AECOM GHD

JOINT VENTURE

LEVEL CROSSING REMOVAL AUTHORITY

FRANKSTON PACKAGE

18 - Edithvale Road, Edithvale
46 - Station Street/Bondi Road, Bonbeach
Groundwater Preliminary Impacts – Ecological Assessment – Rail Under Road

LXRA-LX31-00-PA-RPT-0029

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LEVEL CROSSING REMOVAL AUTHORITY

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Executive summary

The AECOM-GHD Joint Venture (JV) is engaged by the Level Crossing Removal Authority (LXRA) to provide specialist planning and environmental advice for the Level Crossing Removal Program. This preliminary impact assessment has been undertaken to investigate the potential ecological impacts of changes to regional groundwater as a result of the level crossing removals works at Edithvale Road, Edithvale and Station Street/Bondi Road, Bonbeach (Figure 1). The level crossing removal approach at each site is *rail under road*.

Preliminary groundwater monitoring (AECOM-GHD JV, 2016) has identified the potential for groundwater impacts to the Ramsar listed Edithvale-Seaford Wetlands as a result of *rail under road* construction for the level crossing removals.

The Ramsar listed site comprises two hydrologically and hydrogeologically separate features (Edithvale Wetland and Seaford Wetland). Any potential impact that may result from the Edithvale and Bonbeach level crossing removals would impact the Edithvale Wetland only.

The Edithvale Road level crossing is located approximately 1300 metres from the Edithvale Wetland. The wetlands are situated 'up-gradient' to the Edithvale project area however preliminary groundwater modelling suggests that groundwater mounding in the order of 0.1 metres could occur at the Edithvale Wetland. Groundwater mounding refers to the raising of the groundwater level from the natural standing water level.

The Station Street, Bonbeach level crossing is located approximately 2500 metres from the Edithvale Wetland. While preliminary groundwater modelling suggests that groundwater mounding in the order of 0.1 metres could occur at Bonbeach, the area that may be affected extends 1400 metres from the project area and does not intersect with the Edithvale Wetland. There is potential for groundwater change from the cumulative impacts of the Edithvale and the Bonbeach level crossing removals, and the likely impacts of this change justifies further consideration and investigation.

LXRA is undertaking a detailed groundwater impact assessment to provide an improved understanding of the nature of the likely groundwater changes and their relationship to the Edithvale-Seaford Wetlands to inform a determination on the likely impacts on the Ramsar site.

Abbreviations

Term	Definition
BCS	Bioregional Conservation Significance
CPS	Critical ecosystem components
DoE	Department of the Environment (see DoEE)
DEPI	Department of Environment and Primary Industries (see DELWP)
DELWP	Department of Environment, Land, Water and Planning
DoEE	Department of Environment and Energy
DSE	Department of Sustainability and Environment (see DELWP)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (see DoEE)
EE Act	*Environmental Effects Act 1978*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
GDE	Groundwater dependent ecosystem
JV	AECOM-GHD Joint Venture
LAC	Limits of Acceptable Change
LXRA	Level Crossing Removal Authority
m	Metres
MNES	Matters of National Environmental Significance
PMST	Protected Matters Search Tool
Ramsar	The Convention of Wetlands of International Importance (the Ramsar Convention)
VROTS	Victorian Rare or Threatened Species

Glossary

Term	Definition
Biodiversity	The variety of all life-forms, the different plans, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part.
Bioregion	A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.
Bioregional Conservation Status	An assessment of the conservation status of the native vegetation type (EVC) in the context of a particular bioregion, taking account of how commonly it originally occurred, the current level of depletion and the level of degradation of condition typical of remaining stands.
Ecological Vegetation Class (EVC)	A type of native vegetation classification that is described through a combination of its floristics, life form and ecological characteristics, and through an inferred fidelity to particular environment attributes. Each EVC includes a collection of floristic communities that occurs across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
Exotic vegetation	Any vegetation that is not native to Australia or its States and Territories. This can sometimes include native species established outside their natural range.
Groundwater drawdown	Groundwater 'drawdown' refers to the lowering of the groundwater level from the natural standing water level. In the context of this study, it relates to reduced groundwater levels resulting from the installation of subsurface infrastructure required in a *rail under road* design solution.
Groundwater mounding	Groundwater 'mounding' refers to the raising of the groundwater level from the natural standing water level.
Indigenous vegetation	Indigenous vegetation includes vegetation that is native to Australia as well as being native to a specific geographic region.
Matter of National Environmental Significance (MNES)	The EPBC Act defines and protects nine MNES: World Heritage properties, National Heritage places, wetlands of international importance (Ramsar sites), listed threatened species and ecological communities, migratory species protected under international agreements (JAMBA, CAMBA, ROKAMBA), Commonwealth marine areas, Great Barrier Reef Marine Park, nuclear actions (including uranium mines), and a water resource, in relation to coal seam gas development and large coal mining development.
Native vegetation	Native vegetation includes all vegetation that is native to Australia, and its States and Territories.
Non-indigenous vegetation or species	Vegetation or species that are native to Australia, but not to the geographic region to which a site is located.

1. Introduction

1.1 Scope

The AECOM-GHD Joint Venture (JV) is engaged by the Level Crossing Removal Authority (LXRA) to provide specialist planning and environmental advice for the level crossing removal program.

This preliminary impact assessment has been undertaken to investigate the potential ecological impacts of changes to regional groundwater as a result of the level crossing removals works at Edithvale Road, Edithvale and Station Street/Bondi Road, Bonbeach (Figure 1).

Specifically, the aim of the preliminary impact assessment was to assess potential impacts of changes to groundwater on the Edithvale Wetland component of the Edithvale-Seaford Wetlands Ramsar site. To achieve this, the following was undertaken:

- A desktop review of publicly available information on the known ecological values within the Edithvale-Seaford Wetlands.
- A field assessment to verify the findings of the desktop review and to better understand the ecological values of the wetlands that may be impacted by water level fluctuation.
- An assessment of potential groundwater impacts as a result of level crossing removals (based on the groundwater investigation, AECOM-GHD JV, 2016).
- An assessment of risk to the Ramsar criteria which supports the listing of the Edithvale-Seaford Wetlands as a wetland of international significance.
- A risk assessment of ecological impacts on the Edithvale-Seaford Wetlands.
- An assessment of the need to refer the project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the *Environment Effects Act 1978* (EE Act).

1.2 Background

Over the next eight years LXRA will oversee the removal of 50 dangerous and congested level crossings across Melbourne.

The Victorian Government allocated $2.4 billion in its 2015-16 budget to remove at least 20 level crossings by 2018. These sites form the basis of a long term strategic plan being developed to remove all 50 level crossings by 2022.

Construction has already commenced on several sites, and planning and early consultation is underway for the delivery of the entire program.

Level crossings are a key cause of congestion on Melbourne's roads, and form one of the limitations on the number of train services that can operate on each line. The 50 level crossings planned for removal were chosen on a range of different factors, including safety, congestion and overall network benefits.

Three level crossings on the Frankston railway line have already been removed:

- North Road, Ormond
- McKinnon Road, McKinnon
- Centre Road, Bentleigh.

In November 2015, the Victorian Government announced that work on removing a further eight Frankston line level crossings had commenced. These are:

- Charman Road and Park Road[1], Cheltenham
- Balcombe Road, Mentone
- Edithvale Road, Edithvale
- Station Street/Bondi Road, Bonbeach
- Station Street, Carrum
- Eel Race Road, Carrum[2]
- Seaford Road, Seaford
- Skye/Overton Road, Frankston.

1.3 Project description

1.3.1 Study area

For the purpose of this report, the study area is the Edithvale-Seaford Wetlands, a site listed under the Ramsar Convention on Wetlands of International Importance. The Edithvale-Seaford Wetlands Ramsar site comprises two separate wetlands (Edithvale Wetland and Seaford Wetland) both of which are remnants of the Carrum-Carrum Swamp, which was drained in the nineteenth century (Figure 1).

The Ramsar listed site comprises two hydrologically and hydrogeologically separate features (Edithvale Wetland and Seaford Wetland), which are separated hydraulically by Patterson River.

This report addresses the potential biodiversity impacts of the level crossing removals in proximity to the Edithvale Wetland. These are:

- Edithvale Road, Edithvale
- Station Street/Bondi Road, Bonbeach.

Edithvale Wetland

The Edithvale-Seaford Wetlands Management Plan (Ecology Australia, 2016) divides the Edithvale Wetland into two areas:

- Edithvale South Wetlands which comprises a natural depression with one main shallow pool (ES1) and three smaller, deeper pools (ES1a, b and c). The system tends to dry up over summer and autumn but can be manually filled via a pump when the Centre Swamp Drain holds water.
- Edithvale North Wetlands which comprises a series of constructed wetlands (EN1, 2, 3, 3a, 4, 5 and the Dog Pond) that are generally fed by groundwater but also receive stormwater from a series of drains and overland flow. EN4 is a deep, generally freshwater pool which provides good habitat for waterbirds, including several threatened species.

[1] Park Road has since been included in the Cheltenham package of works

[2] Station Street, Carrum and Eel Race Road, Carrum are being considered as a single package of works

1.3.2 Project areas

The Edithvale Road, Edithvale and Station Street/Bondi Road, Bonbeach level crossing removals have been identified with potential to impact on the Edithvale Wetland component of the Edithvale-Seaford Wetland Ramsar site (Figure 1).

The Edithvale Road level crossing project area (the project area) extends approximately 530 metres north from Edithvale Road to Lochiel Avenue and approximately 800 metres south to Elsie Grove. The project area includes the rail corridor and all of Station Street and Nepean Highway to the east and west respectfully between Lochiel Avenue and Elsie Grove.

The Station Street/Bondi Road, Bonbeach level crossing removal project area (the project area) extends approximately 730 metres north from Station Street/Bondi Road to Glenola Road and approximately 900 metres south to Mascot Avenue. The project area includes the rail corridor and all of Station Street and Nepean Highway located to the east and west respectfully between Glenola Road and Mascot Avenue.

At its closest point the Bonbeach project area is approximately 125 metres north of Patterson River.

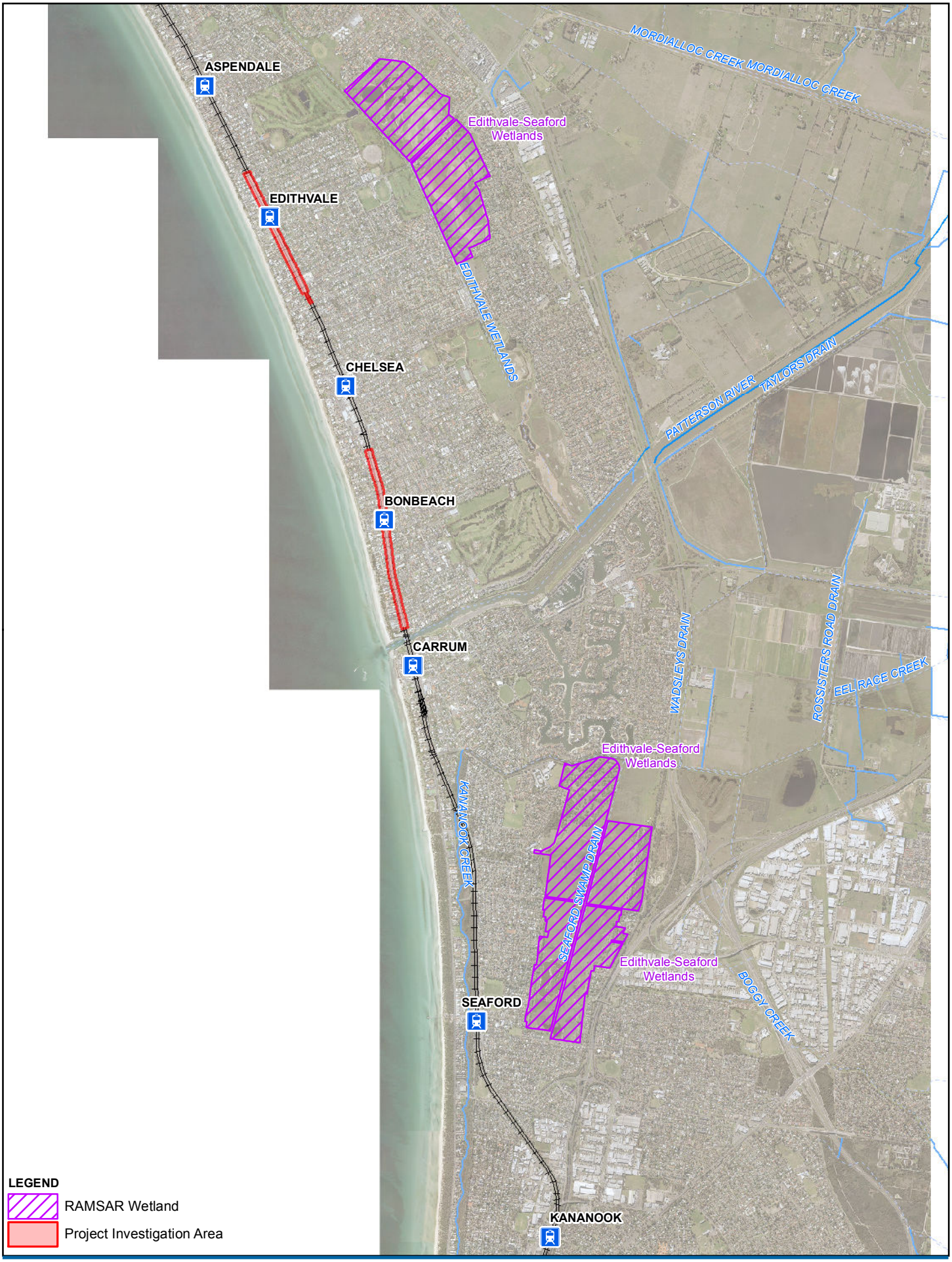
It is proposed to remove the level crossing by lowering the Frankston railway line into a trench whilst maintaining the existing road levels. The rail track would include underground infrastructure (below the rail track) to collect and divert rain water from the trench. Barriers, fencing and screening would be erected along the trench to prevent access by vehicles or people. Decking above the rail trench would be required to provide for station car parking and new pedestrian bridges would be constructed to maintain pedestrian access across the railway line. Approximate lengths, widths and depths are listed in Table 1 and Table 2. A new station building would be provided with access to the below-ground platforms.

Table 1 Rail dimensions

Site	Trench length	Trench width
Edithvale	1000 m	12 m
Bonbeach	1100 m	12 m

Table 2 Rail depth

Site	Trench maximum depth
Edithvale	8 m under Edithvale Road
Bonbeach	8 m under at Bonbeach Station



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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RAMSAR Boundary

Figure 1

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2. Existing conditions

2.1 Ecological values of the Edithvale-Seaford Wetlands

Although physically distinct and hydrologically and hydrogeologically separated wetland systems, the one Ramsar listing applies to both the Edithvale and the Seaford Wetland components, and thus they are discussed collectively below as the Edithvale-Seaford Wetlands.

2.1.1 Desktop assessment

The JV has undertaken a desktop review of publicly available information on the ecological values known to be present within the Edithvale-Seaford Wetlands Ramsar site.

Database searches

The JV reviewed the following government-curated databases to understand the values supported by the Edithvale-Seaford Wetlands:

- Victorian Biodiversity Atlas administered by the Victorian Department of Environment, Land, Water and Planning (DELWP)
- Biodiversity Interactive Map (BIM) administered by DELWP
- EPBC Act Protected Matters Search Tool (PMST) administered by the Commonwealth Department of the Environment and Energy (DoEE)
- Birdlife Australia Birdata atlas
- Google Earth aerial photography.

Victorian Biodiversity Atlas

The location of threatened species records within one kilometre of the Edithvale-Seaford Wetlands is shown in Figure 2.

Fauna

Ninety-seven threatened vertebrate fauna species have been historically recorded within one kilometre of the Edithvale-Seaford Wetlands. Species include 74 species listed under the EPBC Act, 35 species listed under the Flora and Fauna Guarantee Act 1988 (FFG Act) and 65 listed by DELWP as Victorian Rare or Threatened Species (VROTS) (DEPI, 2013a).

In addition, 47 fauna species are recognised as migratory and/or marine under the EPBC Act.

Flora

Eight threatened flora species have been recorded within one kilometre of the Edithvale-Seaford Wetlands. One species (Swamp Everlasting *Xerochrysum palustre*) is listed under the EPBC Act, two are listed under the FFG Act and all are listed on the VROTS advisory list (DEPI, 2014).

Biodiversity Interactive Map

Based on DELWP EVC modelling, there is potential for up to six EVCs to be present within a one kilometre buffer of the Edithvale-Seaford Wetlands. These EVC's and their Biodiversity Conservation Status (BCS) in the Gippsland Plain bioregion are listed in Table 3 and mapped in Figure 2.

Table 3 EVCs within one kilometre of the Edithvale-Seaford Wetlands[3]

EVC No.	EVC name	BCS
1	Coastal Dune Scrub/Coastal Dune Grassland Mosaic	Depleted
2	Coast Banksia Woodland	Vulnerable
48	Heathy Woodland	Least Concern
125	Plains Grassy Wetland	Endangered
904	Coast Banksia Woodland/Swamp Scrub Mosaic	Vulnerable
921	Coast Banksia Woodland/Coastal Dune Scrub Mosaic	Vulnerable

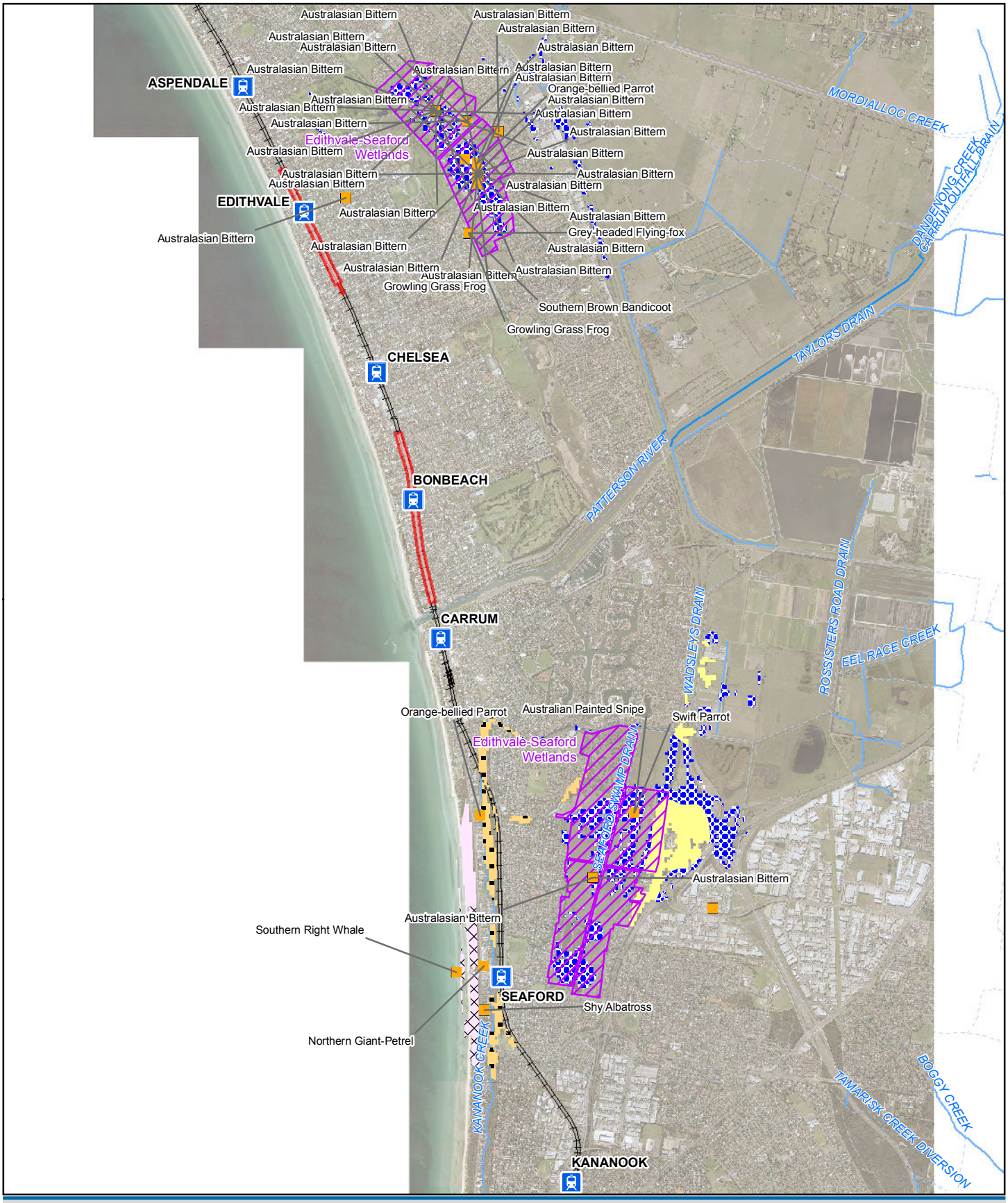
Protected Matters Search Tool

The PMST identified a number of Matters of National Environmental Significance (MNES) that may occur, or for which suitable habitat may occur within one kilometre of the Edithvale-Seaford Wetlands. Results of the PMST search are summarised in Table 4.

Table 4 Summary of PMST results

MNES	Number of occurrences
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance (Ramsar Sites)	1 Edithvale-Seaford Wetlands
Commonwealth Marine Area	None
Listed threatened ecological communities	2 Natural Damp Grassland of the Victorian Coastal Plains Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains
Listed Threatened Species	46 species consisting of: • 40 listed fauna species • 6 listed flora species
Listed Migratory Species	47

[3] Derived from DELWP BIM



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LEGEND

- Project Investigation Area
- RAMSAR Wetland
- Threatened fauna records
- Threatened flora records

EVC (derived from DELWP 2015)

- 1, Coastal Dune Scrub/Coastal Dune Grassland Mosaic
- 2, Coast Banksia Woodland
- 48, Heathy Woodland
- 125, Plains Grassy Wetland
- 904, Coast Banksia Woodland/Swamp Scrub Mosaic
- 921, Coast Banksia Woodland/Coastal Dune Scrub Mosaic

Paper Size A4

0 280 560 1,120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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EVC & VBA Results

Figure 2

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Literature review

The JV reviewed the following publicly available literature that is relevant to the Edithvale-Seaford Wetlands.

The Edithvale-Seaford Wetlands Ramsar Site Management Plan (Ecology Australia, 2016)

Edithvale Wetland is owned and managed by Melbourne Water, whilst Seaford Wetland is owned and managed jointly by Melbourne Water and Frankston City Council. The current Ramsar Wetland Management Plan will guide management at the site from 2016 until 2023 when a new plan is to be prepared in accordance with the Australian Ramsar Management Principles that require the plan to be updated every seven years.

The key values of the Edithvale-Seaford wetlands are detailed within the management plan, and include:

- A diversity of habitat for a range of flora and fauna species.
- Potential habitat for flora species of conservation significance.
- High diversity of significant avifauna, in particular:
    - Twenty species of waterbirds listed under international migratory agreements. The site regularly supports eight international migratory waterbirds and two wetland dependent fauna species listed under the EPBC Act
        - Australasian Bittern *Botaurus poiciloptilus* – Endangered
        - Curlew Sandpiper *Calidris ferruginea* – Critically Endangered
    - Swift Parrot *Lathamus discolour* (Seaford Wetlands in 2015) and Orange-bellied Parrot *Neophema chrysogaster* (last recorded in the 1980s), both listed under the EPBC Act
    - Counts above one percent of the estimated population of two species are regularly recorded within the site: Australasian Bittern and Sharp-tailed Sandpiper *Calidris acuminata.*
    - Important habitat for Latham's Snipe *Gallinago hardwickii* as defined under the EPBC Act (DEWHA 2009) having exceeded the threshold of 18 individuals of the species.Remnant vegetation representing eight Ecological Vegetation Classes (EVCs): Damp Sands Herb-rich Woodland (EVC 3), Swamp Scrub (EVC 53), Brackish Aquatic Herbland (EVC 537), Brackish Herbland (EVC 538), Plains Sedge Wetland (EVC 647), Aquatic Herbland (EVC 653), Brackish Wetland Aggregate (EVC 656) and Tall Marsh (EVC 821).
- Function as an essential component of the regional drainage system and as critical flood storage.

The management plan summarises the most recent assessment of current conditions against Limits of Acceptable Change (LAC) for changes in ecological character of the Ramsar site. The assessment indicates the site is currently within the LAC (Ecology Australia, 2016).

The management plan provides detail on the legislation and policy framework that may affect management and key threatening processes at the site, including (but not limited to) altered hydrology, increasing salinity, decreasing water quality, disturbance of potential acid sulfate soils, pest plants and animals, recreation and climate change, and provides a level of risk for each of these threatening processes. This risk assessment informs the site management actions that are proposed within the plan.

Edithvale-Seaford Wetlands Ramsar Site Boundary Description- Technical Report (DEPI, 2013b)

A requirement of the Ramsar Convention on Wetlands is the production of suitable maps for each Ramsar Wetland, and the federal DoEE requires that the written description and spatial data of the Ramsar site boundaries are accurate. This report defines the Ramsar boundaries, and provides the maps required under the Ramsar Convention on Wetlands.

In the preparation of this technical report, DEPI convened an expert panel to provide advice on the intent of the Ramsar site boundaries, based on the Ramsar Information Sheet for the site compiled in 2001.

The site boundaries for the Edithvale-Seaford Ramsar site proposed in this report have been utilised for this investigation.

Description of the ecological character of the Edithvale-Seaford Wetlands Ramsar Site (DSE, 2012)

This document provides a description of the ecological character of the Edithvale-Seaford Wetlands, and was prepared following the 'Framework for describing the ecological character of Ramsar Wetlands' (DSE, 2005). This description provides a benchmark for monitoring the ecological condition of the site and provides an account of the ecosystem services that the wetlands provide that have been used for the character description. These include:

1. Wetland representativeness
2. Flood control and catchment drainage
3. Supports threatened species, particularly waterbirds
4. Diversity of waterbird species
5. Supports vegetation characteristic of the bioregion.

The ecosystem components that are critical in maintaining the ecosystem services listed above are also discussed, and include hydrology, sedimentation, salinity, vegetation, connectivity, productivity, climate, catchment and land use, soil type, wetland topography and waterbird habitat.

The report describes the hydrology of the wetlands. Prior to 1987, wetland remnants consisted of 'somewhat degraded' shallow, freshwater marsh (116 hectares) and permanent open freshwater (16 hectares). In 1987 to 1988, excavations in both the Edithvale and Seaford Wetlands pierced the natural peat layer that was until that time, limiting the interaction between surface water and groundwater. This breach allowed the inflow of saline groundwater, and by the time of the Ramsar listing in 2001, some of the wetland cells had become brackish or saline.

The Edithvale Wetland is fed primarily from drains collecting stormwater runoff from the developed catchments to the north and the west of the sites, and discharges via a drain to Mordialloc Creek and then into Port Phillip Bay.

The Seaford Wetland is fed from a pump in the Wadsley Road Drain and has increased groundwater inputs from local drainage systems. Seaford Wetland discharges to the Weatherstone Road Drain at the Southern end of the system.

DSE (2012) also sets out recommended monitoring programs that, when implemented, aim to evaluate the change in the ecological character of the wetlands.

Level Crossing Removal Authority- Frankston package- Preliminary Impact Assessment: Groundwater (AECOM-GHD JV, 2016)

The preliminary impact assessment provides initial insight into potential key impacts and risks. This study is framed around technical assessments aimed to improve understanding of the major potential groundwater impacts identified, which include:

1. Short-term groundwater level impacts (dewatering)
2. Long-term groundwater level impacts (drawdown, mounding and water logging)
3. Interference with existing groundwater users
4. Interaction with existing high risk land use sites
5. Impacts to groundwater dependent ecosystems
6. Subsidence impacts
7. Potential for acid sulfate soil activation
8. Potential for saline intrusion

2.1.2 Field assessment

A two day field assessment (one day at each of Edithvale and Seaford wetlands) was undertaken on 13 and 19 September 2016 to provide an account of the condition of the wetland and to better understand the value of the vegetation and habitat within the Edithvale-Seaford Wetlands Ramsar site that may be impacted by the level crossing removals. Access by the public to both wetlands is restricted by cyclone mesh fencing around the entirety of the waterbodies, and much of the fringing vegetation assessment and habitat observations were made from the tracks that surround the perimeter of both wetland sites. This field assessment is considered general in nature and does not distinguish between the Edithvale and Seaford wetland components of the Ramsar site.

Flora

At the time of the surveys, both wetlands supported large expanses of water, and most of the hydrological cells of the wetlands were surrounded by dense fringing vegetation. Vegetation composition and structure most closely resembled either EVC 125 Plains Grassy Wetland (Endangered in the Gippsland Plain Bioregion) or EVC 136 Sedge Wetland, but was generally of poor quality and appeared to have limited species richness. Common Reed *Phragmites australis* dominated the margins of most of the wetlands (Plate 1), but is occasionally outcompeted by Cumbungi *Typha domingensis.* It is possible that dominance of Common Reed is promoted by slightly saline conditions. Occasional breaks in the tall reed beds revealed a patch of vegetation dominated by Swamp Billy-buttons *Craspedia paludicola* and Water Ribbons *Triglochin procerum* growing on damp, muddy margins (Plate 2). Within the Seaford Wetland in particular, wetland vegetation dominated by rush *Juncus* species was common and appeared prevalent in those cells that were shallower, allowing the rushes to colonise the sediment within the centre of some wetland cells.

Vegetated islands or peninsulas within the wetlands were often supported dryland vegetation, such as Swamp Gum *Eucalyptus ovata* Blackwood *Acacia melanoxylon* and Swamp Paperbark *Melaleuca ericifolia* (Plate 3). Those areas of the Edithvale-Seaford wetlands that are accessible to the public have been revegetated with indigenous species including Swamp Gum, River Red Gum *Eucalyptus camaldulensis,* Black Wattle *Acacia mearnsii,* and Kangaroo Apple *Solanum aviculare* (Plate 4).

Plate 1 – Common reed dominates the margins of many cells

Plate 2 – Swamp Billy-buttons and Water Ribbons

Plate 3 – Dryland vegetation on islands

Plate 4 – Revegetation with indigenous species.

Fauna

The field assessment revealed that the value of the habitat provided by the vegetation far outweigh the botanical significance of the vegetation. Floral species diversity was low and typically dominated by common wetland species such as Common Reed and Bullrush. Freshwater meadows such as those shown in Plate 2 were scarce. The proliferation of the dense tall reed beds is likely to encourage the diversity of the birdlife observed, both aquatic and terrestrial. Dense reed beds such as these are the preferred habitat of the Australasian Bittern, and may explain why the species has persisted at the site for so long following its widespread decline in the Melbourne metropolitan area. A diversity of waterfowl, wader and terrestrial avifauna were observed (Table 5), and the regional significance of the habitat provided by the wetland was apparent.

Superb Fairy Wren *Malurus cyaneus* (Plate 5), Grassbird *Rhipidura leucophrys*, and Yellow-rumped Thornbill *Acanthiza chrysorrhoa* were all observed utilising the cover provided by the reed beds. Black-fronted Dotteral *Elseyornis melanops* (Plate 6) and Black-winged Stilt *Himantopus himantopus* were recorded feeding in the shallow margins of a number of wetland cells.

Waterfowl were prevalent, with a high diversity and abundance recorded from within both Edithvale and Seaford wetlands. The most significant species observed was the Magpie Goose *Anseranas semipalmata,* which is listed under the FFG Act (Plate 7).

Several amphibian species were also heard, with valuable habitat recorded from the southern end of the Seaford wetlands.

Plate 5 – Superb Fairy-wren

Plate 6 – Black-fronted Dotterel

Plate 7 – Magpie Goose

Plate 8 – Black Swan.

Table 5 Fauna species recorded during fieldwork at Edithvale-Seaford Wetlands

Common name	Scientific name	EPBC Act	FFG Act	VROT
Amphibians				
Common Froglet	*Crinia signifera*			
Southern Banjo Frog	*Limnodynastes dumerilii*			
Striped Marsh Frog	*Limnodynastes peronii*			
Spotted Marsh Frog	*Limnodynastes tasmaniensis*			
Birds				
Australasian Pelican	*Pelecanus conspicillatus*			
Australian Magpie	*Gymnorhina tibicen*			
Black-fronted Dotterel	*Elseyornis melanops*			
Black Swan	*Cygnus atratus*			
Blackbird	*Turdus merula*			
Black-winged Stilt	*Himantopus himantopus*			
Caspian Tern	*Hydroprogne caspia*	Ma, Mi	L	nt
Chestnut Teal	*Anas castanea*			
Common Starling	*sturnus vulgaris*			

Common name	Scientific name	EPBC Act	FFG Act	VROT
Dusky Moorhen	*Gallinula tenebrosa*			
Eurasian Coot	*Fulica atra*			
Galah	*Eolophus roseicapilla*			
Grassbird	*Rhipidura leucophrys*			
Grey Butcherbird	*Cracticus torquatus*			
Grey Teal	*Anas gracilis*			
House Sparrow	*Passer domesticus*			
Indian Myna	*Acridotheres tristis*			
Little Pied Commorant	*Microcarbo melanoleucos*			
Little Raven	*Corvus mellori*			
Little Wattlebird	*Anthochaera chrysoptera*			
Magpie Goose	*Anseranas semipalmata*		L	nt
Magpie-lark	*Grallina cyanoleuca*			
Musk Lorikeet	*Glossopsitta concinna*			
Noisy Miner	*Manorina melanocephala*			
Pacific Black Duck	*Anas superciliosa*			
Purple Swamphen	*Porphyrio porphyrio*			
Rainbow Lorikeet	*Trichoglossus moluccanus*			
Red Wattlebird	*Anthochaera carunculata*			
Silver Gull	*Chroicocephalus novaehollandiae*			
Spotted Turtle Dove	*Spilopelia chinensis*			
Straw-necked Ibis	*Threskiornis spinicollis*			
Superb Fairy Wren	*Malurus cyaneus*			
Swamp Harrier	*Circus approximans*			
Welcome Swallow	*Hirundo neoxena*			
White Ibis	*Threskiornis moluccus*			
White-faced Heron	*Egretta novaehollandiae*			
White-plumed Honeyeater	*Lichenostomus penicillatus*			
Willy Wagtail	*Rhipidura leucophrys*			
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*			
Fish				
Mosquito Fish	*Gambusia holbrooki*			

Notes to table: Mi – migratory; Ma – marine; L –listed; nt – near threatened.

2.2 Groundwater

The following section provides a summary of the existing groundwater conditions of particular relevance to the Edithvale-Seaford Wetlands as described by AECOM-GHD JV (2016):

- The Seaford Wetland and Edithvale Wetland are separate features in terms of surface hydrology and hydrogeology; with the Patterson River forming a hydraulic divide between the wetlands.
- Most of the existing surface water features present in the area were historically part of the greater Carrum-Carrum Swamp. Stormwater from the Seaford Wetland is collected from municipal drainage and directed into the swamps via modified channels. The Edithvale Wetland comprises a seasonal floodplain system deriving most of its water as runoff from the local catchment.
- The stratigraphy beneath the level crossings near Edithvale-Seaford Wetlands is anticipated to comprise the units identified below (listed in order of increasing depth):
    - Variable (anthropogenic fill)
    - Quaternary coastal eeolian dune deposits
    - Quaternary coastal swamp deposits
    - Tertiary (Pliocene) Baxter Sandstone/Brighton Group sediments
    - Tertiary (Miocene) Fyansford Formation sediments.

These geological units are subdivided into aquifer/aquitard systems as nominated under the Victorian Aquifer Framework. The aquifer systems identified by the assessment that could be intersected during construction near the Edithvale-Seaford Wetlands are summarised in Table 6.

Table 6 Aquifer systems

Period	Sub period	Geological formation	Aquifer or aquitard unit	Lithology
Quaternary	Holocene	Alluvium/Aeolian deposits	Quaternary Aquifer	sand, gravel, clay, silt
Tertiary	Late Miocene to Early Pliocene	Brighton Group/Baxter Sandstone	Upper Tertiary Aquifer (fluvial)	calcareous, ferruginous consolidated sands and sandstones
	Upper-Mid (Miocene)	Fyansford Formation	Upper-Mid Tertiary Aquitard	clay, silt, marl (fractured rock) and minor sand

The report considers that groundwater quality is likely to be varied, and correlates with identified geomorphic features. Shallow groundwater is likely to be brackish to saline within the low-lying areas surrounding the Edithvale-Seaford Wetlands, and associated drainage lines.

Direct rainfall infiltration and artificial recharge to groundwater via stormwater runoff directed to the Edithvale-Seaford Wetlands are largely responsible for recharging the local water table aquifer. These wetland areas are also likely to represent discharge features for local and regional flow systems. For deeper aquifer systems, groundwater discharge is to Port Phillip Bay.

3. Preliminary impact assessment

The purpose of this assessment is to provide advice on the potential impacts of groundwater on the ecosystem values that underpin the Ramsar listing of the Edithvale-Seaford Wetlands. This section provides a summary of the potential regional groundwater changes identified by the preliminary groundwater study (AECOM-GHD JV, 2016) and identifies possible ecological impacts that may eventuate as a result of regional groundwater change.

3.1 Groundwater

Groundwater level and quality data (AECOM-GHD JV, 2016) has been obtained from existing publicly available regional datasets and groundwater models. Available desktop information indicates the depth to groundwater is likely to be less than five metres below ground level. Limited site data obtained to date suggests groundwater levels are likely to range from three metres to six metres below ground level, or less than two metres AHD.

Limited site specific groundwater level or quality data has been obtained from the Edithvale-Seaford Wetlands and as such, assessment of potential impacts to existing groundwater conditions at the Edithvale-Seaford Wetlands is preliminary in nature. Understanding the relationship between the current water quality at the site and the potential effects on groundwater quality is critical to assessing the likelihood and extent of future impacts on the Ramsar site.

3.1.1 Potential groundwater impacts of level crossing removal works

The impacts on groundwater from the proposed level crossing removals are varied, and can include groundwater drawdown that results from excavations. Groundwater mounding can also occur when groundwater travelling down a gradient towards the coast encounters a physical hydraulic barrier, resulting in a 'backup effect' on the upward side of the barrier.

The *rail under road* approach at each site could result in both short-term and long-term groundwater impacts. The requirement for the construction of trenches (with tanked secant pile walls) would create a hydraulic barrier which may impact both the 'up-gradient' side (inland of the rail line) where groundwater mounding may occur and the 'down-gradient' side (seaward of the rail line) where groundwater drawdown may occur (Figure 3). Whilst both these impacts may have an effect on groundwater, groundwater mounding is considered the most relevant risk to the Edithvale-Seaford Wetlands, based on preliminary modelling. As such, groundwater mounding is the focus of the discussion of impacts within this report.

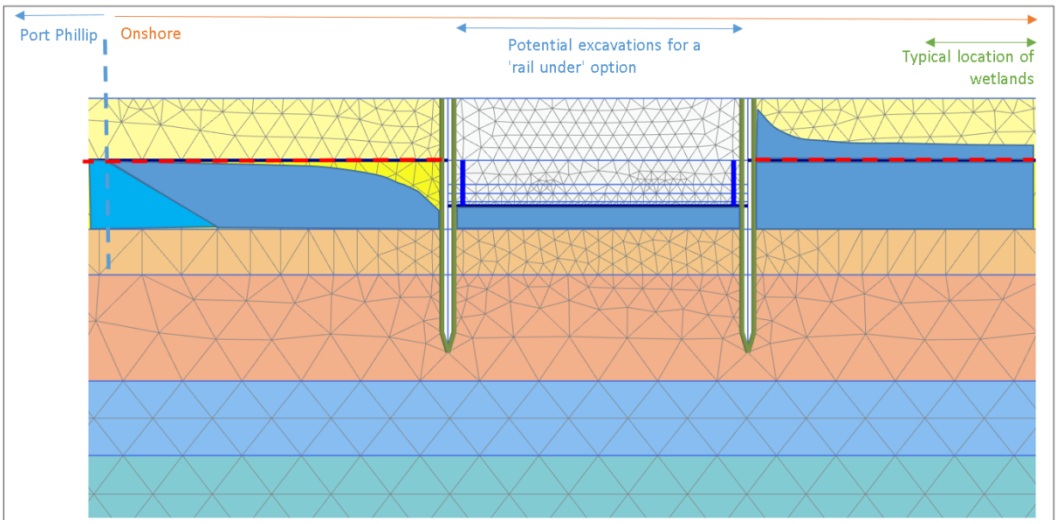


Figure 3 Conceptual schematic of potential groundwater drawdown and groundwater mounding impacts

The groundwater preliminary impact assessment (AECOM-GHD JV, 2016) identifies that potential impacts are likely to be both regional and local in nature given the cumulative impacts of multiple trench structures. This could result in a regionally significant groundwater flow barrier. The extent of groundwater mounding would depend on the number of 'tanked' trenches, the length of the trenches, and the gap between each of the trenches.

The permanency of the trench structures is likely to result in impacts to groundwater that are likely to be long term and irreversible in nature.

3.1.2 Scenario modelling

Two scenarios were modelled by AECOM-GHD JV (2016) to represent two hydrogeological conditions:

- Scenario 1- High hydraulic conductivity aquifer (Brighton Group) system
- Scenario 2- Low hydraulic conductivity aquifer system (Fyansford group).

For each of these scenarios, a number of models were run to reflect differing hydrogeological conditions that may be encountered to develop preliminary estimates of groundwater drawdown and mounding associated with the rail trench structures. Only Edithvale and Bonbeach level crossings are discussed within this impact assessment as they are hydrogeologically connected to the Edithvale Wetland component of the Edithvale-Seaford Wetlands Ramsar site.

The model also considered a number of varying trench geometries; however, the 'stepped' pile geometry was assumed to be representative of the likely retaining wall design and was therefore adopted for the preliminary groundwater impact assessment.

The results of the model run for each site are shown in Figure 4 and provided below:

Bonbeach

- Inferred groundwater mounding as a result of the Bonbeach level crossing removal is not expected to impact the Edithvale-Seaford wetlands. However, there is potential for cumulative groundwater impacts from implementing the *rail under road* approach at both Edithvale and Bonbeach. Cumulative impacts will be assessed through a numerical groundwater model.

Edithvale

- Inferred groundwater mounding of 0.1 metres where the mound interacts with the northern end of the Edithvale Wetland to the east of the crossing.

3.1.3 Groundwater impacts on Edithvale Wetland

Based on the models presented above, construction of one or a number of tanked trenches has potential to impact regional groundwater to the extent such impacts may manifest within the Edithvale Wetland.

The Edithvale Road level crossing is located approximately 1300 metres from the Edithvale Wetland. The wetland is situated 'up-gradient' to the Edithvale project area however preliminary groundwater modelling suggests that groundwater mounding in the order of 0.1 metres could occur at the Edithvale Wetland (Figure 4).

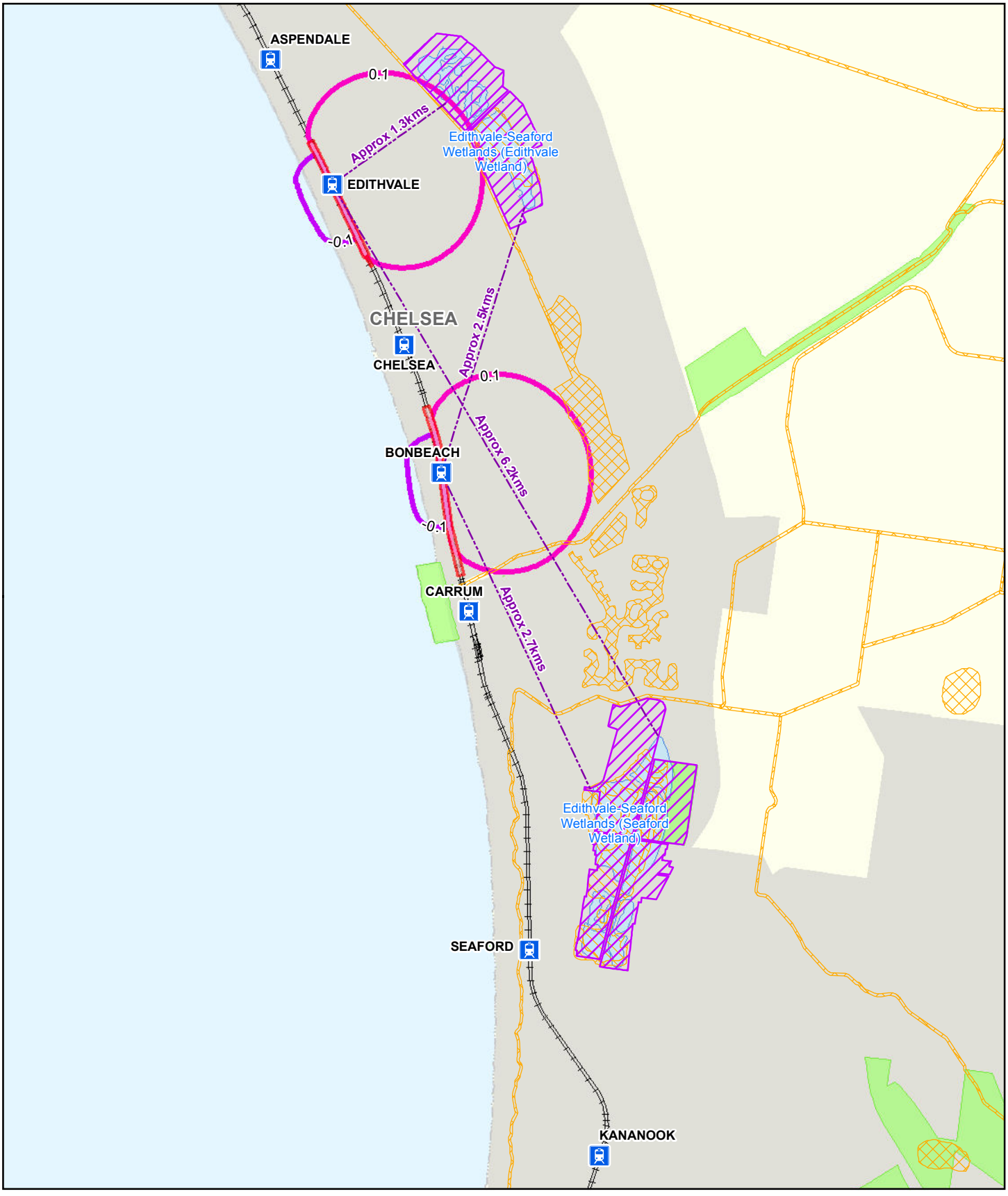
The Station Street, Bonbeach level crossing is located approximately 2500 metres from the Edithvale Wetland (Figure 4). While preliminary groundwater modelling suggests that groundwater mounding in the order of 0.1 metres could occur at Bonbeach, the area that may be affected extends 1400 metres from the project area and therefore does not intersect with the Edithvale Wetland. There is potential for cumulative impacts to groundwater from implementing the *rail under road* approach at both the Edithvale and the Bonbeach level crossing removals, and the likely impacts of this change justifies further consideration and investigation.

3.1.4 Management of inflow

The degree to which the Edithvale-Seaford Wetland managers can control the discharge of water from the wetland system in response to increases in inflow will determine the extent of impact that the groundwater mounding may have.

The wetlands are an integral part of the regional drainage system, receiving, retaining and diverting stormwater and other surface run-off and providing critical flood storage services that help protect surrounding and downstream properties from inundation (Ecology Australia, 2016).

Further consultation with Melbourne Water is required to understand the current hydrological management of the wetlands, including the ability/capacity for Melbourne Water to manage the water levels according to inflows. The ability of the wetland managers to facilitate the release of additional water to compensate for greater inflows may mitigate potential impacts resulting from changed groundwater conditions. However, this remains to be determined.



Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:edged

LEGEND

- Project Investigation Area
- RAMSAR Wetland
- Wetland
- Groundwater Dependent Ecosystem (Surface Expression)

Modelled impact to groundwater levels (m)

- -0.1
- 0.1

Paper Size A4

0 400 800 1,600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEVEL CROSSING REMOVAL AUTHORITY

AECOM GHD JOINT VENTURE

Modelled groundwater change relative to the Edithvale-Seaford Wetlands Ramsar site

Figure 4

X:\Project Data\PRGM\GIS\MXD\Frankston\Hydrology\M004_GW_Changes_Ramsar_20170209a.mxd | edged | Rev A | Date: 13 Feb 2017

3.2 Potential impacts on the ecological values of Edithvale-Seaford Wetlands

Groundwater mounding has the potential to impact the values that underpin each of the Ramsar criteria for listing the Edithvale-Seaford Wetlands as a wetland of international importance. An ecological risk assessment was undertaken to assess potential impacts of groundwater mounding that may result from the proposed level crossing removal.

The ecological impacts discussed in this report have been informed by this desktop and field assessment of the Edithvale-Seaford wetlands, and by preliminary groundwater investigations. The (in-progress) numerical groundwater model and the incorporation of the (in-progress) geotechnical and hydrogeological site investigation data currently being obtained will allow a more detailed determination of the impact of modelled groundwater change.

3.2.1 Risks to Ramsar criteria

The Edithvale-Seaford Wetlands were listed as meeting Ramsar site Criteria 1, 2 and 6 in 2001.

- **Criterion 1 –** A wetland should be considered internationally important if it contains a representative, rare or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region
- **Criterion 2 –** A wetland should be considered internationally important if it supports vulnerable, endangered or critically endangered species or threatened ecological communities
- **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.

The site was also considered by DSE (2012) to meet Criterion 3 given that it supports a high diversity of waterbird species and native vegetation that is typical of the bioregion.

- **Criterion 3-** A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Risks to Ramsar criteria

Risks to Criterion 1 – Damage that has occurred to the wetlands as a result of the excavation works penetrating the peat layer occurred prior to the listing of Edithvale-Seaford wetland as a Ramsar site in 2001. As such, it can be assumed that the wetland was of sufficient quality to still be considered representative of a wetland of international importance. Ecology Australia (2016) highlights altered hydrology as a key threatening process to the values of the Edithvale-Seaford Ramsar Site. Frequency, timing and duration of inundation are all critical influences on the ecological character of a wetland. Indeed, hydrological changes to wetlands are considered a potentially threatening process under the FFG Act.

The *rail under road* approach adopted for the Edithvale and Bonbeach level crossing removals has the potential to affect regional groundwater changes which may alter the hydrology of the Ramsar site. Altered hydrology is a key threat to the ecological values of the wetlands. Frequency, timing and duration of inundation are all critical influences on the ecological character of the wetlands.

Risks to Criterion 2 – Of particular relevance to criterion 2 is the population of Australasian Bittern that the wetlands are known to support. Foraging and breeding habitat are also provided by the wetlands (DSE, 2012). Australasian Bittern is listed as Endangered under the EPBC Act, and is listed as endangered under the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. It is one of 20 birds funded as a priority by the Australian Government to support the species recovery effort (DoEE, 2016).

The Bittern live in dense beds of reeds and rushes that provide camouflage, making them a notoriously difficult bird to spot. The species has been regularly recorded from the Edithvale-Seaford Wetlands. One percent of the south-east Australia population is 20 birds, and the maximum count recorded from the wetlands during monthly surveys is 14 birds.

Change to the volume and quality of the groundwater that enters the Edithvale-Seaford Wetlands has the potential to significantly impact the structure and extent of the reed beds that the species requires. These reed beds require specific hydrological regimes for growth, and typically require regular to semi-regular inundation to persist. It is conceivable that any groundwater impacts that result from the level crossing removals in the vicinity of the Edithvale-Seaford Wetlands may significantly alter the hydro-period of these wetlands, which could significantly reduce the area and extent of the reed beds that currently allow this species to flourish at the site. Whilst these reed beds have the potential to impede wetland function, their continued presence at the site is likely to be critical to the persistence of Australasian Bittern.

The *rail under road* approach adopted for the Edithvale and Bonbeach level crossing removals has the potential to affect regional groundwater and these changes to the volume and quality of the groundwater that enters the wetland may therefore affect the vegetation structure and habitat value of the site for the Endangered Australasian Bittern.

Risks to Criterion 3 – Between 1989 and 2007, 75 species of waterbird were recorded from the Edithvale-Seaford Wetlands (Ecology Australia, 2016). This represents 85% of the waterbird species that were recorded from the Gippsland Plain bioregion for the same period.

Any change to the hydrological regime at the Edithvale-Seaford wetlands is highly likely to impact the use of the site by waterbirds, since their current diversity is highly likely to be a consequence of the diversity of habitats at the site. This habitat diversity is most likely a response to the varying hydro-periods of each of the wetland cells. Thus, any changes to the hydro-period and to water quality of inflows into the wetland are likely to impact habitat diversity, and subsequently impact the abundance and diversity of waterbirds utilising the ecosystem.

The *rail under road* approach adopted for the Edithvale and Bonbeach level crossing removals has the potential to affect regional groundwater and these changes may therefore influence the hydro-period and/or water quality of the site which in turn may alter the habitat and therefore diversity of species the wetland can support.

Risks to Criterion 6 – The Edithvale-Seaford Wetlands support 1% of the East Asian-Australasian Flyway population of Sharp-tailed Sandpiper (Ecology Australia, 2016). Population fluctuations of this species in coastal sites are heavily influenced by the availability of suitable inland habitat. The availability of this habitat is strongly correlated with rainfall (and longer-term climate) variability. That the species has been recorded regularly at the site in numbers exceeding 1% of the East Asian-Australasian Flyway population suggests that the Edithvale-Seaford Wetlands are a valuable habitat commodity for the species in south-eastern Australia.

The species is known to be particularly responsive to ecological change, and in years of inland flooding, will utilise the banks of inland floodplains preferentially over travelling thousands of kilometres further south in search of coastal wetland habitat.

The species prefers the grassy edges of shallow, inland wetlands- exactly the habitat that is provided by the Edithvale-Seaford wetlands. The prevailing hydrological regime has encouraged at least some fidelity to the Edithvale-Seaford Wetlands. However, their ability to exploit other temporary habitat, means that the species has the potential to abandon the wetlands with change in ecosystem function.

The *rail under road* approach adopted for the Edithvale and Bonbeach level crossing removals has the potential to affect regional groundwater changes and these changes may therefore affect the habitat value of the site for Sharp-tailed Sandpipers.

Limits of acceptable change for Ramsar site

As a signatory to the Ramsar convention, Australia is expected to conserve and maintain the ecological character of all Ramsar wetlands in its territory. In order to do so, ecological character descriptions are being prepared for all Ramsar sites (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) undated).

An ecological character description has been prepared for the Edithvale-Seaford Wetlands (DSE, 2012). According to Ecology Australia (2016) the description was updated in 2016 and four components, processes and services were identified that are critical to the ecological character of the Ramsar site:

- Waterbird diversity and abundance
- Waterbird breeding
- Physical habitat for waterbirds
- Threatened wetland species.

The ecological character description allows Ramsar site managers to assess current conditions against the Limit of Acceptable Change (LAC), a tool devised to help managers monitor and manage natural sites. Limits of acceptable change are defined in DSEWPaC (undated) as:

> *the variation that is considered acceptable in a particular component or process of the ecological character of the wetland, without indicating change in ecological character that may lead to a reduction or loss of the criteria for which the site was Ramsar listed (modified from definition adopted by Phillips 2006).*

According to Ecology Australia (2016), a Ramsar Rolling Review in 2016 provided the most recent assessment of current conditions against the LAC. The results of the assessment are summarised in Ecology Australia (2016) with the site under consideration as currently within the LAC. An extract of the summary table is provided here for reference (Table 7).

Groundwater mounding has the potential to influence the ecological character of the Edithvale-Seaford Wetland Ramsar site and therefore whether the site remains within its LAC.

Table 7 Summary of assessment against limits of acceptable change for the Edithvale-Seaford Wetlands Ramsar site

Source: Ecology Australia (2016)

Critical CPS	Limit of acceptable change	2016 assessment
Waterbird diversity and abundance	Abundance of waterbirds will not decline below the following (calculated as a rolling five year average of maximum annual count): • Total waterbirds – 2500 • Migratory waders – 900 • Australasian waders – 125 • Ducks – 650 • Fishers – 200 • Large wading birds – 100 • Herbivores – 450	Abundance of waterbirds (2011 – 2015) from Edithvale-Seaford Wetlands was as follows (BirdLife Australia unpublished data): • Total waterbirds – 7250 • Migratory waders – 2700 • Australasian waders – 300 • Ducks – 1960 • Fishers – 280 • Large wading birds – 275 • Herbivores – 1300 **The site is currently within the LAC.**
	Abundance of Sharp-tailed Sandpiper will not decline below 1% of the population as stated in the most recent Wetlands International Population estimate (based on a five year rolling average of annual maximum counts).	Abundance of Sharp-tailed Sandpipers (2011 – 2015) from Edithvale-Seaford Wetlands was 3300 (1.8% of the population) (BirdLife Australia, unpublished data). **The site is currently within the LAC.**
Waterbird breeding	Breeding of the following species at least once every five years: • Black Swan • Blue-billed Duck • Chestnut Teal • Dusky Moorhen • Purple Swamphen • Swamp Harrier	All species were recorded breeding more than once in the past five years (2011-2015) (Birds Australia 2006, 2007, 2008, 2010, 2012; BirdLife Australia 2013a, 2013b, 2015 and 2016). **The site is currently within the LAC.**
Physical habitat for waterbirds	Habitat that comprises open water, emergent native vegetation (sedges, rushes and reeds) and exposed mudflats, with no habitat comprising more than 70 percent of the total wetland area for more than five successive years.	The extent of tall marsh dominated by Common Reed *Phragmites australis* has increased at the Ramsar site over the past two decades from 34 hectares in 1994 to 57 hectares in 2013 (Melbourne Water unpublished data). However, this is not greater than 70% of the wetland area and a mosaic of open water (deep and shallow) exposed mudflats and emergent vegetation is maintained. **The site is currently within the LAC.**

Critical CPS	Limit of acceptable change	2016 assessment
Threatened species: birds	Presence of Australasian Bittern and Curlew Sandpiper in at least three out of every five years.	Data from BirdLife Australia (2011–2015) indicate: • Australasian Bittern = four out of the past five years. • Curlew Sandpiper = four out of the past five years. **The site is currently within the LAC.**

Key: CPS Critical ecosystem components, processes and services/benefits.

3.2.2 Ecological risk assessment

Objectives

A preliminary ecological risk assessment was undertaken to assess potential impacts of groundwater mounding that may result from the level crossing removals.

Method

An initial step in the method was to identify and describe cause and effect pathways for the potential impacts of the groundwater mounding on the ecological values that the wetland is known to support. A particular focus of this assessment was on those four Ramsar Criteria that the Edithvale-Seaford Wetland satisfies (see Section 3.2.1).

A risk rating was assigned to each potential impact based on the likelihood and the potential severity of consequences. Likelihood levels were assigned in accordance with Table 8. Consequence levels were assigned using descriptors developed specifically for LXRA, and these are presented in Table 9. The risk ratings were determined using the risk matrix in Table 10.

Table 8 Likelihood guide

Likelihood	Description
Almost certain	The event is expected to occur in most circumstances
Likely	The event will probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but not expected
Rare	The event occurs only in exceptional circumstances

Table 9 Consequence guide

Category of impact	Risks to ecological values	Insignificant	Minor	Moderate	Major	Catastrophic
Ecology	Groundwater influx influencing water levels and/or hydro-periods and/or increasing salinity of wetland cells impacting the habitat value of the wetlands	Undetectable change to the extent and quality of habitat (i.e.- no detectable change from current conditions) Undetectable impact on significant species without impact on population viability/species persistence	Detectable change to the extent and quality of habitat Detectable impact on significant species without impact on population viability/species persistence	Moderate change to the extent and quality of habitat (between 5 and 10% loss of habitat extent Moderate impact on significant species threatening population viability/species persistence	Major change to the extent and quality of habitat (between 11 and 30% loss of habitat extent) Major impact on the population viability/species persistence	Catastrophic change to the extent and quality of habitat (between 31 and 100% loss of habitat extent) Catastrophic impact on the population viability/species persistence

Table 10 Risk matrix

LIKELIHOOD LEVEL	CONSEQUENCE LEVEL				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

Results

Ecological risk of groundwater mounding has been assessed in Table 11. Ecological risk assessment- Groundwater impacts on Edithvale-Seaford Wetlands Ramsar site. This risk assessment has assumed a 'worst case' (high permeability) scenario for the Edithvale and Bonbeach level crossing removals.

Table 11 Ecological risk assessment- groundwater impacts on Edithvale-Seaford Wetlands Ramsar site

RISK IDENTIFICATION / INFORMATION			Current Risk		
Risk ID	**Risk Description** ***Identify Risks and Consequences***	**Risk Source** ***Identify Root Cause(s)***	**Likelihood**	**Consequence**	**Risk Rating**
1	Influx of groundwater increases the hydro-period of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter vegetation, and reducing the habitat suitability for migratory waders	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Likely	Major	High
2	Influx of groundwater increases the water depth of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter vegetation and reducing the habitat suitability for migratory waderbirds	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Likely	Major	High
3	Influx of groundwater increases the hydro-period of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter vegetation, and reducing the habitat suitability for the Australasian Bittern	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Likely	Major	High
4	Influx of groundwater increases the water depth of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter vegetation and reducing the habitat suitability for the Australasian Bittern	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Likely	Major	High
5	Influx of groundwater increases the water depth and increases the salinity of some or all of the cells in the wetlands, impacting the ecosystem such that it can no longer be considered to represent a 'near-natural' state	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Possible	Major	High
6	Influx of groundwater increases the salinity of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter	Groundwater mounding as a result of the construction of trenches with tanked secant piled	Possible	Major	High

RISK IDENTIFICATION / INFORMATION			Current Risk		
Risk ID	**Risk Description** ***Identify Risks and Consequences***	**Risk Source** ***Identify Root Cause(s)***	**Likelihood**	**Consequence**	**Risk Rating**
	vegetation, and reducing the habitat suitability for migratory waders	walls			
7	Influx of groundwater increases the salinity of some or all of the cells in the wetlands, significantly altering the extent, structure and composition of the perimeter vegetation, and reducing the habitat suitability for the Australasian Bittern	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Possible	Major	High
8	Influx of groundwater increases the salinity of some or all of the cells in the wetlands, reducing the habitat suitability for waterfowl	Groundwater mounding as a result of the construction of trenches with tanked secant piled walls	Possible	Major	High

4. Relevant legislation and policy implications

4.1 Environment Protection and Biodiversity Conservation Act 1999

Ramsar wetlands are defined as 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 declared Ramsar wetland under the EPBC Act. The Edithvale-Seaford Wetland was declared as a Ramsar site in August 2001, and is Australian Ramsar site number 57.

Ramsar wetlands are recognised as matter of national environmental significance (MNES) 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 (DoE, 2013) provide significant impact criteria for wetlands of international importance (Ramsar sites). 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.' (DoE, 2013, p 13)

There is potential for an impact on the Edithvale-Seaford Wetlands as a result of the *rail under road* approach to level crossing removals at Edithvale and Bonbeach. As a result, a referral to the Federal Minister for the Environment under the EPBC Act will be submitted for the project.

4.2 Environment Effects Act 1978

The Ministerial guidelines for assessment of environmental effects under the Environmental Effects Act, 1978 (DSE, 2006) provides the criteria to inform whether a project should be referred under the EE Act. There are a number of ecological triggers potentially relevant to the level crossing removals including:

Individual potential environmental effects

- Potential long term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia' (Environment Australia 2001).
- Potential extensive or major effects on the health or biodiversity of aquatic, estuarine, or marine ecosystems over the long term.

A combination of potential environmental effects

- Matters listed under the FFG Act:
    - Potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing) including as a result of loss or fragmentation of habitats, or
    - Potential loss of critical habitat, or
    - Potential significant effects on habitat values of a wetland supporting migratory bird species.
- Potential extensive or major effects on beneficial uses of waterbodies over the long term due to changes in water quality, streamflows or regional groundwater levels.

Any project that is considered to trigger the above adverse environmental effects should be referred. The referral should include ancillary works and later project stages that are considered essential to project operation.

There is potential for environmental impacts on the Edithvale-Seaford Wetlands as a result of groundwater changes associated with the *rail under road* approach to level crossing removals at Edithvale. The Bonbeach level crossing removal *rail under road* approach is unlikely to result in groundwater change that directly affects the wetlands but cumulative impacts on regional groundwater may result. As a result, and in recognition, of current uncertainties, a referral to the Minister for Planning under the EE Act will be submitted for the project.

5. Management and mitigation

Environmental management will be an integral part of the detailed design and construction of the Level Crossing Removal Program. An Environmental Management Framework or equivalent document for the project will provide an overarching framework to translate the commitments and management measures into the planning, design and construction of the project.

The Environmental Management Framework or equivalent document will be informed by the technical assessments completed for the level crossing removal program.

Possible mitigation measures designed to minimise impact to ecological values of the Edithvale-Seaford Wetlands will be determined once more detailed modelling has been completed.

The degree of impact that the groundwater mounding may have on the Edithvale-Seaford Wetlands will be influenced by the ability of the wetland managers to control the discharge of water from the wetland system in response to any increases in inflow.

6. Conclusion

A preliminary groundwater assessment has identified the potential for groundwater impacts on the Ramsar listed Edithvale-Seaford Wetlands as a result of the *rail under road* approach adopted for the Edithvale and Bonbeach level crossing removals.

The Edithvale Road level crossing is located approximately 1300 metres from the Edithvale Wetland. The Station Street, Bonbeach level crossing is located approximately 2500 metres from the Edithvale Wetland.

The Edithvale Wetland is situated 'up-gradient' to the Edithvale project area. Preliminary groundwater modelling suggests that groundwater mounding in the order of 0.1 metres could occur at the wetland.

Preliminary groundwater modelling at Bonbeach suggests that groundwater mounding in the order of 0.1 metres could occur, however the area that may be affected extends 1400 metres from the project area and does not intersect with the Edithvale Wetland. However, there is potential for groundwater change at the wetlands from the cumulative impact of the Edithvale and Bonbeach level crossing removals.

LXRA is undertaking a detailed groundwater impact assessment to provide an improved understanding of the nature of the likely groundwater changes and their relationship to the Edithvale-Seaford Wetland to inform a determination on the likely impacts on the Ramsar site.

A referral to the Federal Minister for the Environment under the EPBC Act and a referral to the Minister for Planning under the EE Act are required in recognition of the potential for significant impacts to the Edithvale-Seaford Wetlands as a result of the *rail under road* approach to the level crossing removals at Edithvale and Bonbeach.

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