ATTACHMENT III: MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

1 INTRODUCTION

1.1 Purpose of this attachment

This attachment to the Environment Effects Statement (EES) presents the findings of the investigations and impact assessments undertaken into Matters of National Environmental Significance (MNES) for the Edithvale and Bonbeach level crossing removal projects (the projects).

It should be read in conjunction with the context and methods presented in Chapter 6 *Edithvale-Seaford Wetlands and groundwater dependent ecosystems* (Sections 6.1 to 6.3) and Chapter 8 *Potential local impacts at Edithvale and Bonbeach* (Section 8.11).

The groundwater modelling described in Chapter 5 *Modelling the water environment* concluded that changes to the hydrological regime or ecological conditions due to the projects would not occur at the Edithvale-Seaford Wetlands. However, in response to Section 4.2 of the Scoping Requirements for the EES, a detailed assessment of the wetlands was undertaken and is presented in Technical Report B *Ecology: Wetlands and Groundwater Dependent Ecosystems.* Key outcomes are summarised in Section 2 and Section 5.1 of this attachment.

1.1.1 Matters of National Environmental Significance

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides the legal framework to protect and manage designated MNES. There are nine MNES protected under the EPBC Act:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, if the Commonwealth Minister for the Environment decides that a project could potentially have a significant impact on a MNES, the project becomes a 'controlled action' that must be assessed and approved by the Minister before it can proceed. The matters which the projects may have a significant impact on are known as the controlling provisions.

The Level Crossing Removal Authority (LXRA) referred the Edithvale and Bonbeach level crossing removal projects to the Commonwealth Government under the EPBC Act. On 8 May 2017, the delegate for the Commonwealth Minister for the Environment and Energy determined that the projects are a 'controlled action' and that further assessment and approval is required under the EPBC Act before the two projects can proceed.

The decision was made due to the potential for cumulative impacts by the projects on the internationally-important Edithvale-Seaford Wetlands and the associated listed threatened and migratory flora and fauna, on the basis of the preliminary groundwater modelling. The relevant controlling provisions for this EES are:

- Ramsar wetlands (sections 16 & 17B of the EPBC Act)
- Listed threatened species and communities (sections 18 & 18A of the EPBC Act)
- Listed migratory species (sections 20 & 20A of the EPBC Act).

Ramsar wetlands

A Ramsar wetland is a wetland that has been designated under Article 2 of the Ramsar Convention, or which has been declared by the Federal Environment Minister to be a Ramsar wetland under the EPBC Act.

The Ramsar Convention encourages the designation of sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity. Once designated, these sites are added to the Convention's List of Wetlands of International Importance and become known as Ramsar sites.

In designating a wetland as a Ramsar site, countries agree to establish and oversee a management framework aimed at conserving the wetland and ensuring its wise use. Wise use under the Convention is broadly defined as maintaining the ecological character of a wetland.

Listed threatened species and communities

The EPBC Act provides for the listing of nationally threatened native species and ecological communities, native migratory species and marine species. Threatened species refers to those species that are considered 'threatened, including species that are listed as 'vulnerable', 'endangered' or 'critically endangered' under the EPBC Act.

The EPBC Act protects Australia's native species and ecological communities by providing for:

- identification and listing of species and ecological communities as threatened
- development of conservation advice and recovery plans for listed species and ecological communities
- development of a register of critical habitat
- recognition of key threatening processes
- where appropriate, reducing the impacts of these processes through threat abatement plans.

Listed migratory species

Migratory species are those animals that migrate to Australia and its external territories, or pass though or over Australian waters during their annual migrations. The EPBC Act lists 37 migratory shorebirds that regularly visit Australia. These are species that are subject to the following international agreements relating to migratory shorebird conservation to which Australia is a signatory:

- Bilateral agreements:
  - Japan-Australian Migratory Bird Agreement (JAMBA)
  - China-Australia Migratory Bird Agreement (CAMBA)
  - Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Convention on Conservation of Migratory Species of Wild Animals (also known as the CMS or the Bonn Convention)

1.1.2 Responding to the controlled action

In response to the controlled action decision under the EPBC Act, this attachment has been prepared to summarise the findings of the EES assessment with respect to the three controlling provisions discussed above (Ramsar wetlands, listed threatened species and listed migratory species).

In order to provide necessary commentary on the likelihood of significant impacts specific to MNES identified in the determination for the projects under the EPBC Act, this attachment provides an assessment of the potential mechanisms through which impact on those MNES as a result of the projects could be realised. Potential mechanisms of impact on MNES considered in this assessment include:

- groundwater change
- noise and vibration
- acid sulfate soils and contamination (including waste production)
- dust and air quality
- surface water change
- light spill.

An assessment of the presence of MNES in the project and study areas to inform the environmental impact assessment for the works was undertaken for each controlling provision:

- Ramsar Wetlands (Section 2)
- Migratory species (Section 3)
- Threatened species (Section 4).

Section 2 (Ramsar Wetlands) also includes a detailed assessment of Edithvale Wetland in response to Section 4.2 of the Scoping Requirements.

A risk and impact assessment was undertaken for each of the three controlling provisions in accordance with the methodology described in Chapter 4 *Assessment Framework* and is included in Section 5 of this attachment. The risk and impact assessment has been split into two sections:

- **Ramsar Wetland** (Section 5.1) – addresses the potential risks and impacts resulting from the projects at Edithvale Wetland.
- **Threatened and migratory species** (Section 5.2) – addresses the potential risks and impact resulting from the projects on threatened and migratory species.

1.2 Project overview

LXRA proposes to remove two level crossings at Edithvale and Bonbeach.

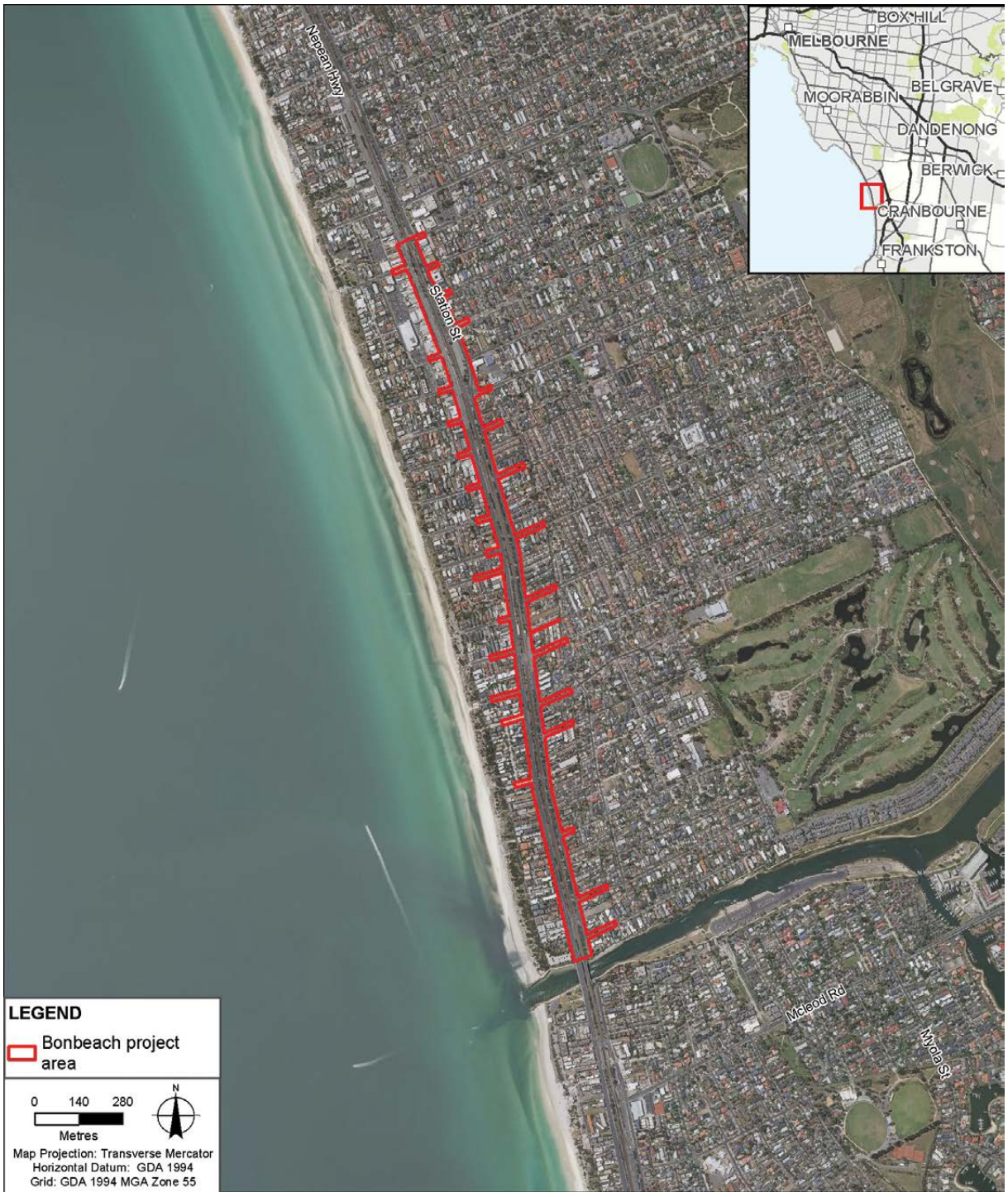
At Edithvale, LXRA proposes to remove the level crossing by lowering the Frankston railway line into a trench under Edithvale Road while maintaining Edithvale Road at the current road level. The trench would be located between Lochiel Avenue and Berry Avenue. It would be up to 1,300 metres in length and 14 metres wide at its narrowest point, widening to 24 metres (including pile widths) at the new Edithvale station platforms.

At Bonbeach, LXRA proposes to remove the level crossing by lowering the Frankston railway line into a trench under Bondi Road while maintaining Bondi Road at the current road level. The trench would be located between Golden Avenue and The Glade. It would be up to 1,200 metres in length and 14 metres wide at its narrowest point, widening to 24 metres (including pile widths) at the new Bonbeach station platforms.

The areas where the level crossings would be removed are referred to as the 'project area'. Refer to Figure 1.1 (Edithvale) and Figure 1.2 (Bonbeach) for the project areas.

Figure 1.1 Edithvale project area

Figure 1.2 Bonbeach project area



The study area for the MNES assessment was defined on the basis of the potential extent of groundwater mounding/drawdown that was identified by the preliminary groundwater modelling (refer to Chapter 5 *Modelling the water environment)*. The GDE study area extends from the coast to approximately 2.5 kilometres inland from the Edithvale and Bonbeach project areas. Refer to Figure 1.3 below. This area includes the Ramsar listed Edithvale Wetland and locally significant Wannarkladdin Wetland.

Figure 1.3 Part A: GDE study area

Wannarkladdin Wetlands are ecologically similar to Edithvale Wetland, although not of international significance and not a Ramsar listed wetland. The Wannarkladdin Wetlands provide habitat for a number of waterbirds and shorebirds and are part of a nationally significant complex of wetlands (which includes the Edithvale-Seaford Wetlands). Based on analysis of BirdLife Australia data, Wannarkladdin Wetlands is known to provide habitat for 10 threatened and/or migratory birds. Refer to Chapter 6 *Edithvale-Seaford Wetlands and groundwater dependent ecosystems* for further information. Wannarkladdin Wetlands have only been considered in this attachment in the context of providing habitat for threatened and migratory species.

Figure 1.3 Part B: GDE study area

Figure 1.3 Part C: GDE study area

1.3 Assessment overview

An assessment was undertaken to understand the potential for the presence of MNES in the project and study areas to inform the environmental impact assessment for the works. This assessment incorporated:

- a desktop assessment and synthesis of government-curated biodiversity datasets including the Protected Matters Search Tool (PMST)
- flora and fauna field assessments
- targeted surveys where appropriate.

Desktop assessment

The desktop assessment to determine the likelihood of MNES presence, included the following species:

- listed as threatened under the EPBC Act
- listed as migratory under the EPBC Act.

This assessment was completed for species predicted to occur by the PMST, within five kilometres of the project areas, which encompassed the study area.

Field assessments

Field assessments for MNES were undertaken in September 2016 and in July 2017 at Edithvale Wetland, and in June and August 2017 in the remainder of the study area.

The field assessments incorporated the following:

- Habitat assessments to inform the determination of the likelihood of each site to support threatened flora and fauna species. Habitat requirements were compared to existing conditions of the study area and a precautionary approach taken to their likelihood of occurrence.
- Threatened ecological community assessments.

Targeted surveys

No suitable habitat for any significant flora or fauna species was identified within the project area, and consequently no species were considered to have greater than a low likelihood of occurrence. No targeted surveys for any flora or fauna species listed under the EPBC-Act were undertaken within the project area.

Within the GDE study area seven threatened species and 20 migratory species were identified as having a moderate or above likelihood of presence (noting some species are both threatened and migratory). Flora and fauna investigations and management plans as previously completed by BirdLife Australia, Ecology Australia and Sinclair Knight Merz were reviewed to inform an assessment of species likelihood and status in the study area.

Targeted surveys for migratory and threatened birds were not undertaken for the purposes of preparing the EES. The level of survey effort by BirdLife Australia (surveys providing 30 years of records) gives a detailed and invaluable insight into the historical presence and regularity of occurrence of threatened and or migratory species within the high value GDEs of the study area. This provides highly credible information for considering the presence and use of habitat by these birds and for identifying important habitat for migratory shorebirds. The BirdLife surveys are considered to be in keeping with national survey guidelines.

Targeted surveys were undertaken where suitable data had not already been gathered. On this basis, a targeted survey was undertaken for Dwarf Galaxias at Edithvale Wetland and Patterson River, as the species was originally considered as having a likelihood of occurrence. Dwarf Galaxias surveys were carried out with reference to state and national survey guidelines for the species. No individuals were found during surveys and the likelihood was revised to unlikely. In addition habitat assessments were completed for Grey-headed Flying-fox commensurate with national survey guidelines. These assessments informed the assessment of species likelihood. Incidental records of significant flora were undertaken as part of the vegetation assessment.

All other threatened and migratory species were assumed to be present where appropriate habitat was also present within the study area.

2 RAMSAR WETLANDS

There are no Ramsar wetlands in the project area. There is one Ramsar wetland in the study area – the Edithvale-Seaford Wetlands Ramsar Site. The Edithvale and Seaford wetlands site are two discrete wetland systems which are physically distinct and are separated by the Patterson River (refer to Technical Report A *Groundwater*).

The Seaford Wetland is not connected by ground or surface water with the Edithvale and Bonbeach level crossing removals projects and therefore would not be impacted by them. The focus of the EES is on the Edithvale Wetland section of the Edithvale-Seaford Wetlands (referred to here as the 'Edithvale Wetland').

A detailed assessment of Edithvale Wetland was undertaken in response to Section 4.2 of the Scoping Requirements and is presented in Technical Report B *Ecology: Wetlands and Groundwater Dependent Ecosystems*. The assessment is summarised in the following section, in conjunction with an assessment of the MNES at Edithvale Wetland.

The Edithvale Wetland covers 103 hectares and provides 39 hectares of wetland habitat. The wetland is a combination of both natural and excavated ponds (referred to as wetland cells) to the north and south of Edithvale Road. Edithvale Wetland is owned and managed by Melbourne Water.

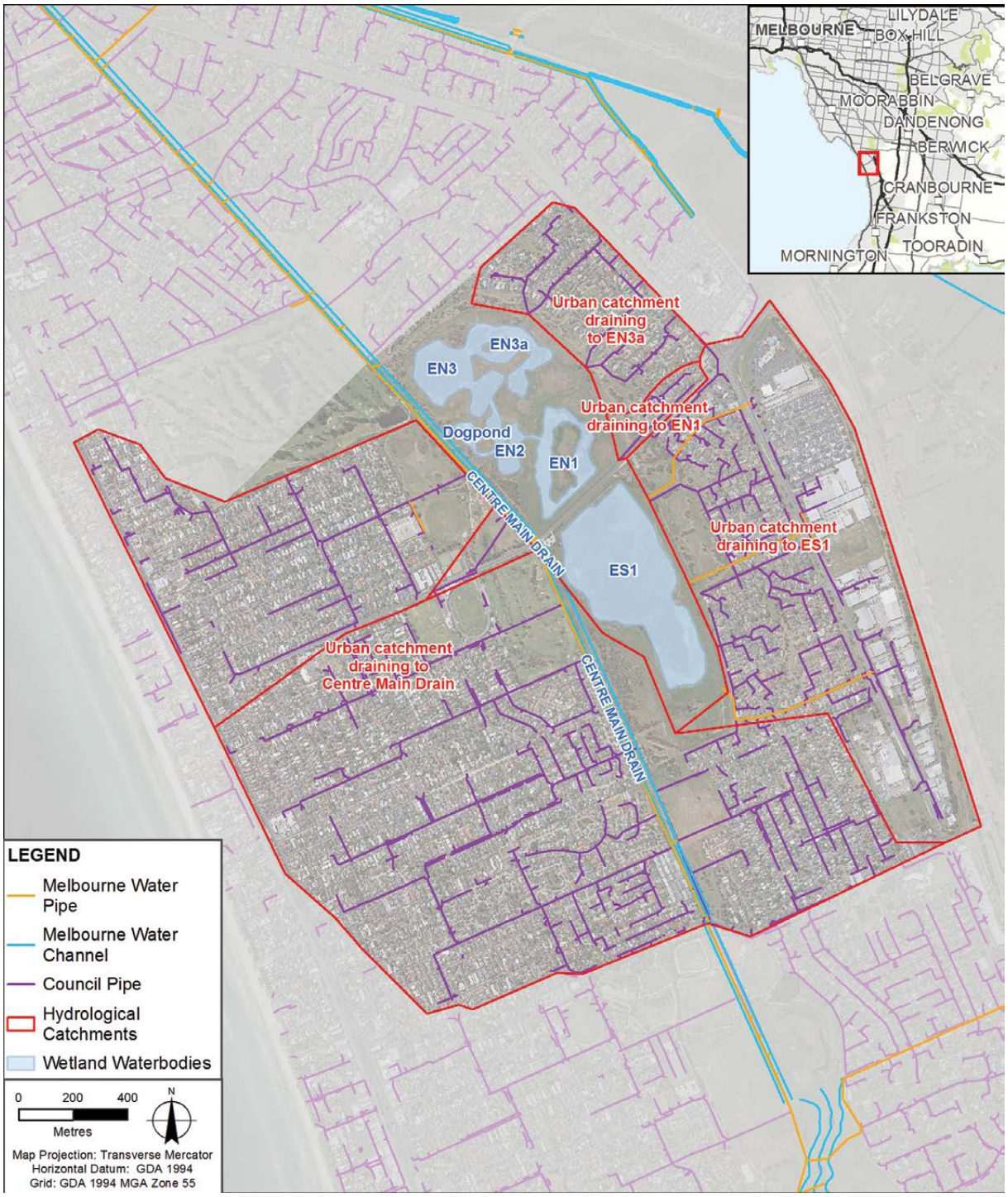
The ability to provide suitable habitat for protected and migratory species is partially due to the seasonal nature of the wetlands themselves. During summer, many of the cells dry out, some to the extent of being reduced to small shallow pools. During summer, mudflats are exposed due to the 'drying' of the wetland, providing habitat favoured by waterbirds, and particularly, migratory shorebirds. This 'wetting and drying' cycle is a key process contributing to the wetlands' international importance.

2.1 Overview of wetland cells

Edithvale Wetland contains a complex of diverse wetland types, including shallow freshwater marshes, permanent open freshwater wetlands and brackish to saline ponds. These consist of a number of water bodies of varying sizes and depths.

Many of the cells are interconnected, controlling the movement of the water from the eastern cells (where surface water inflows are received) to the western cells that discharge to the Centre Main Drain. Edithvale Wetland is divided into two regions – north and south – each comprising a number of individual cells. The complex is separated by Edithvale Road (refer to Figure 1.4).

Figure 1.4 Edithvale Wetland cells



2.1.1 Northern wetland cells

The northern portion of Edithvale Wetland encompasses the following cells (refer to Figure 1.4):

- Edithvale North 1 (EN1)
- Edithvale North 2 (EN2)
- Edithvale North 3 (EN3)
- Edithvale North 3a (EN3a)
- Edithvale North – Dog Pond.

Each cell is described below in Table 1.1. The majority of these cells have varying salinity levels, attributed to the interaction with groundwater. The cells maintain a mixture of permanent and seasonal water bodies, fringed mainly by tall reed beds such as Tall Marsh. Threatened or migratory species that have been recorded at these sites include the Australasian Bittern, Latham's Snipe, Baillion's Crake, Blue-billed Duck, Freckled Duck, Hardhead, Musk Duck, Magpie Goose, Australasian Shoveler and Great Egret.

Table 1.1 Northern wetland cells

Wetland cell and description	Photo
Edithvale North 1 (EN1) Edithvale North 1 (EN1) is a large cell located in the south of the northern section of the Edithvale Wetland. EN1 is a shallow, peat-lined cell, supporting the growth of Salt Club-sedge in late summer and autumn extensive and dense beds of Tall Marsh. The presence of water fluctuates. During summer, the water in the cell evaporates and the vegetation surrounding EN1 dries out. In wet months, the cell maintains moist areas due to the interaction with groundwater.	
Edithvale North 2 (EN2) Edithvale North 2 (EN2) is a deep cell that permanently maintains water throughout the year. The cell interacts with groundwater and the water is saline. The open waters of the cell are fringed by Tall Marsh.	

Wetland cell and description	Photo
Edithvale North 3 (EN3) Edithvale North 3 (EN3) is similar to EN2 – a large expanse of permanent open water, fringed with Tall Marsh. The water is fresh to brackish. EN3 is the largest permanent waterbody of the north portion of the wetlands.	
Edithvale North 3a (EN3a) Edithvale North 3a (EN3a) contains fresh water. EN3a is a deep pool that experiences wetting and drying dependent on the relationship between surface water inflows and evaporation. Filling of this cell generally only occurs between July and August, with inflows mainly contributed from stormwater. This cell exhibits a range of vegetation communities and is one of the smaller cells in the wetlands.	
Edithvale North – Dog Pond The dog pond is a small but deep pool, accessible to the public via a shared user path from Edithvale Common. It is segregated from the main wetland area by fencing and is designated for dogs to swim and play in to reduce disturbance of wildlife elsewhere within the Edithvale Wetland. Water level is determined by groundwater and also relies on inflows from cell EN2.	

2.1.2 Southern wetland cells

The southern portion of Edithvale Wetlands is considered to be one cell – Edithvale South 1 (ES1). ES1 encompasses a few deeper sections which are referred to as Edithvale South 1a (ES1a) and Edithvale South 1b (ES1b). Refer to Figure 1.4, above, for the location of the cells.

The southern wetland cell is of greater ecological importance than the northern cells for migratory bird species that feed on exposed or near exposed mudflats. ES1 is described below in Table 1.2.

Table 1.2 Southern wetland cells

Wetland cell and description	Photo
Edithvale South 1 (ES1) ES1 is a natural dish-shaped pond, approximately 0.5 metres deep and underlain by a thick peat layer which thins towards the edges. The cell comprises sections of shallow and deeper fresh-brackish marsh. During summer and autumn, water levels of ES1 recede, exposing large areas of mudflats critical for the foraging habitat of migratory birds. Two deeper sections (ES1a and ES1b) retain water for longer during dry periods. The southern portion of Edithvale Wetlands exhibit complex vegetation including tall and shorter reed beds of Tall Marsh, Brackish Wetland and Salt Club-sedge.	 

2.1.3 Relationship to the wider water environment

The Edithvale Wetland functions as an essential component of the regional drainage system, serving as an important flood storage component. The water in the wetlands is largely sourced from drains collecting stormwater runoff from developed catchments to the north and east. The stormwater primarily enters via litter traps and sediment ponds at wetland cell EN3. Water is discharged via the Centre Main Drain (to the west) to Mordialloc Creek which then flows into Port Phillip Bay. Alternative sources of inflows at Edithvale Wetland include overland flows and groundwater discharge.

Between 1987 and 1988, some of the wetland cells at Edithvale Wetland were excavated, which penetrated the underlying clay layer. This resulted in a permanent connection between shallow groundwater and surface water within these cells, altering the natural hydrology and surface water quality by increasing levels of salinity.

Many of the wetland cells are interconnected, creating a complex network of water flows. Wetland cell ES1 is relatively shallow, and drains into the northern wetland component via a pipe beneath Edithvale Road. The wetland cells in the northern component drain to the north – EN1 flows into EN2, which flows into EN3. Refer to Chapter 5 *Modelling the water environment* for further details, including a map showing how water flows in the wetland cells.

2.2 Vegetation

Native vegetation includes patches of native vegetation and scattered native trees. The removal of native vegetation is controlled through the application of *Guidelines for the removal, destruction or lopping of native vegetation* an incorporated document under the *Planning and Environment Act 1987*.

Seven EVCs were recorded during EVC mapping of Edithvale Wetland conducted in July 2017:

- Swamp Scrub (EVC 53)
- Tall Marsh (EVC 821)
- Brackish Wetland Aggregate (EVC 656)
- Brackish Aquatic Herbland (EVC 537)
- Aquatic Herbland (EVC 653)
- Plains Grassy Woodland (EVC 55)
- Coast Banksia Woodland (EVC 2).

These EVCs are described in Table 1.3.

Ecological Vegetation Class (EVC)

In Victoria, patches of native vegetation are classified by an Ecological Vegetation Class (EVC) which are based on the general ecological characteristics and underlying geology of the vegetation.

Table 1.3 Native vegetation at Edithvale Wetland

EVC and description	Picture
Swamp Scrub (EVC 53) EVC 53 occurs as small, fragmented patches elevated on three small islands in the north of Edithvale Wetlands (EN1). This EVC is characterised by Swamp Paperbark with a degraded understorey which includes Blackberry and exotic grasses. Scattered Swamp Gums are occasionally present in the patches EVC 53 has a Biodiversity Conservation Status (BCS) of endangered in the Gippsland Plain Bioregion.	
Tall Marsh (EVC 821) EVC 821 is dominated by thick swards of Common Reed and occasionally Cumbungi. Old growth Common Reed is tall and dense while regrowth of Common Reed has a less dense, more open structure. Tall Marsh forms a buffer around the wetlands that shields birds from some human disturbance. This function is actively maintained near walking paths and around the boundary, particularly along Edithvale Road.	

EVC and description	Picture
Brackish Wetland Aggregate (EVC 656) This EVC appears as unvegetated open water/bare soil/mud (EVC 990) for approximately 6 months of the year and large areas have been displaced by the encroachment of Common Reed. EVC 656 has a BCS of endangered in the Gippsland Plain Bioregion.	
Brackish Aquatic Herbland (EVC 537) EVC 537 occurs in deeper water and is dominated by aquatic herbs and fibrous algae. EVC 537 has contracted in extent over the past decade from being once abundant in both northern and southern Edithvale Wetlands to now only in the constructed wetlands in the north.	
Aquatic Herbland (EVC 653) EVC 653 occurs in an area of southern wetland cell ES1 and is replaced with Tall Marsh and Brackish Wetland Aggregate/Unvegetated (open water/ bare soil/mud) as the water levels recede in spring and summer.	
Plains Grassy Woodland (EVC 55) EVC 55 is represented by patches of planted native trees and shrubs including River Red-gum, Swamp Gum and Banksia over a weedy understorey. The understorey of these patches appears regularly mown as part of the maintenance at the wetland.	

EVC and description	Picture
Coast Banksia Woodland (EVC 2) EVC 2 was recorded during field work from elevated land between some wetland cells, and was identifiable by the dominance of Coast Banksia yet to reach canopy height, and growing above introduced grass species. It is considered probable that these patches of vegetation have been planted.	

An additional three EVCs have been previously recorded within Edithvale Wetland by Ecology Australia, however they were not recorded during the July 2017 EVC mapping. These are described below:

- Damp Sands Herb-rich Woodland (EVC3) – was generally restricted to the outer extent of the Edithvale Wetland property boundary, forming an almost continuous link around the cells in the northern portion of the wetlands. A number of these patches are considered likely to have been revegetated. EVC3 has a Bioregional Conservation Status (BCS) of vulnerable in the Gippsland Plain Bioregion.
- Plains Sedgy Wetland (EVC 647) – occurs in the lower lying areas of wetland cell EN1 and is dominated by Water Ribbons, Water-milfoil, Streaked Arrow-grass and Tall Spike-sedge. The floristic diversity of this vegetation is threatened by the encroachment of Common Reed and Cumbungi, which surround and are interspersed through all patches.
- Brackish Herbland (EVC 538) – previously occurred on the outskirts of the Edithvale South and in the middle of the wetland. The distribution of this EVC is likely to fluctuate each year in response to season and rainfall.

2.2.1 Threatened plants

The current management plan for the Ramsar site considers that there is suitable habitat present within Edithvale Wetland for River Swamp Wallaby-grass and Swamp Everlasting (listed under the EPBC Act), Pale Swamp Everlasting (vulnerable in Victoria) and Lacey River Buttercup (rare in Victoria).

Although many of the wetland cells provide the seasonally fluctuating surface water levels that encourage areas of bare ground that River Swamp Wallaby-grass prefers, the prevalence of Tall Marsh EVC around and within many of the cells has reduced the extent of available habitat for River Swamp Wallaby-grass. The growth of both indigenous and exotic graminoid (herbaceous, grass-like) plants is the biggest limiting factor for the existence of the species at the wetland.

The prevalence of aquatic, semi-aquatic and terrestrial weed species at the site is also considered to be a significant limiting factor to the existence and/or persistence of Swamp Everlasting, Pale Swamp Everlasting and Lacey River Buttercup at Edithvale Wetland. However, in the absence of targeted surveys for these species, the likelihood assessments as provided in the current management plan for the site have been adopted for this assessment.

2.3 Fauna

The Edithvale Wetland supports a dynamic and diverse number of animals, many of which are threatened and/or migratory bird species. This diversity is attributed to the complex and cyclical nature of the wetlands habitat. Threatened and migratory species are discussed later in this chapter.

183 bird species have been recorded at Edithvale Wetland, many of which are reliant on the unique aquatic environment. The importance of the wetlands for other birds is perhaps best demonstrated by the diversity of birds of prey it supports. Species recorded include the Swamp Harrier and Little Eagle which are birds not often sighted in suburban Melbourne. The wetland also supports a number of common waterbirds and small woodland bird species.

Twenty-nine native mammal species have been recorded within Edithvale Wetland. These include Eastern Bent-wing Bat, Eastern Grey Kangaroo, Swamp Wallaby and the Short-beaked Echidna. Introduced animals recorded include cats, dogs, Red Fox and Brown Hares.

While no specific reptile surveys are known to have been undertaken within Edithvale Wetland, a number of reptiles have been recorded including the Eastern Blue-tongue Lizard, Southern Grass Skink and Eastern Brown Snake. Ten species of frogs have been recorded within the wetlands including the common Eastern Banjo Frog and the Southern Brown Tree Frog. Potential habitat has been identified for Growling Grass Frog, Southern Toadlet, Verreaux's Tree Frog and Haswell's Frog, however these have not been recorded.

Fish surveys completed as part of this EES investigation recorded four species in the northern wetland cells – Flathead Gudgeon (the only native species recorded), Mosquito Fish, Goldfish, and Oriental Weather-loach. No species of fish were detected in the southern wetland cells. Dwarf Galaxias was previously considered to have potential to be present at the wetlands however the species was not detected during the targeted fish surveys conducted.

Zooplankton (particularly *Daphniidae cladocerans* and *Calanoid copepods*) and *Chironominae* (midge fly) larvae were the most abundant macroinvertebrates in Edithvale Wetland. Zooplankton and benthic invertebrates were most abundant in the southern wetland. This is considered to be a reflection of the relatively uniform depth, a more pronounced wetting and drying cycle, more uniform habitat and less saline water recorded during the EES investigations.

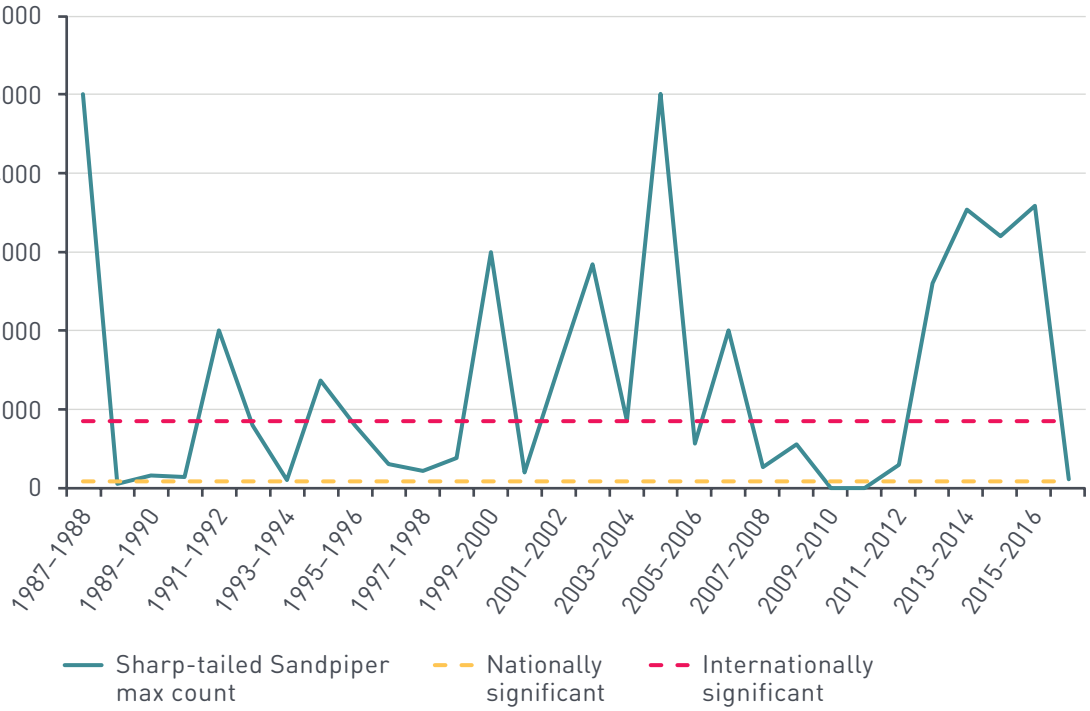
2.3.1 Migratory birds

Edithvale Wetland is known to support a diversity of migratory birds. Key species of concern in relation to the Edithvale Wetland are those which were the basis for the listing of the Edithvale-Seaford Wetlands Ramsar Site and other species which are most dependent on wetland environments. These species could be impacted by any changes to wetland environments associated with the level crossing removals.

Key migratory bird species include Sharp-tailed Sandpiper, and Latham's Snipe. Habitat is considered internationally important for migratory shorebirds if it regularly supports one per cent of the East Asian-Australasian Flyway (EAAF) population of a migratory shorebird population, and nationally important if it supports 0.1 per cent of the EAAF population.

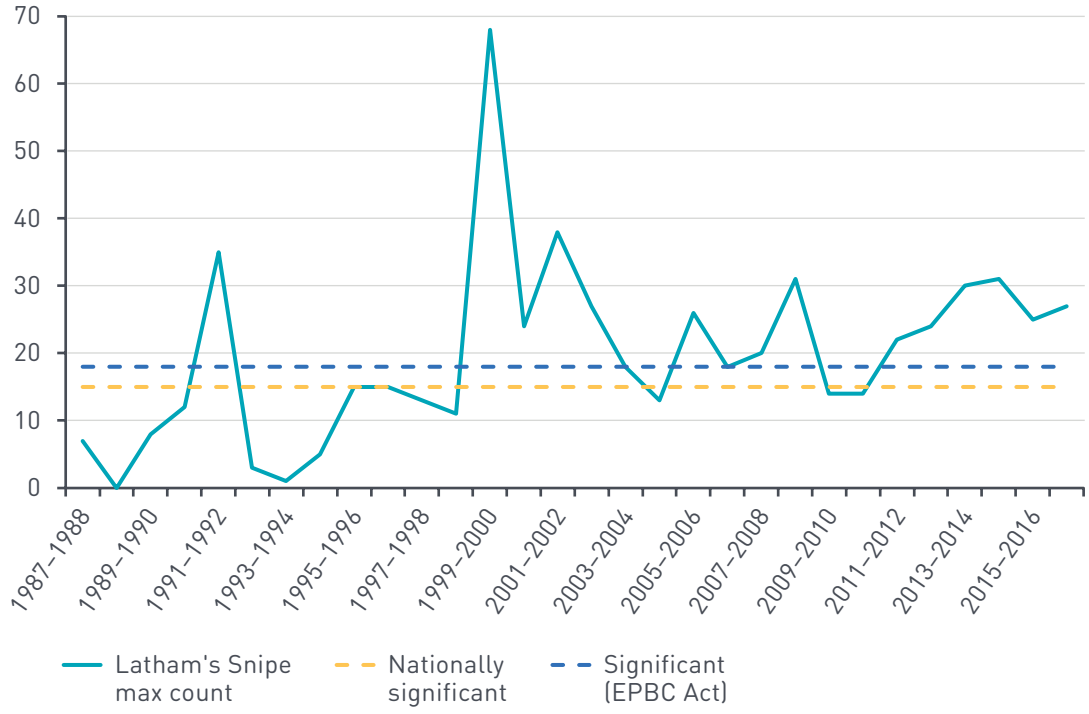
The Sharp-tailed Sandpiper is a shorebird listed as migratory under the EPBC Act. Edithvale Wetland is an internationally significant non-breeding site for the species as it regularly supports more than one per cent of the EAAF. The population recently estimated at 85,000 individuals, as shown in Figure 1.5.

Figure 1.5 Sharp-tailed Sandpiper observations, Edithvale Wetland 1987 – 2016 (max. counts by BirdLife Australia)



Latham's Snipe is a migratory shorebird listed as migratory under the EPBC Act. Edithvale Wetland represents nationally significant habitat for Latham's Snipe and significant habitat for the species under the EPBC Act as it regularly supports more than 0.05 per cent of the EAAF population, which was recently estimated at 30,000 individuals (see Figure 1.6). The threshold for nationally significant habitat is lower for Latham's Snipe due to the cryptic nature of the species.

Figure 1.6 Latham's Snipe observations, Edithvale Wetland 1987 – 2016 (max. counts by BirdLife Australia)



2.3.2 Other migratory birds

An additional 12 migratory shorebirds listed under the EPBC Act have been recorded in small numbers at the Edithvale Wetland and/or within the broader study area. These species are:

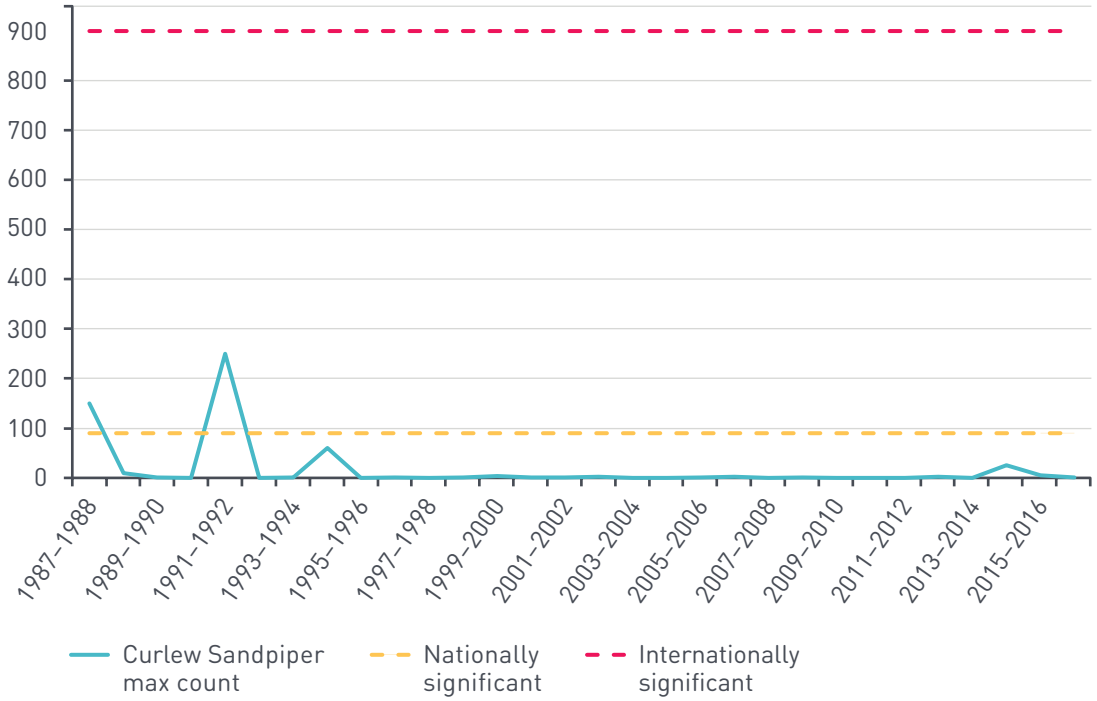
- Bar-tailed Godwit
- Common Greenshank
- Double-banded Plover
- Golden Plover
- Little Curlew
- Long-toed Stint
- Marsh Sandpiper
- Pectoral Sandpiper
- Red Knot (also listed as endangered under the EPBC Act)
- Red-necked Stint
- Wood Sandpiper.

2.3.3 Threatened fauna

The Curlew Sandpiper is a shorebird listed as critically endangered under the EPBC Act. The species is also listed as migratory under the EPBC Act and threatened under the *Flora and Fauna Guarantee Act 1988* (FFG Act). The Curlew Sandpiper is considered endangered in Victoria.

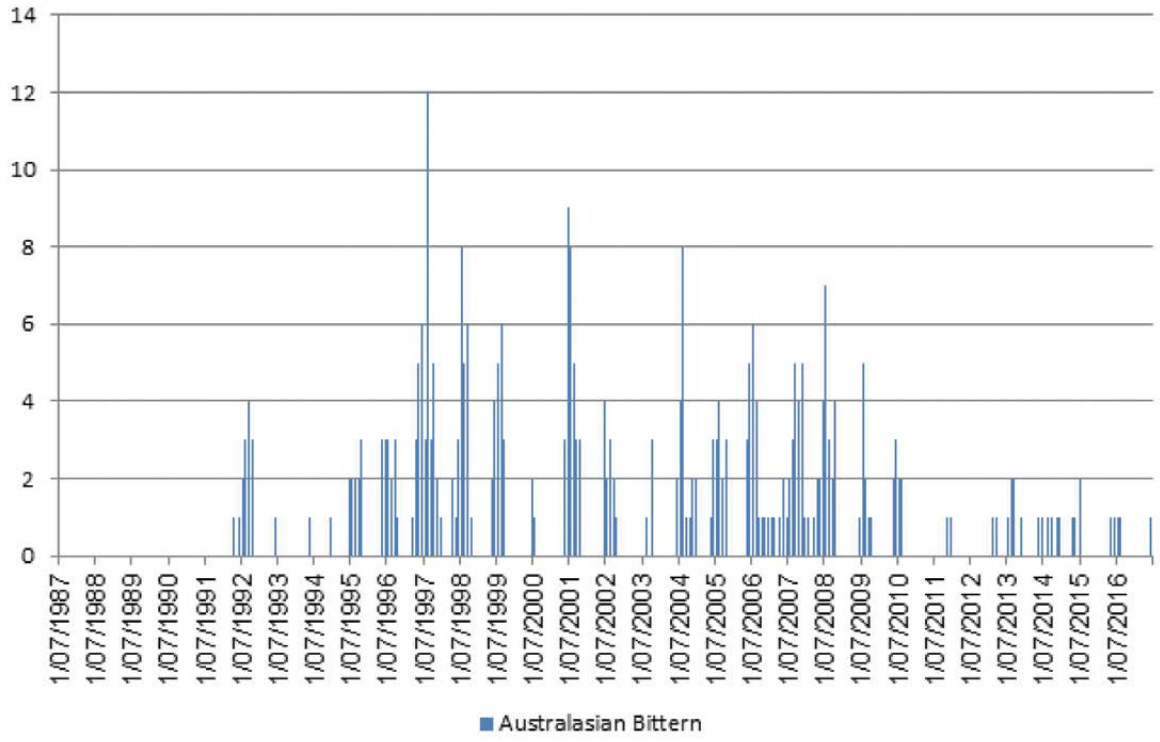
The Curlew Sandpiper has been irregularly recorded at Edithvale Wetland and, when present, the species is usually seen in low abundance (10 birds or less) which is below the threshold for the site to be considered to support nationally or internationally significant habitat for the species, as shown in Figure 1.7. Species presence at the wetland is however included in the wetlands Ramsar listing.

Figure 1.7 Curlew Sandpiper observations, Edithvale Wetland 1987 – 2016 (max. counts by BirdLife Australia)



The Australasian Bittern is a non-migratory species listed as endangered under the EPBC Act, threatened under the FFG Act and is considered endangered in Victoria. In 2010, the estimated total population of the species in Australia was 250 – 800 individuals. Australasian Bittern has been regularly recorded in small numbers within the Edithvale Wetland (maximum counts of 12 birds). Presence of the species at Edithvale Wetland is shown overtime in Figure 1.8. Australasian Bitterns presence at the wetland is included in the wetlands Ramsar listing.

Figure 1.8 Australasian Bittern observations, Edithvale Wetland 1987 – 2016 (max. counts by BirdLife Australia)



2.3.4 Other threatened birds

An additional 15 bird species threatened in Victoria have been recorded in the Edithvale Wetlands, as listed in Table 1.4. One species, Australian Painted Snipe, is also listed as threatened under the EPBC Act.

Some species are regularly observed in high numbers. The birds recorded in the highest numbers all belong to the family Anatidae (Ducks, Geese, and Swans). These species utilise the wetlands differently to migratory birds, with most species preferentially using the deeper northern wetland cells.

Table 1.4 Other threatened birds at Edithvale Wetland

Common Name	EPBC Act	FFG Act	Status in Victoria
Australasian Shoveler			Vulnerable
Australian Little Bittern		Listed	Endangered
Australian Painted Snipe	Vulnerable	Listed	Critically endangered
Ballion's Crake		Listed	Vulnerable
Blue-billed Duck		Listed	Endangered
Caspian Tern		Listed	Near threatened
Eastern Great Egret		Listed	Vulnerable
Freckled Duck		Listed	Endangered
Hardhead			Vulnerable
Intermediate Egret		Listed	Endangered
Lewin's Rail		Listed	Vulnerable
Little Egret		Listed	Endangered
Magpie Goose		Listed	Near threatened
Musk Duck			Vulnerable
White Bellied Sea-Eagle		Listed	Vulnerable

2.4 Significance and listings

Important habitat for migratory shorebirds is defined by criteria outlined in the *Wildlife Conservation Plan for Migratory Shorebirds 2015* and the *Ramsar Convention on Wetlands of International Importance*. The EPBC Act is triggered when proposed actions are likely to have a significant impact on important habitat for migratory shorebirds.

2.4.1 Wildlife Conservation Plan for Migratory Shorebirds

The *Wildlife Conservation Plan for Migratory Shorebirds 2015* defines the terms of nationally and internationally important habitat based on the approach applied through the criteria adopted under the Ramsar Convention.

Wetland habitat is considered internationally important if it regularly supports:

- one per cent of the individuals in a population of one species or subspecies of waterbird or
- a total abundance of at least 20,000 birds.

Wetland habitat is considered of national importance if it regularly supports:

- 0.1 per cent of the flyway population of a single species of migratory shorebird (with the exception of Latham's Snipe, see below) or
- 2000 migratory shorebirds or
- 15 migratory shorebird species.

2.4.2 East Asian-Australian Flyway (EAAF)

Australia is one of 23 countries listed in the EAAF which spans from Alaska, United States of America in the north to New Zealand in the south. A flyway is a term used to describe the migratory pathway of a group of migratory shorebirds. This range includes breeding, stop-off (rest) and over-wintering locations. The EAAF is one of nine major flyways recognised internationally and the only one that involves visitation to Australia.

Australia is part of the Partnership for the Conservation of Migratory Waterbirds and the Sustainable Use of their Habitats in the EAAF (the EAAF Partnership). The Partnership has established a network of internationally important sites for migratory shorebirds.

Of the 397 sites recognised to be internationally important for shorebird conservation in the EAAF, 188 occur in Australia. The Australian sites are comprised of 35 southward migration sites, 94 non breeding sites, 20 north migration sites and 17 breeding sites. The Edithvale-Seaford Wetland is one such internationally important site (non-breeding).

2.4.3 Ramsar Criteria

The Edithvale-Seaford Wetlands are considered to meet Ramsar site Criteria 2, 4 and 6. This is based on the most recent assessment of the wetlands as completed by Hale and Butcher (2017). This assessment '*Ecological Character Description Addendum Edithvale-Seaford Wetlands*' (the Addendum) was prepared in 2017 by DELWP.

The Ramsar criterion met by the Edithvale-Seaford Wetlands and the justification for their application as described in the Addendum are outlined in Table 1.5 below.

Table 1.5 Ramsar Criteria

Ramsar Listing Criteria	Justification for Ramsar Criteria
Criterion 2 *A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities.*	This criterion is only applied to wetland dependent flora and fauna, and the site regularly supports two fauna species listed under the EPBC Act and/or International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: • Australasian Bittern – Endangered (EPBC Act and IUCN). Foraging and breeding habitat are provided by the wetlands. It is one of 20 birds funded as a priority by the Australian Government to support the species recovery effort. The species has been recorded since 1989 when surveys began. • Curlew Sandpiper – Critically Endangered (EPBC Act). This species was not listed as threatened under the EPBC Act at the time of the Edithvale-Seaford Wetlands being listed as a Ramsar site.
Criterion 4 *A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their lifecycles or provides refuge during adverse conditions.*	The basic description of this criterion implies a number of common functions and roles that wetlands provide including supporting fauna during migration, providing drought refuge, supporting breeding and moulting in waterfowl. Twenty species of waterbirds listed under international migratory agreements have been recorded within the Edithvale –Seaford Wetlands. This number includes species that, in Australia, are residents (e.g. eastern great egret) and a number of migratory species that are occasionally recorded at the site. There are eight species of international migratory shorebirds that are regularly supported by the Edithvale-Seaford Wetlands.
Criterion 6 *A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.*	Ramsar Convention guidance indicates that assessment of this criterion should be made using the most recent official population estimates (Wetlands International 2012). Data provided by BirdLife Australia indicate that two species meet this criterion: • Sharp-tailed sandpiper– average annual maximum abundance (1994 – 2015) = 1870 (slightly above the 1 % of population estimate of 1600) • Australasian bittern– average annual maximum abundance (1994 – 2015) = 5 (equivalent to the 1 % of population estimate).

Ecosystem components, processes and services (CPS)

The *National framework and guidance for describing the ecological character of Australian Ramsar wetlands 2008* prepared by the Department of Environment, Water, Heritage and Arts (DEWHA) describes critical components, processes and services (CPS) that make up the ecological character of wetlands.

The Addendum applied the criteria in the framework and identified four CPS that are critical to the ecological character of the Edithvale-Seaford Ramsar site:

- **Threatened wetland species** – two threatened bird species occur regularly in low numbers (Australasian Bittern and Curlew Sandpiper). This CPS is also related to listing of the site under Ramsar criteria 2.
- **Physical habitat for waterbirds** – the mosaic nature of the habitat (open water, emergent native vegetation and exposed mudflats) supports a diversity of species.
- **Waterbird breeding** – 20 species of wetland dependent birds have been recorded breeding within the Ramsar site. This CPS is also related to listing of the site under Ramsar criteria 4.
- **Waterbird diversity and abundance** – the Ramsar site supports a diversity and abundance of waterbirds. This CPS is also related to listing of the site under Ramsar criteria 6.

The critical CPS which relate to Ramsar listing criteria are also covered in the description of those criteria in Table 1.5 above. The Scoping Requirements stipulate that the EES assess adverse impacts on the four CPS that are critical to the ecological character of the wetlands at the time of listing.

Physical habitat for waterbirds is not directly related to a Ramsar listing criteria. The variety of the habitat is what supports the diversity of species. The most important habitat zones being:

- **Edithvale North** – deeper water for a number of duck species which is surrounded by tall reeds
- **Edithvale South** – shallow wetland that provides foraging habitat for shorebirds, grading to tall marsh at the fringes
- **Seaford North 2 Pool, Seaford Central West 1 and Seaford Central East 2** – mosaic of deeper water, tall marsh, and deeper saline ponds important for all wetland bird species.

Protection under the EPBC Act

Ramsar wetlands are recognised as a Matter of National Environmental Significance under the EPBC Act and, as such, any action that has, will have, or is likely to have a significant impact on the ecological character of a Ramsar Wetland must be referred to the Minister and be subject to an environmental assessment and approval process.

The *Matters of National Environmental Significance – Significant Impact Guidelines 2013* provide criteria to define what constitutes a significant impact on wetlands of international importance (Ramsar sites). In accordance with the guidelines an action will be deemed to have the potential for a significant impact if it will result in:

- Areas of the wetland being destroyed or substantially modified
- A substantial or measureable change in the hydrological regime of the wetland, for example, a substantial change to the volume, timing, duration, and frequency of ground and surface water flows to and within the wetland
- The habitat or lifecycle of native species, including invertebrate fauna and fish species, dependent upon the wetland being seriously affected
- A substantial and measurable change in the water quality of the wetland- for example a substantial change in the level of salinity, pollutants, or nutrients in the wetland, or water temperature which may adversely impact on biodiversity, ecological integrity, social amenity, or human health, or
- An invasive species that is harmful to the ecological character of the wetland being established (or an existing invasive species being spread) in the wetland.

3 MIGRATORY SPECIES

No flora or fauna species listed as migratory under the EPBC Act were assessed as having a moderate or greater likelihood of occurrence in the project areas. Low threatened species likelihood is attributable to the heavily disturbed nature of the project areas and the intensive land use (primarily transport) in proximity to the rail corridor.

A total of 20 bird species listed as migratory under the EPBC Act are considered to have at least moderate likelihood of occurrence within the GDE study area. This determination is supported by formal bird surveys completed by Birdlife Australia (ongoing since 1987) at Edithvale Wetland and Wannarkladdin Wetlands, and data from the Victorian Biodiversity Atlas (VBA) and Protected Matters Search Tool (PMST).

Migratory species considered to make the most significant use of suitable habitats within the study area are:

- Sharp-tailed Sandpiper
- Latham's Snipe.

Other species listed as migratory under the EPBC Act that are considered to have at least a moderate likelihood of occurrence include wader species such as egrets, predominately aerial species such as Fork-tailed Swift *Apus pacificus*, and other migratory shorebird species recorded less frequently such as Common Sandpiper *Actitis hypoleucos* and Curlew Sandpiper. Curlew Sandpiper is also listed as threatened under the EPBC Act and, as such, this species is discussed under listed threatened species in Section 4.

A number of habitats for listed migratory species occur within the study area. Core habitat is provided by the Edithvale Wetland – refer to Section 2 for a detailed description. The large aggregations of migratory species that occur within this wetland are testament to its value for migratory shorebirds. Wannarkladdin Wetlands also provide habitat for migratory shorebirds. Less favourable habitat is provided by the vegetation along the northern bank of the Patterson River, anthropogenic waterbodies within golf courses and the Centre Main Drain. These areas provide low quality habitat and may be visited by migratory species on an occasional and opportunistic basis. They do not represent significant or important habitat for migratory species.

4 THREATENED SPECIES

No species listed under the EPBC Act are likely to occur in the project areas. Flora and fauna habitat present within the project areas is discussed in Section 5.2 of Technical Report D *Ecology: Project Areas*.

It is acknowledged that foraging habitat for Grey-headed Flying-fox occurs throughout suburban Melbourne and is likely to occur in neighbouring areas on an occasional and opportunistic basis however as the project areas are typically devoid of foraging trees the species is considered to have a low likelihood of occurrence.

Two flora species and five fauna species listed as threatened under the EPBC Act are considered to have at least a moderate likelihood of occurrence within the GDE study area:

- River Swamp Wallaby-grass
- Swamp Everlasting
- Australasian Bittern
- Curlew Sandpiper (also listed as migratory under the EPBC Act)
- Bar-tailed Godwit (two subspecies) (also listed as migratory under the EPBC Act)
- Australian Painted Snipe
- Grey-headed Flying-fox.

With the sole exception of Grey-headed Flying-fox no listed threatened species are considered likely to occur outside of the high value habitat provided by Edithvale Wetland and Wannarkladdin Wetlands.

4.1 River Swamp Wallaby-grass and Swamp Everlasting (Vulnerable)

River Swamp Wallaby-grass and Swamp Everlasting are both considered to have a moderate likelihood of occurrence at Edithvale Wetland and Wannarkladdin Wetlands, but are unlikely to persist within the remainder of the study area due to historical and ongoing disturbance impacting any potential remaining habitat.

Targeted surveys for these species were not completed for preparation of the EES, primarily because the project is now considered unlikely to impact either of these wetlands.

4.2 Australasian Bittern (Endangered)

Australasian Bittern is present at Edithvale Wetland and is considered to have a moderate likelihood of occurrence at Wannarkladdin Wetlands. Within the broader study area, the species has a low likelihood of occurring due to an absence of suitable habitat. While the study area beyond the high value GDEs may provide foraging habitat it is not considered critical to the local persistence of the species.

The Ramsar listing of the Edithvale Wetland recognises the significance of the presence of Australasian Bittern. An outline of the species status at Edithvale Wetland and in the remainder of the study area is provided in Appendix E of EES Technical Report B *Ecology: Wetlands and Groundwater Dependent Ecosystems*.

4.3 Curlew Sandpiper (Critically endangered and migratory)

Curlew Sandpiper is known to occur within Edithvale Wetland on an infrequent basis. However, the species has not been recorded in sufficient numbers to consider the wetland to be of either international or national significance for the species.

Curlew Sandpiper has not been recorded at the Wannarkladdin Wetlands, however there is suitable habitat available and the species may occur there on an occasional basis. The species is considered to have a low likelihood elsewhere in the study area.

4.4 Bar-tailed Godwit (Vulnerable and migratory)

Bar-tailed Godwit *Limosa lapponica* is a migratory shorebird that has been recorded at Edithvale Wetland by BirdLife Australia on four occasions in 1987, with a maximum of three individuals observed in one count. The species has not been recorded at Edithvale Wetland since.

More than one subspecies of Bar-tailed Godwit exists; the nominate species, *Limosa lapponica*, and two subspecies – Bar-tailed Godwit (Western Alaskan) *Limosa lapponica baueri* and Bar-tailed Godwit (Northern Siberia) *Limosa lapponica menzbieri*.

The BirdLife Australia data does not distinguish between the two subspecies, however, birds that occur in south-eastern Australia and New Zealand are thought to be subspecies baueri. Bar-tailed Godwit (Western Alaskan) is listed as vulnerable under the EPBC Act and Bar-tailed Godwit (Northern Siberia) is listed as critically endangered under the EPBC Act. Both subspecies were identified in the PMST search but for the purpose of this attachment the species is addressed as a whole rather than on a subspecies basis.

Bar-tailed Godwit is considered to have a moderate likelihood of occurrence within Wannarkladdin Wetlands and a low likelihood elsewhere in the study area. Habitat within the Edithvale Wetland is not considered to be nationally or internationally significant for Bar-tailed Godwit give the paucity of records within the wetland.

4.5 Australian Painted Snipe (Endangered)

The Australian Painted Snipe has been recorded at Edithvale Wetland and is considered present, although this determination is based on a single individual recorded on four occasions in 2008 within the BirdLife Australia data (refer to Section 1.3).

It has not been recorded since. The species has a moderate likelihood of occurrence at Wannarkladdin Wetlands and a low likelihood at other GDEs. No significant habitat for the species is considered to occur in the study area.

4.6 Grey-headed Flying-fox (Vulnerable)

Grey-headed Flying-fox have been recorded at Edithvale Wetland and are considered to have a moderate likelihood of occurrence at other GDEs. The species disperses from its camp in Yarra Bend across suburban Melbourne to forage.

Grey-headed Flying-fox is likely to forage throughout the study area on an opportunistic and occasional basis. Foraging resources include suitable vegetation within nature strips, backyards and recreation reserves such as fruit-bearing trees and flowering eucalypts. Such resources within the study area are not considered critical for the species persistence within the broader Melbourne region.

5 IMPACT ASSESSMENT

5.1 Ramsar Wetland

Construction

No risks were identified during the construction phase of the Edithvale and Bonbeach level crossing removal projects in relation to the Edithvale Wetlands and groundwater dependent ecosystems given the physical distance of over one kilometre between the level crossing sites and the wetlands. Refer to Technical Report B *Ecology: Wetlands and Groundwater Dependent Ecosystems* for further information.

Operation

The initial and residual risks identified for the operation phase of the Edithvale and Bonbeach level crossing removal projects in relation to the Edithvale Wetlands and groundwater dependent ecosystems are outlined in Table 1.6.

Table 1.6 Edithvale Wetland risks – operation

Risk ID	Risk name	Risk pathway	Initial EPR	Initial risk	Final EPR	Residual risk
EG72	Edithvale-Seaford Wetland Ramsar Site (Edithvale)	Groundwater mounding resulting in altered hydrological regime and/or water quality leading to a change in ecological character (habitat and/or food availability) that exceeds the limit of acceptable change for critical components, processes and systems to the extent that the Edithvale-Seaford Wetlands no longer meet criteria for listing as a Ramsar site.	EPR GW1 – Rail trench design	Negligible	EPR GW1 – Rail trench design EPR GW2 – Groundwater EPR FF8 – GDE Monitoring and mitigation plan (Edithvale Wetland)	Negligible
EG73	Listed migratory and threatened species	Groundwater mounding leading to an altered hydrological regime and resulting in change in habitat (wet grassland/ mudflats) at Edithvale Wetland to the extent that the site no longer regularly supports listed migratory and/or threatened bird species. Species include Sharp-tailed Sandpiper Latham's Snipe, Australian Bittern and Curlew Sandpiper.	EPR GW1 – Rail trench design	Negligible	EPR GW1 – Rail trench design EPR GW2 – Groundwater EPR GW3 – Groundwater Management and Monitoring Plan EPR FF8 – GDE Monitoring and mitigation plan (Edithvale Wetland)	Negligible
EG74	Native vegetation (Edithvale)	Groundwater mounding resulting in altered hydrological regime and/or water quality resulting in loss of native vegetation (patches and scattered trees) within Edithvale Wetland leading to a reduction in the extent of native vegetation in Victoria.	EPR GW1 – Rail trench design	Negligible	EPR GW1 – Rail trench design EPR GW2 – Groundwater EPR GW3 – Groundwater Management and Monitoring Plan EPR FF8 – GDE Monitoring and mitigation plan (Edithvale Wetland)	Negligible
EG75	Exacerbate sea level rise (Edithvale)	Groundwater mounding resulting in altered hydrology exacerbates or accelerates predicted effects of sea level rise (climate change) resulting in a loss of habitat and change in ecological character of Edithvale Wetland resulting in failure to meet the LAC for critical CPS and/or Ramsar listing criteria.	EPR GW1 – Rail trench design	Negligible	EPR GW1 – Rail trench design EPR GW2 – Groundwater	Negligible
EG76	Threatening process – wetland loss (Edithvale)	Loss of Edithvale Wetland resulting in the exacerbation of a threatening process listed under the FFG Act.	EPR GW1 – Rail trench design	Negligible	EPR GW1 – Rail trench design EPR GW2 – Groundwater	Negligible

Edithvale Wetland provides habitat for a diversity of wildlife. This is associated with the range of habitats the wetland supports which is largely as a result of a hydrological regime and water quality that suits those habitats. Ideal hydrology for the wetlands includes inundation over winter and early spring with a slow drawdown from September to December to provide habitat for migratory waders. Maintenance of deeper pools as permanent water for waterfowl is also important.

Changes to hydrology and water quality (particularly salinity) are recognised as threats to the Edithvale-Seaford Wetland and pose a risk to the criteria under which the site was listed under the Ramsar Convention (as discussed in Section 2.4).

If groundwater mounding were to occur at the wetlands it could potentially alter the hydrological regime and/or water quality of Edithvale Wetland which could result in:

- change in habitat and/or food availability to the extent that the Edithvale-Seaford Wetlands exceed the limit of acceptable change for critical components, processes and systems and no longer meet criteria for listing as a Ramsar site
- change in habitat (wet grassland/mudflats) to the extent that the site no longer regularly supports a nationally significant population of Latham's Snipe
- loss of native vegetation (patches and scattered trees) within Edithvale Wetland leading to a reduction in the extent of native vegetation in Victoria.
- an acceleration, or exacerbation of the predicted effects of sea level rise through climate change, leading to a change in the ecological character of Edithvale Wetland that exceeds the limits of acceptable change for critical CPS and the site no longer meets the Ramsar listing criteria
- exacerbation of a threatening process listed under the FFG Act – wetland loss.

Based on groundwater modelling predictions which are documented in Chapter 5 *Modelling the water environment*, the level crossing removal projects have a negligible risk of groundwater mounding impacting on the habitat of Edithvale Wetland.

The projects would be designed to comply with EPR_GW2 which requires that groundwater level changes do not result in significant ecological impacts on groundwater dependent ecosystems. Compliance with EPR_GW2 would ensure that the rail trench design minimises changes to groundwater levels.

Engineering design development undertaken for this EES has shown that an engineering solution can be implemented that would reduce the magnitude of predicted groundwater mounding (increase in groundwater level) from 0.1 metres within 500 metres of Edithvale Wetlands (based on the initial modelled trench design), to 0.1 metres over 1,000 metres away from Edithvale Wetlands (based on the modelled engineering solution). The residual risk of impacts to the Edithvale Wetlands is therefore negligible, as it is considered almost impossible for changes in groundwater due to the project to affect the ecological character of the Edithvale Wetland.

To confirm the prediction of the model, a Groundwater Management and Monitoring Plan (EPR reference GW3) would be developed to the satisfaction of the EPA Victoria and relevant water authorities to monitor and manage predicted and potential impacts to groundwater following construction of the piled trench walls to confirm that EPR_GW2 has been achieved.

The Groundwater Management and Monitoring Plan must include:

- detailed monitoring parameters including timing, location of monitoring bores
- duration of the monitoring program
- clear trigger levels for changes in groundwater level and quality that require mitigation plans to be implemented.

A Groundwater Dependent Ecosystem Monitoring and Mitigation Plan for Edithvale Wetland would be developed in consultation with the Department of Environment and Energy, DELWP and the land manager (EPR reference FF8). The Plan would only be implemented in the unlikely event that trigger levels for changes to groundwater level and quality detailed in the Groundwater Management and Monitoring Plan were realised.

The Groundwater Dependent Ecosystem Monitoring and Mitigation Plan must include:

- monitoring of groundwater level and water quality at representative and strategic locations
- the frequency and duration of monitoring
- monitoring of surface water quality at representative and strategic locations within the wetlands to differentiate temporal trends from long term changes to groundwater
- criteria (levels and quality) for groundwater and surface water in and around the Edithvale Wetland for determining whether a change in groundwater levels and/or quality is attributable to the projects

- response measures in the event groundwater and surface water change criteria are met, such as:
  - a process for ecological assessment developed by a suitably qualified ecologist to assess changes in aquatic fauna, birds and vegetation and consider whether these can be attributable to groundwater or surface water changes
  - criteria for determine whether a change in the extent or condition of the wetlands is attributable to the projects
  - contingency measures to mitigate potential impacts attributable to the projects
  - include the frequency and duration of monitoring.

Implementing the above controls would maintain the risk as negligible.

5.2 Threatened and migratory species

The following section addresses risks and impact assessment of threatened and migratory species that occur across the study area.

Table 1.7 Threatened and migratory species risk assessment

Risk ID	Risk name	Risk pathway	Final EPR	Residual Risk level
E44	Removal of habitat for threatened species	Removal of habitat for threatened flora and/or fauna species within the project area affecting the persistence of the species.	No EPR specified	Negligible
E46	Disturbance to fauna (project areas)	Increase in noise, vibration and artificial light affecting fauna behaviour within or adjacent to project area resulting in a decline in fauna abundance and/or diversity.	EPR AQ1 Air quality (construction) EPR AQ2 Air quality management EPR NV2 Construction noise EPR SW1 Stormwater management – construction EPR LV2 Lighting EPR LV3 Light spillage	Negligible

Risk ID	Risk name	Risk pathway	Final EPR	Residual Risk level
E49	Unintended impacts on vegetation and habitat	Unintended impacts on adjacent/retained vegetation and habitat resulting from: • Inappropriate placement of construction stockpiling resulting in unintended impacts to native vegetation and habitat. • Soil compaction or excavation causing root damage and vegetation loss within (or adjacent to) the project area. • Dust generation during construction impacting the health of vegetation. • Spills of chemicals resulting in pollution of native vegetation or habitat (particularly Edithvale Wetland and/or Wannarkladdin Wetland) either through surface or groundwater flows. • Unintended loss of vegetation to be retained from accidental plant/personnel access to designated 'No Go Areas' or areas outside of the defined and anticipated project area.	EPR FF5 Protection of retained/ adjacent vegetation	Negligible

The discussion below addresses impacts to threatened and migratory species that could occur during construction and operation.

Groundwater change and quality

No impacts are predicted as a direct result of construction activities. Detailed regional groundwater modelling (refer to Technical Appendix A *Groundwater*) indicates that groundwater mounding during the construction and operational phases of the project would not interact with any habitats considered to support MNES.

No change to groundwater level or quality is predicted to occur at Edithvale Wetland or Wannarkladdin Wetlands. The 0.1 metre groundwater mounding contour occurs no closer than 1,000 metres to the west of the Edithvale Wetland and 1,500 metres to the west of Wannarkladdin Wetlands. As these areas of habitat are not likely to be affected by groundwater change, the Edithvale and Bonbeach level crossing removal projects are not likely to have a significant impact on the Edithvale-Seaford Wetlands Ramsar Site, Wannarkladdin Wetlands, nor the threatened flora and fauna species they are known to support.

Further discussion is provided in Chapter 6 in relation to Edithvale Wetland and Chapter 8 in relation to Wannarkladdin Wetlands.

A number of EPRs have been developed that would avoid, minimise and/or mitigate potential project related impacts to GDEs and therefore MNES. Measures to avoid or minimise groundwater change are a requirement of EPR_GW2 and EPR_GW3 requires the implementation of a groundwater monitoring program to ensure project performance as it relates to the extent and degree of alteration of groundwater is met. These EPRs are presented in Chapter 9 *Environmental Management Framework*.

Change in groundwater quality as it relates to acid sulfate soils, waste production and contamination during the construction and operation stages of the projects are dealt with in EES Technical Report C *Acid Sulfate Soils and Contamination* and summarised in Chapter 7 *Acid sulfate soils and contamination.* This report considers spoil, industrial waste, the presence and activation potential of acid sulfate soils, and chemical use and storage associated with the projects.

The assessment found that spoil (including fill, contaminated soil and acidic soil) and groundwater generated by the trench excavation, during the construction phase, would be removed from the project area and transported to an appropriately licensed facility (EPR references CL1 and CL2). Therefore there is not expected to be any opportunity to indirectly impact MNES.

A Construction Environment Management Plan (EPR reference CL3) would be developed to ensure waste generated during construction is appropriately handled so that no off-site impacts occur, including to MNES.

Impacts to soil and groundwater during operation as a result of the projects are minimal and are not expected to impact on MNES. This is because impacts identified are associated with groundwater mounding and drawdown which have been modelled to occur over 1,000 metres from the identified MNES habitat.

Noise and vibration

Noise and vibration impacts of the projects are considered in EES Technical Report H *Noise and Vibration* and EPRs are provided to avoid or minimise those impacts. Noise and vibration levels sufficient to cause disturbance to amenity are not expected to extend more than 100 metres beyond the rail corridor.

No impacts to MNES are anticipated as a consequence of construction or operational noise or vibration associated with the level crossing removals. This is due to:

- the distance of the project areas from primary habitats considered to support MNES within the study area – Edithvale-Seaford Wetland (approximately 1,000 metres) and Wannarkladdin Wetlands (approximately 1,500 metres)
- the location of those habitats within a heavily urbanised area of Melbourne where there are existing sources of noise pollution. These include, but are not limited to, light and heavy vehicle traffic on the local road network with the most notable roads being Nepean Highway, Edithvale Road (which dissects the Edithvale Wetland) and the M11 (approximately 700 metres east of Edithvale Wetland and approximately 600 metres east of Wannarkladdin Wetlands).

Noise associated with construction within the level crossing removal project areas is unlikely to represent an additional or notable source of disturbance to threatened and/or migratory species utilising habitat within the study area.

Noise associated with operation following the level crossing removals was modelled as part of this project. The modelling results demonstrated that noise would not increase to an extent that it would affect MNES.

EPRs designed to further mitigate impacts include EPR_NV1 which requires the design to be in compliance with relevant policy and EPR_NV2 which requires the development of the Construction Noise and Vibration Management Plan.

Surface water

Surface water impacts of the projects are considered in the EES Technical Report E *Surface Water* which assesses the drainage network for new rail infrastructure, changes to the drainage network and flood protection. EPRs are provided to avoid or minimise the impacts identified.

Surface water risks during construction can be managed by applying standard construction environmental management techniques to protect local waterways (EPR reference SW1).

Surface water generated during operation would be collected and treated prior to discharge so that stormwater discharges do not impact beneficial uses of receiving waterbodies (EPR reference SW2).

Additionally EPRs (EPR references SW3 and SW4) require surface water discharge during construction and operation to have no adverse impact to the drainage network capacities, and maintenance of existing levels of flood protection associated with overland flow paths during construction and operation (EPR references SW5 and SW6).

As a result of these mitigation measures and the distance to the project area impacts to MNES are not anticipated.

Dust and air quality

EES Technical Report I *Air Quality* considers impacts associated with construction including dust and operational emissions. During construction, impacts related to dust impacts off-site can be controlled by applying standard construction environmental management measures.

Due to the applications of the following EPRs and the distance between the project areas and the location of MNES, there are not expected to be impacts to MNES:

- EPR_AQ1 requires construction activities to minimise dust
- EPR_AQ2 requires the control of smoke, dust, fumes and other pollution during construction and operation in accordance with the State Environment Protection Policies for Air Quality Management and Ambient Air Quality.

For operational impacts, the air modelling undertaken predicts that for all modelled pollutants, pollutant concentrations would be much lower than existing background concentrations and are therefore unlikely to have an impact on MNES.

EES Technical Report G *Traffic* considers construction traffic movements, and dirt and debris on roads in the project area and on access routes to the project area during the construction phase. Construction traffic routes would be determined prior to commencing work on-site and the following EPRs have been developed to mitigate impacts during construction:

- EPR_T1 requires the development of Transport Management Plan to mitigate the impacts of traffic generated by construction activities, including the development of route options that recognise sensitive receptors
- EPR_T7 includes the development of measures to manage dirt and debris being transferred to roads.

Due to the distance between the project area and MNES, there is not expected to be any impact to MNES as a result of changes in traffic conditions during operation.

Light

Light spillage impacts have been considered in EES Technical Report D *Ecology: Project Areas* where it was identified there was a negligible risk of light spillage on vegetation and habitat. EPR_FF5 was developed to provide protection of retained/adjacent vegetation and includes directional lighting as a measure to minimise unintended impacts on adjacent vegetation or habitat to be included in the Construction Environmental Management Plan (CEMP).

EES Technical Report J *Landscape and Visual* found that night lighting would be used during the construction period. The distance (over 1 kilometre) between the high value GDEs which are known to support threatened species and the project area where night lighting occurs is such that no impacts are anticipated. EPR_LV3 was developed to include measures to minimise light spillage into adjacent areas during the construction period.

6 CONCLUSION

The EES determined that significant impact to MNES is unlikely.

This is based on the following:

- Suitable habitat for threatened species is not present within or immediately adjacent to the project areas.
- Groundwater modelling shows no impact at Edithvale Wetland or Wannarkladdin Wetlands.
- High value GDEs known to support threatened species are located beyond the area of influence of disturbance associated with the project. The disturbances considered included noise and vibration, contamination, dust, surface water change and sedimentation and/or light spill.