



# Australia

## Glenelg Estuary and Discovery Bay Wetlands

**Ramsar Information Sheet (Offline version)**

## Summary

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### 1.1 Summary description

*Please provide a short descriptive text summarising the key characteristics and internationally important aspects of the site. You may prefer to complete the four following sections before returning to draft this summary.*

#### Summary

The Glenelg Estuary and Discovery Bay Ramsar Site is situated in western Victoria. It covers approximately 22,289 hectares and comprises portions of the Lower Glenelg National Park, the Discovery Bay Coastal Park and the Nelson Streamside Reserve. The Glenelg River estuary is the longest in the bioregion, extending 75 kilometres. The Ramsar site comprises three broad systems that support different wetland types: freshwater wetlands, the Glenelg Estuary and the beach and dune system. The site contains several regionally (and internationally) rare wetland types: intact fen peatlands and a humid dune slack system.,.

The site:

- supports the nationally vulnerable coastal saltmarsh ecological community and eight nationally / internationally listed threatened flora and fauna species.
- provides habitat for 95 waterbird species including 24 species listed under international agreements: CAMBA (24), JAMBA (24), ROKAMBA (21), BONN (21). Beach nesting birds such as hooded plover (*Thinornis rubricollis*) and red-capped plover (*Charadrius ruficapillus*) are regularly recorded nesting on the dunes of the Discovery Bay Coastal Park.
- supports 14 species of native fish which are diadromous, migrating between habitats for part of their lifecycle by providing food, spawning grounds and nurseries. It also acts as a migration path on which diadromous fishes of the region depend.
- provides habitat for obligate aquatic species in the permanent wetlands of the Long Swamp complex and Bridgewater Lakes when the surrounding landscape is dry and during drought conditions.
- supports > 1% of the population of the wetland dependent invertebrate species the Ancient greenling (*Hemiphysalis mirabilis*) in the *Baumea* sedgeland.

The area is popular for recreational and tourism activities, including sightseeing, walking, camping, and recreational fishing. Importantly, the Gunditjmara Indigenous people have a living association with the Ramsar site, which has great cultural significance for them, as it is part of their Koonang (sea) and Bocara Woorrowarook (river forest) country.

The ecological character of the site is defined by 10 critical components, processes and services:

- **Components:**
  - Hydrology
  - Vegetation type and extent
  - Fish diversity and abundance
  - Waterbird diversity and abundance
- **Process:**
  - Stratification
- **Services:**
  - Special features (dune slacks)
  - Supports a diversity of wetland types
  - Supports threatened species
  - Provides physical habitat for waterbirds
  - Ecological connectivity

## Data & location

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### 2.1 Formal data

#### 2.1.1 Name and address of the compiler of this RIS

##### Compiler 1

Name

Andrea White

Institution/agency

Department of Environment, Land, Water and Planning

Postal address (This field is limited to 254 characters)

8 Nicholson St, East Melbourne, Victoria 3002

E-mail (The online RIS only accepts valid e-mail addresses, e.g. example@mail.com )

[Andrea.White@delwp.vic.gov.au](mailto:Andrea.White@delwp.vic.gov.au)

Phone (The online RIS only accepts valid phone numbers, e.g. +1 41 123 45 67 )

+61 3 9637 8594

Fax (The online RIS only accepts valid phone numbers, e.g. +1 41 123 45 67 )

##### Compiler 2

Name

Institution/agency

Postal address (This field is limited to 254 characters)

E-mail (The online RIS only accepts valid e-mail addresses, e.g. example@mail.com )

Phone (The online RIS only accepts valid phone numbers, e.g. +1 41 123 45 67 )

Fax (The online RIS only accepts valid phone numbers, e.g. +1 41 123 45 67 )

#### 2.1.2 Period of collection of data and information used to compile the RIS

From year

1976

To year

2017

#### 2.1.3 Name of the Ramsar Site

Official name (in English, French or Spanish)\*

Glenelg Estuary and Discovery Bay Ramsar Site

Unofficial name (optional)

## 2.2 Site location

### 2.2.1 Defining the Site boundaries

*The site boundaries must be clearly delineated on both: a) a GIS shapefile and b) a digital map/image:*

*-> To define the site boundaries please complete field 2.2.1 a1), 2.2.1 a2) and 2.2.1 b) via the online form.*

**-UPLOAD via online form-**

#### Boundaries description

The Glenelg Estuary and Discovery Bay Ramsar Site consists of:

- Seventeen crown land parcels of the Discovery Bay Coastal Park, namely:
  - All of crown allotment 11 of Section 5 on Parish Plan PP3202;
  - All of crown allotment 9 of Section A on Parish Plan PP2861;
  - All of crown allotments 6A, 7A, 15A, 12A, 41B, 24C and 8 on Parish Plan PP3749;
  - All of crown allotments 14A of Section A and 23A, 23B on Parish Plan PP2673;
  - All of crown allotments 1B, 5, 6 and 7 of Section A on Parish Plan PP3553;
  - All of crown allotment 12 of Section 9 on Parish Plan PP3553.
- All unallocated crown land bounded by the southward prolongation of the western boundary of crown allotment 23B on Parish Plan PP2673, the south-western boundaries of crown allotments 23B on Parish Plan PP2673, 8 on Parish Plan PP3749, 9 of Section A on Parish Plan PP2861, 11 of Section 5 on Parish Plan PP3202 and 5 of Section A on Parish Plan PP3553, the southern boundary of parcel 5 of Section A on Parish Plan PP3553 and the Mean Low Water Mark of the Southern Ocean.
- Three adjacent crown land parcels of the Glenelg River and Nelson Streamside Reserve, namely:
  - All of crown allotment 44A on Parish Plan PP2673
  - All of crown allotments 2A and 30A of Section 5 on Parish Plan PP5584
- Ten adjacent crown land parcels of the Lower Glenelg National Park west of the Winnap-Nelson Road, namely:
  - All of crown allotments 1A, 38A and 41B on Parish Plan PP2055;
  - All of crown allotment 5A on Parish Plan PP2673;
  - All of crown allotment 17 of Section 5 on Parish Plan PP2861;
  - All of crown allotment 23 on Parish Plan PP2884;
  - All of crown allotment 17 on Parish Plan PP3365;
  - All of crown allotment 49 and 2001 on Parish Plan PP3733;
  - All of crown allotment 44 on Parish Plan PP3749.

The site excludes:

- All private land in the township of Nelson.
- Crown land of the Glenelg River estuary south of and including the Nelson to Portland Road and north of Oxbow Lake that is defined by crown allotment 30B of Section 5 on Parish Plan PP5584, crown allotments 36B, 36C and 36D on Parish Plan PP2673, and the Nelson-Portland Road defined by Vicmap road casement persistent feature identifier (PFI) 132491075.
- Unnamed government roads near Lake Monibeong Vicmap PFI 132493250, 132492162 and 132496176.
- All of allotment s 1, 1A, 2 and 3 of Section A on Parish Plan PP3553 adjacent to Bridgewater Lakes and unnamed government roads Vicmap PFI 132510790, 132492838 and 132500803.

### 2.2.2 General location

a) In which large administrative region does the site lie?

Shire of Glenelg, Victoria

b) What is the nearest town or population centre?

Nelson, Victoria (located between the two sections of the site)

### 2.2.3 For wetlands on national boundaries only

a) Does the wetland extend onto the territory of one or more other countries?

☐ Yes / ☒ No

b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party?

☐ Yes / ☒ No

c) Is the site part of a formal transboundary designation with another Contracting Party?

☐ Yes / ☒ No

d) Transboundary Ramsar Site name:

Note it is adjacent to Piccaninnie Ponds Karst Wetland Ramsar site in South Australia

## 2.2.4 Area of the Site

*If you have not established an official area by other means, you can copy the area calculated from the GIS boundaries into the 'official area' box.*

Official area, in hectares (ha):

22289

Area, in hectares (ha) as calculated from GIS boundaries

22289

## 2.2.5 Biogeography

*Please provide the biogeographic region(s) encompassing the site and the biogeographic regionalization scheme applied:*

Biogeographic regions

Regionalisation scheme(s) <sup>1</sup>	Biogeographic region
Other	

Other biogeographic regionalisation scheme

South East Coast (Victoria) Drainage Division (Australian Hydrological Geospatial Fabric – Topographic Drainage Divisions and River Regions)

<sup>1</sup> Marine Ecoregions of the World (MEOW) | Udvardy's Biogeographical Provinces | Bailey's Ecoregions | WWF Terrestrial Ecoregions | EU biogeographic regionalization | Freshwater Ecoregions of the World (FEOW) | Other scheme (provide name below)

## Why is the Site important?

### 3.1 Ramsar Criteria and their justification

*Tick the box against each criterion applied to the designation of the Ramsar Site. All criteria which apply should be ticked. Please explain why you selected a criterion by filling in the relevant fields on this page, on the three other pages of this section 'Criteria & justification' and on the 'Wetland types' page of the section 'What is the site like?'.*

#### ☒ Criterion 1: Representative, rare or unique natural or near-natural wetland types

*To justify this Criterion, please select at least one wetland type as representative, rare or unique in the section What is the site like? > Wetland types and provide further details in at least one of the three boxes below.*

Hydrological services provided

Other ecosystem services provided

Other reasons

The Glenelg Estuary and Discover Bay Ramsar Site meets this criterion with respect to rare wetland types in the bioregion (and globally). The peatlands of the Ramsar site are fen wetlands (i.e. groundwater dependent) and largely have an intact hydrology. These are a rare wetland type globally, with nearby Piccaninnie Ponds Karst Wetlands Ramsar Site perhaps representing the only other significant fen wetland in the bioregion.

The site is geomorphically significant as it includes a humid dune slack system, which is rare in Australia. The dune slack system supports peatlands, wet grassland habitats and temporary pools, which are identified by the Ramsar Convention as globally significant (Ramsar Convention 2003).

The geomorphology and hydrology of the estuary section of the Ramsar site is unusual within the bioregion and can be considered a good representative of wetland type E. It is characterised by:

- being the longest estuary in Victoria (75 kilometres),
- having a groundwater dominated hydrology, and
- significant areas of limestone gorge for most of its length upstream of Nelson.

#### ☒ Criterion 2 : Rare species and threatened ecological communities

*To justify this Criterion, please give details below on:*

- relevant plant species in the section Criteria & justification> Plant species (3.2)
- relevant animal species in the section Criteria & justification> Animal species (3.3)
- relevant ecological communities in the section Criteria & justification> Ecological communities (3.4)

Optional text box to provide further information

The site regularly supports one threatened ecological community, two species of threatened plant and seven threatened animal species.

#### ☐ Criterion 3 : Biological diversity

*To justify this Criterion, please give details in the box below. If you want to name any specific species, please give details on:*

- relevant plant species in the section Criteria & justification> Plant species (3.2)
- relevant animal species in the section Criteria & justification> Animal species (3.3)

Justification

#### ☒ Criterion 4 : Support during critical life cycle stage or in adverse conditions

To justify this Criterion, please give details below on:

- relevant plant species in the section Criteria & justification> Plant species (3.2)

- relevant animal species in the section Criteria & justification> Animal species (3.3)

and explain the life cycle stage or nature of adverse conditions in the accompanying 'justification' box.

Optional text box to provide further information

The site provides habitat for 95 waterbird species including 24 species listed under international agreements: CAMBA (24), JAMBA (24), ROKAMBA (21), BONN (21) and 34 Australian migratory or marine species. Beach nesting birds such as hooded plover (*Thinornis rubricollis*) and red-capped plover (*Charadrius ruficapillus*) are regularly recorded nesting on the dunes of the Discovery Bay Coastal Park, albeit in low numbers (Ewers et al. 2011, Mead et al. 2012). The site also supports 14 species of native fish which are diadromous, migrating between habitats for part of their lifecycle. In addition, the permanent wetlands of the Long Swamp complex and Bridgewater Lakes provide habitat for obligate aquatic species when the surrounding landscape is dry and during drought conditions.

The site meets this criterion for supporting migratory species of waterbirds and fish as well as beach nesting birds and providing freshwater habitat when the surrounding region is dry.

#### ☐ Criterion 5 : >20,000 waterbirds

To justify this Criterion, please give details below on:- the total number of waterbirds and the period of data collection - relevant waterbird species, and if possible their population size, in the section Criteria & justification> Animal species (3.3)

Overall waterbird numbers\*

Start year\*

End year\*

Source of data:

Optional text box to provide further information

#### ☐ Criterion 6 : >1% waterbird population

To justify this Criterion, please give details on relevant waterbird species and their population size in the section Criteria & justification> Animal species (3.3)

Optional text box to provide further information

#### ☐ Criterion 7 : Significant and representative fish

To justify this Criterion, please give information in the box below and details of relevant fish species in the section Criteria & justification> Animal species (3.3)

Justification

#### ☒ Criterion 8 : Fish spawning grounds, etc.

To justify this Criterion, please give information in the box below. Completion of details on relevant fish species in the section Criteria & justification> Animal species (3.3) is optional.

Justification

The Glenelg Estuary provides nursery habitat for several species of recreationally important fish including black bream (*Acanthopagrus butcheri*) and estuary perch (*Macquaria colonorum*). In

particular, the seasonal opening and closing of the estuary is considered important in providing conditions for spawning of black bream (Jenkins et al. 2008).

In addition, the site supports at least 14 species of fish that migrate between habitats for parts of their lifecycle including: short finned eel (*Anguilla australis*), tupong (*Pseudaphritis urvillii*), estuary perch (*Macquaria colonorum*) and common galaxias (*Galaxias maculatus*). A recent tagging study has indicated that mulloway that feed in the Glenelg Estuary may migrate up to 400 kilometres to the Murray Mouth to spawn (Lieschke and Stoessel, in prep.).

The site provides a range of fish species with sources of food, spawning grounds and nurseries, and acts as a migration path on which diadromous fishes of the region depend, as such it is deemed to meet this criterion.

**[ X ] Criterion 9 : >1% non-avian animal population**

To justify this Criterion, please give details on relevant non-avian species and their population size in the section Criteria & justification> Animal species (3.3)

[Optional text box to provide further information](#)

There are recent data on the ancient greenling (*Hemiphysalis mirabilis*) with the species first recorded at Long Swamp in 2008 and a detailed mark and recapture program completed in 2013 (Cordero-Rivera 2015). The species is the only extant representative of this superfamily of damselfly globally.

To date, 24 sites have records for the species across Victoria (19), South Australia (3) and Tasmania (2), however four of the Victorian sites lack recent sightings. The sub-population at Long Swamp likely represents more than 1% of the total global population for this species, possibly as much as 5%, as Long Swamp represents the largest known area of habitat with the species present.

This criterion is met on the basis of the site supporting more than 1% of the population of ancient greenling.



### 3.2 Plant species whose presence relates to the international importance of the site

Scientific name*	Common name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List <sup>2</sup>	CITES Appendix I	Other status	Justification
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	National (EPBC) - Endangered	
<i>Pterostylis tenuissima</i>	Swamp greenhood	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	National (EPBC) - Vulnerable	

Optional text box to provide further information on plant species of international importance:

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<sup>2</sup> | LC | NT | VU | EN | CR | EW | EX

### 3.3 Animal species whose presence relates to the international importance of the site

Phylum	Scientific name*	Common name	Species qualifies under criterion				Species contributes under criterion				Pop. Size <sup>3</sup>	Period of pop. Est. <sup>3</sup>	% occurrence <sup>3</sup>	IUCN Red List <sup>4</sup>	CITES Appendix I	CMS Appendix I	Other Status	Justification
			2	4	6	9	3	5	7	8								
Aves	<i>Botaurus poiciloptilus</i>	Australasian Bittern	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]				EN	[ ]	[ ]	National (EPBC) - Endangered	
Aves	<i>Calidris ferruginea</i>	Curlew Sandpiper	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]				LC	[ ]	[ ]	National (EPBC) - Critically Endangered	International migratory shorebird
Aves	<i>Sternula nereis nereis</i>	Fairy Tern	[X]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]	National (EPBC) - Vulnerable	Breeding recorded within the site
Aves	<i>Thinornis rubicollis</i>	Hooded Plover	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]	National (EPBC) - Vulnerable	
Amphibia	<i>Litoria raniformis</i>	Growing Grass Frog	[X]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]				EN	[ ]	[ ]	National (EPBC) - Vulnerable	Breeding recorded within the site

<sup>3</sup> These fields are only compulsory to justify criteria 6 & 9

<sup>4</sup> | LC | NT | VU | EN | CR | EW | EX

Actinopterygii	<i>Nannoperca obscura</i>	Yarra pygmy perch	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[X]				VU	[ ]	[ ]	National (EPBC) - Vulnerable	
Insecta	<i>Hemiphysalis mirabilis</i>	Ancient greenling	[X]	[ ]	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	1 500 000 to 10 985 000	2013	>5% estimate of total population	EN	[ ]	[ ]		
Mammalia	<i>Miniopterus schreibersii bassanii</i>	Southern bent-wing bat	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]	National (EPBC) - Critically Endangered	
Aves	<i>Calidris alba</i>	Sanderling	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]				LC	[ ]	[ ]		International migratory shorebird
Aves	<i>Charadrius leschenaultii</i>	Greater sand plover	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Pluvialis squatarola</i>	Grey plover	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Charadrius veredus</i>	Oriental plover	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Pluvialis fulva</i>	Pacific golden plover	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Limosa lapponica</i>	Bar-tailed godwit	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird

Aves	<i>Limosa limosa</i>	Black-tailed godwit	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Limicola falcinellus</i>	Broad-billed sandpiper	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Tringa nebularia</i>	Common greenshank	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Actitis hypoleucos</i>	Common sandpiper	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Numenius madagascariensis</i>	Eastern curlew	[X]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]	National (EPBC) - Critically Endangered	International migratory shorebird
Aves	<i>Calidris tenuirostris</i>	Great knot	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Tringa (Heteroscelus) brevipes</i>	Grey-tailed tattler	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Gallinago hardwickii</i>	Latham's snipe	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird
Aves	<i>Tringa stagnatilis</i>	Marsh sandpiper	[ ]	[X]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]					[ ]	[ ]		International migratory shorebird

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Aves	<i>Calidris canutus</i>	Red knot	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Aves	<i>Calidris ruficollis</i>	Red-necked stint	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Aves	<i>Arenaria interpres</i>	Ruddy turnstone	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Aves	<i>Calidris alba</i>	Sanderling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Aves	<i>Calidris acuminata</i>	Sharp-tailed sandpiper	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Aves	<i>Xenus cinereus</i>	Terek sandpiper	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		International migratory shorebird
Actinopterygii	<i>Anguilla australis</i>	Eastern dwarf galaxias	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Atherinosoma microstoma</i>	Short-finned eel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Geotria australis</i>	Smallmouth hardyhead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Mordacia mordax</i>	Pouched lamprey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		

Actinopterygii	<i>Liza argentea</i>	Shortheaded lamprey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Mugil cephalus</i>	Flat-tail mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Myxus elongatus</i>	Sea mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Aldrichetta forsteri</i>	Sand mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		
Actinopterygii	<i>Pseudaphritis urvillii</i>	Yellow-eye mullet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		

*Optional text box to provide further information on animal species of international importance:*

The population estimate provided for Ancient Greenling (*Hemiphysalis mirabilis*) is for the sub-population present at Long Swamp. It is the largest sub-population known for the species from the 19 known localities, of which all are isolated.

3.4 Ecological communities whose presence relates to the international importance of the site

Name of ecological community	Community qualifies under Criterion 2?	Description	Justification
Subtropical and Temperate Coastal Saltmarsh	<input checked="" type="checkbox"/>	The Coastal Saltmarsh ecological community consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate.	Community is listed as vulnerable under the EPBC Act.

Optional text box to provide further information

## What is the Site like?

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### 4.1 Ecological character

*Please summarize the ecological components, processes and services which are critical to determining the ecological character of the site. Please also summarize any natural variability in the ecological character of the site, and any known past or current change*

Ecological character at the Ramsar site is defined by a number of critical components, processes and services:

**Hydrology** - a complex interaction of surface and groundwater expression as well as local rainfall-runoff, particularly in the freshwater wetland and estuary management units. System hydrology is crucial to the functioning of the estuary, and the freshwater wetlands that include ecologically important fens. Freshwater surface inflows are highly variable both seasonally and over longer climatic cycles.

**Vegetation type and extent** – specific vegetation communities are associated with each wetland type in the system. Dune scrub vegetation is important in stabilising the dune system; coastal saltmarsh occurs at Oxbow Lake; freshwater sedgeland and tall marsh are characteristic of the Long Swamp wetlands and there are significant submerged macrophyte communities in the permanent lakes.

**Fish diversity and abundance** - 47 native fish species from 26 families at the site have been recorded from the site, with 28 of these species considered regularly supported. Most common species (in terms of abundance) are the estuarine species small-mouthed hardy-head (*Atherinosoma microstoma*) and black bream (*Acanthopagrus butcheri*) common in Oxbow Lake, and the freshwater species southern pygmy perch (*Nannoperca australis*) dominating the community in Long Swamp. The common galaxias (*Galaxias maculatus*) is a self-sustaining breeding population within the site and that a number of fish species move between habitats during different parts of their lifecycles. There is a good understanding of the spawning and recruitment of black bream in the Glenelg Estuary, with stratification and freshwater inflows important for success.

**Waterbird diversity and abundance** - A total of 95 waterbird species have been recorded within the Ramsar site, 24 of which are listed under international migratory agreements. There are breeding records of nine waterbird species from within the site, dominated by beach nesting species.

**Stratification** - the lower Glenelg Estuary is a seasonally closed salt-wedge estuary and the stratification (distinct layers of fresh and saline water) is important for maintaining recruitment in several fish species, including the recreationally important black bream.

**Diversity of wetland types** - the site comprises a network of interconnected wetland types including freshwater permanent wetlands, intermittently inundated marshes, estuarine waters and intertidal sandy beaches.

**Special geomorphic features** - the site is significant for a number of geological and geomorphic features; in particular the dune slack system is rare, if not unique within the bioregion.

**Physical habitat for waterbirds** - the site provides a network of habitats for waterbird feeding, roosting and breeding. Species that are supported by the site represent a wide range of functional groups (e.g. fishers, waders, ducks) each with different habitat requirements.

**Threatened wetland species and ecosystems** - one nationally listed ecological community and eight nationally or internationally listed species of conservation significance are supported by the site.

**Ecological connectivity** - the wetlands in the site are hydrologically and ecologically connected. The connection between the marine, estuarine and freshwater components is particularly important for fish migration and reproduction.



## 4.2 What wetland type(s) are in the site?

Please list all wetland types which occur on the site, and for each of them: - rank the four most abundant types by area from 1 (greatest extent) to 4 (least extent) in the third column, - if the information exists, provide the area (in ha) in the fourth column - if this wetland type is used for justifying the application of Criterion 1, indicate if it is representative, rare or unique in the last column - you can give the local name of the wetland type if different from the Ramsar classification system in the second column

### Marine or coastal wetlands

Wetland types (code and name) <sup>5</sup>	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1 <sup>6</sup>
B: Marine subtidal aquatic beds (Underwater vegetation)	Glenelg Estuary	4	1	
E: Sand, shingle or pebble shores (including sand beach, dunes and dune slacks)	Discovery Bay	2	1575	Rare
F: Estuarine waters	Glenelg Estuary	1	4680	
G: Intertidal mud, sand or salt flats		4	3	
H: Intertidal marshes		4	35.5	

### Inland wetlands

Wetland types (code and name) <sup>7</sup>	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1 <sup>6</sup>
N: Seasonal/ intermittent/	Outlet Creek	4	1	

<sup>5</sup> A: Permanent shallow marine waters | B: Marine subtidal aquatic beds (Underwater vegetation) | C: Coral reefs | D: Rocky marine shores | E: Sand, shingle or pebble shores | G: Intertidal mud, sand or salt flats | Ga: Bivalve (shell-fish) reefs | H: Intertidal marshes | I: Intertidal forested wetlands | J: Coastal brackish / saline lagoons | F: Estuarine waters | Zk(a): Karst and other subterranean hydrological systems | K: Coastal freshwater lagoons

<sup>6</sup> | Representative | Rare | Unique

<sup>7</sup> M: Permanent rivers/ streams/ creeks | L: Permanent inland deltas | Y: Permanent Freshwater springs; oases | N: Seasonal/ intermittent/ irregular rivers/ streams/ creeks | O: Permanent freshwater lakes | Tp: Permanent freshwater marshes/ pools | P: Seasonal/ intermittent freshwater lakes | Ts: Seasonal/ intermittent freshwater marshes/ pools on inorganic soils | Tp: Permanent freshwater marshes/ pools | W: Shrub-dominated wetlands | Xf: Freshwater, tree-dominated wetlands | Ts: Seasonal/ intermittent freshwater marshes/ pools on inorganic soils | U: Permanent Non-forested peatlands | Xp: Permanent Forested peatlands | Va: Montane wetlands | Vt: Tundra wetlands | Q: Permanent saline/ brackish/ alkaline lakes | R: Seasonal/ intermittent saline/ brackish/ alkaline lakes and flats | Sp: Permanent saline/ brackish/ alkaline marshes/ pools | Ss: Seasonal/ intermittent saline/ brackish/ alkaline marshes/ pools | Zg: Geothermal wetlands | Zk(b): Karst and other subterranean hydrological systems

irregular rivers/ streams/ creeks				
O: Permanent freshwater lakes	Bridgewater Lakes (North and South), Lake Moniboeng	3	113	
Ss: Seasonal/ intermittent saline/ brackish/ alkaline marshes/ pools		4	20	
Tp: Permanent freshwater marshes/ pools		4	69	
Ts: Seasonal/ intermittent freshwater marshes/ pools on inorganic soils		4	10	
U: Permanent Non-forested peatlands	Long Swamp depressions	2	946	Rare

#### Human-made wetlands

Wetland types (code and name) <sup>8</sup>	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1 <sup>6</sup>

#### What non-wetland habitats are within the site?

##### Other non-wetland habitat

Other non-wetland habitats within the site	Area (ha) if known

#### Habitat connectivity (ECD)

Aspects of ecological connectivity considered critical to the character of the Ramsar site include pathways for migratory fish, particularly for diadromous fish, and interconnected habitat for waterbirds.

<sup>8</sup> 1: Aquaculture ponds | 2: Ponds | 3: Irrigated land | 4: Seasonally flooded agricultural land | 5: Salt exploitation sites | 6: Water storage areas/Reservoirs | 7: Excavations | 8: Wastewater treatment areas | 9: Canals and drainage channels or ditches | Zk(c): Man-made subterranean hydrological systems

## 4.3 Biological components

### 4.3.1 Plant species

#### Other noteworthy plant species

Scientific name	Common name (optional)	Position in range / endemism / other (optional)

#### Invasive alien plant species

Scientific name	Common name	Impacts <sup>9</sup>
<i>Spartina</i> spp.	Cord grass	Potentially

#### Optional text box to provide further information

A number of problematic native plant species are known to occur in both the Lower Glenelg National Park and Discovery Bay Coastal Park areas in areas included in the Ramsar site. While native species, they are problematic because of their vigorous growth and ability to displace other native plants, thus reducing vegetation diversity. Problematic species include coast wattle (*Acacia longifolia* var. *sophorae*), spiny rush (*Juncus acutus*) and beach daisy (*Arctotheca populifolia*).

### 4.3.2 Animal species

#### Other noteworthy animal species

Phylum	Scientific name	Common name	Pop. size (optional)	Period of pop. est. (optional)	% occurrence (optional)	Position in range /endemism/other (optional)

#### Invasive alien animal species

Phylum	Scientific name	Common name	Impacts <sup>9</sup>
Actinopterygii	<i>Gambusia holbrooki</i>	Eastern Gambusia	Actually (minor impacts)
Actinopterygii	<i>Cyprinus carpio</i>	Common carp	Potentially
Actinopterygii	<i>Perca fluviatilis</i>	Redfin	Actually (minor impacts)
Actinopterygii	<i>Tinca tinca</i>	Tench	Actually (minor impacts)
Mammalia	<i>Vulpus vulpus</i>	Fox	Actually (minor impacts)

#### Optional text box to provide further information

<sup>9</sup> No impacts | Potentially | Actually (minor impacts) | Actually (major impacts)

## 4.4 Physical components

### 4.4.1 Climate

Please indicate the prevailing climate type(s) by selecting below the climatic region(s) and subregion(s), using the Köppen-Gieger Climate Classification System.

Climatic region <sup>10</sup>	Subregion <sup>11</sup>
C: Moist Mid-Latitude climate with mild winters	Cfb: Marine west coast (Mild with no dry season, warm summer)

If changing climatic conditions are affecting the site, please indicate the nature of these changes:

Climate change has the potential to affect CPS by changes in temperature, rainfall, evaporation, sea levels and ocean pH. These changes can affect wetland vegetation diversity and extent, fish and waterbird populations and estuary stratification, which in turn can affect fish and associated services such as food production, as well as threatened species via loss or degradation of habitat. Specific climate change predictions for the region are for (CSIRO 2016):

- Increased average temperatures in all seasons
- More hot days and warm spells and a reduction in the number of frosts
- Less spring and winter rainfall
- Increased intensity of extreme rainfall events
- Continued rise in mean sea level and increased extreme sea-level events
- A harsher fire-weather climate.

### 4.4.2 Geomorphic setting

a) Minimum elevation above sea level (in metres)

0

a) Maximum elevation above sea level (in metres)

20

b) Position in landscape/river basin:

- ☐ Entire river basin  
☐ Upper part of river basin  
☐ Middle part of river basin  
☒ Lower part of river basin  
☐ More than one river basin  
☐ Not in river basin  
☒ Coastal

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean. (This field is limited to 1000 characters)

<sup>10</sup> A. Tropical humid climate | B. Dry climate | C. Moist Mid-Latitude climate with mild winters | D. Moist Mid-Latitude climate with cold winters | E. Polar climate with extremely cold winters and summers | H. Highland

<sup>11</sup> Af: Tropical wet (No dry season) | Am: Tropical monsoonal (Short dry season; heavy monsoonal rains in other months) | Aw: Tropical savanna (Winter dry season) | BWh: Subtropical desert (Low-latitude desert) | BSh: Subtropical steppe (Low-latitude dry) | BWk: Mid-latitude desert (Mid-latitude desert) | BSk: Mid-latitude steppe (Mid-latitude dry) | Csa: Mediterranean (Mild with dry, hot summer) | Csb: Mediterranean (Mild with dry, warm summer) | Cfa: Humid subtropical (Mild with no dry season, hot summer) | Cwa: Humid subtropical (Mild with dry winter, hot summer) | Cfb: Marine west coast (Mild with no dry season, warm summer) | Cfc: Marine west coast (Mild with no dry season, cool summer) | Dfa: Humid continental (Humid with severe winter, no dry season, hot summer) | Dfb: Humid continental (Humid with severe winter, no dry season, warm summer) | Dwa: Humid continental (Humid with severe, dry winter, hot summer) | Dwb: Humid continental (Humid with severe, dry winter, warm summer) | Dfc: Subarctic (Severe winter, no dry season, cool summer) | Dfd: Subarctic (Severe, very cold winter, no dry season, cool summer) | Dwc: Subarctic (Severe, dry winter, cool summer) | Dwd: Subarctic (Severe, very cold and dry winter, cool summer) | ET: Tundra (Polar tundra, no true summer) | EF: Ice Cap (Perennial ice) | H: Highland (-)

Glenelg River Basin flowing into Southern Ocean

#### 4.4.3 Soil

- ☒ Mineral  
☒ Organic  
☐ No available information

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)?

☐ Yes / ☒ No

Please provide further information on the soil (optional)

Long Swamp complex is characterised by soils that are peat, calcareous and alkaline.  
 The Discovery Bay land system is characterised by steep dunes of highly calcareous sands made up largely of finely broken sea shells. The soils are mineral, with increasing organic material inland from the sea. These soils have been described as unique, with high alkalinity.  
 The sediments within the lower estuary are medium to very fine sands.

#### 4.4.4 Water regime

Water permanence

Presence? <sup>12</sup>
Usually permanent water present
Usually seasonal, ephemeral or intermittent water present

Source of water that maintains character of the site

Presence? <sup>13</sup>	Predominant water source
Water inputs from rainfall	<input type="checkbox"/>
Water inputs from surface water	<input checked="" type="checkbox"/>
Water inputs from groundwater	<input checked="" type="checkbox"/>
Marine water	<input checked="" type="checkbox"/>

Water destination

Presence? <sup>14</sup>
To downstream catchment
Marine

<sup>12</sup> Usually permanent water present | Usually seasonal, ephemeral or intermittent water present | Unknown

<sup>13</sup> Water inputs from rainfall | Water inputs from surface water | Water inputs from groundwater | Marine water | Unknown

<sup>14</sup> Feeds groundwater | To downstream catchment | Marine | Unknown

#### Stability of water regime

Presence? <sup>15</sup>
Water levels fluctuating (including tidal)
Water levels largely stable

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

While a knowledge and quantification of ecosystem water regimes is limited, it is understood that many of the wetlands in the site, including the Glenelg Estuary are groundwater dependent. It is suspected that groundwater is a significant water source for these systems, at times contributing more than surface water sources.

The hydrology of the Glenelg Estuary is influenced by the tidal cycle, when the estuary is open and freshwater river inflows, the latter of which are seasonal.

A range of wetland water regimes are present and several of the wetlands, such as the Bridgewater Lakes are permanently inundated.

#### Connectivity of surface waters and of groundwater (ECD)

The site is highly groundwater dependent with surface expressions of groundwater in large parts of the site.

#### Stratification and mixing regime (ECD)

The Glenelg Estuary is a salt wedge estuary. Stratification commonly occurs where low density fresh water flows over the top of dense saline water without mixing, forming a salt wedge on the estuary floor.

#### 4.4.5 Sediment regime

- ☐ Significant erosion of sediments occurs on the site
- ☒ Significant accretion or deposition of sediments occurs on the site
- ☒ Significant transportation of sediments occurs on or through the site
- ☐ Sediment regime is highly variable, either seasonally or inter-annually
- ☐ Sediment regime unknown

Please provide further information on sediment (optional):

The Glenelg Estuary is an east facing, intermittently closed and open lagoon (ICOL) that is seasonally closed. Sand deposition during low flow periods forms a bar across the mouth, isolating the system from the ocean.

Land clearing and subsequent runoff and erosion in the Glenelg River catchment has resulted in large amounts of sediments moving into the river channel. It is estimated that between 10 000 and 50 000 cubic metres of sand has been deposited per kilometre of channel, causing significant sand slugs and bars upstream of the Ramsar site.

#### Water turbidity and colour (ECD)

Glenelg Estuary - turbidity is generally less than the detection limit, but can exceed 100 NTU on occasions.

Long Swamp complex – high water clarity, some have tannin stained water (e.g. Swan Lake).

#### Light - reaching wetland (ECD)

No current data available on this aspect of the character of the site.

#### Water temperature (ECD)

No current data available on this aspect of the character of the site.

#### 4.4.6 Water pH

- ☐ Acid (pH<5.5)

<sup>15</sup> Water levels largely stable | Water levels fluctuating (including tidal) | Unknown

- ☐ Circumneutral (pH: 5.5-7.4 )  
☒ Alkaline (pH>7.4)  
☐ Unknown

Please provide further information on pH (optional):

The Lower Glenelg Estuary is neutral to slightly alkaline, with median pH 8. The water in Lake Bridgewater is neutral to slightly alkaline (pH, 7.7 – 8.9). Water quality in the majority of the Long Swamp complex wetlands is alkaline, with pH > 8.

#### 4.4.7 Water salinity

- ☒ Fresh (<0.5 g/l)  
☒ Mixohaline (brackish)/Mixosaline (0.5-30 g/l)  
☒ Euhaline/Eusaline (30-40 g/l)  
☐ Hyperhaline/Hypersaline (>40 g/l)  
☐ Unknown

Please provide further information on salinity (optional):

Glenelg Estuary: the interaction of fresh river flow and saline marine tides creates a salt wedge within the estuary, comprising described three distinct layers (Barton and Sherwood 2004):

- Upper layer of fresh, river water constantly flowing downstream;
- Lower layer of denser saline water, moving upstream on the flood tide and downstream on the ebb tide; and
- A middle mixed layer of intermediate density that moves downstream with the freshwater layer, gradually thickening until the freshwater layer disappears.

Long Swamp complex: Fresh water with salinity generally less than 0.5 ppt.

**Dissolved gases in water** (ECD)

Stratification in the Glenelg Estuary can lead to very low oxygen levels which may impact on ecosystem functions such as nutrient cycling as well as influence obligate aquatic biota.

#### 4.4.8 Dissolved or suspended nutrients in water

- ☐ Eutrophic  
☒ Mesotrophic  
☒ Oligotrophic  
☐ Dystrophic  
☐ Unknown

Please provide further information on dissolved or suspended nutrients (optional):

Glenelg Estuary – evidence from both within the site and upstream indicate moderate to high levels of nitrogen and phosphorus. Lake Bridgewater – very low levels of nitrogen and phosphorus.

**Dissolved organic carbon** (ECD)

No current data available on this aspect of the character of the site.

**Redox potential of water and sediments** (ECD)

No current data available on this aspect of the character of the site.

**Water conductivity** (ECD)

No current data available on this aspect of the character of the site.

#### 4.4.9 Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the site itself:

- ☐ i) broadly similar / ☒ ii) significantly different

If the surrounding area differs from the Ramsar Site, please indicate how: (Please tick all categories that apply)

- ☐ Surrounding area has greater urbanisation or development  
☐ Surrounding area has higher human population density

☒ Surrounding area has more intensive agricultural use

☒ Surrounding area has significantly different land cover or habitat types

Please describe other ways in which the surrounding area is different:

The Ramsar site is located predominantly within the Lower Glenelg National Park and Discovery Bay Coastal Parks, which are managed for conservation. Major land uses adjacent to the site include extensive forestry (primarily pine plantations) and grazing of improved and natural pastures.

The Ramsar site includes a range of freshwater and estuarine wetlands and coastal and dune systems. The surrounding landscape is largely terrestrial



## 4.5 Ecosystem services

### 4.5.1 Ecosystem services/benefits

Please select below all relevant ecosystem services/benefits currently provided by the site and indicate their relative importance in the right-hand column.

#### Provisioning Services

Ecosystem service <sup>16</sup>	Examples <sup>17</sup>	Importance/Extent/Significance <sup>18</sup>
Food for humans	Sustenance for humans (e.g., fish, molluscs, grains)	Medium
Genetic materials	Genes for tolerance to certain conditions	Low

#### Regulating Services

Ecosystem service <sup>19</sup>	Examples <sup>20</sup>	Importance/Extent/Significance <sup>18</sup>
Maintenance of hydrological regimes	Groundwater recharge and discharge	Medium
Erosion protection	Coastal shoreline and river bank stabilization and storm protection	Medium

#### Cultural Services

Ecosystem service <sup>21</sup>	Examples <sup>22</sup>	Importance/Extent/Significance <sup>18</sup>
Spiritual and inspirational	Spiritual and religious values	High
Spiritual and inspirational	Aesthetic and sense of place values	Medium
Recreation and tourism	Recreational hunting and fishing	High

<sup>16</sup> Food for humans | Fresh water | Wetland non-food products | Biochemical products | Genetic materials

<sup>17</sup> Sustenance for humans (e.g., fish, molluscs, grains) | Drinking water for humans and/or livestock | Water for irrigated agriculture | Water for industry | Water for energy production (hydro-electricity) | Timber | Fuel wood/fibre | Peat | Livestock fodder | Reeds and fibre | Other | Extraction of material from biota | Medicinal products | Genes for tolerance to certain conditions (e.g., salinity) | Genes for resistance to plant pathogens | Ornamental species (live and dead)

<sup>18</sup> not relevant for site | Low | Medium | High

<sup>19</sup> Maintenance of hydrological regimes | Erosion protection | Pollution control and detoxification | Climate regulation | Biological control of pests and disease | Hazard reduction

<sup>20</sup> Groundwater recharge and discharge | Storage and delivery of water as part of water supply systems for agriculture and industry | Soil, sediment and nutrient retention | Water purification/waste treatment or dilution | Local climate regulation/buffering of change | Regulation of greenhouse gases, temperature, precipitation and other climatic processes | Support of predators of agricultural pests (e.g., birds feeding on locusts) | Flood control, flood storage | Coastal shoreline and river bank stabilization and storm protection

<sup>21</sup> Recreation and tourism | Spiritual and inspirational | Scientific and educational

<sup>22</sup> Recreational hunting and fishing | Water sports and activities | Picnics, outings, touring | Nature observation and nature-based tourism | Inspiration | Cultural heritage (historical and archaeological) | Contemporary cultural significance, including for arts and creative inspiration, and including existence values | Spiritual and religious values | Aesthetic and sense of place values | Educational activities and opportunities | Important knowledge systems, importance for research (scientific reference area or site) | Long-term monitoring site | Major scientific study site | Type location for a taxon

Recreation and tourism	Water sports and activities	High
Recreation and tourism	Picnics, outings, touring	High
Recreation and tourism	Nature observation and nature-based tourism	High
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	Medium

#### Supporting Services

Ecosystem service <sup>23</sup>	Examples <sup>24</sup>	Importance/Extent/Significance <sup>18</sup>
Biodiversity	Supports a variety of all life forms including plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part	High
Nutrient cycling	Storage, recycling, processing and acquisition of nutrients	Medium

Other ecosystem service(s) not included above:

Please make a rough estimate of the approximate number of people who directly benefit from the ecological services provided by this site (estimate at least in orders of magnitude: 10s, 100s, 1000s, 10 000s etc.):

Within the site:

Outside the site:

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site?

☐ Yes / ☒ No / ☐ Unknown

Where economic studies or assessments of economic valuation have been undertaken at the site, it would be helpful to provide information on where the results of such studies may be located (e.g. website links, citation of published literature):

#### 4.5.2 Social and cultural values

Is the site considered internationally important for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? If so, please describe this importance under one or more of the four following

<sup>23</sup> Biodiversity | Soil formation | Nutrient cycling | Pollination

<sup>24</sup> Supports a variety of all life forms including plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part | Sediment retention | Accumulation of organic matter | Storage, recycling, processing and acquisition of nutrients | Carbon storage/sequestration | Support for pollinators

*categories. You should not list here any values derived from non-sustainable exploitation or which result in detrimental ecological changes.*

☐ i) the site provides a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland

Description if applicable

☐ ii) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland

Description if applicable

☐ iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples

Description if applicable

☐ iv) relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland

Description if applicable

## 4.6 Ecological processes

*This section is not intended for completion as part of a standard RIS, but is included for completeness as part of the agreed format of a 'full' Ecological Character Description (ECD) outlined by Resolution X.15*

### Primary production (ECD)

Not critical to the character of the site, but plays an important role as a supporting service, underpinning food webs within the system.

### Nutrient cycling (ECD)

Not critical to the character of the site, but is believed to play an important role in biogeochemical process, although this remains a knowledge gap for parts of the site.

### Carbon cycling (ECD)

No current data available on this aspect of the character of the site.

### Animal reproductive productivity (ECD)

No current data available on this aspect of the character of the site

### Vegetational productivity, pollination, regeneration processes, succession, role of fire, etc. (ECD)

No current data available on this aspect of the character of the site

### Notable species interactions, including grazing, predation, competition, diseases and pathogens (ECD)

See the ecological character description for further details.

### Notable aspects concerning animal and plant dispersal (ECD)

See the ecological character description for further details.

### Notable aspects concerning migration (ECD)

The connection between the marine, estuarine and freshwater components is significant for fish migration and reproduction.

### Pressures and trends concerning any of the above, and/or concerning ecosystem integrity (ECD)

## How is the Site managed?

### 5.1 Land tenure and responsibilities (Managers)

#### 5.1.1 Land tenure/ownership

Please specify if this category applies to the Ramsar Site, to the surrounding area or to both, by ticking the relevant option(s).

##### Public ownership

Category <sup>25</sup>	Within the Ramsar Site	In the surrounding area
Provincial/region/state government	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

##### Private ownership

Category <sup>26</sup>	Within the Ramsar Site	In the surrounding area
	<input type="checkbox"/>	<input checked="" type="checkbox"/>

##### Other

Category <sup>27</sup>	Within the Ramsar Site	In the surrounding area
	<input type="checkbox"/>	<input type="checkbox"/>

Provide further information on the land tenure / ownership regime (optional):

The Ramsar site falls predominantly within the Lower Glenelg National Park and the Discovery Bay Coastal Park. Both the National Park and Coastal Park are managed by Parks Victoria in partnership with local stakeholders.

#### 5.1.2 Management authority

Please list the local office / offices of any agency or organization responsible for managing the site:

Parks Victoria, PO Box 471, Portland, 3305

Provide the name and title of the person or people with responsibility for the wetland:

Don Tumney, Area Chief Ranger

Postal address:

Parks Victoria, PO Box 471, Portland, 3305

E-mail address:

[don.tumney@parks.vic.gov.au](mailto:don.tumney@parks.vic.gov.au)

<sup>25</sup> Public land (unspecified) | National/Federal government | Provincial/region/state government | Local authority, municipality, (sub)district, etc. | Other public ownership

<sup>26</sup> Cooperative/collective (e.g., farmers cooperative) | Commercial (company) | Foundation/non-governmental organization/trust | Religious body/organization | Other types of private/individual owner(s)

<sup>27</sup> Unspecified mixed ownership | No information available | Commoners/customary rights

## 5.2 Ecological character threats and responses (Management)

### 5.2.1 Factors (actual or likely) adversely affecting the Site's ecological character

Please specify if this category applies to the Ramsar Site, to the surrounding area or to both, by ticking the relevant option(s).

#### Human settlements (non agricultural)

Factors adversely affecting site <sup>28</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Housing and urban areas	Low impact	Medium impact	X	X
Tourism and recreation areas	Low impact	Medium impact	X	X

#### Water regulation

Factors adversely affecting site <sup>30</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Water abstraction	Medium impact	High impact	X	X

#### Agriculture and aquaculture

Factors adversely affecting site <sup>31</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Wood and pulp plantations	Low impact	Medium impact	[]	X
Livestock farming and ranching	Low impact	Low impact	X	X

#### Energy production and mining

Factors adversely affecting site <sup>32</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Oil and gas drilling	Low impact	Medium impact	[]	X

#### Transportation and service corridors

Factors adversely affecting site <sup>33</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
			[]	[]

<sup>28</sup> Housing and urban areas | Commercial and industrial areas | Tourism and recreation areas | Unspecified development

<sup>29</sup> Low impact | Medium impact | High impact | unknown impact |

<sup>30</sup> Drainage | Water abstraction | Dredging | Salinisation | Water releases | Canalisation and river regulation

<sup>31</sup> Annual and perennial non-timber crops | Wood and pulp plantations | Livestock farming and ranching | Marine and freshwater aquaculture | Non specified

<sup>32</sup> Oil and gas drilling | Mining and quarrying | Renewable energy | Unspecified

<sup>33</sup> Roads and railroads | Utility and service lines (e.g., pipelines) | Shipping lanes | Aircraft flight paths | Unspecified

Biological resource use

Factors adversely affecting site <sup>34</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Fishing and harvesting aquatic resources	Medium impact	Medium impact	X	X

Human intrusions and disturbance

Factors adversely affecting site <sup>35</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Recreational and tourism activities	High impact	High impact	X	X

Natural system modifications

Factors adversely affecting site <sup>36</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Fire and fire suppression	Medium impact	High impact	X	X
Dams and water management/use	High impact	High impact		X

Invasive and other problematic species and genes

Factors adversely affecting site <sup>37</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Invasive non-native/ alien species	High impact	High impact	X	[]
Problematic native species	High impact	High impact	X	

Pollution

Factors adversely affecting site <sup>38</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
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<sup>34</sup> Hunting and collecting terrestrial animals | Gathering terrestrial plants | Logging and wood harvesting | Fishing and harvesting aquatic resources | Unspecified

<sup>35</sup> Recreational and tourism activities | (Para)military activities | Unspecified/others

<sup>36</sup> Fire and fire suppression | Dams and water management/use | Vegetation clearance/ land conversion | Unspecified/others

<sup>37</sup> Invasive non-native/ alien species | Problematic native species | Introduced genetic material | Unspecified

<sup>38</sup> Household sewage, urban waste water | Industrial and military effluents | Agricultural and forestry effluents | Garbage and solid waste | Air-borne pollutants | Excess heat, sound, light | Unspecified

Garbage and solid waste	Low impact	Medium impact	X	[]
Agricultural and forestry effluents	Low impact	Medium impact		X
Industrial and military effluents	Low impact	Medium impact		X

#### Geological events

Factors adversely affecting site <sup>39</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
			[]	[]

#### Climate change and severe weather

Factors adversely affecting site <sup>40</sup>	Actual threat <sup>29</sup>	Potential threat <sup>29</sup>	Within the site	In the surrounding area
Droughts	Medium impact	High impact	[]	X
Storms and flooding	Medium impact	High impact	X	

#### Please describe any other threats (optional):

<p>The management plan for the site identified the following high priority threats:</p> <ul style="list-style-type: none"> <li>Invasive species: non-native non-woody weeds (e.g. phalaris, Sicilian sea lavender)</li> <li>Invasive species: native woody weeds (e.g. coastal wattle)</li> <li>Invasive species: non-native woody weeds (e.g. boxthorn)</li> <li>Invasive species: non-native terrestrial animals (e.g. pigs, foxes)</li> <li>Invasive species: non-native aquatic animals (e.g. carp)</li> <li>Energy production and mining: oil and gas drilling: decreased groundwater levels</li> <li>Natural systems modification (e.g. inappropriate estuary openings): altered water regimes</li> <li>Natural systems modifications (wildfire): increased nutrients and sediments</li> <li>Climate change (sea level rise): increased ingress of marine water</li> <li>Climate change (extreme storm events): increased beach erosion</li> <li>Climate change (drought): altered water regimes</li> </ul>
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### 5.2.2 Legal conservation status

Please list any other relevant conservation status, at global, regional or national level and specify the boundary relationships with the Ramsar Site:

#### Global legal designations

Designation type <sup>41</sup>	Name of area	Online information url	Overlap with Ramsar Site <sup>42</sup>
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<sup>39</sup> Volcanoes | Earthquakes/tsunamis | Avalanches/landslides | Unspecified

<sup>40</sup> Habitat shifting and alteration | Droughts | Temperature extremes | Storms and flooding | Unspecified

<sup>41</sup> World Heritage site | UNESCO Biosphere Reserve | Other global designation

<sup>42</sup> whole | partly



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Regional (international) legal designations

Designation type <sup>43</sup>	Name of area	Online information url	Overlap with Ramsar Site <sup>42</sup>

National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site <sup>42</sup>
National Parks	Lower Glenelg National Park	<a href="http://parkweb.vic.gov.au/explore/parks/lower-glenelg-national-park">http://parkweb.vic.gov.au/explore/parks/lower-glenelg-national-park</a>	Partly
National Parks	Discovery Bay Coastal Park	<a href="http://parkweb.vic.gov.au/explore/parks/discovery-bay-coastal-park">http://parkweb.vic.gov.au/explore/parks/discovery-bay-coastal-park</a>	Partly
Streamside Reserve	Nelson Streamside Reserve	<a href="http://parkweb.vic.gov.au/explore/parks/nelson-ss.r">http://parkweb.vic.gov.au/explore/parks/nelson-ss.r</a>	Completely

Non-statutory designations

Designation type <sup>44</sup>	Name of area	Online information url	Overlap with Ramsar Site <sup>42</sup>

### 5.2.3 IUCN protected areas categories (2008)

- ☐ Ia Strict Nature Reserve
- ☐ Ib Wilderness Area: protected area managed mainly for wilderness protection
- ☒ II National Park: protected area managed mainly for ecosystem protection and recreation
- ☐ III Natural Monument: protected area managed mainly for conservation of specific natural features
- ☐ IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
- ☐ V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
- ☐ VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

### 5.2.4 Key conservation measures

#### Legal protection

<sup>43</sup> EU Natura 2000 | Other international designation

<sup>44</sup> Important Bird Area | Important Plant Area | Other non-statutory designation

Measures <sup>45</sup>	Status <sup>46</sup>
Legal protection	Implemented

#### Habitat

Measures <sup>47</sup>	Status <sup>46</sup>
Catchment management initiatives/controls	Partially implemented
Improvement of water quality	Partially implemented
Hydrology management/restoration	Partially implemented
Re-vegetation	Partially implemented
Faunal corridors/passage	Partially implemented

#### Species

Measures <sup>48</sup>	Status <sup>46</sup>
Control of invasive alien plants	Partially implemented
Control of invasive alien animals	Partially implemented
Threatened/rare species management programmes	Partially implemented

#### Human Activities

Measures <sup>49</sup>	Status <sup>46</sup>
Management of water abstraction/takes	Implemented
Regulation/management of wastes	Implemented
Fisheries management/regulation	Implemented
Regulation/management of recreational activities	Partially implemented

<sup>45</sup> Legal protection

<sup>46</sup> Proposed | Partially implemented | Implemented

<sup>47</sup> Catchment management initiatives/controls | Improvement of water quality | Habitat manipulation/enhancement | Hydrology management/restoration | Re-vegetation | Soil management | Land conversion controls | Faunal corridors/passage

<sup>48</sup> Threatened/rare species management programmes | Reintroductions | Control of invasive alien plants | Control of invasive alien animals

<sup>49</sup> Management of water abstraction/takes | Regulation/management of wastes | Livestock management/exclusion (excluding fisheries) | Fisheries management/regulation | Harvest controls/poaching enforcement | Regulation/management of recreational activities | Communication, education, and participation and awareness activities | Research

Communication, education, and participation and awareness activities	Proposed
Research	Partially implemented

Other:

### 5.2.5 Management planning

Is there a site-specific management plan for the site?

<sup>50</sup>Yes

Is the management plan/planning implemented?

☐ Yes / ☒ No

The management plan covers

<sup>51</sup>All of the Ramsar site

Is the management plan currently subject to review and update?

☐ Yes / ☒ No

Has a management effectiveness assessment been undertaken for the site?

☐ Yes / ☒ No

Please give link to site-specific plan or other relevant management plan if this is available via the Internet or upload it in section 'Additional material':

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party?

☐ Yes / ☒ No

Please indicate if a Ramsar centre, other educational or visitor facility, or an educational or visitor programme is associated with the site:

URL of site-related webpage (if relevant):

<http://www.ghcma.vic.gov.au/projects/current-projects/glenelg-estuary-and-discovery-bay-wetland-complex-ramsar-nomination/>

### 5.2.6 Planning for restoration

Is there a site-specific restoration plan?

<sup>52</sup>No need identified

Has the plan been implemented?

☐ Yes / ☒ No

The restoration plan covers:

<sup>53</sup>

Is the plan currently being reviewed and updated?

<sup>50</sup> No | Yes | In preparation

<sup>51</sup> All of Ramsar Site | Part of Ramsar Site

<sup>52</sup> Please select a value | No need identified | No; the site has already been restored | No; but restoration is needed | No; but a plan is being prepared | Yes; there is a plan

<sup>53</sup> All of Ramsar Site | Part of Ramsar Site

☐ Yes / ☒ No

Where the restoration is being undertaken to mitigate or respond to a threat or threats identified in this RIS, please indicate it / them:

Further information

### 5.2.7 Monitoring implemented or proposed

Monitoring <sup>54</sup>	Status <sup>55</sup>
Water regime monitoring	Implemented
Water quality	Proposed
Plant community	Proposed
Animal community	Implemented
Birds	Implemented

Please indicate other monitoring activities:

There are several monitoring programs in place:  
 Estuary Watch – monitors estuary opening and closing in the Glenelg Estuary.  
 Nature Glenelg Trust – monitors fish populations in the Long Swamp complex and lower Glenelg Estuary.  
 BirdLife Australia – monitors shorebirds in the beach and estuary portions of the Ramsar site and has a biennial beach nesting bird monitoring program.

<sup>54</sup> Water regime monitoring | Water quality | Soil quality | Plant community | Plant species | Animal community | Animal species (please specify) | Birds

<sup>55</sup> | Implemented | Proposed

## Additional material

### 6.1 Additional reports and documents

#### 6.1.1 Bibliographical references

Butcher, R., Hale, J., Books, S. and Cottingham, P. (2016a). Ecological Character Description for Glenelg Estuary and Discovery Bay Ramsar Site. Report to the Glenelg Hopkins Catchment Management Authority.

Cordero-Rivera A. (2015). Demographics and adult activity of *Hemiphysalis mirabilis*: a short-lived species with a huge population size (Odonata: Hemiphysalidae). *Insect Conservation and Diversity*.

Cordero Rivera A. (2014). Behaviour and ecology of *Hemiphysalis mirabilis* (Odonata: Hemiphysalidae). Report on the work done in Victoria during November and December 2013.

Duncan M. (2010). National Recovery Plan for the Maroon Leek-orchid *Prasophyllum frenchii*. Victorian Government Department of Sustainability and Environment (DSE) Melbourne.

Dickson C.R., Anderson R.A., Murphy A., Pritchard A. and Craig A. (2012). Recovery Plan for three orchid species in South Australia and Victoria: *Caladenia richardsiorum* (little dip spider-orchid), *Caladenia calcicola* (limestone spider-orchid) and *Pterostylis tenuissima* (swamp greenhood). Department of Environment, Water and Natural Resources, South Australia, South East Region & Department of Sustainability and Environment, Victoria, South West Victoria Region.

Ewers C., Esbert N., Hardie M., Ekanayake K., Cullen M. and Maguire G.S. (2011). Report on the 2010 Biennial Hooded Plover Count, Birds Australia.

Glenelg Hopkins CMA (2014). Glenelg Hopkins Waterway Strategy. Glenelg Hopkins Catchment Management Authority, Hamilton.

Glenelg Hopkins CMA (2013). Glenelg Hopkins Regional Catchment Strategy. Glenelg Hopkins Catchment Management Authority, Hamilton.

Glenelg Hopkins CMA (2012). Glenelg Hopkins Regional Waterway Strategy. Glenelg Hopkins Catchment Management Authority, Hamilton.

Glenelg Hopkins CMA (2006). Glenelg estuary management plan. Glenelg Hopkins Catchment Management Authority, Hamilton.

Glenelg Hopkins CMA (2006b). Glenelg Hopkins Fishery Management Plan, Glenelg Hopkins Catchment Management Authority, Hamilton, Victoria.

Mead R., Yarwood M., Cullen M., and Maguire G. (2012). Report on the 2012 Biennial Hooded Plover count. BirdLife.

Parks Victoria (2015). Ngootyoong Gunditj Ngootyoong Mara South West Management Plan. Parks Victoria, Melbourne.




#### 6.1.2 Additional reports and documents

- i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)  
-UPLOAD via online form-
- ii. a detailed Ecological Character Description (ECD) (in a national format)  
-UPLOAD via online form-
- iii. a description of the site in a national or regional wetland inventory  
-UPLOAD via online form-
- iv. relevant Article 3.2 reports  
-UPLOAD via online form-
- v. site management plan  
-UPLOAD via online form-
- vi. other published literature  
-UPLOAD via online form-

*Please note that any documents uploaded here will be made publicly available.*

### 6.1.3 Photograph(s) of the Site

Please provide at least one photograph of the site:

File	Copyright holder	Date on which the picture was taken	Caption
  	Andrea White	November 2013	<p>Photo One:</p> <p>Glenelg River Estuary as viewed from the Beach Road lookout, the opening to the ocean can be seen at far right.</p> <p>Photo Two:</p> <p>Coastal dune scrub on the barrier dunes adjacent to Long Swamp and shorebird habitat along the ocean beach.</p> <p>Photo Three:</p> <p>Lake Mombeong one of the freshwater lakes of Discovery Bay.</p>

☒ I certify that I am the photographer, the valid holder of rights over the photograph(s), or an authorized representative of the organization which is the valid holder of rights over the photograph(s), and I

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#### 6.1.4 Designation letter and related data

Designation letter\*

**-UPLOAD via online form-**

Transboundary Designation letter

**-UPLOAD via online form-**

Date of Designation

28 February 2018

Number of certificates wished