand-covered platforms and reefs, generally those near sandy beaches. In Victoria, it is widespread through all coastal areas (Marchant and Higgins 1993; Pizzey and Knight 2007).	2002	3	Low	Medium	Low	May occasionally forage and roost along Golden Beach and Lake Reeve
BONNA2H,ROKAM BA,JAMBA,CAMBA		v	Tringa nebularia	Common Greenshank	Habitat consists of mudflats, estuaries, saltmarshes, margins of lakes, wetlands, fresh and saline claypans, commercial saltfields and sewage ponds. Regular, widespread summer migrant to Aust. and Tas. (Sept-April). Mostly coastal but can be found inland in suitable habitat. Some occur over winter. (Pizzey and Knight 2007, p.178)	1980	1	Low	Medium	Low	May occcasionally forage within shallows of wetlands on Dutson Downs treatment ponds and more likely to visit Lake Reeve when inundated
		L e	Tyto novaehollandiae	Masked Owl	Inhabits forests, woodlands and caves. Active in middle storey (Simpson and Day 2000/2001). Inhabits diverse range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting, and nearby open areas for foraging (Higgins 1999).	2007	1	Medium	Medium	Medium	Likely to be under– recorded, as there is some suitable habitat present. May forage over woodland/shrubland and roost in large trees if available
		L C e	Uperoleia martini	Martin's Toadlet	Found in dry forest, woodlands, shrublands, grasslands, open and disturbed areas. They are most common near water, but can be found in dry depressions that flood in winter or spring. Eggs are unknown. Tadpoles are aquatic but otherwise unknown.	2014	1	Medium	High	Medium	Suitable ponds and wetlands are present, but larger wetlands presnet at Dutson Downs
		d d	Uperoleia tyleri	Tyler's Toadlet	Found in dry forest, woodlands, shrublands, grasslands, open and disturbed areas. They are most commonly found near water, but can be found in dry depressions that flood in winter or spring. Eggs are unknown. Tadpoles are aquatic but otherwise unknown.	1978	1	Medium	Medium	Medium	Suitable ponds and wetlands are present



Treaty	Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
	e <i>Varanus varius</i>	Lace Monitor	Occurs in well-timbered areas, from dry woodlands to cool temperate southern forests. Species is arboreal, ascending large trees when disturbed; forages widely. Clutches of eggs are laid in arboreal or terrestrial termite mounds (Wilson and Swan 2008).	2017	3	Medium	High	Medium	Suitable woodland habitat (particularly with logs and/or hollows) is present. Recorded at Lake Reeve Bluff
	L v <i>Lissolepis coventryi</i>	Swamp Skink	The Swamp Skink can be found in cool temperate, low-lying wetlands including swamp margins, tea-tree thickets and tidal salt-marshes. The freshwater wetlands are typically dominated by Leptospermum or Melaleuca spp. It typically occurs in or adjacent to dense sedge and tussock life-form vegetation without a dense canopy, allowing it to bask in the sun on logs or in open patches of the vegetation. It shelters in burrows (Wilson and Swan 2008).	-	_	Low	Medium	Low	Not recorded within 5 km but suitable habitat is present in Option 2A
	n <i>Isoodon obesulus</i> EN L t <i>obesulus</i>	Southern Brown Bandicoot	The Southern Brown Bandicoot is active during both the day and night. It is found in forest, heath and shrub communities. It shelters in a nest of vegetation beneath dense cover; it eats fungi, tubers and arthropods (Menkhorst and Knight 2001; Paull 2008).	-	-	Medium	Medium	Medium	Not recorded within 5 km but suitable habitat is present in all three options
	CR L <sup>C</sup> <i>Anthochaera phrygia</i> e	Regent Honeyeater	Its range has contracted dramatically from its historical distribution as the species has suffered badly from broad-scale clearing and complete absence of old growth box-ironbark habitat so that now only around 100 individuals remain wild in Victoria. It is a rare vagrant to the country around Bendigo (where it was once common) and to Gippsland (where it was a regular visitor), and in most years only a handful of birds are seen in eastern Victoria — four-fifths of sightings are from just three locations: Chiltern, the Killawarra, and the Reef Hills. It is highly nomadic in its movements as determined by the need for a nectar rich diet from the flowering of eucalyptus particularly Mugga Ironbark Eucalyptus sideroxylon, White Box Eucalyptus albens, Yellow Box Eucalyptus melliodora and Yellow Gum Eucalyptus leucoxylon (SWIFFT 2017).	-	-	Low	Low	Low	May occur on passage.
BONNA2H,ROKAM BA,JAMBA,CAMBA	EN e <i>Calidris canutus</i>	Red Knot	Summer migrants to Vic from their Arctic breeding grounds in Siberia and Alaska. Young non-breeding birds may remain during winter, especially in Corner Inlet and hundreds in similar habitat in Port Phillip Bay (mainly Queenscliff and Mud Islands). Small flocks irregularly occur elsewhere along the coast and there are a few inland records (e.g. round saline lakes near Colac). Red Knots feed by probing in soft sand or mud at the edge of water or while wading. During high tides they may move to nearby lakes, sewage lagoons and floodwaters to continue feeding, although usually they roost with other waders on spits and islets.	-	_	Nil	Low	Nil	May occur no passage.
	VU L v <i>Grantiella picta</i>	Painted Honeyeater	The Painted Honeyeater is a summer migrants to Victoria. They are generally found to inhabit box-ironbark, Broad-leaved Peppermint and Red Stringybark forests and box-buloke woodlands in the northern foothills of the great Divide. May also occur in Red Ironbark, Red Box forests in southern Victoria. They are occasionally found along Murray River valley to Hattah-Kulkyne NP where they inhabit Black Box woodlands. This species is usually found in open stands of old eucalypts that are infested with mistletoes (Higgins, Peter and Steele 2001).	-	-	Low	Low	Low	May occur on passage, limited suitable habitat present; may roost along Golden Beach or on Lake Reeve (when inundated).
	CR L e <i>Lathamus discolor</i>	Swift Parrot	The Swift Parrot is a winter migrant to Victoria (Swift Parrot Recovery Team 2001). They arrive from their breeding areas in Tasmania, however small numbers of non-breeding birds may remain here during summer (Higgins 1999; Swift Parrot Recovery Team 2001). They are nomadic, and follow the flowering of trees and psyllid infestations. In Victoria their distribution is centered on box-ironbark forests, but they are often seen in town parks and occur sporadically elsewhere in dry forests, dry woodlands and wooded farmlands. They are seldom seen in treeless areas, rainforests or wet forests (Higgins 1999; Pizzey and Knight 2007). Feed mainly in winter-flowering plants, especially Red Ironbarks and ornamental trees and shrubs (Higgins 1999; Swift Parrot Recovery Team 2001).	-	_	Low	Low	Low	May occur on passage.



Treaty	EPBC	FFG	2 Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
САМВА	EN	L C e	Rostratula australis	Australian Painted Snipe	Generally uncommon in Australia and scattered records in Victoria. Uses terrestrial shallow freshwater (occasionally brackish) wetlands, ephemeral and permanent lakes, swamps, claypans, inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire, often with scattered clumps lignum, canegrass or tea-tree (Marchant and Higgins 1993).	-	-	Low	Medium	Low	May occur at Dutson Downs and Lake Reeve (when inundated)
	VU	L v	Maccullochella peelii	Murray Cod	The Murray Cod lives in a wide variety of habitats from silty slow moving rivers to clear rivers with pools and riffles. This fish prefers instream habitat of rocks and logs with over-hanging vegetation (Allen, Midgley and Allen 2002).	-	-	Nil	Nil	Nil	Not known to occur in Dutson Downs
	VU	L v	Prototroctes maraena	Australian Grayling	This species only spends part of its life in freshwater streams, Australian Graylings migrate between freshwater streams and the ocean. Streams where this species occur tend to be clear with gravel bottoms and a variety of instream habitat such as pools and riffles. The upstream migration of this species has been effectively terminated in some rivers by dams (Allen, Midgley and Allen 2002).	_	-	Nil	Low	Nil	Low likelihood of occurrence at Dutson Downs
	VU	L n t	Antechinus minimus maritimus	Swamp Antechinus	Prefers damp habitats with a high percentage of cover of understorey vegetation and has been recorded in forest, woodland, heathland, tussock grassland and sedgeland. The species' preference for sites of low altitude, with a southerly aspect and gentle slope, is consistent with its occurrence close to drainage lines and swamps (Van Dyck and Strahan 2008).	-	-	Low	Medium	Low	Suitable habitats but no local records
	EN	L e	Dasyurus maculatus maculatus	Spot-tailed Quoll	The species is recorded in a range of treed habitats including tropical, subtropical and temperate rainforests, vine thickets, wet and dry sclerophyll forest, woodland and coastal scrub. In Tasmania it also occurs in heathland (Van Dyck and Strahan 2008).	_	-	Low	Low	Low	Woodland and coastal scrub is present but no local records, areas with dense understorey and hollows provide particularly suitable habitat.
	VU	L v	Petauroides volans	Greater Glider	Occurs in wet sclerophyll forest on the ranges and coastal plains from near Mossman, NE. QLD to Daylesford, VIC. Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred food tree species. Requires large tree hollows for shelter, and found in most abundance where there is a high density of tree hollows. In southern Queensland require at least 2–4 den trees for every 2ha of habitat. They are significantly vulnerable to logging and have relatively small home ranges and poor dispersal ability. In Victoria, their numbers have declined sharply in recent years (TSSC 2016).	-	-	Low	Low	Low	No suitable forest is present
	EN	L e	Pseudomys fumeus	Smoky Mouse	Patchy, ephemeral populations in Victoria. Although recorded in subalpine to coastal dune areas, habitat is linked to dietary requirements. Epacrids that provide berries and flowers and legumes that provide seeds are typical of suitable habitat. Underground fungi (truffles) are important in winter while seeds and fruit are important in summer. Invertebrates are taken when available (Van Dyck and Strahan 2008).	-	-	Low	Low	Low	Coastal habitats present but no local records
	vu	L v	Pteropus poliocephalus	Grey-headed Flying- fox	Eastern coastal Australia from Gladstone in Qld to South Gippsland and Melbourne in Vic, with rare influxes further west and south. Rarely more than 200km inland. In warmer months gathers in very large camps, usually in dense forest in gullies. Population is more dispersed in winter. Size of camps fluctuate in response to local food supplies. In south numbers fluctuate in regular pattern, being highest in late summer-autumn and lowest in winter (Menkhorst and Knight 2001).	-	-	Medium	Medium	Medium	May forage over study area but no known roost/camp sites present withy study area, however, species is known to be present in large numbers in broader Gippsland Lakes – Bairnsdale region



Treaty	EPBC	Scientific name	Common name	Habitat/species notes	Last record	Records	Likelihood Option 2A	Likelihood Option 2B	Likelihood Option 2C	Likelihood summary
BONNA1	EN	Caretta caretta	Loggerhead Turtle	Tropical warm, temperate waters worldwide, including those off the Australian coast, particularly the Great Barrier Reef. Occasional strays venture south to cooler waters. Mainly carnivorous, eating mostly molluscs, crustaceans, sea urchins and jellyfish (Wilson and Swan 2008).	-	-	Nil	Nil	Nil	Unlikely to come ashore at Golden Beach
BONNA1	VU	Chelonia mydas	Green Turtle	Occur in tropical and warm temperate waters worldwide. Occasional strays venture south to cooler waters but adults graze on seagrass and seaweeds (Wilson and Swan 2008).	-	-	Nil	Nil	Nil	Unlikely to come ashore at Golden Beach
BONNA1	EN	L <i>Dermochelys coriacea</i> e	Leathery Turtle	Forages in open oceans and coastlines across a vast area from north of the Arctic Circle to south of New Zealand. Nests only in the tropics (Wilson and Swan 2008).	-	-	Nil	Nil	Nil	Unlikely to come ashore at Golden Beach
CAMBA,ROKAMBA, JAMBA		Apus pacificus	Fork-tailed Swift	The Fork-tailed Swift is a migratory species occurring throughout Australia between October-April. This insectivorous species is almost entirely aerial. Occurs over inland plains, often over cliffs or beaches and also over settled areas. Feed aerially, and probably also roost aerially, although rarely seen to land (Higgins 1999; Pizzey and Knight 2007).	-	-	Low	Low	Low	May forage aerially over site, not a common species in Victoria.
BONNA2S,ROKAM BA,JAMBA,CAMBA		L v <i>Sternula albifrons</i>	Little Tern	The Little Tern is both a breeder and migrant visitor to Australia. It mainly inhabits sheltered coastal waters as it mostly forages in shallow waters in bays, inlets, estuaries, lakes, and lagoons. If out at sea, usually travels not further than 50m. This species particularly favours habitat with exposed sandpits, sandbanks, or ocean beaches nearby (Higgins and Davies 1996; Pizzey and Knight 2007).	-	-	Low	Medium	Low	Has potential to forage over Golden Beach, Lake Reeve and wetlands at Dutson Downs, known to breed along Gippsland coastline/ sandy islands
BONNA2H		Monarcha melanopsis	Black-faced Monarch	Inhabits rainforests, eucalypt woodlands, coastal scrubs, damp gullies in rainforest, eucalypt forest, when migrating more open woodland (Pizzey and Knight 2007). Occurs along the eastern-Australian coast (Simpson and Day 2000/2001).	-	-	Low	Low	Low	Limited suitable 'damp' habitat present but no local records, species is generally not common west of East Gippsland
BONNA2H		Myiagra cyanoleuca	Satin Flycatcher	The Satin Flycatcher migrates to southern parts of Victoria during the spring/summer months. It is generally found in many habitat types including wet sclerophyll and woodland particularly along watercourses (Higgins, Peter and Cowling 2006).	_	-	Low	Low	Low	Limited suitable wooded watercourse and damp habitat present but no local records, and very few records in the broader region
BONNA2H		Rhipidura rufifrons	Rufous Fantail	In Victoria, the Rufous Fantail mainly inhabits the undergrowth of temperate rainforests, and wetter eucalypt forests and gullies, but also occurs in paperbark thickets, sub-inland/coastal scrub, along watercourses and within parks/gardens. On migration it is seen at a wide range of locations from farmland to built up streets (Pizzey and Knight 2007).	_	-	Medium	Medium	Medium	Likely to occasionally occur during passage movements, not commonly recorded.
BONNA2H,ROKAM BA,JAMBA,CAMBA		Calidris acuminata	Sharp-tailed Sandpiper	Inhabits tidal mudflats, saltmarshes, mangroves, shallow fresh, brackish or saline inland wetlands, floodwaters, irrigated pastures and crops, sewage ponds and minefields. Breeds in Arctic Siberia, migrates to south and south east Asia. Widespread summer migrant to coastal and inland Aust and Tasmania (Aug - April), mostly SE. Aust, Murray Darling Basin and W. Vic (Pizzey and Knight 2007).	-	-	Low	Medium	Low	Likely to occur at Dutson Downs and Lake Reeve (when inundated)
BONNA2H,ROKAM BA,JAMBA		n <i>Calidris melanotos</i> t	Pectoral Sandpiper	Summer migrant (Aug-April) (Pizzey and Knight 2007). Mainly shallow, fresh to saline wetlands; usually coastal but are occasionally found inland. Habitat includes coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Forage in shallow water or soft mud at the edges of wetlands and often close to low fringing or emergent vegetation (Higgins and Davies 1996).	-	-	Low	Medium	Low	Very uncommon visitor to Victoria, May occur as a vagrant at Dutson Downs and Lake Reeve (when inundated)





Appendix 4. Maps












































appears accurate at publication, nature and circumstances are constantly changing.













12	Legend		Details		
PRACTICAL	Pipeline Study Corridor	Contours (10m)	Date: 15/04/2019 Version: 1		
ECOLOGY acciegical relatoration & consulting	Study Area Pipeline Options	Constructed watercourse	Data Source: Aerial photograph Google Earth Pro.		
Disclaimer Practical Ecology been no herpoinsbillity for the accuracy and completeness of this information and any decision	2a	Natural watercourse	Base map data Copyright © The State of Victoria.		
er actions taken on the basis of the man. While information auguars eccentra at publication, rutars and circumstances are constantly changing	2c	Ramsar wetlands			

















# Appendix 5. Results of Targeted Surveys for the Southern Toadlet

### Habitat Assessment

Site	Waterbody type	Water levels	Time (hrs)	Air temp (°C)	No. ST	Other	Number	Number seen	Notes
					calling	species	calling		
А	dam	50%	2254	17.6		0	0	0	Chelodina longicollis
					0				observed in dam
В	dam/depression	0	2213	16.5	0	0	0	0	
G	wetland	0	2128	17.2		Litoria	5	0	calling from woodland
					0	ewingii			to south
D	drain	0	2115	18.6		Litoria	1	0	calling from woodland
					0	ewingii			~30 m to the east
С	depression	0	2100	18.2	0	0	0	0	
E	tea-tree swamp	0	1951	17.8	0	0	0	0	
F	tea-tree swamp	0	1932	18.1	0	0	0	0	

### Weather Conditions

Date	Site	Start time	Start stop	Temp start	Wind start	RH start	Moon	Rain	Cloud
3/04/2019	А	2254	2312	17.6	17.6 1.6 56.9		0	0	7
3/04/2019	В	2213	2221	16.5	3.1	68.5	0	0	8
3/04/2019	G	2128	2140	17.2	2.1	70.6	0	0	8
3/04/2019	D	2115	2123	18.6	0	62.2	0	0	8
3/04/2019	С	2100	2108	18.2	18.2 2.3		0	0	8
3/04/2019	E	1951	2004	17.8	2.7	70.1	0	1	8
3/04/2019	F	1932	1947	18.1	5	68.7	0	0	8
17/04/2019	А	2147	2204	23.9	2.1	45.4	4	0	8
17/04/2019	В	2108	2116	24.4	0	48.5	4	0	5
17/04/2019	G	2032	2041	22	1.4	58.5	4	0	6



Date	Site	Start time	Start stop	Temp start	Wind start	RH start	Moon	Rain	Cloud
17/04/2019	D	2019	2027	19.2 0 57		57	4	0	8
17/04/2019	С	2003	2012	23.3	23.3 0		4	0	7
17/04/2019	E	1902	1916	22.1 0		52.8	4	0	6
17/04/2019	F	1846	1855	22.6	1.4	38.5	4	0	5

## Survey Results

Date	Site	Southern Toadlets	Number calling	Other species	Number calling	Number seen	Notes
3/04/2019	А	0	0	0	0	0	Chelodina longicollis
3/04/2019	В	0	0	0	0	0	
3/04/2019	G	0	0	Litoria ewingii	5	0	calling from woodland to south. Litoria aurea call playback done in treatment pond
3/04/2019	D	0	0	Litoria ewingii	1	0	calling from woodland ~30 m to the east
3/04/2019	С	0	0	0	0	0	
3/04/2019	E	0	0	0	0	0	dry tea-tree swamp
3/04/2019	F	0	0	0	0	0	only surveyed tea-tree thicket not the swamp
17/04/2019	А	0	0	Litoria ewingii	0	1	microbat observed flying overhead
17/04/2019	В	0	0	0	0	0	microbat observed flying overhead
17/04/2019	G	0	0	Litoria ewingii	1	0	calling to the west
17/04/2019	D	0	0	0	0	0	White-striped freetail bat heard calling overhead
17/04/2019	С	0	0	Crinia signifera, Litoria ewingii	1	0	both species calling north of the sewage canal
17/04/2019	E	0	0	0	0	0	two microbats observed flying overhead
17/04/2019	F	0	0	0	0	0	



Appendix 6. Dwarf Galaxias Report prepared by Streamline Research Pty Ltd

# **GB Energy Pipeline Targeted dwarf galaxias investigation**



Varying aquatic habitat in the study area (natural wetlands, farm dams, irrigation channel, sewerage ponds)

# John McGuckin Streamline Research Pty. Ltd.

# **Final Report prepared for Practical Ecology**

May 2019

### **EXECUTIVE SUMMARY**

Practical Ecology commissioned Streamline Research to conduct a targeted survey for the dwarf galaxias (*Galaxiella pusilla*) for the GB Energy pipeline project. The investigation provides a pre-construction field ecological and environmental assessment as recommended in an earlier desk top study (CNC Project Management, 2018).

The dwarf galaxias is considered of national significance and is listed as vulnerable under the Environment Protection and Biodiversity Conservation (EPBC) Act, 1999. In Victoria, the dwarf galaxias is considered a threatened species (Department of Sustainability and Environment, 2013) and is listed for protection under the Flora and Fauna Guarantee Act, 1988.

The primary purpose of this investigation was to determine whether the dwarf galaxias or habitat for the species is expected to be impacted by the proposed GB Energy pipeline route between Golden Beach and Longford (Figure 1). As fish are not sedentary, the investigation included not only the alignment of the proposed pipeline but all potential waterways within the entire study area.

No referral needs to be made to the Commonwealth Department of the Environment and Energy under the EPBC Act, 1999 for aquatic fauna found within the proposed GB Energy pipeline study area.

General mitigation measures suggested in this report should be sufficient to protect the few watercourses on the GB Energy pipeline route.

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# **1.0 INTRODUCTION**

Practical Ecology commissioned Streamline Research to conduct a targeted survey for the dwarf galaxias (*Galaxiella pusilla*) for the GB Energy pipeline project. The investigation provides a preconstruction field ecological and environmental assessment as recommended in an earlier desk top study (CNC Project Management, 2018).

The dwarf galaxias is considered of national significance and is listed as vulnerable under the Environment Protection and Biodiversity Conservation (EPBC) Act, 1999. In Victoria, the dwarf galaxias is considered a threatened species (Department of Sustainability and Environment, 2013) and is listed for protection under the Flora and Fauna Guarantee Act, 1988.

The primary purpose of this investigation was to determine whether the dwarf galaxias or habitat for the species is expected to be impacted by the proposed GB Energy pipeline route between Golden Beach and Longford (Figure 1). As fish are not sedentary, the investigation included not only the alignment of the proposed pipeline but all potential waterways within the entire study area.

## 1.1 Study area

The GB Energy pipeline is to extend between Golden Beach and Longford, a distance of approximately 18.5 kms. The study area has a width of approximately one kilometre at Golden Beach extending to a maximum width of approximately 3 kms at Longford (Figure 1). The survey area incorporates the Gippsland Lakes Coastal Park, Dutson Downs waste treatment facility and private land, including areas owned by HVP Plantations.



Figure 1. Proposed GB Energy pipeline route – Golden Beach to Longford.

# 1.2 Known fish fauna

There is no fish information available on the Victorian Biodiversity Atlas (Department of Environment Land, Water and Planning (DELWP), 2019) for the GB Energy pipeline study area. Extending the study area did reveal that the dwarf galaxias was recorded in Boundary Creek in 1993 (DELWP), 2019).

The only other nearby record of the species was made in 2001 in Long Waterhole near the junction of the Thomson and Latrobe Rivers (Pitman & Tinkler, 2006).

Back towards Sale, the dwarf galaxias has been captured in Flooding Creek (McGuckin, 2009), but even these records are now a decade old.

It is suspected that the record of dwarf galaxias in Boundary Creek in the broader study area of the desk top study (CNC Project Management, 2018) was the trigger that initiated the field investigation for this species.

No additional survey data of relevance to the study area has been sourced from either Gippsland Water or the East Gippsland CMA.

# **1.3 Survey timing**

The timing of the dwarf galaxias study deliberately targeted the end of summer before winter rain occurred. With less water around it was easier to identify permanent waters which could potentially be primary habitats for the long term survival of localised dwarf galaxias populations. Drought refuge habitats occupied by dwarf galaxias are extremely important, as they allow for movement of the species into other less permanent waterways during wetter periods.

With the current drought, and the drying of many waters that would not necessarily dry up every year, any water found to support the dwarf galaxias was expected to be of high environmental significance. As an annual species any fish captured would be important in contributing to winter breeding in 2019.

Documenting dry habitats is important to this study, as these waters can not be primary habitat for the dwarf galaxias. At best, they can provide temporary habitats for the species after flood events, provided that fish can disperse through suitable waterways from more permanent waterbodies.

### 2.0 FIELD STUDY

Aerial photographs revealed an array of potential aquatic habitat throughout the GB Energy pipeline study area with saline lakes, naturally low lying land, wetlands, sewerage ponds, irrigation channels and farm dams. The intention of the aquatic field survey was to visit these waterways and to determine whether dwarf galaxias were present, and if not, whether the habitat might occasionally support the species during wet periods.

In total 48 localities were examined as part of the targeted survey for the dwarf galaxias conducted between 8-10 April 2019. At each locality a photograph was taken and the grid reference of the site recorded. A high proportion of the localities were dry (31) and did not have any water that could support aquatic fauna. At these localities (sites 1-14, 20-23, 25, 27-35, 40 42 & 46) no further survey work was made.

Three ponds on the Dutson Downs facility were viewed and excluded from sampling. Blue green algae was present in two that lacked fringing aquatic vegetation suitable for supporting dwarf galaxias (Sites 15 and 16). The third was an oily sump (Site 19), with no potential as fish habitat.

In total 14 localities were found with water (Sites 17, 18, 24, 26, 36-39, 41, 43-45, 47 and 48). At each of these locations surveying with a dip netting was undertaken.

Dip netting was the favoured fish capture technique as it is very effective for the capture of the dwarf galaxias and is a technique which minimises the need for handling fish, reducing impact on individual fish. Dip netting allows for dwarf galaxias to be viewed and returned unharmed at their point of capture. Other small resident fish species are also captured when dip netting.

In addition to dip net sampling, five bait traps were set overnight at the three largest waterways where dip netting could not adequately sample all potential habitat of the waterway (sites 44, 47 and 48).

The fish capture protocol adopted in this investigation is in accordance with the Commonwealth survey guidelines for the dwarf galaxias (Department of Sustainability, Environment, Water, Population and Communities, 2011).

*In situ* basic water quality data was also recorded at the locations surveyed with bait traps. Measurements were made with an Orion 230A pH meter, an Orion Model 130 conductivity meter, a YSI Model 51 B dissolved oxygen meter and a Orbeco Model 966 turbidity meter. All instruments were calibrated and used in accordance with NATA protocols.

Figures 2 & 3 shows the location of the aquatic survey sites. Table 1 provides a description of the survey location and the topographical map reference for each site. Pictures for each site are shown in Appendix 1.



Figure 2. Aquatic survey locations in eastern half of the study area.



Figure 3. Aquatic survey locations in western half of the study area.

Site	Location	Sale 1:100000		Latitude	Longitude
		Map No	Map No 8321 zone		0
		5	55		
		East	North		
1	low land depression	530869	5768733	-38.22872	147.35625
2	low land depression	530859	5768856	-38.229502	147.35245
3	wetland	530324	5768911	-38.22692	147.34740
4	wetland	530236	5768852	-38.22802	147.34786
5	wetland	530016	5768749	-38.22854	147.34588
6	wetland	530478	5769335	-38.22313	147.34833
7	wetland	529137	5769510	-38.22208	147.33311
8	low land depression	528844	5769108	-38.22535	147.32891
9	channel from pine plantation	526281	5768540	-38.23076	147.30005
10	channel from pine plantation	526253	5768389	-38.23221	147.29992
11	wetland	526619	5770177	-38.22881	147.30443
12	low land depression	527890	5770943	-38.20881	147.31893
13	low land depression	527786	5770976	-38.20895	147.31734
14	dam	527762	5770955	-38.20900	147.31697
15	waste compost pond	525965	5770559	-38.21223	147.29674
16	waste compost pond	525991	5771012	-38.20916	147.29730
17	sewerage water channel	524609	5769751	-38.21995	147.28129
18	sewerage water channel	525352	5771596	-38.20666	147.28936
19	filled in cardboard pit	525256	5771369	-38.20599	147.289876
20	wetland	528828	5769829	-38.21869	147.32944
21	channel	528257	5770164	-38.21591	147.32279
22	low land depression	529636	5770214	-38.21556	147.33873
23	wetland	529471	5770177	-38.21591	147.33599
24	wetland	528018	5770378	-38.21405	147.32018
25	dam	528136	5770400	-38.21375	147.32260
26	low land depression	528243	5770421	-38.21358	147.32356
27	low land depression	528571	5770485	-38.21202	147.32636
28	low land depression	525333	5//1/26	-38.19860	147.28601
29	farm dam	524437	57/17/8	-38.19/08	147.27957
30	wetland	523081	5771062	-38.20/6/	147.26404
31	low land depression	522460	57/1026	-38.20875	147.25743
32	farm dam	523906	5769163	-38.23460	147.27003
33	low land demassion	512060	5770020	-38.22300	147.23892
34	low land depression	513902	5770911	-38.21824	147.16000
35	dam	514224	5771000	-38.21115	147.15050
30	form dom	514020	5771502	-30.20/04	147.10230
30	farm dam	514930	5771604	-30.20418	147.17040
30	farm dam	515202	5771750	-38 20334	147 17456
<u> </u>	farm dam	514827	5771870	-38 20006	147 1608/
<u>40</u> <u>4</u> 1	farm dam	515296	5771765	-38 20147	147 17572
42	low land depression	515200	5772113	-38 19793	147 18145
43	wetland	516316	5772317	-38,19670	147,18515
43	groundwater storage pond	518644	5772412	-38,19602	147.21293
45	irrigation channel	519893	5772142	-38,19771	147.22495
46	dam	517566	5769633	-38.22118	147.20023
47	sewerage pond	527749	5770226	-38,21558	147.31690
48	sewerage pond	528391	5769970	-38.21788	147.32421

Table 1. S	Survey site	UTM grid	reference and	latitude and	l longitude.
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Appendix 1 lists the survey data and Appendix 2 shows a picture of each site.

### 3.0 RESULTS

### 3.1 Fish capture

The dwarf galaxias was not captured with a dip net at any of the 14 locations surveyed in this study. Bait traps set at the three largest waterways (Sites 44, 47 and 48) also failed to capture dwarf galaxias.

At one survey location (site 48) two small mouthed hardyhead (*Atherinosoma microstoma*) were caught. The species is commonly found in freshwater channels, lakes and slow moving waters near the coast (Kuiter, 2013). The presence in Sewerage Pond E is expected to be due to past connectivity with estuarine habitat which supports the small mouth hardyhead.

### 3.2 Water quality

Table 3 shows the water quality conditions at the three locations where bait traps were set overnight.

Surface water temperatures were high (around  $24^{\circ}$ C), pH was between 8.1 and 8.9 and dissolved oxygen concentrations were close to saturation. An electrical conductivity of 247 µS/cm was noted in the groundwater storage pond (site 44). The two sewerage ponds had similar conductivities at 2240 and 2410 µS/cm respectively (Sites 47 and 48). Turbidities were low ranging between 4.4 – 16.8 NTU.

The water quality conditions in all three of the tested waters could potentially support dwarf galaxias, but the species was not found in any of these waters.

Site	Watercourse	Temp. (°C)	рН	Dissolved oxygen (% saturation)	Electrical conductivity (µS/cm)	Turbidity (NTU)
Site 44	groundwater storage pond	24.8	8.9	112	247	4.4
Site 47	sewerage Pond D	24.0	8.2	105	2240	16.8
Site 48	sewerage Pond E	24.1	8.1	102	2410	9.9

 Table 3. Water quality in this study.

# 4.0 DISCUSSION

## 4.1 Dwarf galaxias

The dwarf galaxias was not found within the study area of the proposed GB Energy pipeline between Golden Beach and Longford. It is not known whether the species has ever been found within the area.

A variety of waterways were examined during this investigation. The survey provided a comprehensive evaluation of natural wetlands, sewerage ponds, irrigation channels and farm dams. The majority of which were dry at the time of the April 2019 survey.

Priority waters for the preservation of dwarf galaxias populations and habitat can be divided into two types of waters, waters which currently support populations and waters which have habitat which could potentially support the species.

For the Golden Beach Longford study area there is no waters which currently support a population of dwarf galaxias. In addition, there is not even one natural wetland habitat that could support the species on the proposed GB Energy pipeline route. The only aquatic habitats that were found to hold water on the alignment were farm dams (sites 37 and 38), which had little natural attributes that would be suitable for the dwarf galaxias.

Two wetlands (sites 4 and 5) which were dry in this investigation could potentially provide habitat for the dwarf galaxias (if a flood event moved fish from a primary habitat), as they have characteristics that would suit the species. By using basic standard erosion controls during pipeline installation these wetlands will be protected.

## 4.2 Mitigation measures to protect waterway habitat

Specific mitigation measures suggested for the GB Energy pipeline route are:

- Installation and maintenance of erosion and sedimentation controls in accordance with the Victorian Environment Protection Authority (EPA) best practice guidelines inclusive of Environmental Guidelines for Major Construction Sites (1996) and Construction Techniques for Sediment Pollution Control (1991). Erosion and sediment controls need to be adaptive and may change as works progress.
- Refilling of vehicles and machinery should be made in a designated area no closer than 100 metres from any drainage point to any waterway.
- Fuel and chemicals should be bunded to EPA guidelines and stored outside of flood zones. A contingency plan should address containment, treatment and disposal of any spill.

## 4.3 Loss of dwarf galaxias habitat and the current drought

The dwarf galaxias has been recorded in Boundary Creek, which crosses the Longford Loch Sport Road. This location is less than a kilometre from the north western corner of the GB Energy pipeline study area. The known record of the dwarf galaxias in Boundary Creek is from 1993, some 26 years ago. Unfortunately, the dwarf galaxias population is expected to have been lost when the creek dried out during the Millennium drought. The creek was found to be dry in 2006 (Stoessel, 2008) and again during this investigation (Figure 4).

It is unknown whether a downstream area of Dowd Morass continues to support a population of dwarf galaxias, but if it does, flooding of Boundary Creek would be the most probable source of dwarf galaxias finding access to waterways within the GB Energy pipeline study area.



Figure 4 Boundary Creek – dry at Longford Loch Sport Road.

The loss of dwarf galaxias populations during the current drought is possibly much worse than that which occurred during the Millennium drought. An example is Flooding Creek which supported an abundant population of dwarf galaxias towards the end of the Millennium drought in October 2009, but which has since dried out (Figure 5).



Figure 5. Flooding Creek near Sale Common in 2009 (left), and in 2019 (right).

The key point of this section is to point out that dry conditions can be deleterious to the dwarf galaxias and that the severity of the current drought may be a contributing factor to the absence of the species in the GB Energy pipeline study area.

## 4.4 Assessment of dwarf galaxias impact under Significant Impact Guidelines

The following discussion assesses the impact of the proposed GB Energy pipeline on the dwarf galaxias based on the Commonwealth's Significant Impact Guidelines (Department of the Environment, 2013).

a. *lead to a long term decrease in the size of an important population.* 

**Unlikely** – there is no known dwarf galaxias population in the proposed study area between Golden Beach and Longford. The nearest known record for the dwarf galaxias is Boundary Creek, and that record was in 1993, some 26 years ago. Boundary Creek is currently dry and has been for a number of years, so even if a population persists at Dowd Morass, it will not be impacted by the GB Energy pipeline.

b. *reduce the area of occupancy of an important population.* 

Unlikely –no disturbance will occur to known habitat for the dwarf galaxias.

c. fragment an important population into two or more populations.

**Unlikely** – fragmentation is not likely to occur as no population of the dwarf galaxias is within the GB Energy pipeline study area.

d. *adversely affect habitat critical to the survival of the species.* 

**Unlikely** – There is no aquatic habitats to be crossed by the GB Energy pipeline that are critical habitat to the dwarf galaxias.

e. *disrupt breeding cycle of an important population.* 

**Unlikely** – the works are to take place in areas which currently do not support dwarf galaxias populations.

f. modify, destroy, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

**Unlikely** – no loss of known habitat for the dwarf galaxias will occur due to the GB Energy pipeline construction work. No existing habitat is likely to be lost that would result in the decline of the species.

g. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat.

**Unlikely** – as no connecting watercourses are present on the proposed route of the GB Energy pipeline, there is no possibility that invasive species will become established in waters that could be occupied by the dwarf galaxias.

h. *introduce disease that may cause the species to decline.* 

**Unlikely** – no unforeseen diseases are likely to be accidentally introduced.

i. *interfere substantially with the recovery of the species.* 

**Unlikely** – no unforeseen circumstances are expected to interfere with any potential reestablishment of dwarf galaxias post drought.

Overall, the GB Energy pipeline will not have an impact on the dwarf galaxias as no population of the species occurs within the entire GB Energy pipeline study area.

# 5.0 CONCLUSION

No referral needs to be made to the Commonwealth Department of the Environment and Energy under the EPBC Act, 1999 for aquatic fauna found within the proposed GB Energy pipeline study area.

General mitigation measures suggested in this report should be sufficient to protect the few watercourses that exist within close proximity to the GB Energy pipeline route.

# 6.0 ACKNOWLEDGEMENTS

I would like to thank Practical Ecology for contracting Streamline Research to undertake the targeted dwarf galaxias investigation. Marcus Baker from CNC Project Management was extremely helpful in assisting with land owner access and locating sites we wished to survey.

Dave Lucas assisted with the field work.

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# **APPENDIX 1. SURVEY LOCATIONS**



Site 1



Site 2



Site 3



Site 4



Site 5



Site 6



Site 7



Site 8



Site 9



Site 10



Site 11



Site 12



Site 13



Site 14



Site 15


Site 16



Site 17



Site 18





Site 20



Site 21





Site 23



Site 24





Site 26



Site 27







Site 30



Site 31



Site 32



Site 33



Site 34



Site 35



Site 36



Site 37



Site 38



Site 39



Site 40



Site 41



Site 42



Site 43



Site 44



Site 45



Site 46



Site 47 Pond D



Site 48 Pond E