Tootgarook Wetland Management Plan

May 2018

This report has been prepared by BMT for the Mornington Peninsula Shire, with assistance from Conservation Volunteers Australia's Revive Our Wetlands team.

The Tootgarook Wetland Management Plan project team wish to express their thanks to the local community members of the Tootgarook Wetland Stakeholder Advisory Committee for their input, local knowledge and enthusiasm. Thanks to the government and agency members of the Project Working Group for their assistance, collaboration and guidance.

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Acronyms

AVIRA	Aquatic Value Identification and Risk Assessment
BMO	Bushfire Management Overlay
CAMBA	China – Australia Migratory Agreement
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DELWP	Department of Environment, Land, Water and Planning
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
ECD	Ecological Character Description
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
ESO	Environmental Significance Overlay
EVC	Ecological Vegetation Class
GDE	Groundwater Dependent Ecosystem
IWC – GDW	Index of Wetland Condition for Groundwater Dependent Wetlands
JAMBA	Japan – Australia Migratory Bird Agreement
LSIO	Land Subject to Inundation Overlay
MNES	Matters of National Environmental Significance
MPS	Mornington Peninsula Shire
MSS	Municipal Strategic Statement
MW	Melbourne Water Corporation
PASS	Potential Acid Sulfate Soils
PSO	Public Acquisition Overlay
PPWCMA	Port Phillip and Westernport Catchment Management Authority
ROKAMBA	Republic of Korean – Australia Migratory Bird Agreement
PWG	Project Working Group
SAC	Stakeholder Advisory Committee
SBO	Special Building Overlay
SEPP	State Environment Protection Policies
SEW	South East Water
SLO	Significant Landscape Overlay
SPPF	State Planning Policy Framework

UNESCO	United Nations Educational, Scientific and Cultural Organisation
Vic EPA	Victorian Environment Protection Agency
VPP	Victoria Planning Provisions
VWMS	Victorian Waterway Management Strategy
WSRL	Water Sensitive Rural Land
WSUD	Water Sensitive Urban Design

1 Introduction

The **Tootgarook Wetland** (**the Wetland**) in Capel Sound is a groundwater dependent freshwater wetland. It is in the **Chinamans Creek Catchment** (**the Catchment**) and has features of local, state and international environmental significance. Over time, the Wetland has been known by many names, including; the Tootgarook Swamp, Boneo Swamp and the Rosebud West Wetland.

In addition to its significant environmental and cultural values, the Wetland also provides many environmental services, such as protecting the low-lying residential land of Capel Sound from flooding and acting as a natural filter for water entering the Port Phillip Bay.

The Wetland has a long history of use, first by the traditional owners of the area and then, following European arrival, for more disruptive uses including peat extraction and agriculture, which involved the partial drainage of the “swamp”.

In recent times, due to commitment of local landholders and community members, significant inroads are being made to reverse past environmental destruction. As a result, the Wetland remains a unique and valuable resource containing high biodiversity values which provides significant social and amenity benefits for the Mornington Peninsula and the broader community.

Given the projected growth in local and regional populations, and the likely associated increase in demand for recreation and connections to the natural environment. The ongoing protection and enhancement of the Wetland and its benefits is vital. Under this context, the **Mornington Peninsula Shire** (**MPS or the Shire**) commissioned the **Tootgarook Wetland Management Plan** (**the Plan**).

The Plan has been prepared to provide strategic guidance for the use, development and management of land in the Wetland and the supporting catchment. The catchment area forming part of the greater wetland system is also significant to the ongoing health and sustainability of the Wetland and therefore the Plan also (to some extent) addresses land management issues within the wider area.

It is important to recognise that most of the area, including land within both the Wetland and catchment, that the Plan covers is in private ownership. For example, approximately 28% of the Lower Catchment – Wetland precinct (Section 3.1.1) is held as one private landholding (Boneo Park). Accordingly, ongoing cooperation and a partnership approach with private landowners will be critical to the ongoing protection of the Wetland.

In this context, this document is intended to be a strategic management plan. It does not aim to provide specific management recommendations for each individual property, but rather provides strategic directions and recommended actions necessary to address the identified threats to the values of the Wetland as a whole, with specific recommendations only where appropriate.

More detailed plans, planning scheme provisions, agreements, covenants, Memorandums of Understanding and other management instruments will need to be developed over time. These may establish more specific targets for maintenance/restoration on particular sites, as is the case under the Trust for Nature covenants and Shire reserve management plans.

To ensure that the actions contained in the Plan can be successfully implemented, an extensive consultation process has been undertaken with all interested stakeholders including; land owners,

businesses, site managers, community groups, local schools, sporting clubs, Government and Agency departments.

It is also recognised that the research and information base which informs the Plan continues to be developed, and significant data gaps still exist. However, in accordance with the precautionary principle, it is considered that a sufficient understanding of the Wetland exists to provide the basis for the Plan and that delaying action until complete information is available, risking further and potentially irreversible impacts, would be counterproductive.

Aerial View of the Tootgarook Wetland looking East

1.1 The Value of Wetlands

Wetlands are a critical part of our natural environment and play a key role in supporting biological diversity. Wetlands support distinctive plant species as well as waterbirds, fish, amphibians and reptiles during important life stages by providing roosting, nesting and feeding habitat as well as areas of refuge during extreme weather conditions. They also form corridors or stepping stone habitats that support the migration of species, including waterbirds and marine mammals.

Wetlands also provide significant economic, social and cultural benefits. They are of high cultural significance to Aboriginal people and are increasingly recognised for their cultural value in supporting awareness and providing a connection to the natural environment. With careful management, wetlands can also support significant recreational and eco–tourism activities, and in some cases, low impact forms of agriculture and aquaculture. Wetlands also help reduce the impacts of flooding, maintain good water quality in rivers, recharge groundwater, store carbon, help stabilise climatic conditions and control pests (OEH 2013).

Despite their significance, wetlands around Australia are under pressure from various processes, usually linked to human activities, which change natural patterns of inundation and drying, the frequency and magnitude of surface and groundwater flows, water quality and the condition of fringing and in-stream habitats. These changes also change the quality and composition of vegetation communities and the associated habitat values. Invasive species also threaten biodiversity by degrading habitat and out-competing or (in the case of introduced animals) preying on native species.

These cumulative impacts undermine the capacity of wetlands to continue to support biodiversity as well as reduce the resilience of wetlands to respond to ongoing threats and pressures (Department of the Environment 2016). While these pressures affect a range of wetland species, of particular concern is the impact on waterbirds which rely on healthy wetlands for their lifecycle. Some of Australia's most vulnerable species are waterbirds.

1.2 The Significance of the Tootgarook Wetland

The Wetland represents the largest **Groundwater Dependent Ecosystem** (**GDE**) and **freshwater marsh** in the region and is identified as a priority area under the **Melbourne Water Healthy Waterways Strategy** (Melbourne Water 2013a). This classification is also reflected in the Port Phillip and Western Port Regional Catchment Strategy (PPWCMA 2012).

The Wetland is also recognised by the Department of Environment, Land, Water and Planning (**DELWP**) as a **biosite of state significance** and forms part of the internationally recognised **Western Port Biosphere**.

While the Wetland is not currently designated as a Ramsar listed wetland (i.e. a wetland of international significance) it arguably meets several the listing criteria, particularly having regard to the presence of nationally listed endangered species, including the Australasian Bittern (BMT WBM 2015). Therefore, it is considered that the Wetland would have strong case for consideration as being of national and internationally significance.

1.3 Vision for the Tootgarook Wetland

The vision for the Wetland is intended to reflect the aspirations of the community, community groups, Government agencies and other key stakeholders.

'The Tootgarook Wetland is maintained and enhanced as a valuable ground water ecosystem, dynamic natural resource landscape and open space that is treasured by the Mornington Peninsula community.

The Wetland's diverse and significant native vegetation communities, which occupy seasonally aquatic and terrestrial areas that provide an important regional refuge for mammals, reptiles, amphibians, and birdlife are protected and enhanced.

The Wetland's ecosystem is protected, recognising its function as a link between the elevated upper catchment and the estuarine and marine receiving environment of Port Phillip Bay. This will enable the Wetland to support the healthy food-chain that attracts and feeds all creatures, especially migratory birdlife and marine life.

Chinamans Creek catchment is recognised and promoted as a cultural place, where our community is continually learning about the special biodiversity and environmental characteristics of the Wetland and the amazing animal and birdlife that resides within our region, and the important role of the Wetland played in supporting the Boonwurrung people and European settlers.'

The above vision was developed, through formal consultation, during 2012-2015 with the Tootgarook Wetland project groups, known as the Project Working Group (government agencies) and the Stakeholder Advisory Committee (community members and local groups) and may be summarised as follows:

The Tootgarook Wetland will be recognised for its great environmental and cultural significance, and for the environmental services it provides. It will be protected and enhanced for these values and as a place to inspire current and future generations.

1.4 Management Objectives

To ensure that the vision for the future of the Wetland is realised, the following management objectives have been developed:

- Prevent the further degradation of the Wetland, and where possible rehabilitate without changing the Wetland's existing ecological character
- Actively promote the Wetland's values by engaging stakeholders in knowledge sharing, towards a greater recognition, appreciation and collaborative management of the Wetland
- Recognise the role of the Wetland in the Catchment and the broader Port Phillip Bay area and adopt a landscape approach to wetland management
- Define the key risks to the Wetland's values, allowing for the Wetland to be managed in a manner that prioritizes resources to provide the best possible outcomes

1.5 Plan Development and Structure

Formal discussions regarding the development of the Plan began with the presentation of a report titled Wetland – Reference Group and SWOT Analysis (Item No. 2.5) at the Mornington Peninsular Shire Council meeting on 13 February 2012. The Councillors resolved to support the report and requested that Shire officers further investigate alternative planning provisions for other land parcels associated with the Wetland, in consultation with relevant agencies and landowners. In addition, the Councillors requested that Shire officer's brief them on any associated planning applications, engineering initiatives and projects in the area.

The first Tootgarook Wetland Information Session, at Tootgarook Community Centre was held on 17 April 2012. There was strong interest to develop a management plan for the Tootgarook Wetland. This led to the establishment of two stakeholder groups. The **Project Working Group** (**PWG**) is comprised of representatives from relevant government agencies and the **Stakeholder Advisory Committee** (**SAC**) engages representatives from the local community. The first meeting of the PWG was held in November 2012, at the Mornington Peninsular Shire office. Nominations to join the SAC were formally accepted in March 2013, and the inaugural meeting was held on 16 April 2013 at the Tootgarook Community Centre.

The Plan was developed collaboratively by the multidisciplinary Project Team comprised of members from the Shire, and consultants BMT and Conservation Volunteers Australia. The Project Team was supported by the PWG and SAC.

Throughout the Plan development, the local community was engaged using various formal and informal media, which included public open sessions.

Project Working Group and Stakeholder Advisory Committee workshop with Collective Possibilities

The structure of the Plan is presented in Table 1-1.

Table 1-1 Tootgarook Wetland Management Plan Structure

Section	Summary
Section 1	**Introduction -** Introduction, Vision, Objectives, Plan Development and Document Structure.
Section 2	**Policy Framework -** Legislation, policy, and planning controls which apply to land within the Wetland and Catchment.
Section 3	**Tootgarook Wetland and Chinamans Creek Catchment Description -** Overview of the site, description of the wetland, natural history, tenure and land use. Sub-precincts and sites of interest are identified.
Section 4	**Value and Threat Assessment** – Identifies, describes and assesses the key Wetland values and threats.
Section 5	**Risk Assessment –** Defines the risk (danger) to each key value attributed to each key threat. This allows for informed decision making for the management of the Wetland.
Section 6	**Action Plan** – presents the recommended management actions based on the following themes: **1.00** Land Use Planning **2.00** Environmental Management **3.00** Recreation and Tourism **4.00** Community Awareness, Education and Involvement **5.00** Research and Monitoring
Section 7	**Implementation and Review**
Section 8	**References**

2 Policy Framework

The policy and planning framework relevant to the management of Tootgarook Wetland is summarised in the following sections.

2.1 Strategies

The over-arching strategy for the management of waterways and wetlands in Victoria is the **Victorian Waterway Management Strategy** (**VWMS**). The VWMS 'provides the framework for government in partnership with the community, to maintain or improve the condition of rivers, estuaries and wetlands so that they can support the environmental, social, cultural and economic values for all Victorians' (DEPI 2013). The VWMS sets out policies for managing public wetlands in fragmented landscapes and high values wetlands on private land, both of which apply to the Tootgarook Wetland.

Falling under the VWMS are the regional waterways strategies which identify priority waterways (areas) and management activities. Melbourne Water's **Healthy Waterways Strategy** is the regional waterway strategy for the Greater Melbourne metropolitan area, for which Melbourne Water acts as the waterways manager. It is in this strategy that the Wetland is identified as a priority area for investment (Melbourne Water 2013a). This Strategy is currently being reviewed by Melbourne Water.

The **Regional Catchment Strategy for the Port Phillip and Western Port region** (PPWCMA 2012) sets out the land management framework for the Port Phillip and Western Port catchment area (coincides with Melbourne Water's area of waterway management).

Other strategies relevant to the management of the Wetland and the Catchment are:

- **East Port Phillip Bay Groundwater Catchment Statement** (SRW 2014), which includes the Nepean Local Management Plan
- **Victorian Coastal Strategy 2014** (VCC 2014)
- **Victorian Floodplain Management Strategy** (Revised Draft) (DELWP 2015)
- **Victorian Coastal Acid Sulfate Soils Strategy** (DSE 2009)
- **Stormwater Strategy 2013-2018** (Melbourne Water 2013b)
- **Port Phillip and Western Port Invasive Plants and Animals Strategy** (PPWCMA 2011)
- **Capel Sound Foreshores Coastal Management Plan** (Capel Sound Foreshores 2015)

Shire strategies and plans that complement the Plan and aid in the management of the Wetland and the Catchment are:

- **Integrated Local Flood and Drainage Strategy** (MPS 2009a)
- **Mornington Peninsula Shire Council Stormwater Management Plan** (WBM Oceanics Australia 2002)
- **Mornington Peninsula Domestic Wastewater Management Plan** (MPS undated)
- **Municipal Waste Management Strategy** (MPS 2009b)

- **Domestic Animal Management Plan 2013 – 2017** (MPS undated)
- **Mornington Peninsula Municipal Fire Management Plan** (MPMFMPC undated)
- **Open Space Strategy** (MPS undated)

2.2 Key Policies and Legislation

This section provides a summary of the key pieces of environment and planning legislation under which the Wetland is managed. There are many other pieces of legislation that are not included in this summary that must be taken into consideration when implementing the management strategies developed in this Plan.

2.2.1 International Conventions

Migratory Species

Australia is a signatory to four international conventions on migratory species. The conventions are the; **Convention on Migratory Species** (also known as the Bonn Convention), **Japan-Australia Migratory Birds Agreement** (**JAMBA**), **China-Australia Migratory Birds Agreement** (**CAMBA**) and **Republic of Korea-Australia Migratory Birds Agreement** (**ROKAMBA**).

The key international legal instrument relating to wetlands is the **Ramsar Convention**. The Ramsar Convention aims to promote the conservation and wise use of wetlands. Under the Convention, parties must designate 'internationally significant' wetlands for inclusion on the List of Wetlands of International Importance. While the Wetland is not currently designated as a Ramsar wetland, there is ongoing work regarding the potential future nomination.

The Wetland and Catchment also fall within the boundary of the Western Port Biosphere under the **United Nations Educational, Scientific and Cultural Organisation's** (**UNESCO**'s) Man and the Biosphere Program. Biosphere reserves include urban, industrial and agricultural areas as well as conservation reserves, and participation by landowners is voluntary. For management purposes, they are structured into three zones:

(1) Core—Conservation areas that are legally protected (e.g. national park)

(2) Buffer—Areas surrounding the core, where activities compatible with conservation occur

(3) Transition—Other areas, e.g. private land, farms, industrial and urban areas, where sustainable practices are developed and promoted by the community

2.2.2 Commonwealth Legislation

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**

The ***Environment Protection and Biodiversity Conservation Act 1999*** (Cth) (**EPBC Act**) is Australia's central piece of environmental legislation, providing a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places; termed **Matters of National Environmental Significance** (**MNES**).

As described in Section 4.1.3, there are species of threatened and migratory birds, considered as MNES that have been recorded in the Wetland. Under the Act proposed developments and actions

that may impact upon these bird species and their habitat could trigger the Commonwealth Environmental Impact Assessment process.

It should be noted that (to date) no EPBC Act referrals to the Minister relating to development proposals within the existing wetland boundary have triggered the Act.

2.2.3 Victorian Legislation

***Water Act 1989* (Vic)**

The ***Water Act 1989*** (Vic) is Victoria's principal act regulating water in Victoria. It provides the legal framework for the administration and allocation of surface water and groundwater in Victoria. Under the Act a system of licences and offences for works on waterways is established, allowing for actions to be managed on freehold land.

The Act also requires waterway managers to manage wetlands and the adjacent 20 metres for Designated Waterways. As the Wetland lies partly on private land, it is unclear as a 'swamp or marsh', which are included in the definition of a waterway under the Act, the Wetland is a Designated Waterway. If the Wetland is not a Designated Waterway, the application of the Act is limited.

***Catchment and Land Protection Act 1994* (Vic)**

The ***Catchment and Land Protection Act 1994*** (Vic) establishes a broad, overarching framework for the integrated and co-ordinated management of catchments, which aims to maintain and enhance the State's land and water resources, balancing long-term land productivity with environmental conservation.

Under the Act, Victoria is divided into ten catchment regions, and a Catchment Management Authority (**CMA**) is established for each region. The Mornington Peninsula falls within the Port Phillip and Western Port region. The Port Phillip and Western Port region is unique as Melbourne Water acts as the waterway manager and the **Port Phillip and Western Port Catchment Management Authority** (**PPWCMA**) acts as the land manager.

The Act provides a duty for landholders to protect water resources, conserve soil, eradicate and control the growth of weeds and pests on private land.

***Coastal Management Act 1995* (Vic)**

The ***Coastal Management Act* 1995** (Vic) was enacted to establish the Victorian Coastal Council, provide for the establishment of Regional Coastal Boards and co-ordinate strategic planning and management for the Victorian coast. It also provides for the preparation and implementation of management plans for coastal Crown land and a co-ordinated approach to approvals for the use and development of coastal Crown land.

***Environment Protection Act 1970* (Vic)**

The ***Environment Protection Act 1970*** (Vic) establishes the **Environment Protection Authority** (**Vic EPA**) and makes provision for the Authority's powers, duties and functions. These relate to improving the air, land and water environments by managing waters, control of noise and control of pollution. The EP Act regulates industrial development and activities through a permit and licensing framework with associated enforceable offences.

The Act also requires the establishment of **State Environment Protection Policies** (**SEPP**s). SEPPs are subordinate legislation developed to provide more detailed requirements and guidance for the application of the Act to Victoria.

There are three main features of the policy and its schedules:

(1) beneficial uses

(2) environmental quality objectives

(3) attainment program

The two most relevant SEPPS to wetlands are Waters of Victoria and Groundwater.

Environmental Effects Act 1978 (Vic)

The ***Environment Effects Act 1978*** (Vic) requires consideration to be given to projects which may have significant impacts on the Victorian environment. Like the Commonwealth EPBC Act if proposed projects are likely to impact on matters of regional or State environmental significance then an environmental impact assessment process is triggered. The Wetland displays several characteristics that are considered of State significance.

Aboriginal Heritage Act 2006 (Vic)

The ***Aboriginal Heritage Act 2006*** (Vic) provides for the protection and management of Victoria's aboriginal heritage through processes linked to the Victorian planning framework. More specifically the Act establishes the Victorian Aboriginal Heritage Council (advises the Minister for Aboriginal Affairs on issues relating to the management of cultural heritage), and includes provisions for Cultural Heritage Management Plans and Cultural Heritage Permits.

As a site of aboriginal heritage value, the provisions of the Act must be taken into consideration during the planning process.

Heritage Act 1995 (Vic)

The ***Heritage Act 1995*** (Vic) is Victoria's principle legislation for the identification and management of non-Indigenous heritage places and objects of State significance, historical archaeological sites and maritime heritage. The Act establishes the Victorian Heritage Register, the Heritage Inventory and the Heritage Council of Victoria.

The *Heritage Act 1995* (Vic) provides protection for historic heritage places and objects of State significance. Currently there are no heritage places of State significance identified within the Wetland or the Catchment. The heritage places of local significance are protected by Heritage Overlays included as part of the Shire's planning schemes (Section 2.3).

2.3 Planning Controls

2.3.1 State Planning Controls

The ***Planning and Environment Act 1987*** (Vic), supported by the ***Planning and Environment Regulation 2005*** (Vic), provide the legal framework for the operation of Victoria's planning system. The Act sets out procedures for preparing and amending the **Victoria Planning Provisions** (**VPPs**) and planning schemes, obtaining permits under schemes, settling disputes, enforcing compliance with planning schemes, and other administrative procedures.

The VPPs are set of standard provisions that are used as a state-wide reference, or template for the development of municipal planning schemes. The state-wide provisions of the VPPs may be complemented by local policies contained in the Municipal Strategic Statement and by local schedules to the standard VPP zones and overlays.

All Planning Schemes include the **State Planning Policy Framework** (**SPPF**), which sets out the State Planning Policies which apply to all land in Victoria. Clause 12 of the SPPF (Environmental and landscape values) provides that; *planning should help to protect the health of ecological systems and the biodiversity they support (including ecosystems, habitats, species and genetic diversity) and conserve areas with identified environmental and landscape values*.

2.3.2 Local Planning Controls

The State Planning Policy Framework is implemented through the **Mornington Peninsula Planning Scheme**. The Mornington Peninsula Planning Scheme sets out the planning goals for Shire and the provisions for individual planning zones and overlays.

The Mornington Peninsula is identified as an environmentally sensitive area and as one of only four regions across Victoria identified to have significant geographic and physical features, which contribute to the quality of life of Melburnians and Victorians.

As a result, the **Mornington Peninsula Localised Planning Statement** (Victorian Government 2014) has been developed. Localised planning statements are long-term policies that set out broad policies for the future planning and development of a region.

Notably, the Localised Planning Statement highlights that the Mornington Peninsula has only a limited role in accommodating further infill residential development and prioritises other objectives including the conservation of natural systems and biodiversity.

In this context, the Statement provides that:

- The natural systems of the Mornington Peninsula, on both public and privately-owned land, will be conserved and managed for their habitat and biodiversity values and to maintain and enhance the experience of the natural environment. This will include the conservation of areas of significant flora and fauna value and sites of geological significance.
- Planning for the Mornington Peninsula will be directed towards maintaining and increasing biodiversity and increasing the resilience of natural systems. Where the development of land requires environmental offsets, these will be provided on the Mornington Peninsula and in the local area where appropriate.

- Maintenance of environmental quality and protection against pollution and degradation of every description will be primary considerations.
- Planning for the area will consider information from scientific studies and other research into the area and adjacent bays and catchments.

Objectives which are consistent with the Planning Statement are expressed throughout the **Municipal Strategic Statement** (**MSS**) and local policies which form part of the Mornington Peninsula Planning Scheme.

In terms of land use zoning, most of the Wetland and the Catchment is included in the Green Wedge Zone (GWZ2 and GWZ4). However, the areas adjacent to the existing residential area of Capel Sound continue to be included in zones reflecting previous planning directions, including the General Residential Zone (GRZ) – adjacent to Elizabeth Avenue and St Elmo's Close, the Industrial 3 Zone (IN3Z), and Special Use Zone (SUZ4 – integrated recreational and residential development), as well as areas of public land that are included in the Public Park and Recreation (PPRZ), and Public Conservation and Resource Zone (PCRZ). There are also several Public Use Zones and Road Zones which apply to specific areas.

In addition to the land use zoning provisions there are also several planning overlays, which apply over all or part of the Wetland area. Overlays are intended to identify particular environmental, design or heritage characteristics which need to be considered in the assessment of use and development proposals. The overlays which apply to the Wetland area include:

- Seven Environment Significance Overlays (**ESO**) -
  - ESO 14 - Tootgarook Swamp – Boneo Flats Land Unit
  - ESO 17 - Streamlines
  - ESO 18 - Wetlands
  - ESO 19 - Fluviatile Deposits
  - ESO 23 - Semi- Stabilised Dunes
  - ESO 28 - Mornington Peninsula Bushland
  - ESO 30 - Tootgarook Wetland
- A Heritage Overlay
- A Land Subject to Inundation Overlay (**LSIO**)
- A Public Acquisition Overlay (**PAO**)
- A Significant Landscape Overlay (**SLO**)
- A Bushfire Management Overlay (**BMO**)

The most recent change in relation to planning scheme controls in this area was the introduction of Environmental Significance Overlay (ESO) 30 – Tootgarook Wetland in March 2016 (through Planning Scheme Amendment C188 part 2). This new ESO better reflects the environmental value and sensitivity of the area and the greater evidence base now available.

3 Tootgarook Wetland and Chinamans Creek Catchment Description

The Tootgarook Wetland is in Capel Sound (formerly Rosebud West) on the Mornington Peninsula approximately 65 km south of Melbourne (Figure 3-1).

The Wetland is situated within the Chinamans Creek Catchment, which covers an area of approximately 4,480 hectares (Figure 3-1). The Catchment spans from the Arthurs Seat hills in the east, to Cape Schanck in the south, the boundary of the Aeolian dune buffer system to the west, and Port Phillip Bay to the north. Most of the Wetland lies directly south of the urban fringe of Capel Sound in the area encompassed by Truemans Road to the west, Boneo Road to the east and Limestone Road to the south.

Most of land within the catchment has been cleared for market gardens, grazing, housing, recreation including equestrian use and golf courses, roads and light industry (small scale). Limited and isolated patches of native vegetation exist in the upper reaches of the catchment along the western boundary within the Mornington Peninsula National Park, the Peninsula Gardens Bushland Reserve and alignment of watercourses.

The wetland is fed both by rainwater, groundwater and surface water from Drum Drum Alloc Creek (which flows from the Rosebud Sands area to the east) and Chinamans Creek. It flows into Port Phillip Bay via Chinamans Creek.

The two creeks have long been linked by a constructed drain (now referred to as part of Chinamans Creek) which runs south to north through the centre of the Wetland. The original course of Chinamans Creek ran through the Capel Sound residential area, in the vicinity of the Tern Avenue Bushland Reserve.

The northern section of the original Wetland is now within the residential area between Elizabeth Avenue and Point Nepean Road.

The core Wetland area still covers an area of approximately 590 hectares as shown in Figure 3-1, with the maximum extent associated with areas that are periodically waterlogged or inundated with water with sufficient frequency and/or duration to influence the ecological processes and plant and animal communities that occur there.

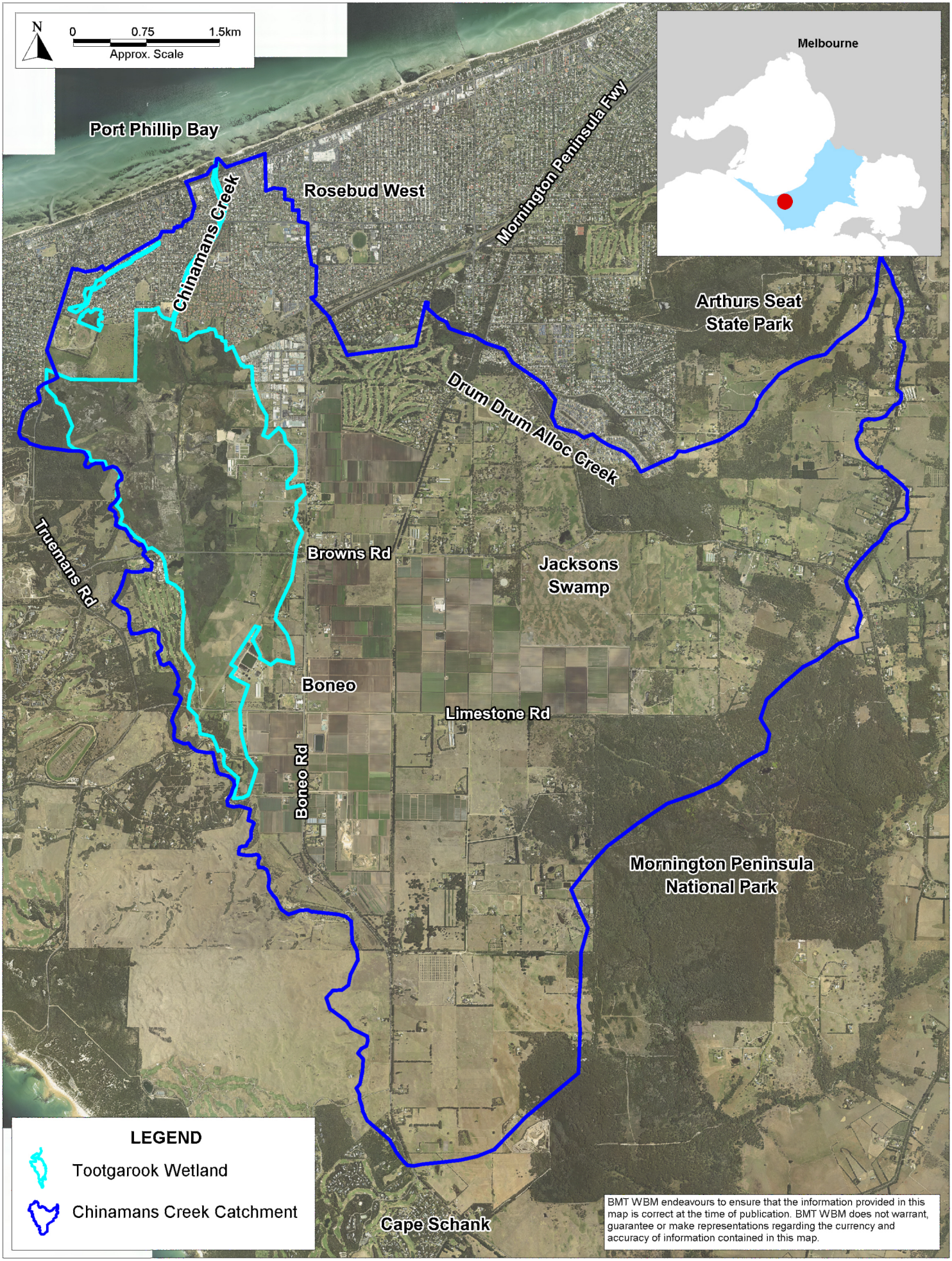

Figure 3-1 Tootgarook Wetland and Chinamans Creek Catchment Location

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3.1 Catchment Precincts

The Catchment has been divided into five catchment precincts as shown in Figure 3-2. This assists in both identifying values and threats which relate to specific areas and framing subsequent actions.

Each catchment precinct has varying characteristics as described in the following sections. Where there are distinct land use types present within a precinct, sub-precincts have been defined.

The precincts are described as follows:

- **Precinct 1** Lower Catchment – Wetland
- **Precinct 2** Lower Catchment – Town
- **Precinct 3** Lower Catchment – Industrial
- **Precinct 4** Middle Catchment – Horticulture
- **Precinct 5** Upper Catchment – Rural
- **Precinct 6** Upper Catchment – National Park

3.1.1 Lower Catchment - Wetland

The Lower Catchment – Wetland precinct (Figure 3-2) contains the main body of the Wetland and comprises several land-uses that can be best described as mixed use semi-rural or urban fringe. The main land uses present in this precinct include semi-rural private land, wetland conservation and Shire-managed bushland reserves.

Key sites within this precinct are described below.

Truemans Road Recreation Reserve (Former Landfill)

The Truemans Road Recreation Recreational Reserve, located on a former landfill site, establishes the north-western extent of the main Wetland area. The former landfill, which has now been decommissioned, disconnects the Tootgarook Wetlands Reserve and the Tern Avenue Reserve (original wetland outlet) from the rest of the Wetland.

The Truemans Road Recreation Reserve on Truemans Road provides two sports fields, athletics track, hard courts, playground, a miniature aero sports field and associated pavilions/car parking. It is home to Southern Peninsula Little Athletics, Southern Peninsula Masters Athletics, Rosebud Heart Junior Soccer Club, Tootgarook Cricket Club, and Australian Croatian Social (Bocce) club, Nepean Netball Association, Flinders Greyhound Club and Nepean Miniature Aerosport Association. The sports fields are located on the north-west section of the site, the Shire is currently rehabilitating the south-west section and the aero sport area is located on the eastern section of the site, and is subject to a use agreement with Council.

Future “Inland” Arterial Road/Freeway Reservation

A corridor of land designated for the possible future extension of the Mornington Peninsula Freeway runs from current Mornington Peninsula Freeway - Boneo Road roundabout southwest across the Wetland. East of the Chinamans Creek channel this land is managed by VicRoads. To the west of Chinamans Creek the road corridor runs through private land.

Council's strategic position is that any increase in the east-west capacity of the road network on the southern Mornington Peninsula should be provided by a new inland arterial road, subject to a further feasibility analysis and aligned with the Tootgarook Wetland Management Plan recommendations. Council has requested that the existing Public Acquisition Overlay for the Mornington Peninsula Freeway reserve extension between Boneo Road and Melbourne Road be investigated for removal from the Mornington Peninsula Planning Scheme (Council Meeting 13 June 2017, Item 3.5). Council is concerned with the potential environmental impacts of a freeway extension through the Tootgarook Wetlands and has requested further investigation by VicRoads to explore viable alternatives.

312 Boneo Road (Boneo Park)

The Boneo Park property is made up of a land parcels totalling approximately 330 ha, representing approximately 56% of the core Wetland Area. In 2013, approximately 200 hectares of the land was included in a native vegetation offset agreement and placed under conservation covenants with the **Trust for Nature** to ensure it is protected into the future. The front section of the property adjacent to Boneo Road, which is not covenanted, has been developed as an equestrian facility.

The Trust for Nature covenants implement agreements made through the "Bushbroker" program (or similar programs), where public agencies and private developers fund environmental improvements on suitable sites to offset the loss of native vegetation which result from their development/infrastructure projects. The funding is intended to achieve biodiversity improvements – but does not affect ownership of the land. The covenants do however provide for annual monitoring by Trust for Nature and an ongoing requirement to maintain the land after the initial 10-year implementation period.

Boneo Park, and the use of conservation offsets and covenants, is a significant example of a conservation initiative on private land, supported by the private land owner, which can act as a model for other landowners within the management plan area.

92 Elizabeth Avenue (front section) and 9 St Elmo's Close, Capel Sound

These are the two remaining undeveloped parcels remaining in the General Residential Zone. Both areas have previously been subject to unsuccessful development applications. These properties have been identified as areas where the current zoning needs to be reviewed as a matter of priority. Having regard to their potential as biodiversity/native vegetation credit offset sites, future planning provisions may support this role.

The Shire recently acquired 92 Elizabeth Avenue. A significant area of this property is already committed under a revegetation order under Section 114 of the *Planning and Environment Act 1987* (Vic).

3.1.2 Lower Catchment – Town

The Lower Catchment – Town precinct (Figure 3-2) encompasses Capel Sound and is located between the northern boundary of the Wetland and Port Phillip Bay.

Capel Sound is mostly residential development accompanied by standard services such as schools and commercial enterprises. The town is located on the coastal dunes that separate the Wetland from Port Phillip Bay. However, development has encroached on the Wetland area, particularly in

the area north of the Truemans Road Recreational Reserve where the original wetland outlet (Chinamans Creek) was located.

3.1.3 Lower Catchment – Industrial

The industrial precinct on Boneo Road (Figure 3-2) contains a mixture of high density industrial and industrial/commercial development. The natural ground elevations in the industrial precinct are similar to those in the remnant wetland area and where filling or other drainage works have not been implemented would become inundated during storm events or other high flow events.

Surface water quality sampling has indicated that there is an unacceptable level of pollutants entering Drum Drum Alloc Creek before flowing into Chinamans Creek and the Wetland. Elevated levels of pollutants are a common issue associated with industrial areas and can have significant adverse impacts on wetland flora and fauna species. Both Council and the EPA are committed to investigating pollution hotspots. Recent subdivision of land in this area has enabled Council to secure an additional area adjacent to the existing reserve.

3.1.4 Middle Catchment - Horticulture

The Middle Catchment - Rural precinct (Figure 3-2) contains a large area of commercial irrigated horticulture.

The area contains highly productive soils, suitable for intensive soil-based horticultural production. Two or three crops per year are generally grown requiring significant inputs of water and fertiliser to reach their productive potential.

Historically these market gardens have been irrigated using extracted groundwater. However, in recent times reliance on groundwater extraction has been reduced because of recycled irrigation water being made available from South East Water (**SEW**) Sewerage Treatment Works.

There are areas of native vegetation within the Middle Catchment – Horticulture precinct including a perched wetland known as Jacksons Swamp. The extent of Jacksons Swamp has been greatly reduced because of land grading for horticultural purposes.

3.1.5 Upper Catchment – Rural

The Upper Catchment - Rural precinct (Figure 3-1) contains areas cleared of native vegetation for grazing or semi-rural residential purposes, like the Semi-Rural areas of the Lower Catchment – Wetland precinct. It also contains several significant areas of natural habitat that provide important habitat corridors for native fauna across the Catchment.

3.1.6 Upper Catchment – National Park

The Greens Bush section of the Mornington Peninsula National Park encroaches on the upper catchment. The National Park provides an area of native woodlands within the catchment.

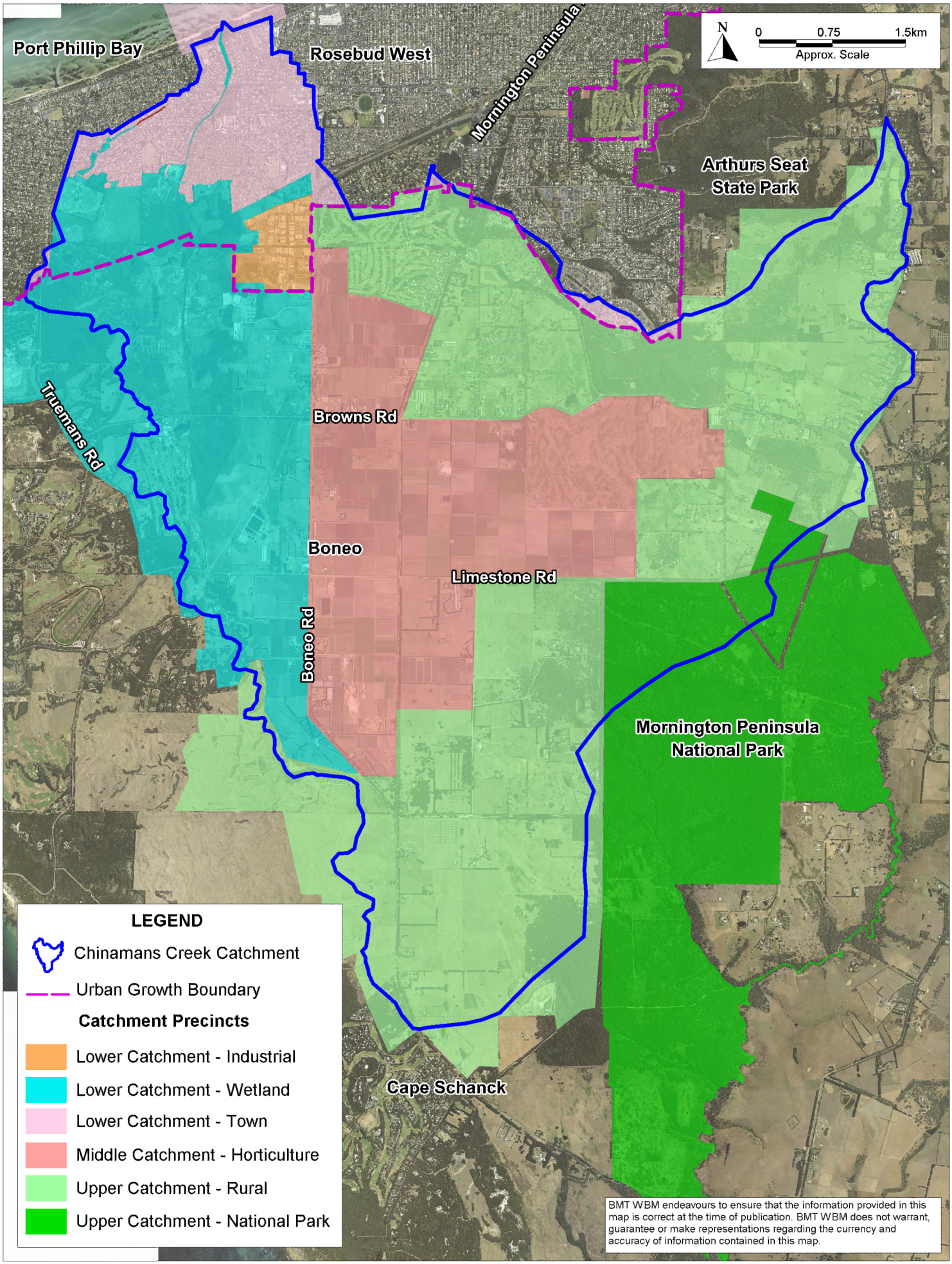

Figure 3-2 Chinamans Creek Catchment Map

3.2 Land Tenure and Management

The Wetland and Catchment includes land in both public and private ownership (Figure 3-3). Approximately 80% of all land covered by the Plan area consists of private land holdings. The balance is made up of State government and Shire owned land.

There are six Shire-managed bushland reserves located within the Wetland:

- Tootgarook Wetlands Reserve
- Tootgarook Swamp Bushland Reserve
- Tern Avenue Bushland Reserve
- Sanctuary Park Bushland Reserve
- Drum Drum Alloc Creek Bushland Reserve (40 Colchester Road)
- Chinamans Creek Bushland Reserve

These reserves provide areas of relatively natural habitat in reasonably good condition and the Tootgarook Swamp Bushland Reserve is covered by a **Trust for Nature Covenant**. The Trust for Nature also supports large conservation areas on private land, through further covenants.

Road reserves within and adjacent to the Wetland contain important areas of natural habitat.

Limited and isolated patches of native vegetation exist in the upper reaches of the catchment along the western boundary within the Mornington Peninsula National Park, Peninsula Gardens Bushland Reserve and along the alignment of two watercourses.

The Capel Sound Committee of Management, are delegated to manage the public land the foreshore area of the Chinamans Creek and abutting lands. Parks Victoria manages the marine component of the creek estuary. South East Water manage land developed for purpose of waste treatment located in Limestone Road.

Melbourne Water is the water authority for the region and manages the waterways within the region, including Chinamans and Drum Drum Alloc Creeks and the retarding basin in the industrial precinct.

VicRoads manages a parcel of land that constitutes a future freeway/ road corridor from Boneo Road to Chinamans Creek. Other road reserves within the area (e.g. Browns Road) are controlled by the Shire.

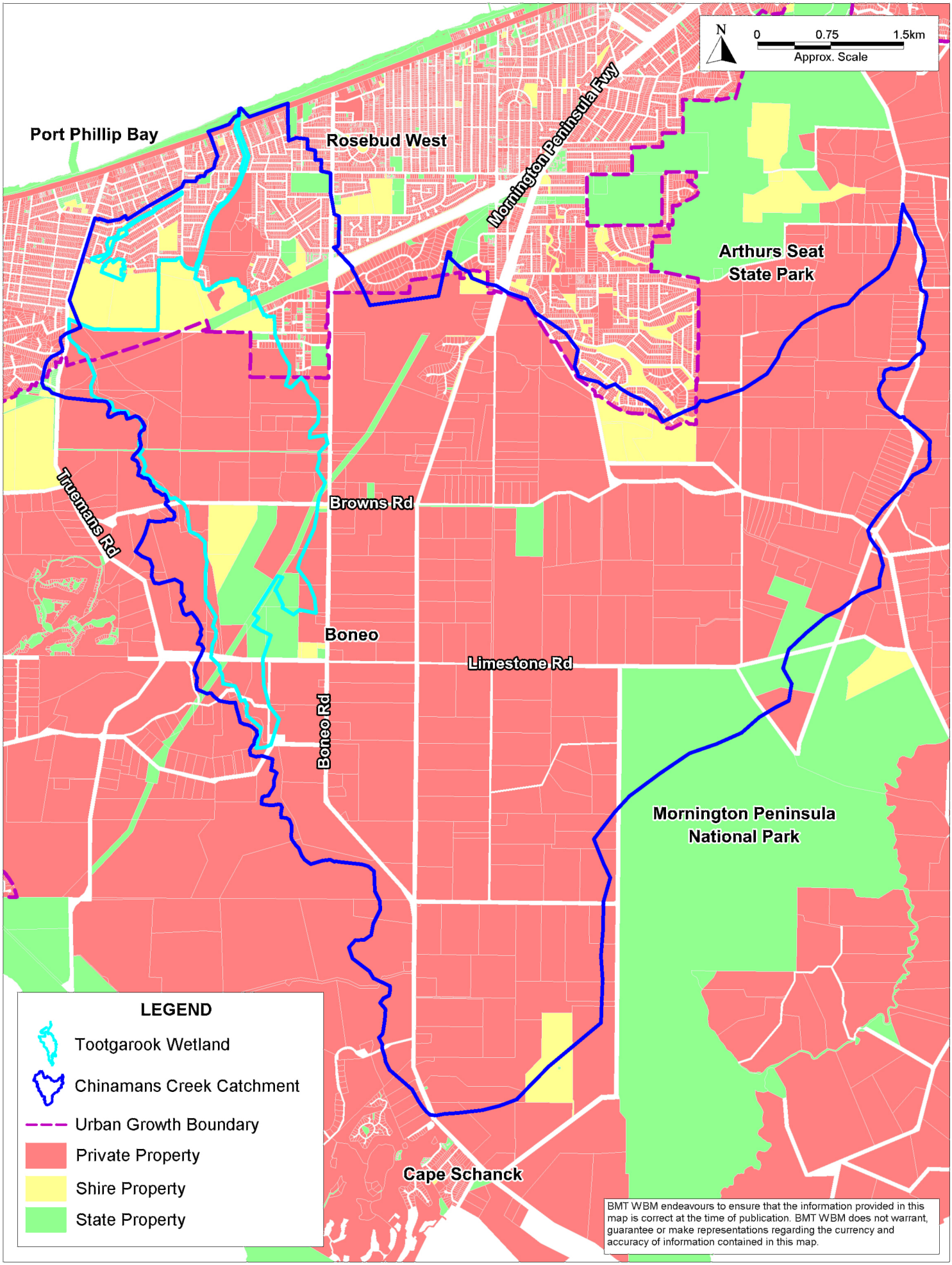

Figure 3-3 Land Tenure

3.3 Wetland Formation and History

The Wetland commenced forming between 6,000 and 4,000 years ago, when sea levels rose to a level approximately 1 - 1.5 metres above current sea levels creating a shallow inlet in the area that now incorporates the Wetland (BMT WBM 2015). Figure 3-5 presents a timeline of the Wetland's formation.

As the sea level in Port Phillip Bay retreated to current levels, the inlet became truncated by a series of prograded curved beach ridges that now lie under Capel Sound. Mostly isolated from the influence of tides and the incursion of seawater, the low-lying area behind the beach ridges was inundated by surface and ground water inflows. Native plants colonised the site, and over time, the Wetland in its natural form (pre-European) was realised approximately 200 years ago.

The creation of an inundated anaerobic environment provided the basis for the formation of peat soils due to the incomplete decomposition of vegetation.

Prior to European settlement and development of the Mornington Peninsula the Wetland covered a much greater area. Topography and historic survey provide an indication of the original extent of the Wetland, as shown in Figure 3-4, which was drawn following survey undertaken in 1841. This map shows that the original Wetland outlet was located to at the northwest corner of the Wetland (now the Tern Avenue Bushland Reserve), running northeast where it met Port Phillip Bay near the current location of the Chinamans Creek outlet. Several further surveys completed prior to the 1950s shows that the Wetland extended along a low-lying corridor of land that is now followed by Chinamans Creek.

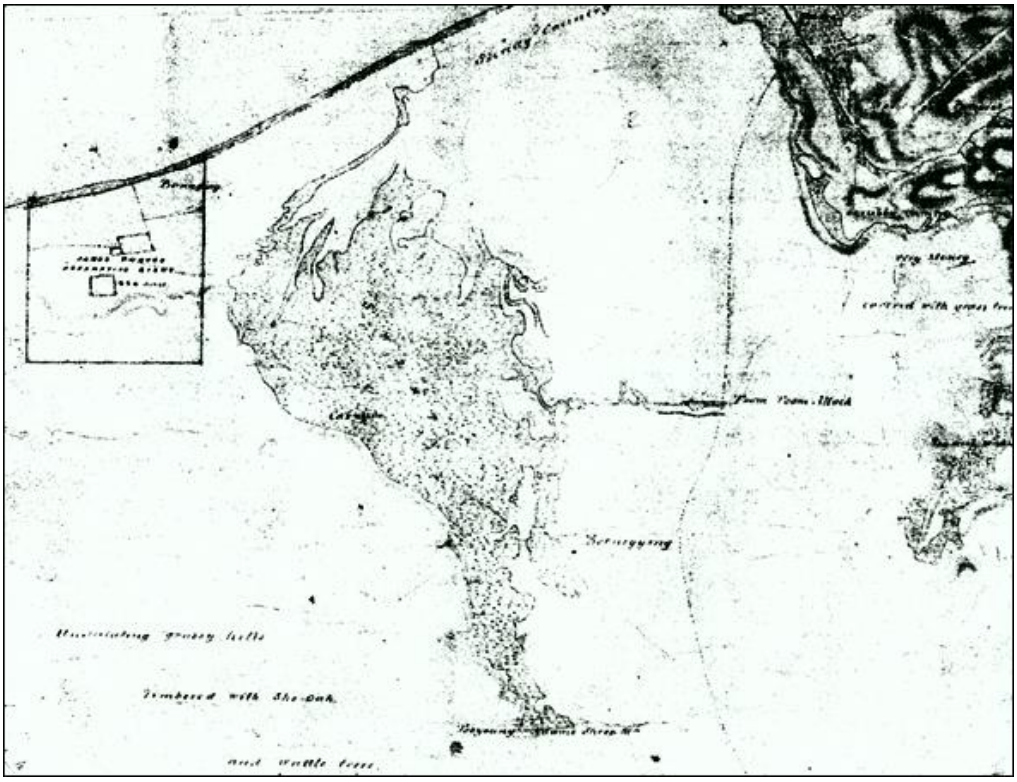

Figure 3-4 1841 survey of the Nepean Peninsula (Smythe 1841)

Drainage of the wetland commenced in 1878 and continued into the mid-1900s and Chinamans Creek was realigned and channelised in (Condina and Craigie 1998).

Vegetation, limestone and peat removal was extensive in the mid to late 1800s. Dairy farming began in 1850 near Boneo increasing vegetation clearance.

It is likely that many wetland plant species present have colonised the site as a result of European settlement and the subsequent disturbance of the site (Tonkinson et al. 2003). This is due to major changes in the Wetland function, mainly the draining of the Wetland via the establishment of Chinamans Creek, among other factors.

The earliest definitive description of the Tootgarook Wetland's vegetation identified in Moxham et al. (2009) was made by Anon in 1857, who noted that the area was 'swamp edged with tea-tree in general". Tonkinson et al. (2003) postulate that most of the site may have originally supported grassy vegetation dominated by Common Tussock-grass (with a wide range of smaller herbs, grasses and sedges adapted to seasonal inundation and waterlogging of the soils) with smaller areas of the wetland providing habitat for swamp scrub, waterlogging tolerant grasses, sedges, ferns and herbs

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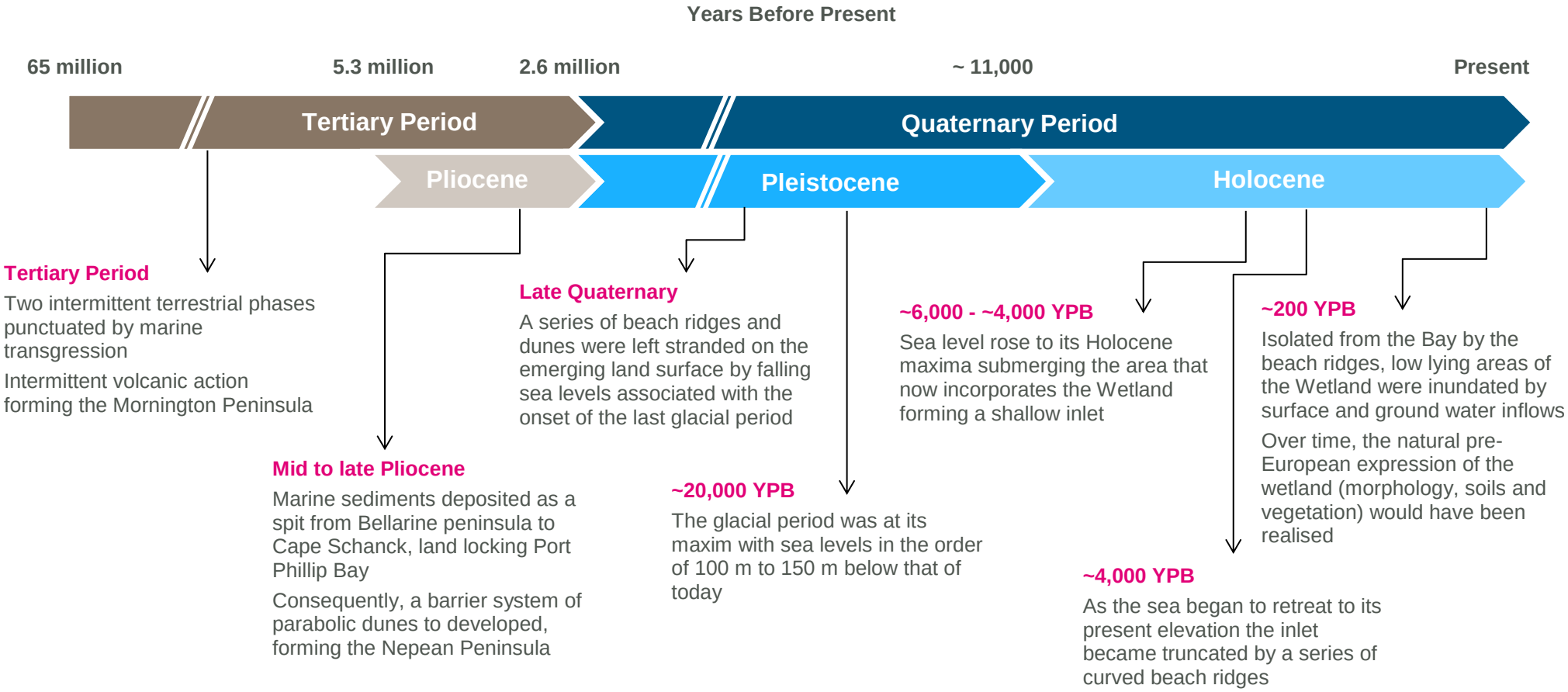

Figure 3-5 Geological / Geomorphological History and Wetland Formation Timeline

3.4 Current Wetland Character and Function

In its current form, the Wetland is a 590-hectare **groundwater dependent freshwater wetland**. Of the 590 hectares, approximately 60% (340 hectares) of the remnant Wetland area is relatively undisturbed by human activity and retains very high biodiversity values, providing a variety of important ecosystem services and benefits (described in Section 3.4.3).

An overview of the Wetland and its functions is shown on the Tootgarook Wetland Conceptual Model (Figure 3-6).

3.4.1 Wetland Extent

The current extent of the Wetland, as shown in Figure 3-1, is defined as follows:

- The **Cups dune formations** define the western boundary.
- The eastern boundary is defined by the edge of the low-lying areas that are likely to become intermittently inundated.
- The northern boundary has been defined along the urban fringe of Capel Sound, and excluding the former Rosebud West Landfill and the Tootgarook Sports Reserve.
- The South-East Water Sewerage Treatment Works has been excluded.
- Chinamans Creek, the Boneo Maze and Mini Golf including its Constructed Wetlands, the Tern Avenue Bushland Reserve, Sanctuary Park Conservation Reserve and Tootgarook Wetlands Reserve have all been included.

The Wetland extent shown in Figure 3-1 was defined for the **initial ecological character description** (**ECD**) (BMT WBM 2015). This extent was defined using aerial photography and ground elevation information and has not been 'ground truthed'.

Significant portions of the Wetland as defined in this Plan, particularly along Boneo Road have been drained, cleared and partially developed for agricultural purposes. Other areas, now forming part of the Capel Sound township have been developed for residential, commercial and industrial purposes.

While the ecological character of these areas has been diminished, they exhibit resilient physical and hydrological properties that suggest that these land parcels should be incorporated into the area identified as part of the Wetland extent.

3.4.2 Wetland Type(s)

The Tootgarook Wetland is currently classified as a **shallow freshwater marsh** in Victoria's Wetland Inventory. Under the Victorian Wetland Classification System, shallow freshwater marshes '*generally occupy ephemeral sheets of water which contract in size during the drier months. The degree of inundation, water depth and water availability at the periphery of the wetland changes seasonally i.e. usually dry by mid-summer and fill again with the onset of winter rains. However, soils tend to remain waterlogged throughout the year and surface water up to 0.5 m deep may be present for as long as eight months*' (Corrick and Norman 1980).

Many Australian wetlands are 'ephemeral' meaning there are times when they are dry and times when they are wet. Wetlands are the productive parts of our landscape because of this wet/dry cycle. There are many different stages within the wetting and drying cycles that builds greater biodiversity and production, than if the wetland was only wet.

During a drying phase when the water retreats, it stimulates reproduction in many plants and animals. Most wetland plants have strategies to survive the dry periods, such as staying dormant underground in tubers or rhizomes. Others will set seed that are dormant until the water returns.

Aquatic plants can also travel to re-invade wetlands, with the assistance of wildlife. For example, many aquatic sedges, have seeds that adhere to birds' feathers and can travel great distances, as the birds search for water. The drying of a wetland after a flood will also allow other plant species to invade the drying soil when their seeds germinate in the rich silty soil. Red gums are a great example of a species that is specialised to regenerate in wet and dry conditions.

The re-wetting of a wetland results in an explosion of life and a nearly instant source of food for wildlife in the area.

Several other remnant wetland types occur within the Wetland, including:

- **Deep freshwater marsh** - generally remain inundated to a depth of 1–2 m throughout the year.
- **Freshwater meadow** - shallow (up to 0.3 m) and temporary (less than four months duration) surface water, although soils are generally waterlogged throughout winter.
- **Permanent open freshwater** - usually more than 1 m deep. They can be natural or artificial. Wetlands are described to be permanent if they retain water for longer than 12 months, but they can have periods of drying.

3.4.3 Ecological Character

Ecological character is '*the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time*' (Ramsar 2005).

In general terms, ecosystem processes interact with components to generate a range of wetland services/benefits.

These services/benefits can be broadly applicable to all wetlands ecosystems (such as water regulation) or specific to a given site (for example, breeding habitat for an important bird species or population).

The Tootgarook Wetland Ramsar Nomination Feasibility Study 2015 (BMT WBM) provides detailed data and mapping, regarding the Ecological Character of the Wetland. Table 3-1 below provides a summary of the identified components, processes and benefits.

Table 3-1 Critical and supporting components, processes and services/benefits

	Components	Processes	Services/Benefits
Critical	CC1 – Wetland habitats CC2 – EVCs CC3 – Significant flora CC4 – Significant fauna CC5 – Peat soils	CP1 – Surface hydrology CP2 – Groundwater hydrology CP3 – Breeding (Australasian Bittern)	CS/B1 – Maintaining biodiversity CS/B2 – Water regulation including downstream W/Q CS/B3 - Cultural Heritage values
Supporting	SC1 – Aquatic invertebrates SC2 – Coastal Moonah Woodland	SP1 – Climate SP2 – Geology SP3 – Geomorphology SP4 – General ecosystem/biological processes	SS/B1 – Mediating potential ASS SS/B2 - Carbon sequestration

3.4.4 Wetland Function

As a GDE the Wetland's values are maintained by steady discharge of groundwater that is supplemented by periodic surface water inflows from the Catchment.

Melbourne Water commissioned a study to conceptualise the groundwater dependence of the Tootgarook Wetland (SKM 2012) and has since undertaken groundwater and surface water monitoring confirming that the Wetland is a highly groundwater dependent system (Jacobs 2017). The water table is at or just below the surface throughout the Wetland with seasonal variations in level of approximately 1m (Jacobs 2017). This maintains saturation of the soils supporting unique wetland habitats. Groundwater also discharges into the Chinamans Creek and Drum Drum Alloc Creek channels where it flows directly into Port Phillip Bay.

The Wetland's groundwater catchment is different to the surface water catchment (Chinamans Creek Catchment). As visualised in Figure 3-7, local groundwater flows from the recharge areas in the higher topographies; the hills in the east and dunes to the west (approximately along the alignment of Truemans Road) before discharging in the Wetland. Deeper regional groundwater flows in a northerly direction under the beach ridges (Capel Sound) where they provide freshwater discharge into Port Phillip Bay. This is critical in maintaining sea-grass along Capel Sound.

Groundwater maintains saturation of the wetland ecosystem. This provides habitat for wetland flora and fauna that in turn provide several services including the removal, recycling and immobilisation contaminants and nutrients. The complex relationships between hydrologic and biologic processes of wetlands are shown in Figure 3-7.

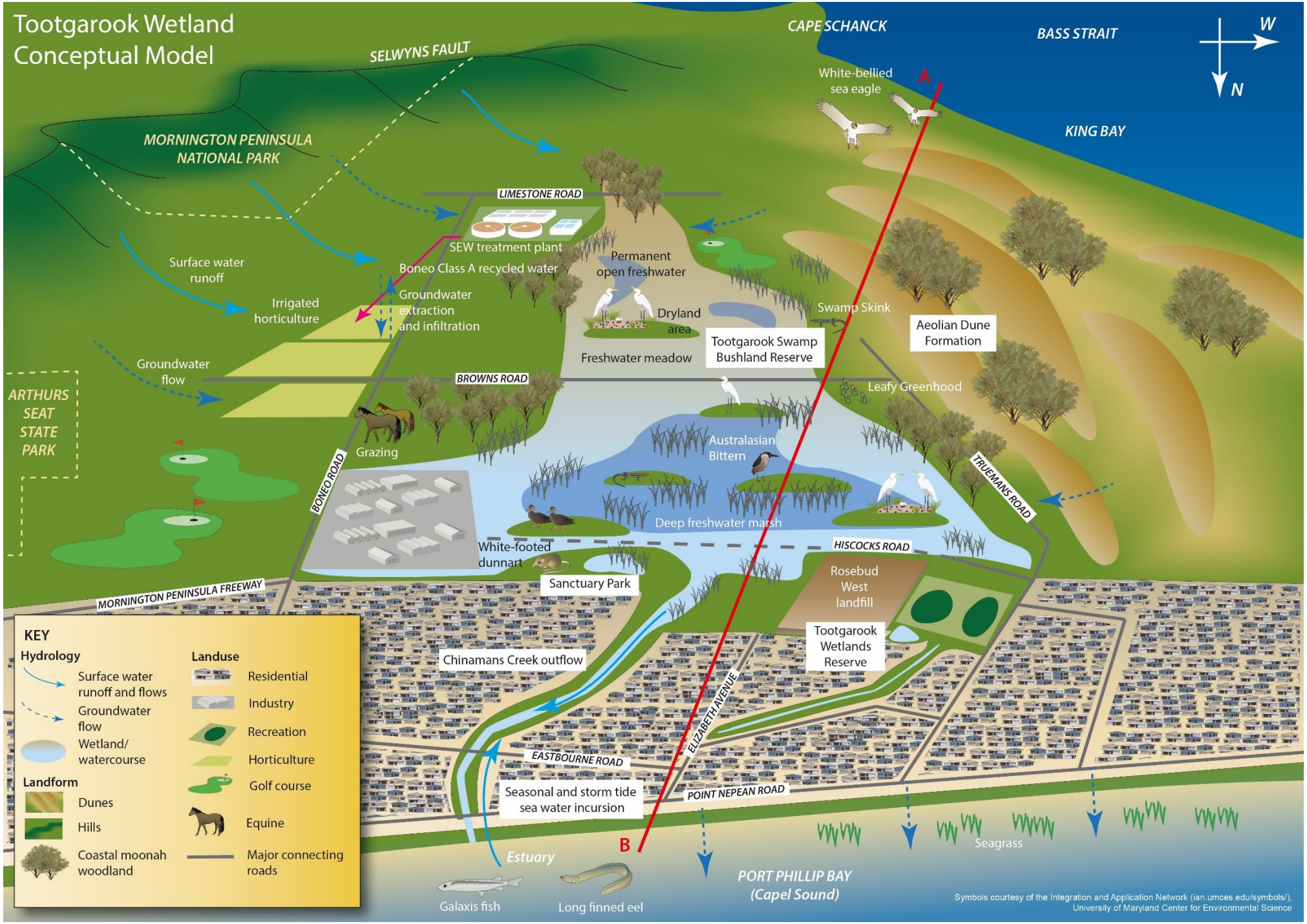

Figure 3-6 Tootgarook Wetland Conceptual Model

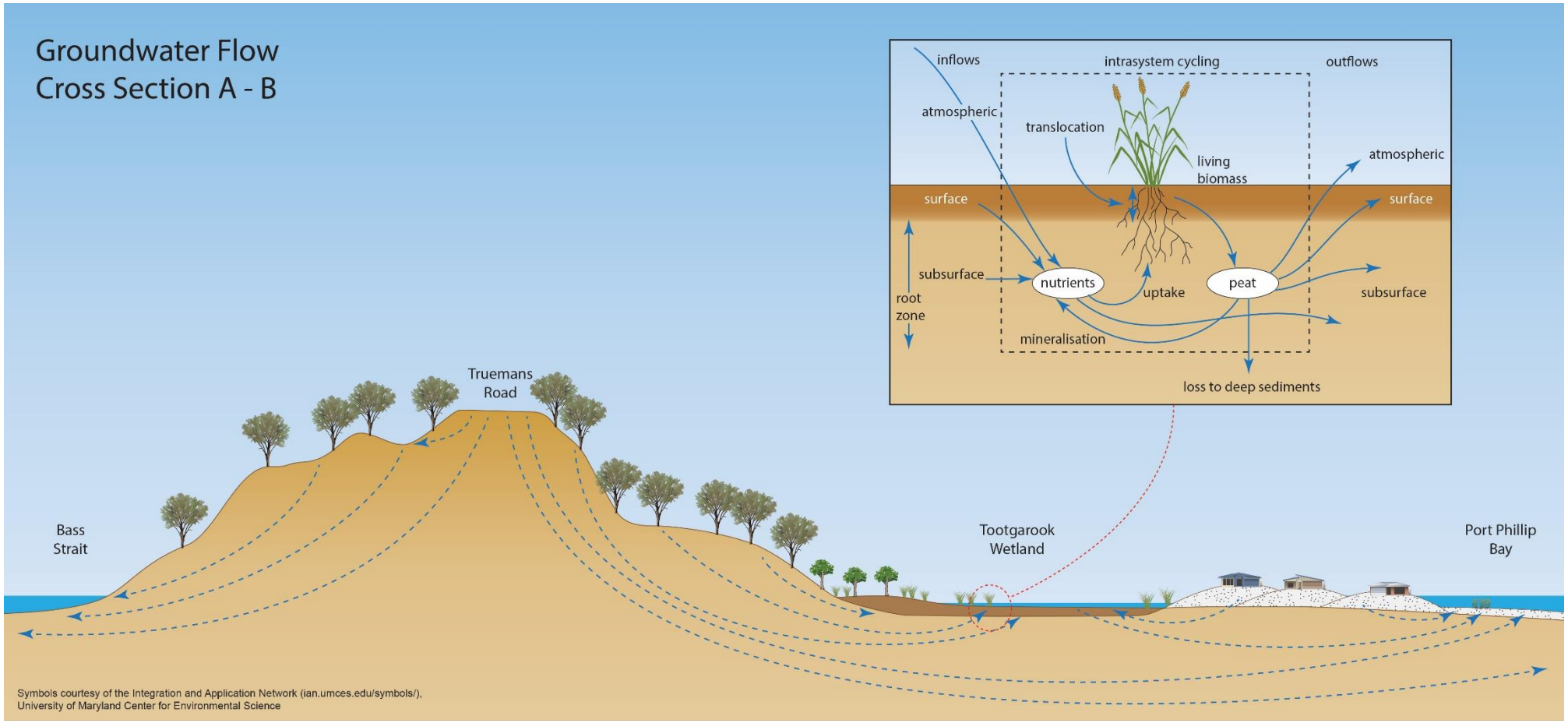

Figure 3-7 Wetland Processes

3.5 Current Wetland Condition

There have been numerous ecological studies completed for individual areas and/or processes and services/benefits of the Wetland, including the recent fauna surveys undertaken by Legg (2014) and BirdLife Australia (2016). However, as a whole, there remains significant knowledge gaps regarding the ecological condition of the Wetland.

In 2016 Melbourne Water commissioned the Arthur Rylah Institute to undertake a condition assessment of four priority groundwater dependent wetlands in their management area, including the Tootgarook Wetland (Papas, et al. 2016). The assessment was undertaken using **the Index of Wetland Condition for Groundwater Dependent Wetlands** (**IWC - GDE**) method. This method uses a combination of desktop and field assessments to assess the Wetland's condition against seven subindices as show in Figure 3-8. Five individual quadrats across the Wetland were used to determine the overall condition.

Overall, the Wetland was assessed to have an IWC – GDW score of 6, equating to the moderate condition category. A summary of the results of the IWC – GDW along with notes is presented in Table 3-2.

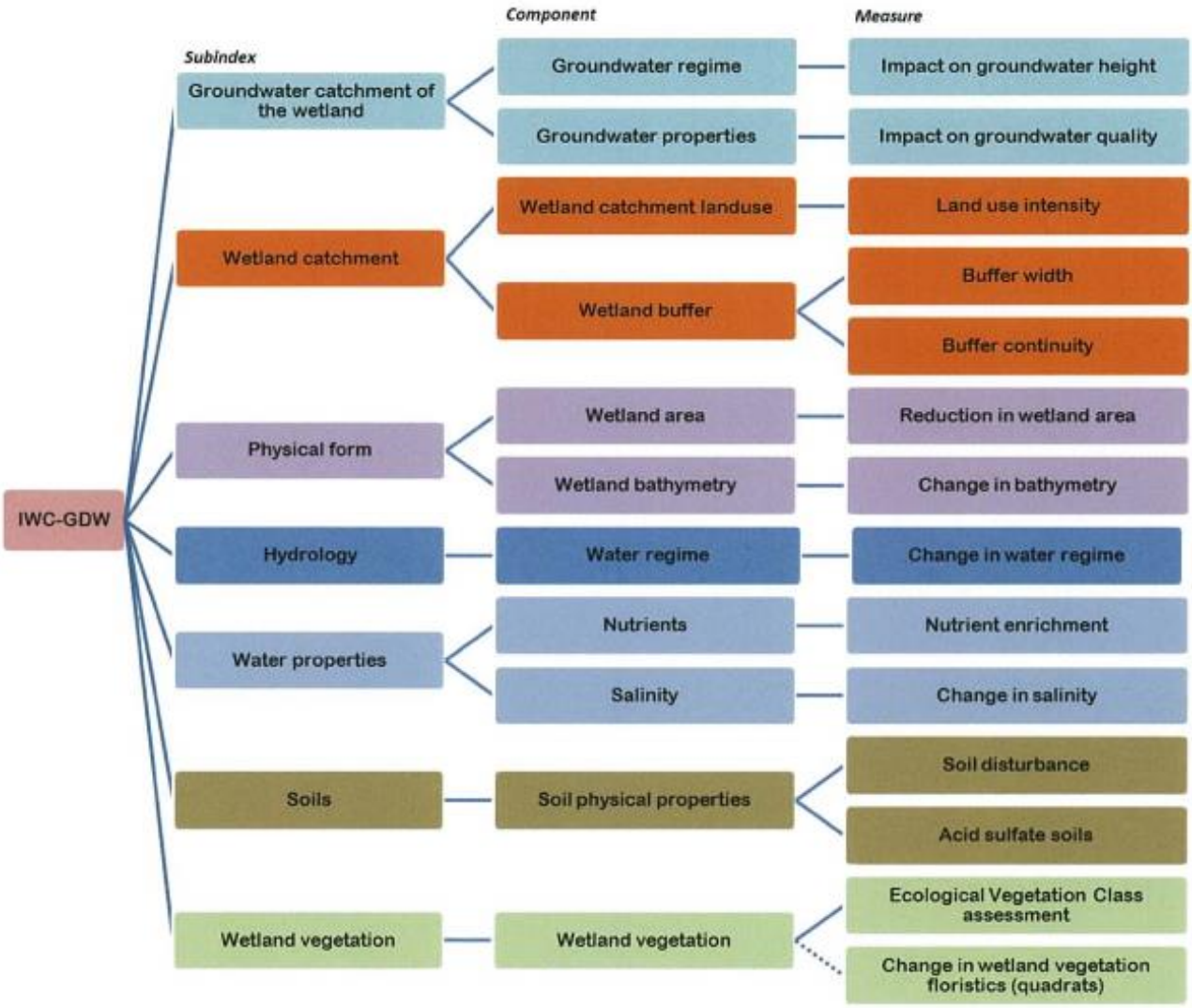

Figure 3-8 Structure of the IWC – GDE and its Measures (Papas, et al. 2016)

Table 3-2 Summary of the results for the IWC – GDW (Papas, et al. 2016)

Measure	Max Possible Score	Score	Notes
Likelihood of impact on groundwater height	10	5	Several activities are present that impact on groundwater height and quality (e.g. groundwater extraction, stormwater infiltration, solid waste disposal) – resulting in a medium likelihood of impact on groundwater quality and quantity from these activities
Likelihood of impact on groundwater quality	10	5	
Wetland groundwater catchment subindex	**20**	**10**	Confidence in the result for groundwater quality is however low, as groundwater quality data is not available
Land use intensity adjacent to wetland	10	2	A very small part of the wetland has a native vegetation buffer – resulting in very low score for this metric
Wetland buffer assessment	10	2	Land use intensity in the wetland catchment is high – resulting in a very low score for this metric
Wetland catchment subindex	**20**	**4**	The wetland catchment subindex score is therefore very low (very poor condition)
Reduction in wetland area	10	6	The wetland has undergone a substantial reduction in wetland area since European settlement
Change in bathymetry	10	8.75	The wetland bathymetry is modified in some parts with internal tracks and a channel
Physical form subindex	**20**	**12.75**	These measures contribute to a moderate physical form subindex score
Hydrology subindex (severity of change in water regime)	**20**	**10**	Several activities that affect the groundwater hydrology and surface hydrology are present (groundwater extraction, stormwater infiltration, drainage water via a channel) These activities are contributing to a moderately altered water regime
Severity of nutrient enrichment	10	5	Several activities are likely to be affecting the nutrient status of the wetland (nutrient runoff into the wetland, stormwater infiltration, drainage of nutrient rich water into the wetland, solid waste disposal) – contributing to a medium magnitude of nutrient enrichment
Severity of change in salinity	10	10	
Water properties subindex	**20**	**15**	
Severity of soil disturbance	10	9.8	Soils are largely undisturbed. Acid sulfate soils remain a future risk
Activated acid sulfate soils	10	10	
Soils subindex	**20**	**19.8**	
Vegetation subindex (wetland EVC quality assessment)	20	13.6	Most sites had a high cover of weeds The mean vegetation quality among all sites was moderate
IWC-GDW overall score	**10**	**6**	

Condition Category	Very Poor	Poor	Moderate	Good	Excellent

4 Value and Threat Assessment

Based on previous background reports and consultation with stakeholders, the Wetland's key values and threats have been identified and quantified. Scores have been assigned for asset values and threats allowing for a quantitative risk assessment and prioritisation process. The results of the value and threat assessment are presented in Section 4.1.9 and Section 4.2.10, respectively.

4.1 Key Values

The wetland components, processes and services/benefits identified as critical in BMT WBM (2015) were used to identify the Wetland's **key values**. A summary of each key wetland value along with their value score is provided in this Section.

4.1.1 Uniqueness

Although the Wetland has been modified over time, it still provides an important representative example of a near-natural wetland of its type, a groundwater dependent **shallow freshwater marsh**.

The Wetland represents the largest example of a shallow freshwater marsh and GDE in Melbourne Water's management area.

The shallow freshwater marsh wetland type has been depleted by 70% within the Gippsland Plain bioregion (DSE 2012), which includes part of Port Phillip Bay and the whole of Western Port, and extends from the east of Melbourne to Bairnsdale in eastern Victoria.

Within the South-East Coast Drainage Division (used for international Ramsar assessments in Australia) there are currently 37 wetlands that contain areas classified as; freshwater lagoons and marshes (equivalent to coastal freshwater lagoon), in the Directory of Important Wetlands in Australia.

The relative rarity of this wetland type increases its value in relation to biodiversity policies. It provides an opportunity for landholders to realise a financial return through participation in programs which aim to provide environmental services and biodiversity offsets, such as the Bushbroker Program and Trust for Nature conservation covenants which apply to significant areas of public and private land in the Tootgarook wetland.

4.1.2 Habitat

The Wetland includes four wetland habitat types that are otherwise absent in the local region (Eccocentric 2012):

- **Shallow freshwater marsh**
- **Deep freshwater marsh**
- **Freshwater meadow**
- **Permanent open freshwater**

These habitats support over 240 indigenous plant species that make many different plant communities called **ecological vegetation classes** (**EVC**s).

While comprehensive 'ground truthed' habitat mapping has not yet been undertaken for the entire wetland, several targeted field and desktop habitat assessments been undertaken as summarised in Jacobs (2014). These assessments have identified a complex of EVCs, including those identified as either 'Endangered' or 'Vulnerable' in the Gippsland Plain Bio-region. These include:

- **Aquatic Herbland** (Endangered)
- **Brackish Grassland** (Endangered)
- **Brackish Sedgeland** (Endangered)
- **Brackish Wetland** (Endangered)
- **Coastal Alkaline Scrub** (Vulnerable)
- **Damp Sands Herb-rich Woodland** (Vulnerable)
- **South Gippsland Plains Grassland** (Endangered)
- **Sedge Wetland** (Vulnerable)
- **Swamp Scrub** (Endangered)
- **Coast Banksia Woodland** (Vulnerable)

Further EVC types and specific wetland EVCs have also been identified.

The **South Gippsland Plains Grassland** EVC type also makes up a part of the ecological community known as the **Natural Damp Grassland of the Victorian Coastal Plains** as listed as threatened under the EPBC Act.

The South Gippsland Plains Grassland in the Wetland
(Image courtesy of Cameron Brown and Jessica Durrant,
Save Tootgarook Swamp Inc.)

Some of the above-mentioned habitat types along with other types of native habitats are found throughout the Catchment as remnant native vegetation of varying condition. Remnant native vegetation plays an important role as it provides for habitat corridors that facilitate the movement of fauna throughout the catchment and beyond.

Through its interactions with groundwater, the Wetland also provides a flow of freshwater and nutrients that are vital to the seagrass marine habitat found along Capel Sound.

4.1.3 Rare Flora and Fauna

Flora

To-date, many indigenous plant species have been identified within the Wetland (Save Tootgarook Swamp 2014). Significant species which have recorded in the Wetland include:

- **Coast Wirilda** (*Acacia uncifolia*)
- **Rare Bitter-bush** (*Adriana quadripartita s.s. (glabrous form.*)
- **Leafy Twig-sedge** *(Cladium procerum)*
- **Coast Bitter-bush** (*Adriana quadripartita*)
- **Water Parsnip** (wetland dependent) (*Berula erecta*)

In total, 24 flora species identified as of significance under the EPBC Act, the FFG Act or listed on the Advisory List of Rare or Threatened Plants in Victoria are known to, or likely to occur within the area (BMT WBM 2015).

Birds

Birds are good indicators of the ecological condition of a wetland, as they are sensitive to change in physical, chemical and biological factors. They are also sufficiently detectable and inexpensive to monitor (Purnell and Wilson 2015). Since 2013, BirdLife Australia has been undertaking standardised bird surveys across sites in the Wetland. To January 2016, a total of 122 species of birds were recorded (Purnell and Wilson 2016).

Of these, 14 species are listed under the Advisory List of Threatened Vertebrate Fauna in Victoria and/or the FFG Act, including:

- **Australasian Bittern** (*Botaurus poiciloptilus*) (endangered)
- **Australasian Shoveler** (*Anas rhynchotis*) (vulnerable)
- **Ballon's Crake** (*Porzana pusilla*) (threatened – FFG Act)
- **Common Greenshank** (Tringa nebularia) (vulnerable)
- **Eastern Great Egret** (*Ardea modesta*) (vulnerable)
- **Hardhead** (*Aythya australis*) (vulnerable)
- **Latham's Snipe** (*Gallinago hardwickii*) (near threatened)
- **Lewin's Rail** (Lewinia pectoralis) (vulnerable)
- **Little Egret** (*Egretta garzetta*) (endangered)
- **Marsh Sandpiper** (*Tringo stagnatilis*) (vulnerable)
- **Pied Cormorant** (*Phalacrocorax various*) (near threatened)
- **Royal Spoonbill** (*Platalea regia*) (near threatened)
- **Spotted Harrier** (*Circus assimilus*) (near threatened)
- **White-bellied Sea-eagle** (*Haliaeetus leucogaster*) (vulnerable)

A further 11 species of threatened listed birds have been recorded at the Wetland (BMT WBM 2015).

BirdLife Australia confirmed 23 recordings of the EPBC Act listed **Australasian Bittern** within the Wetland, representing a maximum of three individuals. However, Australasian Bitterns are regularly underrepresented in standard surveys. In December multiple birds have been observed, which can be considered as evidence of potential breeding in the Wetland (Purnell and Wilson 2015).

Along with the Australasian Bittern, the **Eastern Curlew**, listed as critically endangered under the EPBC Act in May 2015, has also been recorded in the Wetland (Cullen 2010). No new recordings were obtained by BirdLife Australia.

An Australasian Bittern recorded in the Wetland. (Image courtesy of Cameron Brown and Jessica Durrant, Save Tootgarook Swamp Inc.)

BirdLife Australia has recorded seven EPBC listed migratory species:

- **Cattle Egret** (*Bubulcus coromandus*)
- **Common Greenshank** (Tringa nebularia)
- **Eastern Great Egret** (*Ardea modesta*)
- **Latham's Snipe** (*Gallinago hardwickii*)
- **Marsh Sandpiper** (*Tringo stagnatilis*)
- **White-bellied Sea-eagle** (*Haliaeetus leucogaster*)
- **Sharp-tailed Sandpiper** (*Calidris acuminata*)

Amphibians and Reptiles

In 2014, vertebrate fauna assessments were undertaken at seven locations in the Wetland by Legg (2014). During these surveys, four vertebrate fauna species listed as threatened in Victoria were observed, including the:

- **Southern Toadlet** (*Pseudophryne semimarmorata*) (vulnerable)
- **Common Long-necked Tortoise** (*Chelodina longicollis*) (data deficient)
- **Swamp Skink** (Egernia coventryi) (vulnerable)
- **Glossy Grass Skink** (*Pseudemoia rawlinsoni*) (vulnerable)

4.1.4 Flood Storage

The Wetland's value for providing flood storage, minimising the flood risk to Capel Sound has long been established.

Detailed flood modelling of the Tootgarook catchment has recently been undertaken; confirming the Wetland's importance in regulating floodwaters by acting as a natural "retarding basin", protecting the downstream urban area even in large flood events (Engeny Water Management 2012).

This function will be important to mitigate the impacts of climate change, which is expected to increase the intensity of storm events.

4.1.5 Water Quality Management

The Shire is involved in a number of monitoring programs, which, inter alia, relate to Chinamans Creek and the wider Catchment (refer to the EPA's Yarra and Bay program http://yarraandbay.vic.gov.au/actions/action-9 and EPA/MW Better Bays and Water Ways: A Water Quality Improvement Plan for Port Phillip Bay and Western Port http://www.epa.vic.gov.au/ourwork/programs/~/media/Files/water/coasts/docs/BetterBaysWaterways-WQIP-FINAL.pdf.

No specific studies relating to the capacity of the Wetland to effectively reduce pollutant loads on downstream water quality being discharged into Port Phillip Bay have been completed. However, it is widely supported that wetlands act as a filter removing a range of pollutants. The Wetland also helps improve water quality in Port Phillip Bay by filtering toxicants, excess nutrients and sediments from the catchment inflows.

It is important to note that following the construction of the Chinamans Creek drainage system, water volumes entering the Wetland have become responsive to rainfall events and retention times have been reduced. Along with vegetation clearing, these modifications are likely to have reduced the pollutant filtering capacity of the wetland.

4.1.6 Soils

The wetland contains extensive areas of **peat soils**. Peat soils are not just sediment; they are also a component of a living ecosystem. The net-production of these soils forms the substrate on which the living part depends.

Surfaces of organic deposits like peat provide specialised habitats for plants and animals that are tolerant of aquatic, reducing and often acid conditions. The extent of mining and the remaining presence of peat soils following later 19th and early 20th century extraction in the wetland remains unknown.

Peat lands play a vital role in regulating the hydrologic cycle by absorbing large volumes of water during times of high rainfall and flood before slowly releasing it during drier seasons. They also store a large amount of carbon and when disturbed can release greenhouse gasses into the atmosphere.

Coastal peat formation is induced by waterlogging of silted-up areas when there is sufficient supply of freshwater (Kumano et al 1990). In eastern Australia, many coastal peatlands occur as thin strips behind the barrier dune systems like this Wetland.

The Wetland contains sandy and concretionary limestone deposits overlain by calcareous and ligneous clay and peat. Small inliers of limestone outcrop at the surface. However, the majority are approximately 2.6 m below ground level.

The Middle Catchment – Horticulture precinct predominantly occurs in the Boneo and Rosebud soil mapping units. These are highly productive soils, and have been increasingly utilised horticultural production in the market gardens.

Soils in the upper undulating region of the catchment, particularly those with higher organic matter, support mixed agriculture and grazing uses.

The Aeolian derived soils of the north-south axis dune ridge support **Coastal Moonah Woodlands** (EVC) despite long term stock grazing. Recent removal of stock from this dune system, and associated rehabilitation works, have been accompanied by significant natural regeneration.

4.1.7 Cultural Heritage

Cultural heritage incorporates both the indigenous and European historical values of the Wetland.

Pre-European Cultural History

The Wetland takes its name from the Aboriginal word Tootgarook, believed to be the word for the 'croaking of frogs' (University of Melbourne 2008). Prior to European settlement and development of the Wetland was inhabited by the **Boonwurrung** (Boon Wurrung) people whose traditional land extends from the Werribee River in the north-west, down to Wilsons Promontory in the south east, taking in the catchments of the old Carrum swamp, Western Port Bay and the Tarwin River, and including Mornington Peninsula, Phillip and French islands.

A summary of the importance of the Wetland provided by the Cultural Heritage Officer with the Shire (2015) is provided below:

The Tootgarook Wetland, Boniyong "the place of the Bandicoot" is an integral ecological unit central to one cultural landscape on the Mornington Peninsula. It provided to the Old people permanent freshwater and a variety of food resources that supported generational families to be able to live sustainable healthy lifestyles. The evidence of the Old people who lived within the Tootgarook Wetlands cultural landscape region is derived from Indigenous archaeological sites. As we know, an archaeological site or an archaeological deposit is essentially the remains of what people have left behind over many thousands of years. In saying this, the Indigenous archaeological deposits within the Tootgarook Wetland offer an opportunity to explore and educate about the rich Indigenous cultural history. This is derived from identifying and interpreting the remains that the Old people have left behind.

The remains are predominately home bases where the Old people resided and made their Mia Mias, shell middens and artefact sites. In addition, there was once an aqua-culture industry where the Old people made weirs that would trap fish and eels to catch and trench traps to catch water birds. Camouflaged hunting ambush spots were also made, which surrounded the wetlands to catch game.

The shell middens contain bones from animals (shellfish, Kangaroo, birds, fish) that the Old people collected and ate, cooking pits containing hot rocks and charcoal. Artefact sites are an Industrial

archaeological site where men would sit down and prepare and maintain their stone tools through one of the oldest human practises in the world being stone knapping before going out to hunt.

Importantly, like all homes today, Indigenous families would sit down together at these places and sites surrounding the Tootgarook Wetlands, spend time together, have social relations and ponder, like us, all about their surrounding universe. Interestingly, greenstone axe heads have been located surrounding the Tootgarook wetlands. Greenstone is a type of Basalt rock but not local to the Mornington Peninsula, but comes from Mt William on Wurundjeri Country located to the north of Boon Wurrung\Bunurong country. This means that the families who lived within the Tootgarook Wetlands Cultural Landscape region were trading and interacting with their neighbours from the Kulin Nation.

Post European Settlement and Development

Permanent settlement of the Mornington Peninsula began in earnest in the early 1840's following the discovery of a superior source of lime. The lime industry became one of the primary industries on the southern Mornington Peninsula and along with the peat industry, is evidenced by the still visible 'scaring' left on Wetland's landscape. Marl and limestone were mined from the site with a tramway running down Truemans Road to the bay. A lime kiln was situated on the original course of Chinamans Creek in the northwest of the site (Condina and Craigie 1998).

The Wetland itself, or any sites within it are not listed on National Heritage List or the Victorian Heritage Register, Heritage Victoria has indicated that historical infrastructure in the Wetland is consistent with places on the Victorian Heritage Register.

4.1.8 Tourism, Recreation and Education

While most of the Wetland is under private ownership and not freely accessible to the general public, the Wetland is still highly valued to the local community, as evidenced by the Save Tootgarook Swamp Inc. and the Friends of Tootgarook Wetland Reserves community groups.

Bushland Reserves

Of the six Shire managed bushland reserves located in the Wetland, the only one easily accessible to the public is the Tootgarook Wetlands Reserve, which is a six hectare area of artificial wetland separated from the main wetland body by the former landfill. A shelter and viewing platform for bird watching and education is provided at this site.

There are also walking paths provided along limited sections of Chinamans Creek.

Private Recreation and Tourism

Boneo Maze and Mini Golf, a privately-run entertainment and eco-tourism complex, has established an artificial wetland on Limestone Road. The artificial wetland lies within the original extent (pre-European) of the Wetland and provides a good representation of the natural features found in the Wetland.

Along with the Boneo Park equestrian centre which provides limited private access to the Wetland, Boneo Maze and Mini Golf highlights the potential value of the Wetland for eco-tourism. Eco-tourism can have significant flow on effects for the local economy if managed correctly.

Bird Watching and the Avi-Tourism Industry

The partnership of BirdLife Australia and Mornington Peninsula Shire for the Tootgarook Swamp Bird Monitoring Program (Purnell and Wilson 2016) have produced on ground field study observation data, and two professional Birdlife education videos, known as:

- Tootgarook Swamp Bird Monitoring Program - BirdLife Australia & Mornington Peninsula Shire found online at https://www.youtube.com/watch?v=GvjUOnQ9LMs 2015
- BirdLife Australia & MPS Tootgarook Swamp monitoring program- year 2 found online at https://www.youtube.com/watch?v=VZJNIYzv9G8 2016
- Coly-Lion the Australasian Bittern still in Tootgarook, footage captured by wildlife motion camera https://www.facebook.com/SaveTootgarookSwampInc/videos/1110958012273911/

These videos and the participating field study bird watchers have elevated the status of the region, as a reliable destination, to observe locally, nationally and internationally significant birdlife. However, as access to the Wetland is currently limited and there is no specific viewing infrastructure installed, the Wetland is currently underutilised as a bird watching destination.

Education

The Wetland can play a significant role in educating local people and visitors to the area about the natural environment, and particularly the special characteristics of wetlands.

The size and diversity of the Tootgarook wetland, the distinctive landscape and the history of land use by Traditional Owners and post European settlement provide many opportunities to enhance the experience, provide for interpretation and foster involvement and sense of stewardship for the area.

As an example, in 2015 the Rosebud West Wetland Upgrade project (Figure 4-1), working with students from Eastbourne Primary School and Rosebud Secondary College, has delivered infrastructure upgrades to the Tootgarook Wetlands, including upgrading the access path from the Truemans Road Recreation Reserve.

Details of the project can be viewed online at https://www.facebook.com/Rosebud-West-Wetland-Upgrade-774141239298887.

Figure 4-1 Rosebud West Wetland Upgrade Project

4.1.9 Values Assessment Results

The results of the value assessment are presented in Table 4-1. A modified version of the assessment criteria defined in the **Aquatic Value Identification and Risk Assessment** (**AVIRA**) manual (DEPI 2014) was used for this assessment. The value assessment criteria adopted for this assessment are presented in Table 4-2.

Table 4-1 Summary of Values Assessment

Wetland Value	Value Score	Description
Uniqueness	**4**	Represents the largest of example of a GDE in the Port Phillip and Western Port catchments. The Wetland also represents the largest remnant example of shallow freshwater marsh in the catchments.
Habitat	**5**	Contains endangered and vulnerable wetland EVCs with no vegetation condition data available (excellent vegetation condition assumed when no data available for endangered wetland EVCs). Provides habitat for endangered and vulnerable flora and fauna and migratory bird species.
Rare Flora and Fauna	**5**	Supports wetland-dependent species listed as vulnerable under the Advisory List of Rare or Threatened Plants in Victoria. Supports wetland-dependent species listed as endangered under the EPBC Act and species listed as vulnerable under the Advisory List of Threatened Vertebrate Fauna in Victoria.
Flood Storage	**4**	Provides significant flood storage, minimising the risk of whole of catchment flooding in Capel Sound.
Water Quality Management	**3**	Likely to provide water quality management services, however effectiveness would be compromised by the Chinamans Creek drainage system. Further data required.
Soils	**4**	Contains deposits of peat soils that are valuable for their role in natural processes including flood storage and carbon capture.
Cultural Heritage	**3**	While the Wetland itself, or any sites within it are listed as an on National Heritage List or the Victorian Heritage Register, Heritage Victoria has indicated that historical infrastructure in the Wetland is consistent with places on the Victorian Heritage Register. The Wetland also contains areas of cultural heritage sensitivity, and the area was occupied during the late Pleistocene period.
Tourism, Recreation and Education	**3**	Significant and palpable community advocacy for the Wetland. Limited use and access for the wider community for recreation and education purposes.

Table 4-2 Value Assessment Criteria

Value Score	Description
5	A value of national or state significance
4	A value of high regional or local significance OR A potential value of national or state significance
3	A potential value of high regional or local significance
2	A potential value of significance that is not currently recognised
1	A value of low significance
0	No Value

4.2 Key Threats

It is important to describe and qualify the Wetland's **key threats** as they provide the basis for the risk assessment used to prioritise management actions for the Plan, as described in Section 5.

4.2.1 Future Development

Future development of the Wetland and the Catchment poses both direct and indirect threats to the Wetland. The direct threats include habitat destruction and land filling leading to irreversible impacts.

Indirect threats include altered ground water and surface water regimes, impacts on water quality, potential exposure of acid sulfate soils, loss of flood storage capacity, light and sound pollution impacts on fauna species, increased litter, increased fire risk, increased pressure from domestic animals on fauna species and increased incidents of fauna collisions with vehicles.

The areas that remain within the General Residential Zone, adjacent to the existing residential area and the areas within the Industrial Zone on the eastern edge of the wetland arguably represent the greatest current threats in terms of future development. However, the corridor of land running through the northern section of Wetland owned by VicRoads for the possible future extension of the Mornington Peninsula Freeway is also significant. The potential impacts of this development need to be carefully assessed as a high priority.

Continued development in the broader Catchment is resulting in areas of remnant vegetation being destroyed. These pockets of remnant vegetation are import in providing habitat corridors for wetland and other native species.

Future development of the Mornington Peninsula region increases human interaction with the Wetland. This may have significant positive effects for the Wetland but if not managed properly could lead to unsociable site use and vandalism.

4.2.2 Intensive Agriculture

Where crop raising (such as horticulture or viniculture), intensive animal husbandry and aquaculture significantly alters the topography, natural land surfaces, native vegetation, leading to loss of habitat values as well as altered ground water and surface water regimes, there is potential for exposure of acid sulfate soils and impacts on water quality.

Intensive animal husbandry is where the keeping and care of agricultural and equine animals and their primary food source is brought in from outside the enclosure and holding area, as opposed to grazing on the land.

4.2.3 Grazing and Pastoral Use

Stock grazing has been eliminated from significant areas of the Wetland by landowners choosing to enter conservation covenants. In areas where environmentally-aware landowners have voluntarily de-stocked the Wetland without covenants, there is a risk that stock grazing could resume.

Areas adjacent to the Wetland are still used for pasture, mainly for horses. Hoofed animals impact vegetation values by grazing or trampling native herbs, grasses and larger flora species during their

infancy. The manure of grazing animals also increases nutrient loads of surface water runoff into the Wetland.

The Wetland and adjacent land have been degraded by slashing, ploughing and pasture improvement (Jacobs 2014a). While large areas of the Wetland are well-managed by the Shire and environmentally responsible owners, grazing and pastoral use continues to encroach on the Wetland, preventing the regeneration of native vegetation.

4.2.4 Feral Animals and Environmental Weeds

Thirteen species of introduced fauna (feral animals) were recorded in the Wetland by Legg (2014) including; six species of birds, five species of mammals, and two species of fish.

Introduced birds compete, in some instances aggressively, with native birds for both habitat and food reducing native bird numbers in the Wetland. The Common Starling and Common Blackbird, both recorded in the Wetland are also prolific spreaders of noxious weed seeds (Legg 2014).

While control programs have resulted in low population densities, Feral Cats and Red Foxes are still present in the Wetland. These introduced predators are a threat to most ground or shrub dwelling fauna species including birds. House Mice and Black Rats are also present in the Wetland. These pests compete with native species for habitat and food, spread parasites and disease, and Black Rats are known to kill the threatened Swamp Skink and other small reptiles.

Many habitat changing weeds have been identified in the Wetland Legg (2014). Whilst most weed infestations are occurring around the edges of EVCs where the native habitat has been disturbed by human activity, in some instances they have penetrated into an EVC. Habitat-changing weed outbreaks have the potential to take over causing large changes and destruction of essential habitats. Consequently, a large reduction in fauna population densities and species diversity will occur.

Of the weeds identified, seven species are listed as Weeds of National Significance including; Boneseed, Box Thorn, English Blackberry, Fla-leaf Broom, Gorse, Prickly Pear and Willow species.

4.2.5 Surface Water Flow Changes

While the Wetland has been classified as a GDE, changes to the surface water flow regime can have a significant impact on the Wetland. This is due to the fine balance that wetland ecosystems have with water regimes.

It is unlikely that there will be any significant alterations to surface water flow in the future as substantial as the construction of Chinamans Creek and its associated drains.

The construction of Chinamans Creek altered the natural (pre-disturbance) functioning of the system which resulted in changes to the habitats and biota and consequently, the ecological character of the wetland. However, it is possible that a culmination of additional small-scale drainage works undertaken for development, industrial or agricultural purposes throughout the Catchment could result in critical changes to surface water flow.

The increased percentage of impervious area associated with development, if not properly managed can result in changes to the surface water flow regime. By increasing impermeable surfaces, the

catchment tends to respond to rainfall events by producing surface flows that are larger but shorter in duration, and potentially more intermittent removing base flows.

Over irrigation, with either captured surface water or from groundwater extraction can also have a impact on the surface water flow regime.

4.2.6 Groundwater Extraction

As a GDE, the habitat in the Wetland is maintained by the relatively constant flow of groundwater into the Wetland and consequently alterations to the groundwater flow regime can have dire consequences for the Wetland.

It was estimated that approximately 3.9 gigalitres/year of groundwater was extracted for irrigation purposes in 2008 in the Boneo area (URS 2008). During the decade of drought conditions preceding 2008, the water tables dropped by 1-3 metres in the Boneo area because of decreased rainfall and increased extraction (URS 2008).

Melbourne Water has recently installed groundwater monitoring bores in the Wetland. However, an extended period of observation and detailed modelling is required to definitively establish the relationship between groundwater extraction and climate variability on groundwater level and inflows into the Wetland.

Falling water tables not only deprive the Wetland of a relatively constant source of freshwater inflow, it also could result in seawater intrusion. This would severely alter the Wetland's characteristics to represent those of a brackish or saline wetland. The Wetland has been identified to contain **Potential Acid Sulfate Soils** (**PASS**). Acidification of PASS could occur if the water table is too low, soils are exposed to air and soils dry. Soil acidification and resulting sulfuric acid entering the Wetland and waterways results in a significant drop in pH which is usually fatal to most aquatic species.

In addition to the risks associated with groundwater extraction, physical alterations to the surface topography where groundwater is expressed, such as the construction of flow paths, of which Chinamans Creek is an extreme example, can 'drain' groundwater out of the system lowering the water table.

While a falling water table is associated with many potential impacts, a higher water table could also have significant effects.

Stage 2 of the Boneo Class A Recycled Water Scheme, implemented in 2012 was expected to reduce groundwater extraction to approximately 1.6 gigalitres/year (URS 2008). Excess recycled irrigation water will also increase groundwater recharge.

Recent analysis of groundwater levels (Jacobs 2017), suggest that at present the water table has returned to its long-term average depth. It is unclear whether this can be attributed to lower groundwater extraction or the wetter climate over recent years following the end of millennial drought.

It is important to note that if the water table rises above natural levels because of increased groundwater recharge due to over irrigation, the Wetlands characteristics will also be significantly altered.

4.2.7 Water Pollution

Water pollution can impact on wetlands in a variety of ways. High concentrations of heavy metals and other toxicants can directly impact on the health of flora and fauna species. Increased nutrient levels can result in algal blooms that are potentially toxic for some species and deplete the water of oxygen potentially suffocating aquatic species.

The only surface water quality data currently available is Melbourne Water's long-term water quality monitoring data in Chinamans Creek. This data suggests that it is likely that there are water pollutants present in the Wetland. However, this data was measured downstream of the Wetland in Chinamans Creek, a highly-urbanised area and it is not a definitive indication of water quality in the Wetland.

There is range of potential pollutant sources located within the Catchment. Storm water runoff from urban and industrial areas is likely to contain pollutants. Run-off from roads, pastoral areas, market gardens and golf courses may contain pesticides, sediments and other pollutants. High nitrate levels in Chinamans Creek, are likely from fertilised market gardens to the east of the Wetland. These market gardens are irrigated with Class A recycled water from the Boneo Wastewater Treatment Plant and are also likely high users of fertilizer. There is also high metal contamination from the industrial areas on Drum Drum Alloc Creek. (Jacobs 2014a) and a risk of leaking septic tanks contaminating groundwater that flows into the Wetland and beyond.

Leaching from the former landfill site could also pollute groundwater and subsequently surface water flowing into the Wetland. An environmental audit by GHD (2013) found that the risk of leaching from former landfill site having effects on the ecological system of the Wetland is low, but this has not been confirmed. Elevated levels of Ammonia were recorded in the Tern Avenue Bushland Reserve and this continues to be monitored by the Shire and EPA.

4.2.8 Climate Change

Due to climate change; the average temperature is predicted to rise, annual rainfall to decrease and local droughts are expected to be longer and more severe. The number of rainy days are expected to decrease while evaporation increases in the Port Phillip and Western Port region (DEPI 2013).

When it does rain, the rain will be more intense leading to flash flooding and erosion. These factors will greatly alter the supply of both surface and groundwater to the Wetland. The resulting impacts on the Wetland would be like those discussed above in relation to changes to the water regime. The ability of fauna and flora species to adapt to these changes is uncertain, although wetland habitats are in some ways more resilient (to drought conditions) and provide greater opportunities for adaptation than other locations.

4.2.9 Sea Level Rise

Due to climate change, the sea level in Port Phillip is predicted to rise. If the bay levels rise, saltwater intrusion into the Wetland via Chinamans Creek during storm surges will become more frequent and is if rise great enough, permanent saltwater intrusion into the Wetland may occur.

4.2.10 Threats Assessment Results

The results of threat assessment are presented in Table 4-3. A modified version of the assessment criteria defined in the AVIRA manual (DEPI 2014) was used for this assessment. The threat assessment criteria adopted for this assessment are presented in Table 4-4.

Table 4-3 Summary of Threats Assessment

Wetland Value	Value Score	Description
Feral Animals and Environmental Weeds	**4**	Native species of flora and fauna can be "pushed out" of the Wetland by aggressive and well adapted pests and weeds.
Future Development	**5**	Development irreversibly changes the characteristic of a given area of the Wetland from that of a natural environment to an urban environment.
Grazing and Pastoral Use	**3**	The destruction native habitat for, or because of livestock or equine grazing, pastoral use or other purposes can cause significant impacts; particularly when native habitat is completely removed from an area of wetland. Species of flora will take a medium timeframe to recover or regrow, a process which is extended, possibly indefinitely, if native vegetation is replaced with introduced species.
Intensive Agriculture	**4**	Where crop raising (such as horticulture or viniculture), intensive animal husbandry and aquaculture significantly alters the topography, natural land surfaces, native habitat and/or ground cover vegetation.
Surface Water Flow Changes	**4**	Alterations in the surface water hydrological regime because of development or irrigation practices, could alter the ecosystem lifecycle of the Wetland particularly in areas that are reliant on and sensitive to surface water flows.
Water Pollution	**4**	The toxic effects of water pollution often only have impact on the medium/short term health of the Wetland. Instances of persistent or extreme point source pollution or continued over fertilisation can have significant long-term impacts.
Groundwater Extraction	**4**	Prolonged periods of low water table levels because of over extraction, exacerbated by drought conditions, will result in "drying" of the Wetland soil and pools, resulting in a flora dieback, particularly species with shallow roots.
Climate Change	**4**	Increased temperatures, decreased annual rainfall and the number of rainy days, and increased evaporation will greatly alter the surface and groundwater regimes. This will result in the long term "drying" of the Wetland soil and pools, resulting in a flora dieback, particularly species with shallow roots.
Sea Level Rise	**5**	Permanent saltwater intrusion from Port Phillip Bay because of sea level rise will change the Wetland from a shallow freshwater marsh with limited saltwater intrusion to a saline ecosystem.

Table 4-4 Threat Assessment Criteria

Threat Score	Description
5	Threat causes irreversible impacts
4	Threat causes significant impact with long term (greater than 50 years) effects on a value
3	Threat cause significant impact with medium/short term effects on a value (where medium term is between 10 and 50 years and short term is up to 10 years)
2	Threat causes moderate impact with medium/short term effects on a value (where medium term is between 10 and 50 years and short term is up to 10 years)
1	Threat causes low impact with medium/short term effects (where medium term is between 10 and 50 years and short term is up to 10 years)
0	Does not cause impacts

5 Risk Assessment

Managing, protecting and enhancing wetlands is dependent on gaining a good understanding of the values associated with those wetlands, the threats to these wetland values and the risks that these threats pose to the values. Once this understanding has been developed, management actions to address the threats can be properly planned and prioritised.

Risks assessments are a valuable tool that allows an objective comparison of the risk (danger) to each **key value** attributed to each **key threat**, as identified in Section 4.

The risk assessment process adopted for the Plan is presented in Figure 5-1 and is consistent with the Australian/New Zealand Standard: Risk Management (AS/NZS 4360:2004) (SA/SNZ 2004).

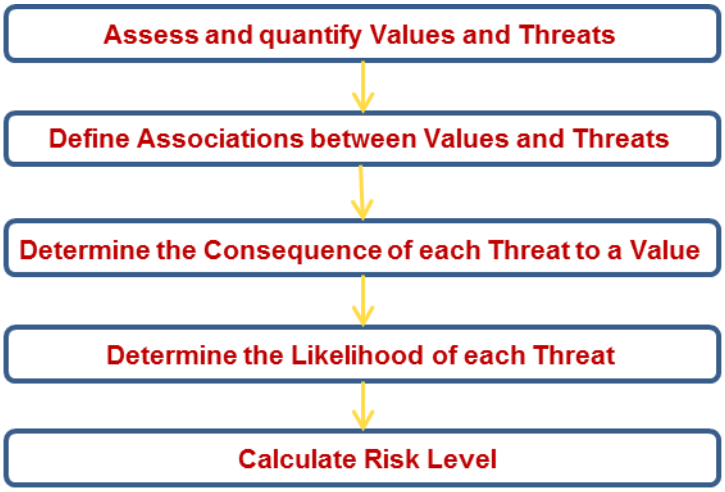

Figure 5-1 Risk Assessment Process

5.1 Calculating Risk

Risk is defined as the chance of something happening that will have an impact on objectives, and is measured in terms of a combination of the consequences and their likelihood. (SA/SNZ 2004), where:

- **Consequence** - The impact of a risk if it occurred
- **Likelihood** - The probability or frequency of a risk occurring

For example, the consequences of been involved in aeroplane accident are very severe, but the likelihood is very low. As a result, the risk of been involved in aeroplane accident would be considered lower than that of having a bicycle accident where the consequences are lower (overall) but the likelihood is much higher.

This same concept can be applied for wetland management to assess the risk posed to wetland values.

The following Sections summarise the process adopted to determine consequence and likelihood and ultimately risk.

5.1.1 Consequence

A consequence is an outcome or impact of an event and can be evaluated by the severity of the impact that a threat has on a value. Therefore, to measure consequence, we need to determine a **value score** (Section 4.1.9), **threat score** (Section 4.2.10); and the **association** between the value and the threat.

Each individual value and threat combination identified for the Plan has been given an association rating; High Medium, Low and None (no association), as presented in Table 5-1.

The association ratings adopted for this risk assessment are detailed in Morris and Papas (2012) where values and threats consistent with those identified in the Tootgarook Wetland were available.

Each association has also been assigned a level of **confidence**; High, Medium or Low as per Morris and Papas (2012). A unique level of confidence has been given to associations that were assessed based on the professional opinion of the Project Team and input from the PWG and SAC. The level of confidence assigned to and association is not used as a metric in this risk assessment. Rather it can be used a guide in the prioritisation process and to identify knowledge gaps.

The assigned consequences are presented in Table 5-2.

To relate value and threat scores to determine consequence, the AVIRA framework has developed three consequence rating tables based on the assigned level of confidence; High, Medium or Low. The consequence rating tables are presented in Table 5-3 to Table 5-5.

Table 5-1 Value and Threat Associations

		Wetland Value							
		Uniqueness	Habitat	Rare Flora and Fauna	Flood Storage	Water Quality Management	Soils	Cultural Heritage	Tourism, Recreation and Education
Wetland Threat	Future Development	High (T)	High (L)	High (L)	High (H)	Medium (T)	High (T)	High (M)	Medium (L)
	Intensive Agriculture	High (M)	High (H)	High (H)	Medium (M)	High (H)	High (H)	High (L)	Low (L)
	Grazing and Pastoral Use	High (T)	High (L)	High (L)	Low (T)	High (T)	High (T)	High (M)	Medium (L)
	Feral Animals and Environmental Weeds	Medium (T)	High (L)	High (L)	None (T)	Low (T)	Low (T)	Medium (M)	Medium (L)
	Surface Water Flow Changes	Medium (T)	High (H)	High (H)	High (H)	High (T)	High (T)	Medium (L)	Medium (L)
	Groundwater Extraction	High (T)	High (H)	High (H)	Low (T)	High (T)	High (T)	Medium (L)	Medium (L)
	Water Pollution	Medium (T)	High (H)	High (H)	None (T)	High (T)	Medium (T)	Medium (L)	Medium (L)
	Climate Change	Medium (L)	Medium (L)	Medium (L)	High (L)	Medium (L)	Medium (L)	Low (L)	Low (L)
	Sea Level Rise	High (L)	High (L)	High (L)	High (L)	Medium (L)	High (L)	Low (L)	Medium (L)

Association	Description
High	The threat always or often impacts the value
Medium	The threat may impact the value
Low	The threat does not impact the value but it is remotely possible
None	The threat does not impact the Value

Confidence	Description
High (H)	Repeated scientific evidence supports association rating
Medium (M)	Single studies or observations suggests association rating
Low (L)	Expert/professional opinion based on logical/plausible connection rather than direct evidence
Plan (T)	Expert/professional opinion of the Tootgarook Wetland Management Plan Project Team

Table 5-2 Consequence Rating of a Threat to a Value

Wetland Threat (Threat Score)	Wetland Value (Value Score)							
	Uniqueness (4)	Habitat (5)	Rare Flora and Fauna (5)	Flood Storage (4)	Water Quality Management (3)	Soils (4)	Cultural Heritage (2)	Tourism, Recreation and Education (3)
Future Development (5)	High	Very High	Very High	High	Low	High	Medium	Low
Intensive Agriculture (4)	Medium	High	High	Low	Low	Medium	Low	None
Grazing and Pastoral Use (3)	Low	Medium	Medium	None	Very Low	Low	Very Low	None
Feral Animals and Environmental Weeds (4)	Low	High	High	None	None	Very Low	Very Low	Very Low
Surface Water Flow Changes (4)	Low	High	High	Medium	Low	Medium	Very Low	Very Low
Groundwater Extraction (4)	Medium	High	High	Very Low	Low	Medium	Very Low	Very Low
Water Pollution (4)	Low	High	High	None	Low	Low	Very Low	Very Low
Climate Change (4)	Low	Medium	Medium	Medium	Very Low	Low	None	None
Sea Level Rise (5)	High	Very High	Very High	High	Low	High	None	Low

Table 5-3 Consequence Rating Table for High Value and Threat Associations

Threat Score	Value Score 0	1	2	3	4	5	No Data
No Data	None	Very Low	Low	Medium	High	Very High	Very High
5	None	Very Low	Low	Medium	High	Very High	Very High
4	None	None	Very Low	Low	Medium	High	High
3	None	None	None	Very Low	Low	Medium	Medium
2	None	None	None	None	Very Low	Low	Low
1	None	None	None	None	None	Very Low	Very Low
0	None	None	None	None	None	None	None

Table 5-4 Consequence Rating Table for Medium Value and Threat Associations

Threat Score	Value Score 0	1	2	3	4	5	No Data
No Data	None	None	Very Low	Low	Medium	High	High
5	None	None	Very Low	Low	Medium	High	High
4	None	None	None	Very Low	Low	Medium	Medium
3	None	None	None	None	Very Low	Low	Low
2	None	None	None	None	None	Very Low	Very Low
1	None	None	None	None	None	None	None
0	None	None	None	None	None	None	None

Table 5-5 Consequence Rating Table for Low Value and Threat Associations

Threat Score	Value Score 0	1	2	3	4	5	No Data
No Data	None	None	None	Very Low	Low	Medium	Medium
5	None	None	None	Very Low	Low	Medium	Medium
4	None	None	None	None	Very Low	Low	Low
3	None	None	None	None	None	Very Low	Very Low
2	None	None	None	None	None	None	None
1	None	None	None	None	None	None	None
0	None	None	None	None	None	None	None

5.1.2 Likelihood

Likelihood is a general description of the probability or frequency of a threat occurring. While in some instances likelihood of a threat occurring can be quantified using probabilities, for instance the probability of a flood occurring in any one-year, general descriptors are required to more intangible threats identified for this plan. The likelihood assigned to each threat is presented in Table 5-6.

The likelihood categories adopted for this risk assessment, as presented in Table 5-7, are based on those developed for the AVIRA framework. In general, the threats identified for this study are already occurring, therefore the likelihood categories are formed around expected future trends for a given threat.

Table 5-6 Threat Likelihood

Feral Animals and Environmental Weeds	Future Development	Grazing and Pastoral Use	Intensive Agriculture	Surface and Water Flow Changes
Certain	Likely	Certain	Certain	Probable
Water Pollution	**Groundwater Extraction**	**Climate Change**	**Sea Level Rise**	
Probable	Likely	Likely	Likely	

Table 5-7 Likelihood Criteria

Likelihood	Description
Certain	Threat already occurs and is not expected to decrease without intervention
Likely	Threat does not occur, or occurs with negligible impacts and there is clear pressure for the threat to increase
Probable	Threat does not occur, or occurs with negligible impacts and it foreseeable that there will be future pressure for the threat to increase
Unlikely	Threat does not occur, or occurs with negligible impacts and there no current indication that the threat will increase
Not Probable	There is no current link between catchment pressures and the threat

5.1.3 Risk Level

The **risk level** associated with each value and threat combination is presented in Table 5-8. The level of risk is determined by combining consequence and likelihood using a set of ratings criteria.

Due to the high scores given to the Wetland values of habitat and fauna, because of their national significance, several threats have been assessed to pose a high level of risk. These threats; feral animals and environmental weeds, future development, and grazing, pastoral use and habitat destruction all pose a direct threat to the extent and quality of natural habitat and individual species. Along with groundwater extraction, these threats also pose the highest levels of risk to the Wetland's values.

Table 5-8 Risk Level

Wetland Threat	Wetland Value: Uniqueness	Habitat	Rare Flora and Fauna	Flood Storage	Water Quality Management	Soils	Cultural Heritage	Recreation and Education
Future Development	High	Very High	Very High	High	Low	High	Medium	Low
Intensive Agriculture	High	Very High	Very High	Medium	Medium	High	Medium	No Risk
Grazing and Pastoral Use	Medium	High	High	No Risk	Low	Medium	Low	No Risk
Feral Animals and Environmental Weeds	Medium	Very High	Very High	No Risk	No Risk	Low	Low	Low
Surface Water Flow Changes	Very Low	Medium	Medium	Low	Very Low	Very Low	Very Low	Very Low
Groundwater Extraction	Medium	High	High	Very Low	Low	Medium	Very Low	Very Low
Water Pollution	Very Low	Medium	Medium	No Risk	Very Low	Very Low	Very Low	Very Low
Climate Change	Low	Medium	Medium	Medium	Very Low	Low	No Risk	No Risk
Sea Level Rise	High	Very High	Very High	High	Low	High	No Risk	Low

Likelihood	Consequence: None	Very Low	Low	Medium	High	Very High
Certain	No Risk	Low	Medium	High	Very High	Very High
Likely	No Risk	Very Low	Low	Medium	High	Very High
Probable	No Risk	Very Low	Very Low	Low	Medium	High
Unlikely	No Risk	No Risk	Very Low	Very Low	Low	Medium
Not Probable	No Risk	No Risk	No Risk	Very Low	Low	Low

6 Action Plan

To manage the risks identified and assessed in Section 5, an **Action Plan** has been developed, based around five key themes:

(1) Land Use Planning

(2) Environmental Management

(3) Recreation and Tourism

(4) Community Awareness, Education and Involvement

(5) Research and Monitoring

The Action Plan, presents a series of prioritised actions that will assist Council, other agencies, landowners and the community to set goals; prioritise projects, establish roles and monitor results. It should also provide a basis on which to seek project funding and grants.

The prioritisation of actions has had regard to the following criteria along with input from both the PWG and the SAC:

- The level of risk and the degree of association between the action and the risk i.e. how directly does the action address the risk
- Urgency/timeframe
- The logical sequence of actions (particularly where further information or research is required)
- The likely costs (and cost/benefit ratio) and other potential barriers to implementation, including the need to identify appropriate agency roles, the need to achieve cooperation and coordination with private land owners and the lack of statutory/planning scheme mechanisms

The action plan tables developed for each of the five management themes includes:

- Management Action (what needs to be done)
- Priority (what order the actions should occur)
- Responsibility (who is needed, who should be informed/involved)
- Detailed Description (notes)

6.1 Land Use Planning

Land use planning and the Mornington Peninsula Shire planning scheme play a central role in managing the use and development within the wetland and catchment areas.

Under the direction of the State Government, the Shire has primary responsibility, as both a Planning Authority and Responsible Authority, for establishing appropriate policies, zones, overlays and other provisions.

It is important that the land use planning regime across the catchment, particularly in the *Lower Catchment – Wetland* precinct, reflect and protect the significant values of the Wetland.

The land use planning actions recommended are presented in Table 6-1.

Key Issues

- Existing land use varies significantly across the Catchment and within the Wetland area
- Land use planning controls (zones and overlays) prescribe what use and development activities can be undertaken on public and private land
- There are no clear examples of zoning controls e.g. within the Victoria Planning Provisions, that provide a model for this area. However, Environmental Significance Overlay 30 – Tootgarook Wetland, as an area specific control, provides useful directions
- It may be necessary to complement Planning Scheme provisions with other land management controls – such as conservation covenants, agreements and MoUs

Objectives

- Ensure that the objectives of this Plan are reflected in the Mornington Peninsula planning scheme and are considered in all land use and development planning decisions
- Ensure that the objectives of this Plan are considered in future reviews of the Mornington Peninsula planning scheme

Table 6-1 Recommended Land Use Planning Actions

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
1.01	Review Environmental Significance Overlay - C188	Review the boundary of Environmental Significance Overlay (ESO) 30 – Tootgarook Wetland), over the extent of the Wetland including the SEW land on Browns Road.	High	**MPS,** SEW	Refer to C188 Panel report. The ESO30 - Tootgarook Wetland overlay boundary was delineated at the time of listing in 2015. Opportunity exists to revise ESO30 boundary and conditions.
1.02	Land Re-Zoning of 92 Elizabeth Ave, Capel Sound	Re-Zoning of the Shire owned property at 92 Elizabeth Ave to PCRZ (excluding area zoned PUZ4).	High	**MPS**	Property recently acquired by MPS (2018), refer to Section 3.1.1.
1.03	Land Re-Zoning in the Wetland	Re-Zone land in the Wetland to a land use zone that protects wetland values and facilitates proper environmental management: Former Landfill, Hiscock Rd.	Medium	**MPS**	
1.04	Land Re-Zoning of the Shire Wetland Reserve 66 Henry Wilson Dr	Re-Zoning of Council Wetland Reserve at 66 Henry Wilson Dr from INZ3 to PCRZ.	Low	**MPS**	
1.05	Land Re-Zoning of Shire Bushland Reserves	Re-Zoning of Shire Bushland Reserves, GWZ2 to PCRZ.	Low	**MPS**	
1.06	Land Re-Zoning of Drum Drum Alloc Creek Bushland Reserve	Re-Zoning all or part of the Drum Drum Alloc Creek Bushland Reserve (40 Colchester Road) from INZ3 to PCRZ.	High	**MPS**	The Drum Drum Alloc Creek Bushland Reserve (40 Colchester Road) is identified for re-zoning in a general Mornington Peninsula planning scheme review. See MPS Council Minutes 25/08/14 Item 3.4: Council Resolution 4D. (R1200)
1.07	Future inland arterial road/freeway reservation assessment	Advocate for the completion, as a matter of priority, of an initial feasibility study (including an environmental impact assessment) in relation to the future use and development of the VicRoads reservation and the removal of Public Acquisition Overlay.	High	**MPS**, VicRoads	Refer to Section 3.1.1 for Shire's position on the future inland arterial road/freeway. A Council resolution is in place to advocate for removal of the Public Acquisition Overlay. Shire's traffic section is currently developing alternative traffic recommendations to put a case to VIC Roads.

Action Plan

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
1.08	Investigate Land Acquisition	Investigate the feasibility of the transfer or purchase of private land that exhibits high wetland values, or can be rehabilitated, for management by the Shire as a Bushland Reserve.	Low	**MPS**	9 Elmo's Cl, Capel Sound has been identified for possible future acquisition. Investigate adding public acquisition overlay. Good potential for public education/ecotourism site.
1.09	Shire Wetland Buffer Guidelines	Consider developing MPS local government guidelines, policy and planning scheme for definition and management of agreed Wetland buffer zones.	Medium	**MPS**, DELWP	Consistent with Management Strategy 3.5 of the Western Port Ramsar Site Management Plan. To be consistent with any Wetland Buffer Guidelines developed by DELWP. Refer to existing WA, NSW and QLD legislative definitions and requirements for managing wetland buffers.
1.10	Shire Wetland Buffer Management Strategy	Develop and implement a Shire strategic approach to use and development of areas that buffer and are adjacent to the Wetland that consider the cumulative impact of multiple land use and development actions on the ecological character.	Medium	**MPS**, DELWP	Requires development and implementation of Wetland Buffer Guidelines in the MPS Planning Scheme.
1.11	Land Management: Financial Incentives	Identify opportunities and promote the use of financial incentives for private landholders to undertake environmentally beneficial works and practices.	High	**MPS**, MW, Trust for Nature, PPWCMA, DELWP, Landcare	Funding sources available include: • Land Sustainability Rebate Incentive (LSR) (MPS) • Stream Frontage Management Program (MW) Under the 2018 Healthy Waterway Strategy, MW is considering the possibility of providing funding to private landholders to do environmental works on wetland buffers. MPS is currently preparing a Biodiversity Strategy which will identify and promote instruments to incentivise conservation. DELWP has an environmental grant program that may apply to wetland restoration.

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
1.12	Land Management: Best Practise and Sustainable	Develop and distribute best practice fact sheets and landholder guidelines relating to sustainable land management and habitat restoration to new and existing landholders.	Medium	**MPS**, DELWP, TFN	Refer to MPS 'Common Ground' fact sheets and Western Port Biosphere / PPWCMA / Landcare. Action links to: • MPS Biodiversity Strategy. • SEW case studies. • Western Port Biosphere Water Stewardship program

6.2 Environmental Management

The Shire, other agencies, land owners and community groups all undertake a range of environmental management activities in the Wetland and the Catchment including:

- Bushland Reserve management
- Road and public reserve maintenance
- Drainage works and maintenance
- Litter management
- Drainage and integrated water management
- Water quality monitoring
- Access and use of groundwater management
- Fire Management
- Rehabilitation works
- Pet, pest and feral animal control

These activities, and the way in which they are conducted, have a direct effect on the environmental conditions of the Wetland and Catchment areas. The land use planning actions recommended are presented in Table 6-2.

Key Issues

- There is no single point of co-ordination across all government agencies, community groups and landholders.
- Existing environmental management works may not be providing the maximum benefit to the Wetland's values due to lack of co-ordination and site-specific methodologies.

Objectives

- Seek to engage with landowners and agencies to establish a co-ordinated environmental management program across the Catchment.

Ensure environmental management is undertaken using methodologies that represent best practice and are relevant to the local environment.

Table 6-2 Recommended Environmental Management Actions

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
2.01	Flood mitigation and response measures	Incorporate environmental considerations when assessing flood mitigation works for and undertaking flood response measures.	High	**MPS**, **MW**, SES, VicRoads, Landholders	Development/works in flood prone areas assessed under Vic Building Regulations and under the Planning Scheme. Clearing vegetation and sediments from drains inhibits water retention and filtration capacity of the wetland.
2.02	Investigate Chinamans Creek hydraulic control	Investigate the suitability of a hydraulic control (weir or similar structure) on Chinamans Creek at Elizabeth Avenue or other appropriate location to improve Wetland water retention while maintaining Chinamans Creek flood flow drainage capacity.	Medium	**MPS,** MW	Shire to advocate, Chinamans Creek is a MW asset requiring works to be developed, assessed and implemented by MW. Has the potential to fundamentally change the water regime of the Wetland, requiring a long term environmental assessment. Will also reduce the potential for future saltwater intrusion.
2.03	Fire risk vegetation control, Prevention Notices and Fire Ready Plans	Incorporate environmental considerations when issuing Fire Prevention Notices and assessing Fire Ready Plans, and in the management of bushland and roadway reserves.	High	**MPS**, Landholders, CFA, VicRoads	MPS fire management does currently include environmental considerations in Bushland Reserves.
2.04	Implement Shire's Smart Water Plan natural environment actions	Implement the MPS Smart Water Plan general recommendations and Chinamans Creek Catchment (7.4) specific actions, to support the significant biodiversity and natural values.	High	**MPS**, MW, Landholders, SEW, SRW	In association with MW's Healthy Waterways and Stormwater Strategies, the PPWP Regional Catchment Strategy, Review of SEPP (WoV) Smart Water Plan is due for review. MPS will consider including biodiversity into the review.
2.05	Implement Shire's Smart Water Plan water quality actions	Support the implementation and recommendations of the MPS Smart Water Plan section 7.4, to reduce nutrient and sediment inflow.	High	**MPS**, MW, Landholders, SEW, SRW	In association with MW's Healthy Waterways and Stormwater Strategies, the PPWP Regional Catchment Strategy, Review of SEPP (WoV) Use WSUD to reduce stormwater inputs to the wetland and Chinaman's Creek. Best Practice Environmental Management Guidelines for Urban Stormwater (CSIRO).

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
2.06	Pollutant Management	Identify the sources, potential impact and mitigation strategies for toxicants entering Lower Catchment – Wetland Precinct, through roadside drains, storm water drains, waterways and groundwater. Identify and lead management strategies for point source pollution control. Incorporate WSUD into the planning scheme.	High	**MW**, EPA, MPS, SEW, Landholders	Use Smart Water Plan to prevent pollution of surface and groundwater.
2.07	Browns Road Upgrade	Future upgrades of Browns Road to incorporate environmentally sensitive design and provide better Wetland connectivity.	High	**VicRoads**, MPS	Increased drainage to hydraulically connect the Wetland An upgrade has been completed. Four trial underpasses were installed and are being monitored.
2.08	Future Road Corridor Reserve Management	Advocate that the parcel of VicRoads managed land that extends along the future road corridor from Boneo Road to Chinamans Creek is managed in a manner consistent with the Shire's Bushland Reserves.	High	**MPS**, VicRoads	Refer to Section 3.1.1 for Shire's position on the future inland arterial road/freeway.
2.09	SEW easement management	Manage easement in line with Tootgarook Wetland Management Plan and MPS Biodiversity Strategy to maintain biodiversity values.	High	**SEW**	
2.10	Existing WSUD/WSRL Assessment	Investigate the function and suitability of existing public and private WSUD/WSRL assets to assist the role, health and function of the Wetland.	Medium	**MPS, MW**, Landholders	In association with Shire's Integrated Local Flood Management, Drainage Management Strategy and Smart Water Plan, and MW's Water Sensitive Urban Design Guidelines – South Eastern Councils.
2.11	Environmental Water Action Plan	Support the implementation of MW's Environmental Water Action Plan for the Wetland and groundwater catchment, including on-site rehabilitation and monitoring works.	High	**MW**, Shire, SRW, SEW, PPWCMA, Landholders	MW's Environmental Water Action Plan is currently pre-release.
2.12	Trust for Nature Covenants	Support further use of Trust for Nature covenants to protect areas of natural habitat in conjunction with Biodiversity credit programs	High	**MPS,** TFN	An information session with Trust for Nature could be run to inform landholders of the potential benefits of covenants.

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
2.13	Invasive Plant and Pest Animal Strategy	Continue MPS's bushland management program and feral animal control relating to the wetland. Support activities for pest animal control programs (cat, fox, rat, and dog) Encourage adjoining landowners to participate in integrated fox control program	High	**MPS**, DELWP, Landholders, Parks Victoria, Landcare, PPWCMA, Shire, NGOs	Support activities under the Port Phillip and Western Port Invasive Plant and Animal Strategy
2.14	Wildlife Sanctuaries/Corridors	Identify priority roosting and nesting sites for native species, so that Landholders and stakeholders can implement natural habitat imitation and remnant vegetation restoration activities and works.	Medium	**MPS**, Landholders, Parks Victoria, Landcare, PPWCMA, Shire, NGOs	MPS Biodiversity Plan, and Mornington Peninsula Landcare Network "Linking the Mornington Peninsula Landscape" project. Private-Works-on-Nature-Strips-Reserves (11/2014)
2.15	Support MW's Healthy Waterways Strategy	Support the implementation of riparian, in-stream and catchment works identified in the Healthy Waterways Strategy.	High	**MW**, MPS, PPWPCMA, EPA, DELWP	MW is currently updating their Healthy Waterways Strategy.
2.16	Memorandum of Understanding	Develop a Memorandum of Understanding (MoU) between different management authorities to provide for better coordination of management activities.	High	**MPS**, DELWP, MW, SRW, SEW, PPWCMA, VicRoads.	
2.17	Blue Carbon Programs	Investigate the potential of blue carbon and carbon farming offsetting and associated opportunities for raising resources to implement the Plan	Low	**MPS**, MW, DELWP, PPWCMA, Landcare, TFN	Port Phillip and Westernport have an estimated Blue Carbon value in the order of $15.4 million (Carnell et al. 2015). Stay abreast of research as it becomes available.
2.18	Revegetation	Identify and prioritise areas suitable for revegetation projects.	Medium	**MPS**, Landholders	For areas identified on private land, encourage landholders to use land management financial incentives (Action 1.11).

6.3 Recreation and Tourism

Members of the local community recognise the high value of the Wetland as a passive recreation site. Further promotion of the Wetland for passive recreation and eco-tourism can be consistent with and complementary to the primary environmental protection objectives of this plan.

However, to ensure compatibility of use and conservation it is important that facilities be upgraded to enable appropriate access to the Wetland, provide a good environmental experience and ensure that Wetland values are not adversely impacted by human (motorised or non-motorised), livestock (equine or community farms), recreation (active or passive) or tourism (organised or impromptu) activities.

Establishing defined areas as locations for recreation and visitation will improve the 'net community benefit" associated with the wetland and arguably support funding applications to protect the Wetland's values.

The recreation and tourism actions recommended are presented in Table 6-3.

Key Issues

- Limited physical and visual access to the main body of remnant Wetland area, and limited parking and public amenity facilities.

Objectives

- Increase opportunities for community access and passive recreation within carefully defined locations within and adjacent to the Wetland.
- Promote the Wetland as a visitor destination and encourage eco-tourism as an alternative use of land.

Strengthen the social and economic case for increased funding for Wetland management.

Table 6-3 Recommended Recreation and Tourism Actions

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
3.01	Visitation and Promotion Plan	Develop a Visitation and Promotion Plan to establish the Wetland as a passive recreation destination.	Medium	**MPS**, Tourism Victoria, Landholders, Community Groups	The Visitation and Promotion Plan should include: • Identify strategies to actively promote the Wetland • Identify the sites and infrastructure required to facilitate increased visitor numbers • Considerations for visitor safety • An environmental impact assessment • A framework for the Shire to encourage and regulate private ecotourism operators
3.02	Wetland Visitor Brochure	Prepare a brochure and map showing visitors access points for ecotourism, education and recreation. Make available as a downloadable PDF on-line.	Low	**MPS**	
3.03	Improve Access and Facilities for Shire Bushland Reserves	Improve access and facilities for Shire Reserves including: • A raised viewing platform for the public to view the entire Wetland • Raised walkways • Parking and amenities for visitors to the Tootgarook Wetland	Medium	**MPS,** Landcare, Community Groups, Conservation Volunteers	Funding sources available include: • Interface Growth Fund (DELWP) • Tourism Demand Driver Infrastructure Program (TDDI) 4 locations have been identified as potential sites for a viewing platform: • 92 Elizabeth Ave • Drum Drum Alloc Creek Bushland Reserve • SEW Sewerage Treatment Works • Truemans Road Recreation Reserve (former landfill)
3.04	Passive Recreation in Open Spaces	Promote appropriate locations on public land within the Wetland as a passive recreation sites.	Medium	**MPS**, Community Groups, Conservation Volunteers	Funding sources available include: • Interface Growth Fund (DELWP) • Tourism Demand Driver Infrastructure Program (TDDI)

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
3.05	Improved Walking Trails	Improve the walking around the Wetland.	Medium	**MPS,** Landcare, Community Groups, Conservation Volunteers	Investigate linking trail through Boneo Park, Boneo Primary School Wetlands, Boneo Maze Wetland, 92 Elizabeth Avenue, Tootgarook Wetlands Reserve. Consider tracks linking the Wetland to foreshore, Pt. Nepean NP and Greens Bush using the freeway reserve (if Pao removed). Funding sources available include: • Interface Growth Fund (DELWP) • Tourism Demand Driver Infrastructure Program (TDDI)
3.06	Ecotourism Public-Private Partnerships	Investigate and establish public-private partnerships to improve ecotourism infrastructure, education and services.	High	**MPS**, Landowners, Commercial Operators	Boneo Park is developing a restaurant and viewing area with directional and interpretive signage to enable visitors to explore the wetland.
3.07	Commercial Ecotourism	Support commercial ecotourism operators to utilise the wetlands while sustaining the values.	Medium	**MPS**, Landowners, Commercial Operators	

6.4 Community Awareness, Education and Involvement

There are several active community and school groups along with engaged private landowners, currently contributing to the environmental management of the Wetland and other areas of the Chinamans Creek Catchment, including;

- Friends of Tootgarook Wetland Reserves
- Friends of Chinamans Creek
- Southern Peninsula Indigenous Flora and Fauna Association (SPIFFA)
- Save Tootgarook Swamp
- Capel Sound Foreshore Committee of Management
- Rosebud West Wetland Upgrade Project (Primary and Secondary schools)
- Boneo Park Equestrian Centre (McNaught Family)
- Birdlife Australia – Mornington Peninsula Branch

The work undertaken by community members and landholders has played a significant role in the protection of Wetland values. The continued involvement of these active community members plays a large role in the future management, community inclusion and public awareness of the Wetland.

To build on the work performed by the engaged community members, it is important to develop actions that engage the broader section of the local community by improving community awareness and co-ordinate involvement.

The community awareness, education and involvement actions recommended are presented in Table 6-4.

Key Issues

- Despite some very engaged and strong community groups, there is limited appreciation and understanding of the Wetland in the wider community.
- There is no single point of co-ordination for community groups. To-date this has not been considered a significant issue. However, as the number of involved community members increases a more co-ordinated approach will be required, for actions such as combined grant applications and hosting community events.

Objectives

- Actively promote the Wetland's significant environmental, natural, social, historical and cultural values to provide greater recognition and appreciation of the Wetland in the broader community.
- Engage and work with community members, landholders and land managers to promote best practice environmental, land and water management across the Catchment to protect the Wetland's values and natural assets.

Establish an ongoing Community Liaison Group to provide for ongoing communication between Council, agencies and community members, including land owners, on issues relating to the wetland and implementation of the Plan

Table 6-4 Recommended Community Awareness, Education and Involvement Actions

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
4.01	Wetland Reference Group (WRG)	Establish an ongoing Community Reference Group for the Wetland to share information and coordinate activities.	High	**MPS**	Invite participation by Community and Traditional Owner Reps, MW, PPWCMA, DELWP, SRW, SEW, Landcare, Western Port Biosphere, Dolphin Research Institute
4.02	Catchment Participation and Inclusion Plan	Develop a Community Participation Plan to coordinate the existing groups and promote further community participation.	High	**MPS**, Community and Traditional Owner Reps, MW, PPWCMA, DELWP, SRW, SEW, Landcare, Western Port Biosphere, Dolphin Research Institute, Conservation Volunteers	Community Participation and Inclusion Plan should: • Identify strategies to increase community engagement • Coordinate and strengthen ties between the existing community groups • Coordinate and strengthen ties between the community groups, government and agencies and researchers • Develop an approach to recognise the significant history of community involvement with the Wetland
4.03	Catchment Vegetation and Weed Education	Conduct regular education and community awareness sessions, and assisted site surveys to identify and implement control actions for existing, introduced, new and emerging weed species.	High	**MPS**, Parks Victoria, Landcare, PPWCMA, Vic Agriculture, Community Groups	
4.04	Engage with Education Sector	Promote Tootgarook wetland values, education opportunities and infrastructure to the primary, secondary and tertiary education sectors	Medium	**MPS**, Local Schools, Education Department	Produce a set of brochures/fact sheets on the wetland values and distribute to schools. Tootgarook Wetland is included in VC Geography text book VCE Year 12. Investigate opportunities to build the capacity of year 12 geography teachers to educate students on Tootgarook Wetlands in line with the curriculum. Build sense of ownership of wetlands and recreation/education infrastructure through engagement with the school community.
4.05	Maintain the Tootgarook Wetland Webpage	Maintain the Tootgarook Wetland webpage (Shire) and the online feedback process for stakeholder involvement and community activities via updates and links.	High	**MPS**	http://www.mornpen.vic.gov.au/Activities/Parks-Reserves/Wetlands#Tootgarook-wetlands-10

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
4.06	Welcome to the Wetland Campaign	Create and implement a community awareness campaign of Welcome to the Wetland, with associated ecosystem functions, and the identified community values and environmental threats, to existing species and their habitats.	Medium	**MPS**, Landcare, Community Groups	
4.07	Wetland Educational and Wayfinding Signage	Create and install roadside placemaking and education signage to inform the public of the location of the Wetland, species and habitat present, the associated reporting guidelines and hotlines for threatening and damaging behaviour.	High	**MPS**	
4.08	Sustainable Practices and Incentives	Support awareness and extension of sustainable land management practices to landholders, land managers, and operators across the Catchment.	High	**MPS**, MW, PPWCMA, SRW, Landcare, BioSphere, Landowners	Promote and educate sustainable land management practices to landholders, managers and operators while undertaking routine functions, such as permit approvals, site maintenance, etc.
4.09	Promote Wetland Conservation and Stewardship	Promote positive conservation and stewardship of Wetland biodiversity and habitat, in association with incentive schemes such as Trust for Nature, Land for Wildlife, Bush Broker and Land Sustainability Rebate.	High	**MPS**, TFN, BioSphere, Landcare, MW, PPWCMA	
4.10	Wetland conservation projects promotion	Recognise and support good outcomes from existing public and private land management and conservation projects – including owners implementing TFN covenants and other environmental initiatives.	High	**MPS**, Landowners, MW, TFN, Community Groups PPWCMA, Landcare, BioSphere, Conservation Volunteers	

6.5 Research and Monitoring

Jacobs (2014b) developed a monitoring program for the Wetland. This program focuses on defining the ecological character of the Wetland and includes:

- Habitat mapping
- Fauna monitoring
- Groundwater and surface water level monitoring
- Surface water quality monitoring

It is recommended that these monitoring programs and associated research be continued. It is important to establish/ improve key ecological data sets and evidence based benchmarks to assess the progress of the Plan and provide current condition information.

To date the following research and monitoring has been undertaken:

- Mapping of Ecological Vegetation Classes (EVCs) and habitat types (presently EVC mapping has been undertaken through a range of studies and is fragmented and inconsistent)
- Bird surveys (2013 -2016) undertaken by BirdLife Australia (Purnell and Wilson 2016)
- Targeted vertebrate fauna assessments (Legg 2014)
- Index of Wetland Condition for Groundwater Dependant Wetlands assessment (Arthur Rylah Institute, MW)
- Groundwater and surface water monitoring in the Wetland (MW)
- Index of Wetland Condition for Groundwater Dependent Wetlands – priority wetland assessments (unpublished client report for MW) (Papas, et al. 2016)

It is important that results of the monitoring program are made available to the public to promote community participation in wetland management. Data collected by community groups (citizen science) can also be incorporated into the monitoring programs, to further support community involvement.

The recommended monitoring and research actions are presented in Table 6-5.

Issues

- Current monitoring is undertaken by various organisations/individuals (Shire, MW, community organisations/individuals) for various purposes (formal Wetland management, individual site assessments, recreation). As a result, the large amount of data collected is fragmented and not easily accessible or discernible.

Objectives

- Improve the understanding of the Wetland's values and functions to establish baseline for the Wetland's current ecological character to;
  - assess the effectiveness of management actions

    - assess changes to the Wetland over time
- Seek to coordinate monitoring activities with relevant agencies and (where appropriate) community groups.
- Collate and disseminate research and monitoring and information

Table 6-5 Recommended Research and Monitoring Actions

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
5.01	Ecological Character Description (ECD) of the Wetland and Catchment	Complete an ECD of the Wetland and Catchment to determine the benchmarks for the implementation of the Plan to be assessed against.	High	**MPS**, MW, DELWP	An initial ECD has been completed by BMT WBM (2015)
5.02	Continue Existing Monitoring Programs	Continue existing monitoring programs (MW) for the Wetland	High	**MW**, MPS, SRW, SEW, PPWCMA, Landholders, Community Groups	Focusing on key elements of the ECD, including: • Birdlife Australia Annual Surveys (MW funded) • Groundwater and surface water monitoring
5.03	Research and Monitoring MoU	Develop an agreement between government agencies and community groups to co-ordinate monitoring and information sharing.	High	**MPS**, MW, SRW, SEW, PPWCMA, VicRoads, Landcare, Landholders, Community Groups	A web-based portal should be used to provide easy access of monitoring information to community (refer to Action 4.05).
5.04	EVC Mapping and Benchmarks	Map the location, extent and condition of flora species, to better spatially define EVC in the Wetland and across the Catchment, and establish condition assessment benchmarks.	High	**MPS**	
5.05	EVC Destruction Identification	Determine the impacts associated with current unauthorised activities on EVCs, to spatially identify, map and prioritise protection of habitat in the Wetland and across the Catchment.	High	**MPS**, SRW, SEW, PPWCMA, Parks Victoria, Landcare, VicRoads, Landholders	
5.06	Flora and Fauna Surveys	Undertake ongoing field surveys to establish flora and fauna benchmarks and assess changes in Wetland health.	High	**MPS**	
5.07	Waterway Monitoring	Add additional monitoring sites to Improve understanding of surface water flow.	Medium	**MW**, MPS	MW to investigate installing a surface water flow gauge.

Action Plan

	Management Action	Description	Priority	Responsibility (Bolding Indicates lead Agency)	Further Notes
5.08	Catchment Water Quality Monitoring	Undertake regular monitoring and review of Catchment water quality and its impact on ecological character.	Medium	**MW**, MPS, EPA, SRW, SEW, PPWCMA, DELWP, Landholders, Community Groups	Water quality data should be used to assess the implementation of the MPS Smart Water Plan.
5.09	Wetland Water Resources Assessment	Undertake surface water and groundwater balance modelling to define the Wetland's hydrologic regime for setting flow benchmarks.	High	**MW,** MPS, SEW, SRW	Consistent with MW's Environmental Water Action Plan (pre-release).
5.10	Tootgarook Wetland Management Plan (Plan) Review	Ensure the Tootgarook Wetland Management Plan, is regularly reviewed as per Section 7.	High	**MPS**, Wetland Reference Group (if established)	Ensure that the review has regard to emerging knowledge and issues, and changes to relevant legislation.
5.11	Climate Change Assessment	Improve understanding of future climate change impacts on the hydrology of the wetland.	Medium	**DELWP**, MPS, MW	Impactors may include; sea level intrusion, prolonged droughts, storm events and altered water table.
5.12	Define Potential Acid Sulfate Soil	Undertake field study and review the extent and condition of Potential Acid Sulfate Soils in the Wetland and Catchment.	Low	**MPS**, MW, Landholders, PPWCMA, Landcare	

7 Implementation and Review

The successful implementation of the Tootgarook Wetland Management Plan will require cooperation across a wide range of land owners, agencies and community groups.

Although there are still critical decisions that need to be made, there is increasingly a shared understanding of the values and vulnerabilities of the Wetland.

The actions recommended in this management plan provide a framework to further develop this understanding, protect the key values and support coordinated management. Many of the actions extend over several years or are ongoing, and it is the nature of environmental management that there is often a substantial time lag between the commencement of actions and discernible outcomes.

In the context of an adaptive management cycle (Figure 7-1), the Plan should be continuously reviewed as more knowledge and information becomes available, new issues emerge and policies change.

A more formal review of implementation progress should be undertaken annually, with a broader audit of the Plan completed every five years.

The annual review should primarily focus on progress against high priority actions, particularly to enable consideration of annual funding and grant application opportunities.

The broader audit should target the performance of the Plan against the vision and objectives, re-evaluate the values, threats and subsequent risk assessment, and re-evaluate the management actions.

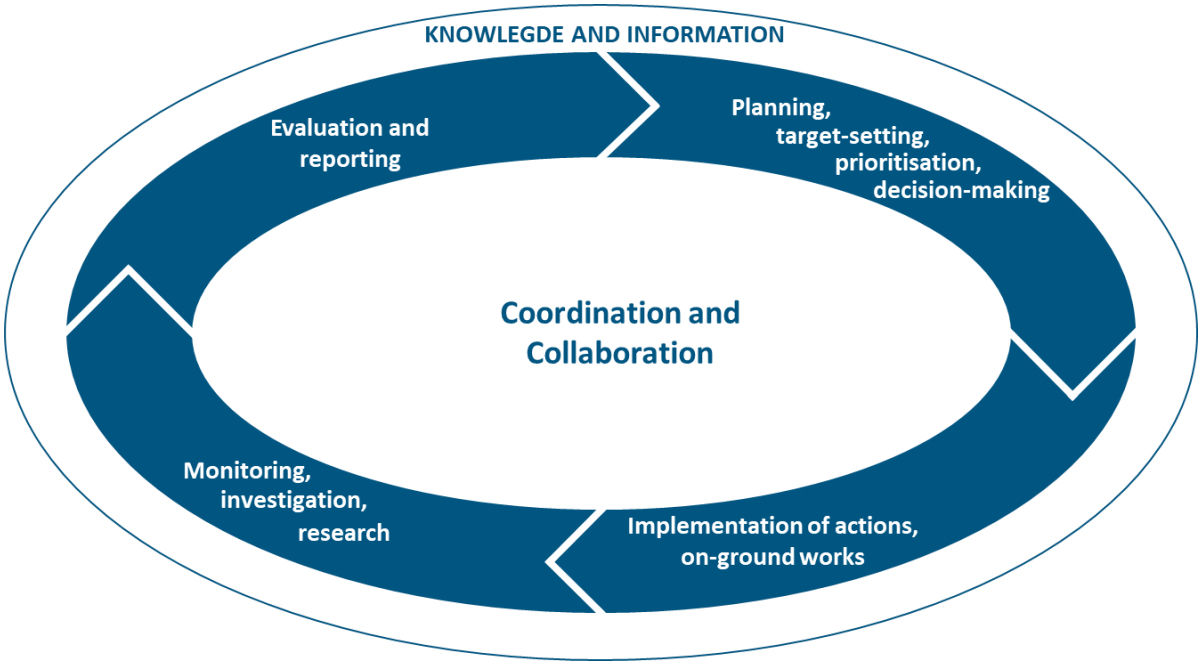

Figure 7-1 Adaptive Management Cycle under Melbourne Water's Healthy Waterways Strategy (Recreated from Melbourne Water 2013a)

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