Wonboyn Lake Entrance Management Policy

Review of Environmental Factors 2020

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1. Overview

1.1 Introduction

Bega Valley Shire Council (BVSC) assumes responsibility for the management of entrances at a number of estuaries throughout the Local Government Area that are subject to periods of closure to the ocean. These estuaries are referred to as intermittently closed and open lakes and lagoons (ICOLLs). Entrance management of ICOLLs essentially involves artificially removing or manipulating sand around the entrance berm, to release built-up waters to the sea. This is done typically when water levels within estuaries exceed specific 'trigger' levels as a precursor to potential detrimental impacts on access, infrastructure or industry around the waterways.

Interim Entrance Management Policies have previously been prepared for Wallaga Lake, Cuttagee Lake, Bega River, Back Lake, Curalo Lake and Wonboyn Lake within the Bega Valley Shire. Through a more holistic process including Government and public stakeholder consultation, final Entrance Management Policies have now been developed for the following ICOLLs within BVSC:

- Wallaga Lake;
- Cuttagee Lake;
- Bega River;
- Wallagoot Lake;
- Back Lake;
- Lake Curalo; and
- Wonboyn Lake

The Entrance Management Policy for Wonboyn Lake is provided in Appendix A which outlines specific "trigger" levels, procedures, and summary of Review of Environmental Factors (REFs) for artificially opening the estuary to the sea as a part of entrance management works. The Review of Environmental Factors (REF) (this document) details the potential impacts of implementing the Entrance Management Policy on the estuary environment and identifies the mitigation measures to be adopted in order to minimise potential impacts in accordance with the Part 5 of the Environmental Planning and Assessment Act (1979).

This document has considered the economic, ecological, social and hydrological impacts of managing estuary entrances to alleviate flooding with the intention to return to a more natural opening regime. It is intended that the Entrance Management Policy and associated REF be reviewed approximately every five years.

1.2 Aims and Objectives

The aims and objectives of Wonboyn Lake Entrance Management Policy are to:

- Minimise interference with natural entrance opening processes and minimise associated impacts on ecological processes;
- Accommodate future climate change considerations and in particular sea level rise and rainfall variability;
- Minimise risks to public and private safety associated with excessive inundation of foreshores and associated infrastructure;
- Conserve or enhance the biological diversity and flora and fauna communities of the estuarine lakes systems;
- Clearly establish triggers for initiating artificial entrance openings;
- Determine procedures to be initiated for entrance operations including entrance breakouts;
- Determine key responsibilities for management of the entrance;
- Detail the procedure for monitoring of lake entrances; and
- Provide a transition period for oyster farmers and residents to adjust infrastructure above the long-term trigger level of 1.4m

In meeting the above aims and objectives, Council will consider the following:

- Facilitate vertical natural migration of riparian and estuarine ecological communities in response to sea level rise;
- Limit opportunities for ingress and establishment of introduced and invasive species to the estuaries;
- Minimise impacts on local fisheries resources and other ecological species, where possible;
- Conserve and protect items and places of historical and cultural value;
- Enable continued existing use of lands for as long as practical;
- Strategically relocating or adapting key assets so as to minimise artificial interference in estuary processes in the future;
- Gain broad based community understanding and support for management of the lake entrances;
- Time requirements for review of entrance management practices.

1.3 Entrance Management Philosophy

The NSW Department of Primary Industries fish habitat management policies and guidelines "support minimal interference with ICOLL entrance barriers and advocates natural processes being allowed to operate to the greatest extent possible". In line with this philosophy, entrance management policies have been prepared that broadly aim for minimal or no opening with the long-term goal to retain or progressively reinstate natural behaviour (i.e. greater adaptation to closed entrances), with consideration to potential impacts of future sea level rise.

To achieve this goal, Wonboyn Lake requires the progressive removal, relocation or modification of assets and activities that are affected by inundation. Low lying assets include oyster lease infrastructure, oyster sheds and private jetties and sheds. In adopting this philosophy, affected communities will benefit by reducing their risk exposure under both existing and changed climate conditions in the long term. Adjustment of infrastructure will also enable the oyster industry to better function through variable water levels and periods of

closure. Management of the ICOLL entrances will generally accord to the philosophy shown in

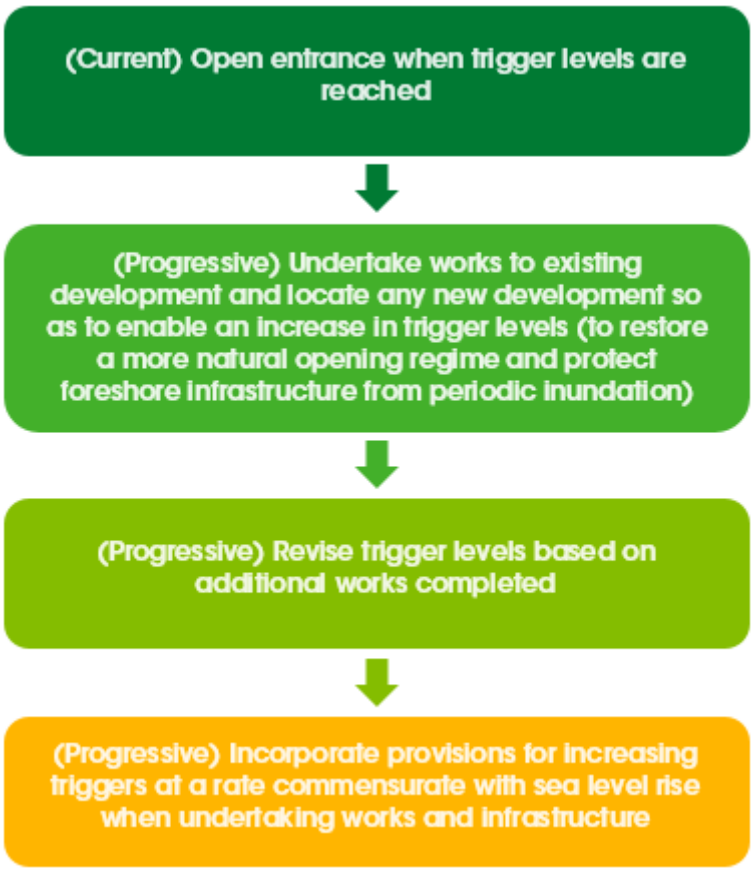

Figure 1.

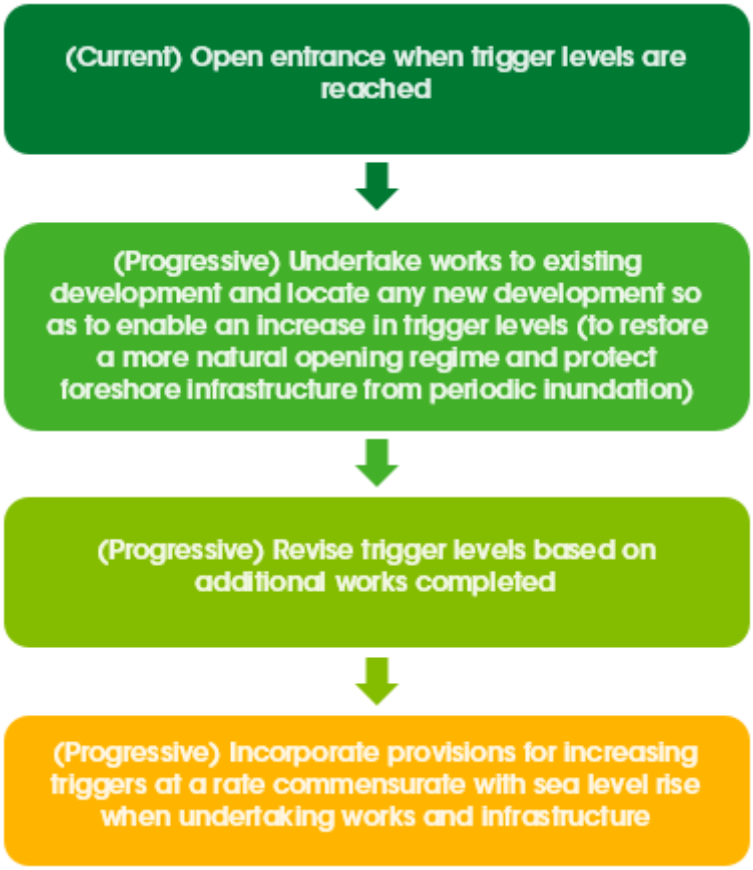

Figure 1: ICOLL Entrance Management Philosophy

1.4 Previous Draft Policies and Assessments

1.4.1 Wonboyn Lake and Estuary Management Plan

The Wonboyn Lake and Estuary Management Plan (WBM Oceanics, 2004), was prepared under the direction and supervision of the Bega Valley Shire Council's Wonboyn Lake and Estuary Management Committee. The principal objectives of this plan were to:

- Provide a process to maintain and improve the environmental values of the lake and estuary; and
- Present management options developed and agreed upon in the Estuary Management Study in the appropriate form, with consideration of associated issues such as: discussion and justification of the option; with whom the responsibility lies for implementing the option (agencies and groups with primary and secondary responsibilities for implementing the recommended options); specific actions required to implement each option (required monitoring works and activities to ensure that the proposed works program is moving towards desired environmental outcomes and to enable the progressive refinement of the works program if necessary); costs of implementation; and timeframe for the completion of option implementation.

The result was the prioritisation of all management options, with the top twenty management actions in the Estuary Management Plan being: (1) Environmental strategies in Development Control Plan; (2) EMPs for all development applications; (3) Foreshore reservations;(4) Management Plan for future of oyster leases; (5) Management Plan for flow within estuary; (6) Rezone important habitats; (7) Assess dredging of entrance; (8) Implement Stormwater Management Plan; (9) Maintain riparian vegetation; (10) Walkway along foreshore; (11) Management Plan for recreational use; (12) Reduce sediment flow from road runoff; (13) Restrict future urban development; (14) Cultural interpretative signage; (15) Channel markers and signs; (16) Develop water quality guidelines; (17) Restrict/control foreshore access; (18) Recovery plan for seagrasses; (19) Non-motorised access points; (20) Fish Habitat Protection Plan.

It is of note that Option S-2: Entrance dredging was rejected as a possibility by Bega Valley Shire Council and the local community at the time, due to environmental, social and economic considerations. Reflection on the option by WBM in 2004 found that the benefits of dredging the entrance did not outweigh the detriments of keeping the entrance in its natural state. During their analysis water quality in Wonboyn estuary did not suggest the need for dredging of the entrance, nor did the estuary have a significant need for dredging for navigation purposes. Thus it was recommended by WBM that "the entrance should remain in its natural form and should wait for floods to remove accumulated sand" (WBM Oceanics, 2004).

1.4.2 Wonboyn Lake Entrance Openings: Review of Environmental Factors

A Review of Environmental Factors (REF) was prepared for Wonboyn Lake in October 2004 (BVSC). In early September 2004 the Wonboyn Lake entrance closed for the first time since the 1940's and subsequently the community held an open forum with unanimous support to reopen the estuary to the sea. The primary driver behind this artificial opening was the communities concern that prolonged closure of the lake's entrance would significantly impact the Wonboyn oyster industry, and consequently have flow-on economic effects to the economy of Wonboyn Lake Village.

Unlike most artificial lake openings which are carried out at higher lake water levels to alleviate flooding, the REF was prepared with lake levels around 0.4 m AHD. With such relatively low water lake levels it was documented that "mechanical opening of Wonboyn Lake will be difficult, expensive and have a low chance of achieving a meaningful scouring of the entrance bar" (BVSC, 2004). Fortunately while artificially trenching a channel on the 8th and 9th of December, a storm event over the catchment resulted in the lake levels rising to 1.5 m AHD (gauged at Agnew Wharf), which consequently scoured the remaining entrance bar trench and opened the lake to the ocean.

The prepared REF documented existing biological, cultural, socio-economic issues, the proposal and alternative management options in conjunction with an assessment of environmental impact. The REF details two access options; (1) Shoreline Option – traversing the shoreline, via private property; and (2) Woodland Option – creating a new track east of the powerlines through the sand dunes. The Woodland access option was undertaken for the 2004 opening. The cost of this access option and trenching works was $10,000 and caused moderate damage to mature Melaleuca, Banksia, Acacia, coastal heathlands and coastal foredune vegetation species.

In 2016 a Review of Environmental Factors was prepared for multiple estuaries across the Bega Valley to support the development of ICOLL Entrance Management Policies. A REF for Wonboyn Lake was developed in line with a draft policy with a trigger of 1.4m AHD. The Draft Policy was not endorsed by stakeholders and Council as the trigger height did not incorporate oyster lease infrastructure, however, information from the 2016 REF has been utilised in recent REF's.

In 2020 a Review of Environmental Factors was prepared for a low water level artificial opening of Wonboyn lake to mitigate post-bushfire water quality impacts to supplement the 2016 REF. The entrance closed in October 2019 following a period of lower than average rainfall. Bushfires in January 2020 effectively burnt the entire Wonboyn catchment leaving bare forest floor covered in ash and prone to erosion. Community concern for local oyster industry and estuarine ecology increased post bushfire due to the risk of declining water quality due to sediment and ash runoff in a closed system. The REF prepared by Elgin outlined the risks, benefits and procedures associated with a low- level opening and condition of the lake at the time.

As was the case in 2004, low level openings are not recommended due to the low likelihood of creating a sufficient tidal exchange. Based on DPIE modelling, a low water level opening was expected to provide some short term (15 days) tidal exchange flushing benefit to the lower estuary however limited to no benefit in the upper estuary. Council obtained approval to prepare a dry notch via submission of the 2016 REF to Crown Lands. An initial channel was dug on the 8th of February in preparation for a significant rainfall event to aid a natural opening. On the 12th February the lake was manually opened at a level of 0.3m AHD. Machinery remained on site for five additional days to continue to excavate the channel and entrance. As expected with low water levels, the lake closed one to two weeks after.

2. Relevant Legislation

2.1 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are environmental planning instruments that regulate land use and development. SEPPs are made by the Minister for Planning under Part 3 of the Environmental Planning and Assessment Act 1979 and administered by the Department of Planning and Infrastructure.

A number of SEPPs are relevant to entrance management and are briefly described below:

2.1.1 State Environmental Planning Policy (Infrastructure)

SEPP (Infrastructure) provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process. The intent of the SEPP is to support greater flexibility in the location of infrastructure and service facilities along with improved regulatory certainty and efficiency for the State. The SEPP specifies a number of activities that may be permitted with or without consent when carried out by public authorities. These include for flood mitigation activities and activities related to maintaining or restoring tidal flows for ecological purposes.

Where opening an ICOLL entrance or maintaining an entrance berm at a certain level for the purposes of flood mitigation, a public authority may use the State Environmental Planning Policy (Infrastructure) to assess the activity in accordance with Part 5 of the Environmental Planning and Assessment Act 1979. This applies to undertaking works as set out in the Entrance Management Policies for Wonboyn Lake as the works fall within the scope of provisions outlined in State Environmental Planning Policy (SEPP) Infrastructure (specifically works for flood mitigation). Approvals still need to be obtained from relevant authorities, and an assessment under Part 5 of the Act is required (including preparation of a Review of Environmental Factors, as contained within this document).

2.1.2 State Environmental Planning Policy (Coastal Management) 2018

The State Environmental Planning Policy (Coastal Management) 2018, known as the CM SEPP, provides mapping that identifies the extent of each coastal management area across NSW according to definitions in the CM Act. Mapping of these areas is available via the Coastal SEPP mapping tool. The CM SEPP imposes targeted development controls for each management area to guide appropriate development within the coastal zone.

The proposed works will occur in areas mapped as Coastal Environment Area and Coastal Use Area. The works proposed satisfy the objectives of both CM areas, in particular, the works aims to maintain and improve water quality and estuary health.

2.2 Environmental Planning and Assessment Act 1979

The objective of the Environmental Planning and Assessment Act 1979 (EPA Act) is to encourage proper management, development and conservation of natural and constructed resources. The Act is the primary legislation controlling development activity in NSW and is administered by the

Minister for Planning. Approval processes for "development" and "works" in NSW are provided for in Part 4 and Part 5 of the EPA Act.

Part 4 of the EPA Act lays out the legislative regime for what is commonly known as the standard process for lodgement and consideration of development applications, and includes development assessment, development contributions and development certification. Essentially Part 4 processes apply where the local authority (Council) is the consent authority. The issue of permissibility is generally found in the Local Environment Plan (LEP) relevant to the Council. The controls for development of particular sites or use are found in Councils LEP and Development Control Plan (DCP).

Part 5 of the EPA Act establishes an environmental assessment system for certain activities that do not require development consent under Part 4. Part 5 only applies to those proposals which are permissible without requiring development consent and are often infrastructure proposals approved by local councils or State agencies which are undertaking them. Part 5 focuses on the obligation of the "determining authority" to consider the environmental impact of any "activity". This involves considering the likely environmental impacts of the activity and to consider the appropriate level of environmental assessment that is required. For the opening of Wonboyn Lake, this is in the form of a Review of Environmental Factors, but if the potential impacts were considered significant, an Environmental Impact Statement (EIS) or Species Impact Statement (SIS) would have been required. The need for other relevant permits and licences remains.

2.3 Coastal Management Act (2016)

The Coastal Management Act 2016 replaces the Coastal Protection Act 1979 promotes ecologically sustainable development of the coastal zone and identifies the importance of the natural, social, cultural and economic values of the coast. It provides a legislative framework for coordinated coastal planning across NSW and supports the aims of the Marine Estate Management Act 2014, as the coastal zone forms part of the marine estate. Under the CM Act, the coastal zone is defined as comprising four coastal management areas that include:

1. **Coastal wetlands and littoral rainforests area** – areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26
2. **Coastal vulnerability area** – areas subject to coastal hazards such as coastal erosion and tidal inundation
3. **Coastal environment area** – areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands.
4. **Coastal use area** – land adjacent to coastal waters, estuaries and coastal lakes and lagoons

2.4 Crown Land Management Act 2016

The The *Crown Land Management Act 2016* provides for the administration and management of Crown Land, which includes most beaches, coastal reserves, near-shore waters and estuaries. The Act contains a number of principles for administering and managing Crown Land, and these are:

a. that environmental protection principles be observed in relation to the management and administration of Crown Land;
b. that the natural resources of Crown Land (including water, soil, flora, fauna and scenic quality) be conserved wherever possible;
c. that public use and enjoyment of appropriate Crown Land be encouraged;
d. that, where appropriate, multiple use of Crown Land be encouraged;
e. that, where appropriate, Crown Land should be used and managed in such a way that both the land and its resources are sustained in perpetuity; and
f. that Crown Land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the State consistent with the above principles.

The estuary beds and entrance channels of Wonboyn Lake are Crown Land. Landowner consent from the Department of Planning, Industry and Environment (Crown Lands) is therefore required before works on these Crown Land parcels can be undertaken. A single licence can be obtained from the Department of Primary Industries (Lands) covering entrance management of all coastal lakes in the Shire, to be reviewed and renewed concurrently with the review of the individual Policies.

2.5 Fisheries Management Act 1994

The objectives of the Fisheries Management Act 1994 (FM Act 1994) are to conserve, develop and share the fisheries resources of NSW for the benefits of present and future generations. The Act applies specifically to aquatic flora and fauna including fish, invertebrates and marine vegetation, such as mangroves, seagrass and saltmarsh. The Act also includes schedules of endangered aquatic species, populations and ecological communities, which must be considered in the same manner as species listed under the Biodiversity Conservation Act 2016.

Under the Act a public authority (other than a Local Government Authority) is required to consult with the relevant Minister prior to carrying out or authorising dredging or reclamation (s 199). Dredging works includes excavating and/or the removal of material. A Local Government Authority proposing to undertake dredging works is required to obtain a permit under Section 200. However, Section 200 does not apply if the dredging is authorised under the Crown Lands Act 1989 or by another relevant authority (other than a Local Government). This means that consent for the dredging works, if a licence is awarded under the Crown Lands Act 1989 or by another relevant authority, is not required for a second licence from the Department of Primary Industries (Fisheries) under the FM Act 1994. It is a condition of the FM Act 1994 however, that in issuing a licence for the works, other authorities (such as Department of Primary Industry - Lands) must consult with Department of Primary Industries (Fisheries) regarding the proposal. Section 205 (harm to marine vegetation) of the FM Act 1994 could apply if seagrasses or saltmarsh areas were to be damaged in managing the ICOLL entrances.

To support the Fisheries Management Act 1994, the Department of Primary Industries (DPI) also has Fish Habitat Management Policies and Guidelines (NSW Fisheries, 1999), these state:

- The Department supports minimal interference with ICOLL entrance barriers and advocates natural processes being allowed to operate to the greatest extent possible.

- The Department does not support the artificial opening of an ICOLL unless the proponent can demonstrate that the social, environmental and economic benefits greatly outweigh any potential adverse impacts.

- The Department supports using estuary management plans and environmental assessment processes to analyse the issues relating to opening a particular ICOLL, and to develop an entrance management plan or entrance management policy. Proposals for artificial openings which are to be carried out according to a formulated entrance management plan or policy are more likely to be approved.

In implementing the above policies, DPIE uses a number of guidelines relating to the development of entrance management policies, environmental assessment and criteria that should be met prior to artificial entrance opening occurring.

2.6 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides for the protection of matters of national environmental significance, including:

- World Heritage Properties;
- National Heritage Places;
- Wetlands of International Importance;
- Listed Threatened Species and Ecological Communities;
- Listed Migratory Species; and
- Commonwealth Marine Areas.

If an activity has the potential to impact on one or more matters of national environmental significance, an assessment process in accordance with the EPBC Act and Guidelines (Environment Australia 2000) is required. If the assessment concludes that a significant impact is likely, then the activity will be deemed a controlled action and approval for the activity is required from the Commonwealth Department of Environment and Heritage via a detailed referral process, including public exhibition.
A number of Threatened and Migratory Species and Ecological Communities are found at many of the coastal lakes along the NSW South Coast, including those ICOLLs subject to this environmental assessment.

2.7 NSW Local Government Act 1993

Under the Local Government Act 1919, Councils had general authority to open coastal lakes and lagoons under Section 352A. Although this provision was not specifically carried through in the Local Government Act 1993, Councils have continued to assume such responsibility on behalf of the interests of the public.

2.8 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 and its regulations replaces the Threatened Species Conservation Act 1995. The purpose of this Act is to maintain a healthy, productive and

resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development, and in particular aims to:

a) to conserve biodiversity at bioregional and State scales, and
b) to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations, and
c) to improve, share and use knowledge, including local and traditional Aboriginal ecological knowledge, about biodiversity conservation, and
d) to support biodiversity conservation in the context of a changing climate, and
e.) to support collating and sharing data, and monitoring and reporting on the status of biodiversity and the effectiveness of conservation actions, and
f.) to assess the extinction risk of species and ecological communities, and identify key threatening processes, through an independent and rigorous scientific process, and
g.) to regulate human interactions with wildlife by applying a risk-based approach, and
h.) to support conservation and threat abatement action to slow the rate of biodiversity loss and conserve threatened species and ecological communities in nature, and
i.) to support and guide prioritised and strategic investment in biodiversity conservation, and
j.) to encourage and enable landholders to enter into voluntary agreements over land for the conservation of biodiversity, and
k.) to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity, and
l.) to establish a scientific method for assessing the likely impacts on biodiversity values of proposed development and land use change, for calculating measures to offset those impacts and for assessing improvements in biodiversity values, and
m.) to establish market-based conservation mechanisms through which the biodiversity impacts of development and land use change can be offset at landscape and site scales, and
n.) to support public consultation and participation in biodiversity conservation and decision-making about biodiversity conservation, and
o.) to make expert advice and knowledge available to assist the Minister in the administration of this Act.

Threatened species and threatened ecological communities (TECs) are listed under Part 4 of the Act and together with the Environmental Planning and Assessment Act 1979 requires consideration of whether a development or an activity is likely to significantly affect threatened species, populations and ecological communities or their habitat. Where a proposal is likely to have a significant impact on threatened species, a Species Impact Statement must be prepared. Under s 91 of the Act, a licence is required if a proposed activity is likely to significantly affect threatened species, populations or ecological communities or their habitats. Consideration has been given to potential harm or damage to threatened species and listed migratory species, for each of the ICOLLs covered in this REF.

2.9 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 provides for the declaration of reserves (including national parks, nature reserves and state conservation areas) and the protection of flora, fauna and Aboriginal heritage. The Act is administered by the Minister for the Environment and the

relevant State agency for the management of reserves is DPIE (National Parks and Wildlife Service).

Consideration must be given to Section 86 of the National Parks and Wildlife Act 1974, as it is an offence to harm or desecrate an Aboriginal object or Aboriginal place without an exemption or defence (penalties apply). The transportation of heavy equipment to some of the ICOLL entrance sites (and to a lesser likelihood the entrance excavation) has the potential to harm Aboriginal objects and/or sites. As a precautionary measure, BVSC commissioned NSW Archaeology to undertake a specific Aboriginal Cultural Heritage Assessment Report (ACHAR) and have prepared an application for an Aboriginal Heritage Impact Permit (AHIP) associated with the entrance management works.

2.10 Local Land Services Act 2013

This Act regulates the clearing of native vegetation on all land in NSW, except for excluded land listed in Schedule 1 of the Act. The Act outlines what landowners can and cannot do in clearing native vegetation. Note: whilst works would involve disturbance to native vegetation in some instances, Council is exempt from requiring a controlled activity permit.

2.11 Water Management Act 2000

The object of the *Water Management Act 2000* is the sustainable and integrated management of the state's water for the benefit of both present and future generations.

After an extensive period of public consultation, the Water Management Act 2000 was passed by the NSW Parliament in December 2000, establishing a completely new statutory framework for managing water in NSW. For the first time, NSW had comprehensive water legislation to guide our water management activities.

The Water Management Act 2000 is based on the concept of ecologically sustainable development – development today that will not threaten the ability of future generations to meet their needs. The Act recognises:

- the fundamental health of our rivers and groundwater systems and associated wetlands, floodplains, estuaries has to be protected
- the management of water must be integrated with other natural resources such as vegetation, soils and land to be properly effective, water management must be a shared responsibility between the government and the community
- water management decisions must involve consideration of environmental,
- social, economic, cultural and heritage aspects social and economic benefits to the state will result from the sustainable and efficient use of water.

Note: whilst works would involve disturbance to waterfront land, Council is exempt from requiring a controlled activity permit under section 38 of the Regulations.

2.12 Bega Valley Comprehensive Local Environmental Plan 2013

The BVSC CLEP 2013 aims to make local environmental planning provisions for land in Bega Valley in accordance with the relevant standard environmental planning instrument under section 33A of the EP&A Act. The particular aims of this Plan are as follows:

a.) to protect and improve the economic, natural and social resources of Bega Valley through the principles of ecologically sustainable development, including conservation of biodiversity, energy efficiency and taking into account projected changes as a result of climate change,
b.) to provide employment opportunities and strengthen the local economic base by encouraging a range of enterprises, including tourism, that respond to lifestyle choices, emerging markets and changes in technology,
c.) to conserve and enhance environmental assets, including estuaries, rivers, wetlands, remnant native vegetation, soils and wildlife corridors,
d.) to encourage compact and efficient urban settlement,
e.) to ensure that development contributes to the natural landscape and built form environments that make up the character of Bega Valley,
f.) to provide opportunities for a range of housing choice in locations that have good access to public transport, community facilities and services, retail and commercial services and employment opportunities,
g.) to protect agricultural lands by preventing land fragmentation and adverse impacts from non-agricultural land uses,
h.) to identify and conserve the Aboriginal and European cultural heritage of Bega Valley,
i.) to restrict development on land that is subject to natural hazards,
j.) to ensure that development has minimal impact on water quality and environmental flows of receiving waters.

2.13 Approvals Required for the Implementation of the Entrance Management Policies

The approvals potentially required for implementation of the Entrance Management Policy for Wonboyn Lake are summarised in Table 1. These approvals are required prior to commencement of entrance management works.

As indicated in the *Fisheries Management Act 1994*, a separate licence to dredge does not need to be obtained from the Department of Primary Industries (Fisheries), providing that a dredging licence is obtained under the Crown Land Management Act 2016, and that in issuing a licence for the works, Department of Primary Industries (Lands) have consulted with Department of Primary Industries (Fisheries) regarding the proposal.

Table 1: Potential Entrance Work Approvals/Concurrence Required

Relevant Act	Approvals Required	Approval Body
Crown Land Management Act 2016 (refer Section 2.4)	Licence to carry out dredging activities on Crown Land	DPIE (Crown Lands)

NSW Fisheries Management Act (refer Section 2.5**Error! Reference source not found.**)	Permit for destruction of marine vegetation, if applicable	DPI (Fisheries)
Biodiversity Conservation Act 2016 (refer Section 2.6)	Permit to carry out activities that could harm a threatened species, population or ecological community	DPIE
National Parks and Wildlife Act (refer Section 2.9	Permit to carry out activities on Aboriginal objects or places (Aboriginal Heritage Impact Permit)	DPIE

2.14 Recommended Approval Conditions

It is recommended that approval be provided to enable Council to implement the various Entrance Management Policies for a fixed period of five (5) years, conditional to Council receiving relevant licences/permits from those outlined in Table 1. After this time, Council should be required to review the Policy and associated environmental impacts before approval and licence renewals are issued.

3 Wonboyn Lake Entrance Management REF

3.1 Location

Wonboyn Lake is situated on the far south coast of New South Wales, approximately 30 km south of Eden. The lake has a surface area of 4.2 km^2, a catchment of 335.4 km^2 and is classified as a youthful, wave dominate barrier estuary (Roy et al 2001). The lake bed is deeper than most other ICOLLs in the area, with an average bed depth of approximately 2.7m (Roper et al., 2011) and a maximum depth of approximately 6 m (WBM, 2004). The Wonboyn River and Stevens Creek provide the significant freshwater inflows to the lake. Ninety percent of the lake's catchment lies within the East Boyd, Nadgee and Timbillica State Forests, with a further 4% of the catchment in the Nadgee Nature Reserve and Mount Imlay National Park (see Figure2).

Figure 2: Wonboyn Lake Estuary

3.2 Description of Proposed Activity

As discussed previously in the REF, it is proposed that Council artificially open the entrances of certain ICOLLs throughout the shire, but only when there is a need to alleviate nuisance flooding of foreshore assets which can occur when the ICOLL entrances are closed. This intervention is carried out in accordance with a defined water level as outlined in the relevant formal Entrance Management Policies and summarised in Table 2 below.

Table 2: Summary of Entrance Opening Levels for other BVSC ICOLLs	
Estuary	**Lake Opening Trigger Level**
Wallaga Lake	1.1-1.25 m AHD
Cuttagee Lake	1.6-1.8 m AHD
Bega River	1.36 m AHD
Wallagoot Lake	1.2-1.4 m AHD
Back Lake	1.2-1.4 m AHD
Lake Curalo	1.2 m AHD

In the past Wonboyn Lake has remained open to the ocean more than 95% of the time, with only three closures on record. Wonboyn Lake is unique whereby assets including sheds and jetties both private commercial, have generally been built fairly low (majority below 1m) as the natural range of water levels is between 0.1m – 0.4m AHD. The oyster industry also requires open entrance conditions which provide tidal variation and the temperature and salinity conditions required to maintain oyster health. To account for these factors in the Entrance Management Policy, Council has developed an interim and long-term policy with multiple triggers.

Due to the low-lying infrastructure situated around Wonboyn Lake, an interim set of triggers are in place for five years to allow for the oyster industry and private land holders to adjust infrastructure to withstand longer periods of inundation and higher water levels. After this five-year period the trigger levels will be raised in line with the future policy below. The following conditions are required to initiate an opening of the entrance channel:

Interim Trigger (five years from adoption of the Policy)

The entrance to Wonboyn Lake may be opened in the following circumstances:

- Water level at or above 1m AHD; or
- Water level between 0.75m – 1m AHD either for a period of at least 2 months, or significant rainfall is predicted in the catchment (100mm+) and/or other exceptional circumstances including water quality (water temperature over 31^0C and/or salinity <24ppt persisting over a period of two weeks). For exceptional circumstance openings or openings below 1m, Council will consider an opening based on the advice of Council Environment staff; approval required from DPI Fisheries, DPIE Biodiversity and Conservation Division and; consultation with the Wonboyn Oyster Industry, DPI Food Authority and DPI Aquaculture.

No more than <u>two</u> lower level openings (0.75m-1m AHD) are to be undertaken within a 12-month period.

Due to the importance of a sustained opening in this estuary, all efforts will be made to open the lake at the highest possible levels and under the most suitable conditions to achieve sufficient scour with consideration given to forecast rain events, tides, swell conditions and sea level.

Long Term Trigger (for the period five to ten years after Policy adoption)

The entrance to Wonboyn Lake may be opened in the following circumstances:

- Water level at or above 1.4m; or

- Water level at or above 1m and significant rainfall is predicted in the catchment (100mm+)
- Water level is between 1m and 1.4 m for at least 2 months and/or other exceptional circumstances including water quality (water temperature over 31^0C and/or salinity <24ppt persisting over a period of two weeks). Exceptional circumstance openings will be based on the advice of Council Environment staff, approval required from DPI Fisheries, DPIE Biodiversity and Conservation Division and consultation with the Wonboyn Oyster Industry, DPI Food Authority and DPI Aquaculture.

The success of ICOLL entrance openings generally depends on a large volume of water being released from the lake to scour built up marine sands from the entrance channel and any near shore marine deposits. Generally, the higher the lake water level prior to mechanical opening, the more successful the opening is. A minimum height of 0.75 in the interim trigger and 1m in the secondary trigger have been developed for this reason with a maximum of two 'lower level' openings (below 1.4m AHD) permitted in a 12 month period.

The proposed entrance opening works have two distinct components:

1. Site access; and
2. Entrance excavation.

Both components need to be considered in this REF independently due to their particular potential environmental impacts.

3.2.1 Equipment Access

The earthmoving equipment (most likely an excavator or backhoe) required to carry out the opening would need to be unloaded on the intersection of Greencape Lighthouse Road and Archers Road due to the unsuitable condition of Archers Road for a semi-trailer to travel. It is approximately 2.1 km from this point to the powerline easement on the northern boundary of the houses that line the northern shoreline of Wonboyn Lake (See Figure 33). The final 500 m of the route is through a dense, vine forest type vegetation community (including Lilly Pilli, Sweet Pittosporum, Water Vine, Pomaderris sp.) that forms a tight canopy over the track, giving a tunnel appearance. The canopy is only high enough for a conventional vehicle to pass and would be damaged by heavy machinery moving along this route. While the vegetation here is visually appealing, it does not constitute part of any threatened ecological community, nor were there threatened vegetation types identified. There is no alternative option in accessing the powerline easement due to the topography of the area. It was hoped that Council would be able to travel down to the powerlines to the rear of the properties and avoid the canopy covered section of the track. However, a near vertical cliff along the easement makes this option impossible.

From the eastern end of the powerline easement the machine would be required to follow an existing track for some 660 m around the north-eastern side of the lake to reach the beach. This track was previously used by BVSC for a lake entrance opening in 2004, and traverses a significant section of native vegetation. At the advice of DPIE, BVSC engaged specialist consultant Envirokey to undertake a Flora and Vegetation Community Impact Assessment (FVCIA) for this section of the machine access route. The purpose of the FVCIA was to assess the potential impacts of the proposed access to threatened flora species, flora populations and threatened ecological communities (TEC) and their habitats as listed under the schedules of the Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection and

Biodiversity Conservation Act 1999 (EPBC Act). The findings of the Envirokey investigation are provided in Envirokey (2016) and attached as Appendix C.

Once on the beach the excavator would travel 400 m along the high tide wave runup line to reach the entrance excavation site.

This route has been selected to minimise future disturbance to vegetation during machine access and egress, as it follows an existing cleared track. The route also minimises the extent to which the machine would pass through dune areas that are potential habitat for threatened shorebirds. However, it is expected that minor damage to vegetation along the edges of the track and dune grasses is inevitable. Particular care will be taken to avoid damage to, or disturbance of vegetated areas of sand dunes and shell middens, and as a precautionary measure a permit (AHIP) from DPIE has been granted to undertake the works (though there are no known Aboriginal objects or places within the access or work areas).

The earthmoving equipment will be escorted by a supervisor to ensure that the correct access route is followed and opening procedures are correctly adhered to. As part of Council's Memorandum of Understanding the Eden Aboriginal Lands Council would be invited to have a sites officer present during the site access and entrance opening works. As per the Wonboyn Lake Entrance Management Policy, if the lake is required to be opened between August and April, BVSC staff will also liaise with NPWS and the local Shorebird Coordinator.

Figure 32: Location of Entrance Opening Works

0 150 300 600
Metres

3.2.2 Channel Excavation

The work will involve excavating a small channel across Disaster Bay Beach immediately to the north of 'Baycliff' using mechanical equipment, most likely an excavator. Sand excavated from the beach berm will be deposited on the beach adjacent to the excavated channel, away from any dunal vegetation or identified threatened shorebird habitat, and will not be removed from the site (though during other estuary opening events the excavated material is usually naturally dispersed within the first couple of tidal cycles). The exact disposal area will depend on the extent of the entrance bar at the time of opening.

The channel dimensions cannot be specified, but the preferred size as outlined in the Policy is 2-5 m wide with the bed graded to the ocean. Excavation will cease once a strong outward flow of water has been established. The total excavation time will typically be of 4-6 hours duration, but could be 10+ hours if a significant entrance berm is present or during particularly adverse working conditions.

The flowing water will scour sand from the excavated channel causing the channel to enlarge and/or migrate. The degree of enlargement/migration cannot be predicted but experience at this site and at other lakes has shown that if excavation is in the area of the natural entrance channel the artificial channel will rarely exceed the dimensions, or move from the locations, that are attained by natural breakouts.

To maximise the effectiveness of the established entrance channel, completion of the excavated channel will generally be undertaken during the falling stage of the tidal cycle, just after the peak of the high tide. This should ensure that an adequate head difference between the water in the lake and the ocean is maintained for as long as possible. Preference will also be given to undertaking the works during a spring tide but since these only occur for a few days every fortnight this is not always possible. However, the commencement of the excavation will be dependent upon the amount of sand to be removed and the capacity of the machinery being used.

3.3 Purpose of the Activity

The purpose of the works is to lower lake water levels below that which causes flooding problems for low-lying assets, and to re-establish a tidal connection between the lake and the ocean. As outlined in the Policy, the lake may also be opened on the grounds of maintaining suitable water quality conditions for oyster survival.

3.4 Consideration of Alternatives

Ultimately there are no viable alternatives to the artificial opening of the lake in the short term to reduce inundation if high lake water levels occur. The "do-nothing" option is unacceptable because of the potential safety risk and disruption that could be caused if the lake was left closed and water inundated Wonboyn Road. The high water levels may also remain for many months compounding the scale of disruption through lack of access to private properties, National Park and other recreational facilities by floodwaters. Therefore, not interfering and allowing nature to take its course so that water levels rise until a natural breakout takes place, could in most situations cause undue disturbance.

Due to the relative economic importance of the local oyster farming industry to the small community of Wonboyn, Council has elected to continue to support the requirements of the

industry in the short term, by allowing the lake to be opened at lower levels (minimum 0.75m AHD) for a period of five years post adoption of policy or to improve water quality in exceptional circumstances as outlined in the policy. After the initial five years the minimum height for opening will be raised to 1m AHD.

While it is difficult to quantify the value of these economic and social drivers, Council is concerned about the impacts on the Wonboyn Village as a whole, if there was to be a major downturn in the oyster industry and a possible long term reduction in fish stocks and changes in the Lake's ecology. As such, there is no short term viable alternative to artificially opening the entrance to the lake on water quality grounds when required for oyster survival.

However, the ongoing mechanical opening of Wonboyn Lake is logistically difficult, expensive and unsustainable during long periods of drought, predicted to potentially worsen with ongoing climate change. The difficulty lies in:

- the distance the machinery is required to travel from the nearest trafficable road;
- no well-established/maintained access route to the beach; and
- the potentially low water levels in the lake at the time of opening (interim policy and for water quality purposes), which will likely result in only a shallow entrance channel being scoured.

Due to these limitations, the Wonboyn Lake Entrance Management Policy (Appendix A) advocates a minimal entrance intervention in the long term, with preference for returning to a "natural as possible" breakout regime. In order to achieve this, a number of measures will need to be considered. These are likely to include:

- Investigating alternative methods to retain oyster survival when the lake is closed, e.g. transporting to another lake etc.;
- Raising the level of Wonboyn Road at Myrtle Cove;
- Progressive and opportunistic raising of assets to levels above 1.4 m AHD;
- Maintaining a buffer of no new residential development within close proximity to and below an elevation of 3.0 m AHD around Wonboyn Lake.

3.5 Description of the Existing Environment

3.5.1 General Characteristics

The Wonboyn River enters Disaster Bay approximately 20km due south of Eden. The river winds downstream from its waterfall tidal limit through steeply sided, wooded terrain. Wonboyn Lake forms a 1 km^2 lobe attached to the river along its southern bank some 3.5 km upstream of the entrance. The village of Wonboyn is situated on the southern shore of the lake. The river is freely navigable to about 1 km downstream of the tidal limit, except over the difficult entrance bar which is often shallow but rarely closed.

3.5.2 Sediments

In general, sediment qualities in the Wonboyn Estuary are typical of an undisturbed estuary with low rates of tidal flushing and low tidal velocities. Fine sediments from the catchment have accumulated in the estuary, especially in Wonboyn Lake, where the low tidal velocities and similarly low flood velocities allow such deposition and accumulation (WBM Oceanics, 2004).The

entrance bar and adjoining shoals are composed predominantly of marine sands that have been deposited in the entrance, largely by the forcing of waves and wind.

3.5.2.1 Acid Sulfate Soils

In NSW, potential acid sulfate soils have been mapped in estuaries and embayments along the coastline. The impacts of acid drainage can be substantial and may include fish kills, oyster damage and mortality, release of heavy metals from contaminated sediment, human and animal health impacts, adverse impacts on soil structure and damage to built structures such as bridges.

Acid sulfate soils are those that have been formed in low energy, depositional environments over the last 6000 years. Published risk maps show the entire bed of Wonboyn Lake as having a high risk of potential acid sulfate soils. By maintaining an open entrance to the lake, water levels in the lake will be similar to those experienced following a natural entrance breakout or when the entrance is open to tidal exchange (as has been typical for Wonboyn Lake for several decades). It is therefore unlikely that artificially opening the entrance to the ocean will have any effect on potential acid sulfate soils. In relation to the berm area where the excavation works are proposed, acid sulfate soils are highly unlikely to occur as the area is highly dynamic and consists predominantly of marine sands deposited from wave action.

3.5.2.2 Bank Erosion and Sedimentation

Coastal and Marine Geosciences (1999) undertook a sedimentation study of the Wonboyn Estuary for DLWC. This study examined the major depositional environments within the estuary and provides background data on the nature and origin of sediments in the estuary. Key findings of this study (as summarised in WBM Oceanics, 2002) were as follows:

- The estuary comprises three geomorphic divisions, as follows:
    - Tidal Delta – This lower section of the estuary is comprised of emergent sand shoals and bifurcating tidal channels. Sediments are typically clean, moderately well to well sorted, medium grained, rounded, shelly quartz sand of marine origin.
    - Central Basin – The central basin or lake is relatively deep and marks the inland limit of the deposition of marine sands. The basin is partially filled with organic rich shelly muds typical of an estuarine central mud basin environment.
    - Fluvial Delta – Upstream of Wonboyn Lake, moderately sorted muddy sands and sandy muds of fluvial origin occur within the incised bedrock valley. Fluvial sediments from the local catchment merge with marine sands of the tidal delta in the north of the lake basin. Poorly sorted, lithic rich, gravelly, angular sands characterise fluvial delta deposits in the area.
- Material deposited in the Central Basin essentially comprised organic rich sandy muds with shell, gravel and plant fragments;
- Nitrogen levels in Wonboyn Lake sediments were high, possibly due to naturally higher levels of organic material in the mud basin sediments.

WBM Oceanics (2002) undertook an analysis of sedimentation (both catchment and marine based) of the Wonboyn estuary, and concluded:

- Historical rates of fluvial sedimentation will undoubtedly have been affected by catchment forestry, but are unlikely to be affected in the foreseeable future;

- There would appear to be no significant likelihood that the existing (and historic) rates of fluvial sedimentation (which are comparatively slight) are affecting estuarine health; and
- Catchment forestry does not appear to be a major problem for the estuary.
- Marine sedimentation rates are dominated by the condition of the estuary entrance; and
- Oyster leases present within the estuary appear to be having a minimal to negligible effect on marine sedimentation processes.

In recent years the foreshore along North Wonboyn has eroded, which has resulted in private residents constructing a range of ad-hoc and/or temporary protection works in attempt to slow the erosion. During heavy coastal storms with elevated water levels in the lower estuary, ocean swells were seen to cross the lower part of the estuary and cause significant overtopping of the eroded foreshore. WRL (2015) provided an analysis of processes in the lower estuary and concluded that no definite or obvious cause of the foreshore recession at North Wonboyn could be identified, but it is likely that the recession is a natural adjustment of the shoreline position, within a dynamic section of the estuary. These adjustments in the foreshore are more than likely linked to adjustments in the surrounding estuary shoals and channels, and are driven by a number of processes including:

- Time periods between large freshwater flooding events that scour the lower estuary sand shoals;
- Wave climate on the open coast which drives the infilling of sand within the lower estuary shoals;
- The extent to which the estuary entrance is open to the sea, which dictates the tidal exchange; and
- Ongoing evolution of the estuary due to a shift of the entrance from the southern side of the headland to the present northern side.

3.5.3 Hydrology

3.5.3.1 Entrance Behaviour / Characteristics

The typical tidal range within Wonboyn Lake is somewhat less than the open ocean due to the attenuation caused by the constrained nature of the shallow entrance shoals (WBM Oceanics, 2002). During a short water level data collection campaign in 2000, WBM Oceanics (2002) determined that with a significantly shoaled entrance, there is only minimal tidal fluctuation within the lake for all but the largest ocean tides. From the assessment, the following conclusions were drawn with respect to tidal flushing of the estuary:

- The lower estuary (below Wonboyn Lake) is extremely well flushed, even with the constrained (2000) entrance conditions. Flushing times are of the order of 1-15 days for most areas;
- Wonboyn Lake tends to act as a 'dampener' on tidal flushing due to its significant volume. This effect is particularly noticeable for the 2000 assessment and associated constrained entrance channel; and
- The upper estuary is poorly flushed by tidal processes, and as such is sensitive to increased pollutant loadings.

DPIE have undertaken an analysis of the entrance state for Wonboyn on the basis of available gauged data, which is included below.

DPIE Analysis:

Manly Hydraulics Laboratory have maintained a water level gauge on behalf of DPIE in Wonboyn Lake since 20/8/1997, so approximately 23 years of water level data exists for the estuary. At the time of installation, the entrance was open. Entrance closure and opening has been identified from observing the stop and start of a tidal signal from the graphed data (see Figure4). There are other small periods of time where no data has not been collected, but it's considered unlikely to have resulted in missing other entrance opening/closures as periods of closure are uncharacteristic and have been well documented.

Between 20/8/1997 and 25/7/2015, only 2 separate periods of entrance closed conditions have been identified, with closed conditions lasting 98 days and 131 days respectively (Table). The total duration of closed entrance conditions compared to the full record equates to being closed for only approximately 3% of the time. The duration of open entrance conditions from the water level records highlights that the estuary typically is open to tidal flow for periods of several years and rarely closes. The total duration of open entrance conditions for the full record equates to approximately being open for 97% of the time, outlining the predominantly open nature of the estuary. The three periods of time where the entrance did close were during exceptionally dry conditions (~2000 – 2009 & ~2015-2020) where other ICOLLs on the South Coast experienced similar uncharacteristic closed periods and/or longer and more frequent periods of closed conditions.

The level of the three recorded entrance openings were 1.55, 1.34 m and 0.98m AHD. It should be noted that this may not provide a good surrogate for natural berm height. An OEH survey of Wonboyn Lake berm on 11/9/14 directly adjacent to the open entrance channel found the berm height to be approximately 1.87 m AHD. Comparison of Wonboyn water levels to ocean water levels recorded from Twofold Bay in Eden show that the tidal range is heavily restricted compared to the full open ocean tidal range (Figure 5). Tidal range is generally in the order of about 0.1 to 0.3 m and rarely exceeds this range (Figure 54 and Figure 635).

Table 3: Periods of Entrance Closures, Opening and Opening Levels for Wonboyn Lake

Entrance Closure Date	Entrance Opening Date	WL Height at Opening	Closure Duration (days)	Open Duration (days)
NA	20/08/1997	NA	NA	NA
2/09/2004	9/12/2004	1.55	98	2570
7/10/2009	15/02/2010	1.34	131	1763
13/10/2019	1/06/2020	0.98	231	3562
Total			229	6319
Total			~5%	~95%

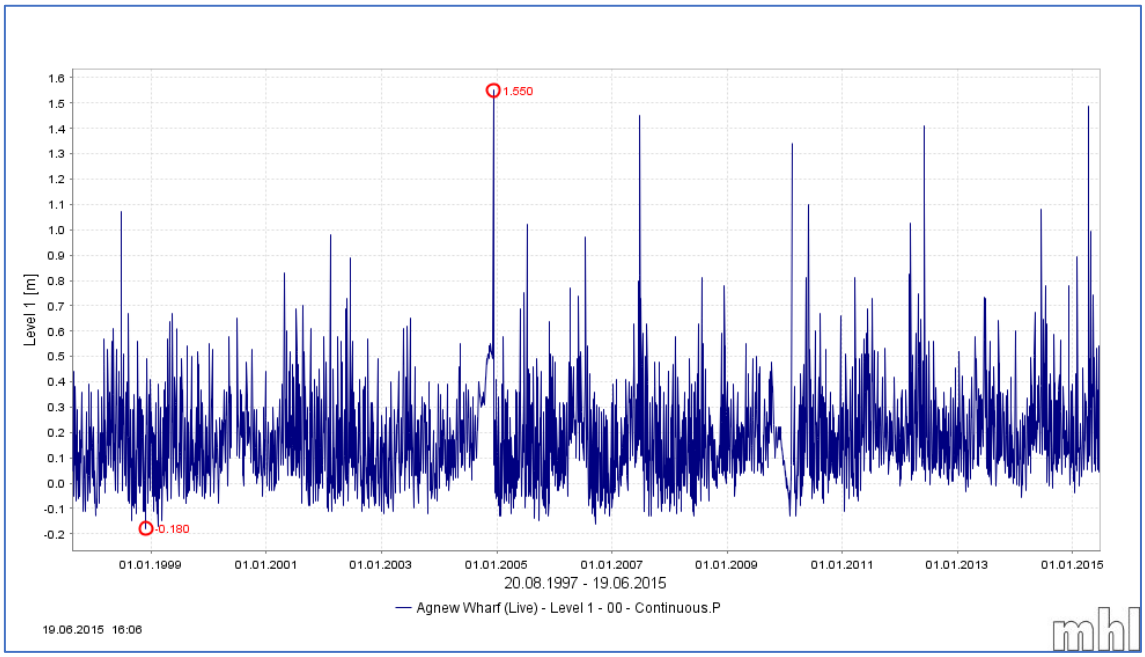

Figure 4: Complete Water Level Data Set from the Wonboyn Lake Water Level Gauge Situated off Agnew Wharf

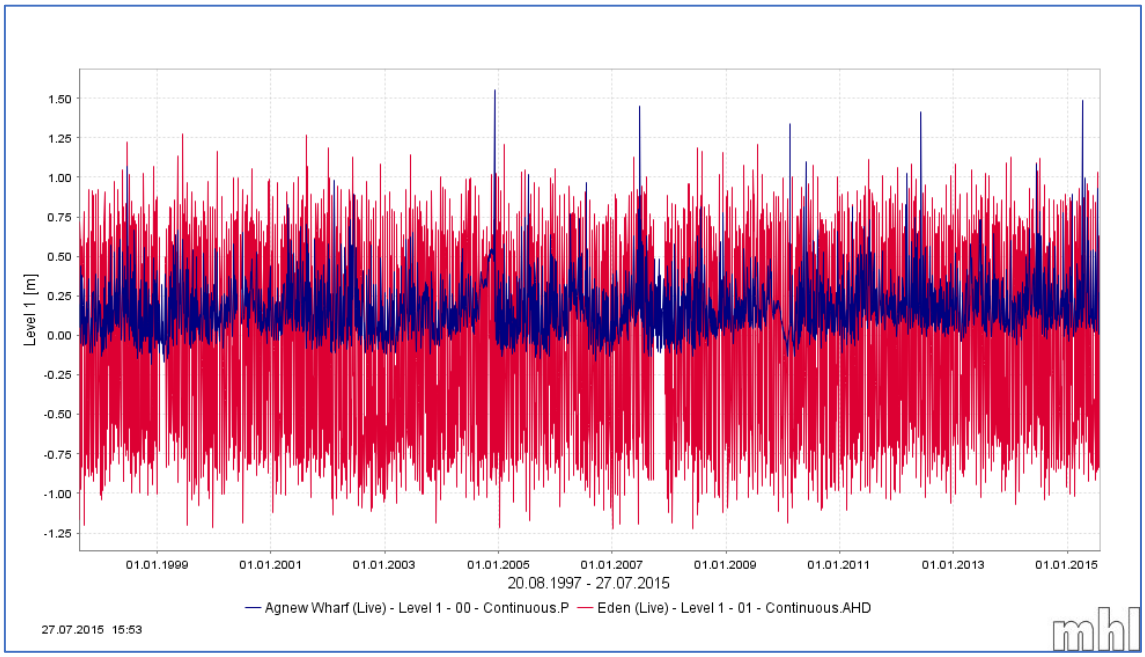

Figure 5: Complete Water Level Data set from Wonboyn Lake Water Level Gauge, plotted against the Open Ocean Water Level Records from Twofold Bay

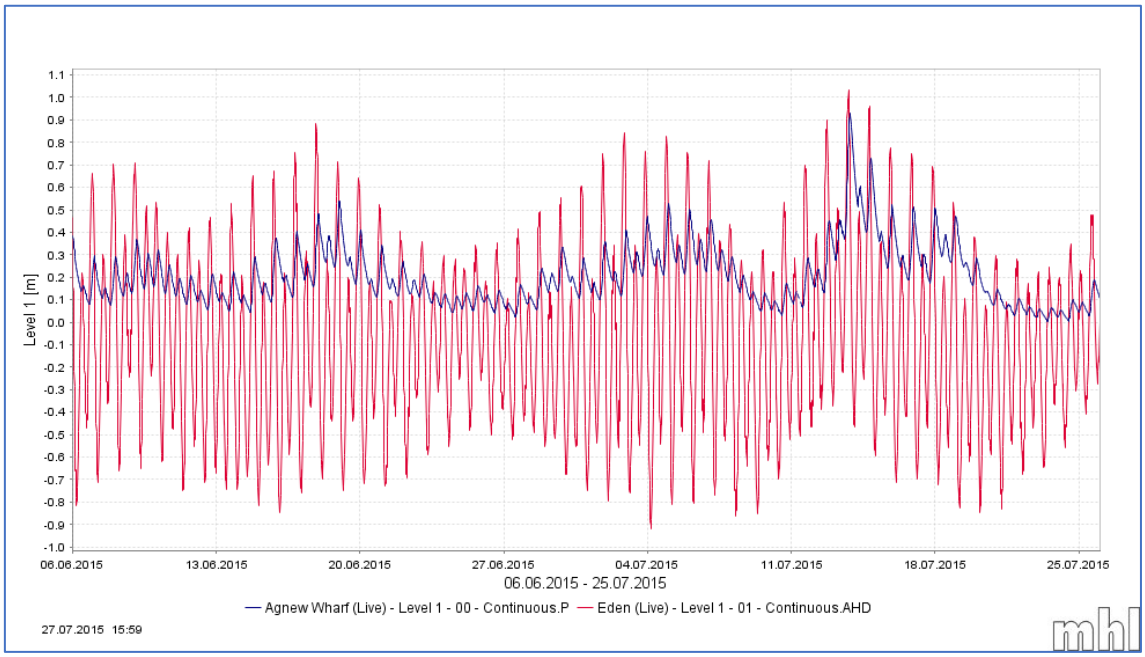

Figure 63: Snapshot of Wonboyn Lake Water Level Record Plotted Against the Open Ocean Water Level Record from Twofold Bay

Prior to approximately 2000, Wonboyn Lake entrance was in general considered to be permanently open. This was confirmed by a review of aerial photography available for the area (WBM Oceanics, 2002). However, the nature of the entrance and lower estuary shoals varies considerably with time, and the relative incidence of floods (which tend to scour the entrance and re-align channels) and large wave events (which will tend to mobilise nearshore sand deposits and encourage the entrance to close). Interpretation of available aerial photographs since 1962 (Figure) shows that the entrance of the lake is typically on the immediate north side of 'Baycliff', though WRL (2015) reports that it is possible that at some stage in the past (pre 1962) that the entrance would have been located further to the south.

3.5.3.2 Water Quality

The waters of the Wonboyn estuary exhibit excellent chemical water quality attributes, indicative of the near pristine nature of the catchment, and minimal sources of pollutant input (WBM Oceanics, 2002). It can be expected that the water quality adjacent to the entrance will be of similarly good condition, although any prolonged closure will obviously have an impact on the chemical composition of the waters in the lower estuary, due to the absence of any tidal flushing.

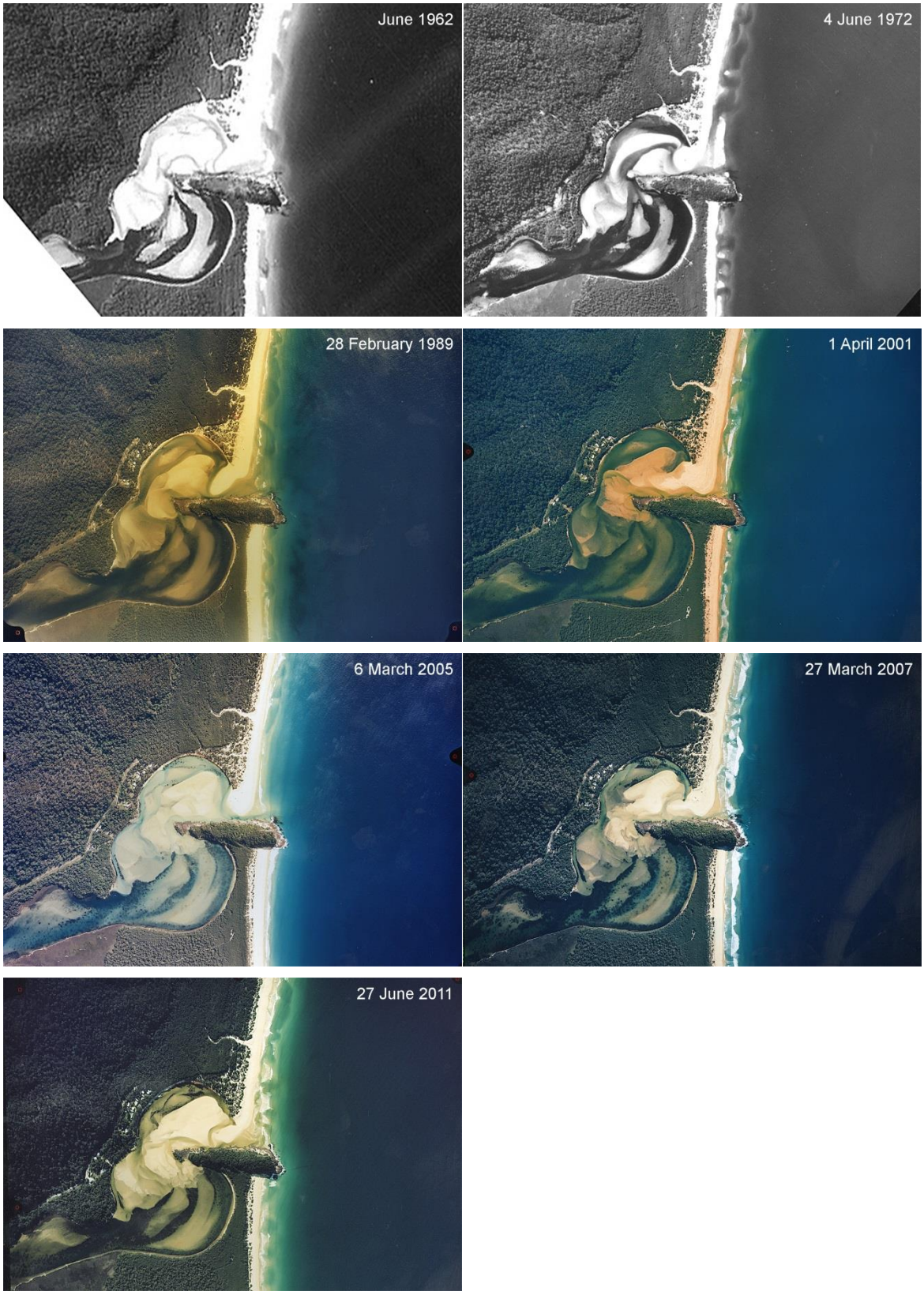

Figure 7: Aerial Photographs of the Wonboyn Lake Entrance 1962 to 2011

3.5.4 Ecology

Wonboyn Lake and its surrounds provides habitat for a number of significant flora and fauna species. The estuary itself contains several significant saltmarsh species and regionally significant wetland areas, as well as a diverse range of habitats such as rocky shores, sand shoals, deep lake sediments and estuarine wetlands. WBM Oceanics (2002) presented a detailed review of the ecological processes for both the Wonboyn estuary and its surrounding catchment, the information of which has contributed largely to this summary of lake ecology. As well as a detailed field work program, WBM Oceanics (2002) also completed a desktop review of existing information using a range of sources including:

- collation of existing database records for the estuary (e.g. NSW NPWS Wildlife Atlas);
- review of previous published and unpublished studies for the estuary (e.g. DLWC zooplankton sampling);
- airphoto interpretation to investigate patterns of vegetation cover and vegetation types;
- review of vegetation mapping prepared by NSW National Parks & Wildlife Service and NSW Fisheries.

For the purpose of assessing threatened and endangered species via the Atlas of NSW Wildlife, the lake and its immediate surrounds where defined within the geographical domain:

GDA94

North: -31.18 South: -37.28

East: 149.99 West: 149.89

Within this domain The Atlas of NSW Wildlife identified 28 species protected under the Biodiversity Conservation Act 2016, 7 species protected under the Environment Protection and Biodiversity Conservation Act 1999, and 7 species protected under the Japan Australia, Korea Australia and China Australia Migratory Birds Agreements.

3.5.4.1 Flora

Aquatic Vegetation

Two seagrass species were recorded during field inspections in July – August 2000: *Zostera capricorni*, which was the most conspicuous seagrass species; and the paddle weed *Halophila australis*, which had relatively sparse coverage throughout the lower estuary reaches. These seagrasses are highly productive, provide nursery and foraging habitat (for fish, crustaceans and molluscs), bind sediments against erosion and help regulate nutrient cycling. These seagrasses are import marine vegetation and as a result are protected under the NSW Fisheries Management Act 1997. However, there are no seagrasses or saltmarsh communities in the immediate entrance area for which entrance opening works are proposed.

Marine dominated macroalgae assemblages (multicellular plants which can be seen with the naked eye including seaweeds and filamentous algae) were reported by WBM Oceanics (2002) as being present around Bay Cliff, the rocky headland at the mouth of the Wonboyn River. The brown algae *Hormosira banksii* and *Sargassum spp*. were reported to be abundant along

sheltered parts of the lower intertidal zone and among rock-pools throughout the lower estuary and around Bay Cliff. *Colpomenia sinuosa*, a cosmopolitan species of brown algae, was also common in sheltered areas around Bay Cliff. At the time of initial field surveys (July-August 2000), the brown alga *Ectocarpus* constituted the dominant macroalgae species in the lower estuary. This species was reported to blanket the rocky shores, as well as seagrass beds (restricted mainly to *Zostera capricorni*) and oyster racks, throughout the lower estuary and Wonboyn Lake, but was comparatively uncommon in the upper estuary.

Transitional and Fringing Wetland Vegetation

Several transitional and fringing endangered ecological communities (EECs) listed under the NSW *Biodiversity Conservation Act 2016* are known to occur within the Wonboyn Lake estuarine catchment (Figure 88). These EECs include Coastal Saltmarsh, Bangalay Sand Forest and Freshwater Wetlands.

Saltmarsh areas occur throughout the lower reaches of Wonboyn estuary. It was noted in WBM Oceanics (2002) that Wonboyn estuary had the fifth largest area of saltmarsh in southern NSW estuaries (i.e. south of Clyde River), totalling 0.483 km^2. This community of species is very important to estuarine food webs, providing a site for invertebrate breeding and a feeding area for economically important fish and shorebirds. In conjunction Coastal Saltmarsh also provides an ecological buffer and filter mechanism for sediment and nutrients. Saltmarsh has declined around the state, and due to this state wide declining trend Coastal Saltmarsh has been listed as an endangered ecological community under the *Biodiversity Conservation Act 2016*.

The NPWS Threatened Species Unit undertook site inspections of three areas in the lower reaches of Wonboyn estuary during November 1999. A number of significant plant species were recorded during the site inspection, as follows:

- *Distichlis distichophylla* (Australian Saltgrass): this species is listed as endangered under the Biodiversity Conservation Act 2016. Australian saltgrass is a perennial, salt-tolerant grass growing up to 30cm tall, with creeping rhizomes up to more than 1m long. It grows in saline soils and is known from the South Western Plains region of NSW and areas in Victoria, Tasmania and South Australia, but is also known to occur in the south-eastern margin of Wonboyn Lake (SEPP14 #10).
- *Myoprum insulare*: this species is thought be at its northern distribution limit at the study area (recorded in SEPP14# 9, 10), and may therefore represent a significant record.

The Freshwater Wetlands on Coastal Floodplains endangered ecological community occupies an area ≈220,000 m^2 north east of the Wonboyn entrance (see Figure 8). *Melaleuca ericifolla*, *Baumea articulata*, *Periscaia Praetermissa*, *Phragmites australis*, *Triglochin procerum*, *Typha orientallis* and *Cladium procerum* typically characterise this endangered ecological community which provides important habitat, food and water source for freshwater fish, amphibian, native mammal and bird species (Tozer et al 2004).

Extensive areas of the catchment for the lower Wonboyn estuary are dominated by the Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions endangered ecological community, which occupies a total area of ≈500 ha across two significant areas (see

Figure 88). Firstly, stretching from the private properties at North Wonboyn in a north easterly direction just inland from the sand dunes of Disaster Bay beach, and secondly stretching south from the lower part of the Wonboyn estuary, again just inland from the sand dunes of the ocean beach. Bangalay Sand Forest typically has a dense to open tree canopy and occurs on dunes exposed to salt-bearing sea breezes. The most common vegetation species within this endangered ecological community are *Eucalyptus botryoides, Banksia integrifolia subsp. Integrifolia, Eucalyptus pilularis, Acmena smithii, Dianella spp., Lepidosperma concavum, Lomandra longifolia, Pteridium esculentum* (Bracken), and the grasses *Imperata cylindrical, Microlaena stipoides var. stipoides, Themeda australis* (Tozer et al 2004). This vegetation complex once would have occupied many coastal localities however clearing, habitat degradation and weeds have caused substantial losses across the NSW state. As a result this remanent vegetation community has been placed as endangered and likely to become extinct unless the circumstances and factors threatening its survival cease to operate (NSW Scientific Committee 2012).

Access Track Vegetation

The FVCIA undertaken by Envirokey (2016) provided a botanical survey of vegetation 5 m either side of the proposed 660 m long access track from the power line easement at North Wonboyn to the beach. The report from this investigation is presented in Appendix C, and a summary of the identified vegetation presented here. The botanical survey identified a total of 54 native and 7 introduced plant species, while no threatened flora were identified. The survey identified 3 native vegetation communities that would be impacted along the access route:

- 0.15 hectares of impacted “Bangalay - Old-man Banksia open forest on coastal sands, Sydney Basin and South East Corner” (Threatened Ecological Community, with identified species indicating the community can be classified as the EEC Bangalay Sand Forest);
- 0.12 hectares of impacted “Coast Banksia – Coast Wattle Dune Scrub, Sydney Basin and South East Corner” (not listed as a Threatened Ecological Community);
- 0.0048 hectares of impacted “Spinifex beach strand grassland, Sydney Basin and South East Corner” (not listed as a Threatened Ecological Community).

No threatened flora species as listed under the schedules of the TSC Act or EPBC were recorded within the vicinity of the proposed works, though there is potential for the following species to occur within the area:

- Australian Saltgrass (*Distichlis distichophylla*);
- Hidden Violet (*Viola cleistagamoides*).

A total of 15 hollow-bearing trees were identified in the area within 5 m of the access track. These comprised 17 hollows of which 12 were small, two medium and three large. Council proposes to utilise the existing access track with no impact on hollow bearing trees.

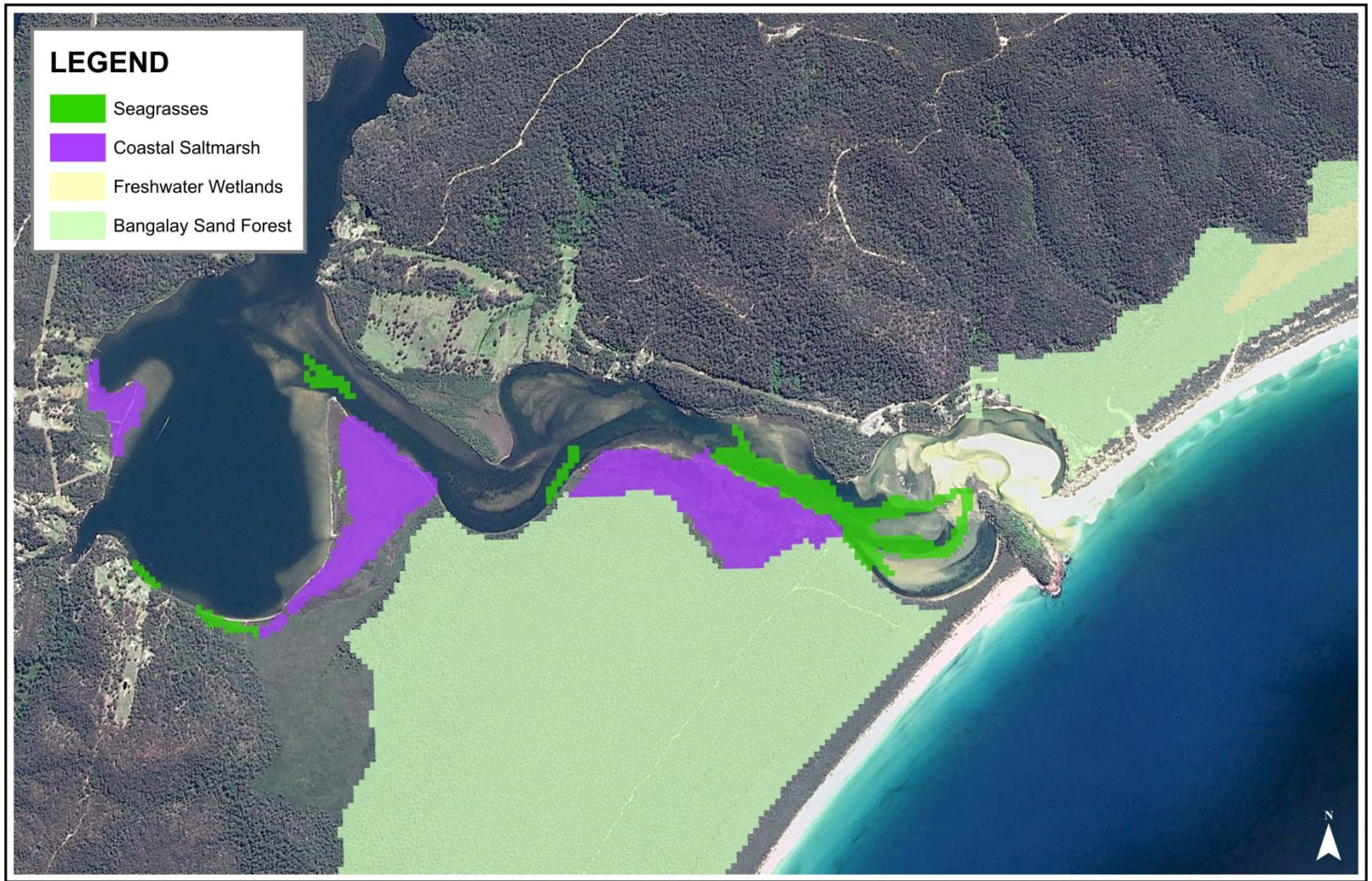

Figure 84: Threatened Flora – Wonboyn Lake

0 300 600 1200
Metres

3.5.4.2 Fauna

Mammals

The Atlas of NSW Wildlife has identified 9 species listed as vulnerable and one species as endangered under the NSW Biodiversity Conservation Act 2016 within the study area. Of these species, the Southern Brown Bandicoot is listed as endangered, and the Koala, Long-nosed Potoroo and the Grey-headed Flying-Fox are listed as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. These species are listed in Table:

Table 4: Threatened Mammals in the Wonboyn Lake Region

Common Name	Scientific Name	NSW Status	Comm. Status
Southern Brown Bandicoot (eastern)	*Isoodon obesulus obesulus*	E	E
White-footed Dunnart	*Sminthopsis leucopus*	V	
Koala	*Phascolarctos cinereus*	V	V
Long-nosed Potoroo	*Potorous tridactylus*	V	V
Eastern Pygmy-Possum	*Cercartetus nanus*	V	
Yellow-bellied Glider	*Petaurus australis*	V	
Eastern Freetail-bat	*Mormopterus norfolkensis*	V	
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V	
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V

V= Vulnerable; facing a high risk of extinction in the medium-term future.

E= Endangered; facing a very high risk of extinction in the near future.

Birds

The Atlas of NSW Wildlife has identified 15 bird species listed as vulnerable, 1 species listed as endangered and 1 species listed as critically endangered under the NSW Biodiversity Conservation Act 2016 within the study area. Of these species, the Eastern Curlew is listed as critically endangered and the Hooded Plover as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. In addition, 7 species are protected under the Japan-Australia, Republic of Korea-Australia and China-Australia Migratory Birds Agreements. These species are shown in Table 5. OEH (2015) present maps of sites that are significant to shorebird nesting throughout the Bega Valley Shire and identify the Wonboyn Lake entrance as one of these sites. Figure 1059 shows the identified locations and species from DPIE (2015).

Table 5: Threatened Avifauna in the Wonboyn Lake Region				
Common Name	**Scientific Name**	**NSW Status**	**Comm. Status**	**Migratory Bird Agreements**
White-throated Needletail	*Hirundapus caudacutus*			C,J,K
Short-tailed Shearwater	*Ardenna tenuirostris*			J,K
Eastern Curlew	*Numenius madagascariensis*		CE	C, J, K
Caspian Tern	*Hydroprogne caspia*			C, J
Eastern Reef Egret	*Egretta sacra*			C
White-bellied Sea-Eagle	*Haliaeetus leucogaster*			C
Fork-tailed Swift	*Apus pacificus*			C, J, K
Little Eagle	*Hieraaetus morphnoides*	V		
Eastern Osprey	*Pandion cristatus*	V		
Sooty Oystercatcher	*Haematopus fuliginosus*	V		
Pied Oystercatcher	*Haematopus longirostris*	E		
Hooded Plover	*Thinornis rubricollis*	CE	V	
Brown Treecreeper	*Climacteris picumnus victoriae*	V		
Gang-gang Cockatoo	*^^Callocephalon fimbriatum*	V		
Glossy Black-Cockatoo	*^Calyptorhynchus lathami*	V		
Olive Whistler	*Pachycephala olivacea*	V		
Little Lorikeet	*Glossopsitta pusilla*	V		
Eastern Ground Parrot	*Pezoporus wallicus wallicus*	V		
Powerful Owl	*^^Ninox strenua*	V		
Masked Owl	*^^Tyto novaehollandiae*	V		
Sooty Owl	*^^Tyto tenebricosa*	V		
Barking Owl	*Ninox connivens*	V		
Scarlet Robin	*Petroica boodang*	V		
Flame Robin	*Petroica phoenicea*	V		

V= Vulnerable; facing a high risk of extinction in the medium-term future.

E= Endangered; facing a very high risk of extinction in the near future.

CE= Critically Endangered; facing a very high risk of extinction in the immediate future.

J= JAMBA listed; Japan-Australia Migratory Bird Agreement.

C= CAMBA listed; China-Australia Migratory Bird Agreement.

K= ROKAMBA listed; Republic of Korea-Australia Migratory Bird Agreement.

Amphibians and Reptiles

The Atlas of NSW Wildlife has identified 1 amphibian species listed as endangered under the NSW Biodiversity Conservation Act 2016, which is also listed as vulnerable under the

Commonwealth Environment Protection and Biodiversity Conservation Act 1999. This species is shown in Table6:

Table 6: Threatened Amphibians in the Wonboyn Lake Region			
Common Name	**Scientific Name**	**NSW Status**	**Comm. Status**
Green and Golden Bell Frog	*Litoria aurea*	E	V

V= Vulnerable; facing a high risk of extinction in the medium-term future.

E= Endangered; facing a very high risk of extinction in the near future.

Aquatic Fauna

Discussions with local residents indicate that the major species caught by recreational anglers include jewfish (*Argyrosomus japonicus*), flathead (*Platycephalus spp*.), bream (*Acanthopagrus spp*.), tarwhine (*Rhabdosargus sarba*), luderick (*Girella tricuspidata*), whiting (*Sillago spp*.) and tailor (*Pomatomus saltatrix*). No data are available to assess the relative catch of these species, nor the amount of angling effort in the estuary. Given the general lack of any significant tourist infrastructure on the estuary (one caravan/cabin park, and one resort), fishing pressures would not be expected to be as high as more popular tourist centres of the NSW south coast (e.g. Eden, Merimbula). As there is restricted shoreline access around the estuary, almost all fishing is conducted from boats.

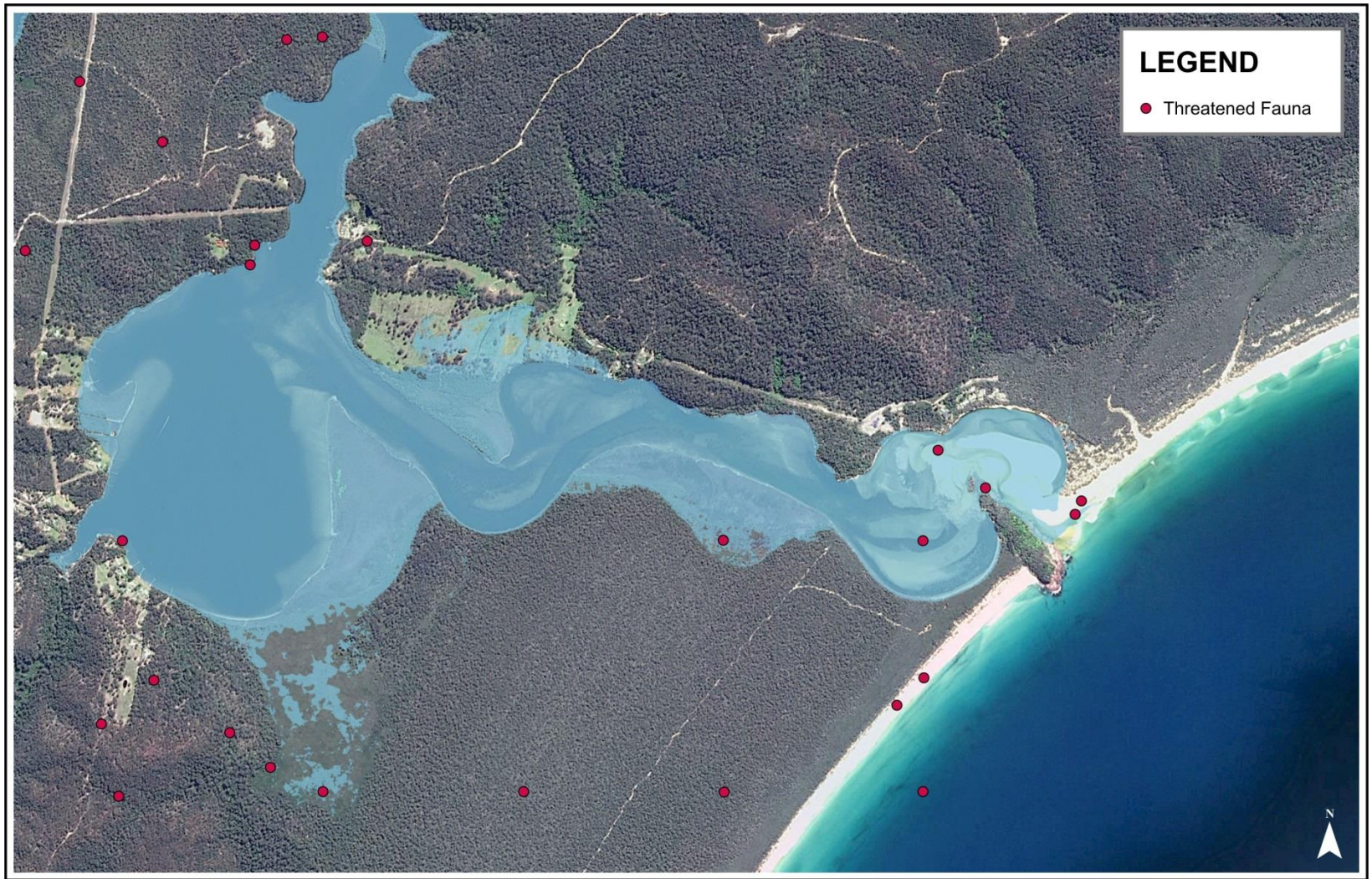

Figure 9: Threatened Fauna – Wonboyn Lake

Figure 105: Significant Shorebird Sites at Wonboyn Lake Entrance (OEH, 2015)

3.5.5 Cultural Heritage

3.5.5.1 Aboriginal Cultural Heritage

Sites of Aboriginal cultural significance, such as middens, camping areas, artefact scatters, shelters and other sites are frequent around Bega Valley Shire Council estuary shorelines, beaches and islands. There are also many areas of spiritual and cultural significance, the details of which are not generally known and are unlikely to be made known to people other than the tribal custodians of the knowledge.

The ACHAR undertaken by Archaeology NSW for this project (Dibden, 2016), is included as Appendix B of this REF, and should be referred to for a detailed description of the relevant Aboriginal cultural significance. The investigation included searches of the NSW OEH AHIMS, the NSW State Heritage Inventory and the Australian Heritage Database, as well as a detailed field inspection of the access track and entrance opening area. Six sites were identified in the database searches for the wider Wonboyn Lake estuary search area, and the field inspection identified artefacts and fragmented shell along most of the access track. While the access track area is disturbed, it was identified in the ACHAR to be of archaeological potential and to contain subsurface deposits with the possibility of burials. The cluster of objects identified at location (762855mE, 5873988mN) was logged as site “Wonboyn Lake 1” and was assessed to be of moderate local significance.

3.5.6 Socio-Economic Discussion, Recreational and Commercial Uses

Socio-economic issues were the primary driver for Council moving to support a Policy that includes an option to mechanically open the lake on the grounds of water quality and oyster health. The Lake is seen as being central to Wonboyn economic and social wellbeing as the village’s main industry, and recreational activities are centred around the Lake.

3.5.6.1 Recreation

The Wonboyn Lake estuary and its foreshore provide a number of recreational opportunities for both residents and holiday makers alike. Fishing, boating, swimming, hiking, picnics/bbqs, sight seeing and nature observation are just a few of the many recreational activities available in, on and around the lake. Mechanically opening the entrance to the lake will allow the lake to continue to be used for recreational purposes in much the same manner as has happened in the past, as prior to the last decade, the lake has typically remained open to the sea.

3.5.6.2 Commercial

As previously discussed, there is a significant oyster farming industry that is established on Wonboyn Lake. While historically there was a larger number of leases present on the lake, a range of environmental factors (flooding, low tidal flushing, toxigenic bloom of *Prorocentrum minimum*) saw the industry somewhat devastated around 2002. The lake's oyster farmers invested a great deal of resources in re-establishing their leases and are significant stakeholders in the management of the lake and its entrance. It has been reported that Wonboyn Lake is the most southerly oyster-producing estuary in NSW, with an estimated 45.7 hectares of oyster lease, comprising 47 leases held by 13 aquaculture permit holders (BVSC, 2004). The oyster industry is the only primary industry in Wonboyn and is an important part of the Village's economy.

Wonboyn is a popular coastal holiday destination, with Wonboyn Village and North Wonboyn resort providing various forms of holiday accommodation. Holiday makers are an important source of income for the people of Wonboyn, with the areas natural values, outdoor recreational opportunities (including recreational fishing) and relative isolation being integral to the areas tourism appeal.

The Wonboyn community have previously expressed their concern at the potential impact on both the village's economy and the residents own recreational opportunities if the lake was allowed to remain closed for any significant amount of time. These concerns are centred on perceived threats to the lakes water quality and impact on fish stocks and the lake ecology.

3.6 Description of the Activity Impacts and Mitigation

3.6.1 Acid Sulfate Soil Impacts/Mitigation

It is highly unlikely the entrance opening works will directly expose acid-generating sediment. Although the bed of Wonboyn has been identified as potential acid sulfate soils (PASS), it is unlikely that actual acid sulfate soils (AASS) are likely to occur where the works are proposed as the berm area is highly dynamic and consists predominantly of marine sands deposited from wave action following previous entrance openings. Furthermore, as the entrance channel has been well scoured by previous floods and was typically in a naturally open state for long periods of time, it is unlikely that artificially maintaining an open entrance will result in the development of actual ASS.

3.6.2 Bank Erosion and Sedimentation Impacts/Mitigation

Maintaining an open lake entrance will have an impact on the sand shoals and entrance bar in the vicinity of the entrance. However, due to the localised nature of these fluctuations, it is

likely that natural background processes will dominate the evolution of sand shoals within the lower estuary which, and in-turn dominate any impacts on foreshore erosion processes.

It should be recognised that mechanical opening of the entrance will result in scouring and blowout of the entrance bar, that may in turn allow a greater amount of wave energy into the lower section of the lake than occurred prior to lake closure when the entrance was shoaled. This may aggravate existing erosion problems at North Wonboyn, and while this would also occur (likely to a greater extent) with a natural entrance breakout.

3.6.3 Hydrology Impacts/Mitigation

Artificially opening the lake entrance may have a moderate negative impact on the lake as entrance opening is an important determinant of the hydraulic character. Following periods of extended drought when the lake entrance would naturally close, natural breakout of Wonboyn Lake would tend to occur during or soon after a significant rainfall event. Rainfall is a necessary precursor to raise water levels to a level significantly greater than mean sea level, and to 'liquefy' the sand barrier and reduce its cohesion. The ability of the lake water to erode a deep and wide entrance channel is directly related to the head difference that exists between the lake and the ocean at the time of breakout. A large head difference will result in a larger and deeper channel.

Therefore, intervention in the entrance process during extended periods of dry weather may reduce the capacity of the opening to erode sediments from the entrance area and lower shoals during subsequent flood events. Over the long term this may conceptually cause sedimentation impacts and changes to the hydrologic regime as a build up of sediment in the entrance area will result in lower breakout levels and may progressively result in beach bar widening and lake infilling. However, it should be recognised that the extent to which this adverse effect can occur is limited due to the very infrequent nature of entrance closure.

Positive and negative water quality impacts may also result from entrance opening. Positive impacts include flushing nutrients and pollutants from the system in some locations. Negative impacts of entrance opening include: potential increases in nutrient concentrations in areas that aren't flushed as a result of entrance opening; and potential rapid increases in dissolved oxygen concentrations resulting from rapid decay of organic material.

3.6.4 Aquatic Vegetation Impacts/Mitigation

There are no seagrasses or saltmarsh communities in the immediate entrance area for which works are proposed. The endangered Australian Saltgrass *Distichlis distichophylla* has been identified in wetlands on the south-east margins of the lake, well away from the intended works area. The opening of the lake and potential restoration of pre-closing tidal cycle will impact on the frequency and degree of inundation experienced by these vegetation communities. As the proposed opening of the lake is aimed at restoring the tidal cycles that the Lake's aquatic vegetation communities have experienced for the last 60 years, it is unlikely that this would have serious negative impacts on these vegetation communities.

3.6.5 Indirect Impacts to Transitional and Fringing Wetland Vegetation

The entrance excavation works themselves are unlikely to have any direct impact on any endangered ecological communities (EECs). As the 'typical' hydraulic regime of Wonboyn Lake

is for the entrance to be open to the ocean, it is also unlikely that indirect impacts associated with changing water levels from opening the entrance would have an impact on any EECs. As a precautionary measure, a Test of Significance assessment for the endangered ecological communities has been completed and is located in Section 3.8.

3.6.6 Direct Impacts to Access Track Vegetation and Mitigation

Envirokey (2016, Appendix C) provided an analysis of the likely direct impacts associated with excavator access to the site, with their analysis reproduce below. Photographs of the access track vegetation are shown in Figure 11611.

Envirokey Vegetation Impacts Report:

"The proposed 660 metre excavator track would occur mostly within an existing track that was evidently being used frequently by four-wheeled motorcycles resulting in an existing area of disturbance up to two metres wide. Additionally, there was also evidence of the previous excavator movement which was about 15 years ago. This consisted of small piles of Coast Tea-tree which had been pushed over in a more open area through the existing vegetation. The vegetation present in the previously disturbed track was mostly low regrowth shrubs and native groundcovers. Despite this, the movement of an excavator through this vegetation would result in some damage mostly by crushing of groundcovers and low growing shrubs under the weight of the machine. Some larger Coast Tea-tree and Tree Broom-heath would most likely need removal which could be facilitated by the excavator arm, however this would result in extensive damage to the groundcover as the root system would also be extracted using this method. It is recommended that if larger shrubs need to be removed, that they are cut off at ground level using a chainsaw as this would minimise the ground disturbance. Some minor lopping of overhead vegetation would also be required to facilitate the movement of the excavator however this is expected to be minimal.

The damage to the vegetation communities present would result in damage to the Biodiversity Conservation Act listed Bangalay Sand Forest TEC of up to about 0.15 hectares. This is expected to be temporary and would not result in permanent removal of vegetation. As it is not expected that any canopy species would be removed, low growing shrubs and groundcovers would recover reasonably quickly from this disturbance."

The report recommended the following measures to minimise impacts to flora and fauna:

- The proposed track area should be clearly delineated with temporary fencing or flagging tape to reduce to risk of machinery or persons impacting on vegetation outside of the impact area.
- Machinery used to excavate the estuary opening should be clean of dirt or mud to minimise the potential for weeds being brought into the TEC and other native vegetation communities.
- Tree saplings or shrubs that cannot be driven over by the machine would not be pushed over by the machine, they would be cut down at ground level using a chainsaw to minimise ground surface disturbance.
- Lopped vegetation such as tree saplings, shrubs that are cut down, or overhead branches that are lopped would be placed on the ground in the area of disturbance once the machine has completed work.

Test of Significance Assessments for the 2 potentially impacted threatened vegetation species (Australian Saltgrass and Hidden Violet) and 1 threatened ecological community (Bangalay Sand Forest) were presented in Envirokey (2016). The results of the assessment concluded that

the proposed machine access would be unlikely to have a significant effect on these threatened species and community, and on this basis, a Species Impact Statement is not required.

Figure 116: Photos of Wonboyn Lake Access Track and Vegetation

3.6.7 Fauna Impacts/Mitigation

Mammals

It is unlikely that the entrance excavation works will have an impact on threatened mammal species or endangered populations, as these populations would typically be located some distance from the lake entrance.

Localised areas of damage to vegetation communities during access of the excavator may result in damage or very minor loss of habitat for threatened mammal species. These impacts would be minimised through careful route selection, particularly by avoiding high value habitat including hollow bearing trees while prioritising the use of already disturbed areas. However, it is inevitable that some vegetation will be damaged or removed during the process. Measures listed above in 3.6.6 will ensure minimum damage to fauna habitat.

Any impacts to threatened mammals are expected to be very minimal due the extensive availability of alternative habitat adjacent to the impact area.

Birds

The small sand dunes to the north/north west of the entrance are a known nesting area of the Hooded Plover. During previous site inspections, several Hooded Plovers were identified in this area, as well as Pied Oyster catchers that were noted on the lake foreshore. Depending on the time of the year, if undertaken without appropriate mitigation measures, entrance works including machine access and channel excavation could potentially have a significant negative impact on these and other resident and migratory threatened shorebird species. Shorebirds could be adversely impacted if entrance works were to be undertaken between August and April and critically if the works were to occur between September and March, as the works could disrupt breeding colonies and/or disturb and destroy nests.

To ensure that the entrance opening works result in no or only relatively minor impacts to shorebirds, a number of mitigation measures to reduce the likelihood and extent of impacts on shorebirds have been written into the Entrance Management Policy and would be employed for any Wonboyn opening. These mitigation measures include:

- A machine access route that minimises areas of dune impacted by the machine;
- Stipulated communication with NPWS staff, including the Shorebird Recovery Coordinator, if entrance management works are to be implemented between August and April inclusive;
- Awareness of the presence and location of nesting shorebirds in access and entrance areas through the monitoring undertaken by the South Coast Shorebird Recovery Program; and
- Assistance on site from NPWS Officer/Shorebird Recovery Coordinator to provide a lower impact access and entrance opening if nesting shorebirds are present.

If a mechanical entrance opening is planned within the shorebird breeding season (August to April inclusive), Council officers will liaise with the local National Parks and Wildlife Service/Shorebird Recovery Coordinator to determine appropriate responses. This may include altering the location of the channel opening works and/or as a last resort translocating nests to a site nearby that is safe. If required, assistance from NPWS officers and/or the Shorebird Recovery Coordinator will ensure that the entrance opening process does not adversely impact nesting shorebirds. Deferral of entrance opening may occur if unacceptable impacts on the breeding success of threatened shorebirds is likely and an acceptable alternative course of action cannot be determined.

Entrance opening may also be beneficial to shorebird populations in other circumstances as it may hamper access to nest sites by predators and expose aquatic food sources. It should also be noted that any impacts to shorebirds from scour of the entrance berm could also occur with a natural entrance opening, and in fact managing the entrance opening possibly reduces the chance of impacts by allowing for translocation of nests that are located on the entrance berm/channel area. If the entrance was to break out naturally and rapidly, these nests may be destroyed.

As the location and number of nesting shorebirds at the site is variable from season to season, it is preferable to rely on up-to-date knowledge regarding shorebirds from the South Coast Shorebird Recovery Program and advice from the Shorebird Recovery Coordinator, to inform additional adaptive management responses on an "opening-by-opening" basis, as opposed to a "one-off" survey for this REF. Test of Significance assessments have been carried out for the potentially impacted shorebird species (Hooded Plover and Pied Oystercatcher), and are included in Section 3.8. As the impacts to these species are likely to be minimal due to the mitigation measures stipulated within the Policy, at this stage it is not necessary to undertake a Species Impact Statement.

The sand shoals that dominate the lower estuary are important for wader and water birds. The diversity of species and numbers depend on the extent of the sand shoals and food sources. During the rare times of lake closure, higher lake water levels can result in inundation of these sand shoals, with the impact of a prolonged inundation of entrance shoals on wading species unknown. However, this is a naturally occurring process.

Amphibians and Reptiles

While unlikely, minor damage to vegetation along the edge of the access track from the excavator may have an impact on the endangered Green and Golden Bell frog. As a precaution a Test of Significance assessment has been carried out for this species and included in Section 3.8.

Aquatic Fauna

The lake entrance area allows passage for a variety of fish species and prawns. A closed entrance obviously impacts on fish and prawn recruitment and the ability of fish and prawns to pass to sea to spawn. The impact on the fish stocks within Wonboyn Lake following a prolonged entrance closure is unknown. For the purposes of this REF it is recognised that no threatened species or populations of fish will be impacted and the opening works are within the lower range of the natural opening regime.

3.6.8 Aboriginal Cultural Heritage Impacts/Mitigation

Any unknown Aboriginal sites that may exist around the immediate foreshore of the estuary will have been subject to cycles of flooding and drying over many years and thus are likely to be resilient to changes in lake level. It is possible however, that further flooding and drying combined with wave action may expose sensitive sites or lead to erosion of culturally important areas. While unlikely, entrance works may have both positive and negative impacts on currently un-reported Aboriginal cultural heritage sites. Positive impacts could include opening the entrance prior to naturally high estuary water levels. This will reduce the risk of inundation and erosion from hydrologic forces. During high water levels it has also been recognised that boats may travel close to and over sites, drop anchors and create wake that may lead to site degradation. On the contrary negative impacts could include increased frequency of wetting and drying from rises and falls in estuary water level as a result of slightly more frequent entrance openings.

While no impacts to Aboriginal places or items in the area of entrance opening were identified in the ACHAR (Dibden, 2016), the potential for further impacts to disturbed and subsurface deposits along the access track was identified. BVSC has received an AHIP associated with the

entrance management works. It is recommended that monitoring take place during the access and entrance opening process, that impacts to the ground surface along the access track be minimised, and that whenever possible access along the beach section be restricted to the corridor within the intertidal and wave runup zone of the beach.

3.6.9 Recreational Impacts

The Wonboyn Lake estuary and its foreshore provide a number of recreational opportunities for both residents and holiday makers alike. Fishing, boating, swimming, hiking, picnics/bbqs, sight seeing and nature observation are just a few of the many recreational activities available in, on and around the lake. As the lake has functioned with a near permanent entrance to the sea for many years, the recreational activities that are established on the lake have evolved with an open estuary entrance arrangement. As such, it is expected that recreational activities would benefit from maintaining an open entrance, at least in the short term.

3.6.10 Commercial Impacts

Socio-economic and primarily commercial issues are the primary driver for Council to support a Policy that specifies artificial opening of Wonboyn Lake during periods of prolonged lake closure. The lake is seen as being central to the economic and social wellbeing of Wonboyn, as the village's main industry (oyster farming) is centred around the lake. The oyster industry is the only primary industry in Wonboyn and is an important part of the Villages economy. Council has expressed its support for the Wonboyn oyster industry and through the *Wonboyn Lake Entrance Management Policy*, has resolved to maintain a tidal exchange by artificially opening the lake entrance during infrequent periods of prolonged closure in line with the conditions outlines in the Policy.

Wonboyn is a popular coastal holiday destination, with Wonboyn Village and North Wonboyn Resort providing various forms of holiday accommodation. Holiday makers are an important source of income for the people of Wonboyn, with the area's natural values, outdoor recreational opportunities (including recreational fishing) and relative isolation being integral to the areas tourism appeal. These characteristics have been developed and are supported by a lake that is open to the sea on a near permanent basis.

3.7 EP&A Act 1979: Impact Consideration Checklist

a.	Will there be any environmental impact on a community? ☐ **n/a or negligible** ☒ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: There will be no impact on the community during the carrying out of the work. The community will be restricted from using the entrance area whilst works are in progress. Suitable precautionary measures will be taken to lessen such impacts. A range of community members would be negatively impacted if the Policy was not implemented, as access to properties and infrastructure would be inundated. The local oyster farming industry could also be significantly impacted if the Policy was not implemented, and there was no structured mechanism for opening the lake entrance to maintain suitable water quality for oyster survival.
b.	Will there be any transformation of a locality? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Access The minimal removal of vegetation as required to provide access for earthmoving equipment will result in temporary impact on a section of EEC on the northern side of the lake. This impact would be temporary, in that there is no proposal to create or allow any form of formalised vehicular access. Expert investigation into the vegetation impacts reported "The damage to the vegetation communities present would result in damage to the BC Act listed Bangalay Sand Forest TEC of up to about 0.15 hectares. This is expected to be temporary and would not result in permanent removal of vegetation. As it is not expected that any canopy species would be removed, low growing shrubs and groundcovers would recover reasonably quickly from this disturbance". Excavation The work will result in the lake entrance being opened to the ocean to restore tidal exchange between the lake and the ocean. The size of the entrance after opening will be dependent the degree of scouring that occurs during the first outgoing tide. If a successful opening is achieved, there is expected to be little lateral migration of the entrance and as such the entrance would retain the same physical characteristics as it had prior to closure.
c.	Will there be any environmental impact on the ecosystems of the locality? ☐ **n/a or negligible** ☐ positive ☐ low adverse ☒ medium adverse ☐ high adverse Comment: Access As described in Section 3.6.6 (and Envirokey, 2016), there may be a temporary impact on the vegetation community along the end of Archers Road and short-term physical

	impacts on a small section of Bangalay Sand Forest EEC on the northern section of the lake. Excavation There will be no adverse environmental impact on the ecosystems of the locality through the restoration of a regular tidal cycle. Historical records indicated that the lake has been open and therefore subject to tidal cycles for some 60 years. The lake's ecosystem has adapted to this tidal regime and should not suffer any negative impacts from the proposed opening and restoration of tidal cycles. If following opening, water leaves the lake on the outgoing tide and the lake closes prior to the high tide there is potential for the exposure of foreshore/nearshore ecosystems due to the reduced water levels in the lake. Shallow sections of the lake could experience rapid increases in biological oxygen demand which will have an impact on aquatic fauna. This eventuality is difficult to predict due to the complex natural factors that will combine to determine the success or otherwise of the works. None the less it is important that this possible outcome is identified.
d.	Will there be any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? ☐ **n/a or negligible** ☐ positive ☒ low adverse ☐ medium adverse ☐ high adverse Comment: Access There will be a temporary aesthetic impact due to the required removal of vegetation along parts of the proposed access route. There will be no broad or permanent reduction in aesthetic, recreational, scientific or other environmental quality or value of a locality Excavation Following the works there may be small piles of excavated sand present, until channel migration results in their removal. This normally happens on the first outgoing tide following the opening. There will be heavy machinery onsite during the works which will have a temporary impact on the aesthetics of the entrance area. An exclusion area would be enforced during works around the entrance area, resulting in a temporary loss of access and recreational opportunity to the occasional person who visits the area. While intervention in the natural breakout process conceptually diminishes the scientific value of the system since an element of 'naturalness' has been lost, in reality the vast majority of ecological processes will continue to operate. The locality could still be suitably used for a wide range of scientific purposes (this has been demonstrated at other ICOLLs on the Far South Coast such as Wallagoot Lake).

e.	Will there be any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Stone artefacts and fragmented shell were identified along the excavator access track during the site investigation. The ACHAR also identified the potential for subsurface deposit and burials along the access track. Impacts beyond those already occurred to disturbed surface deposits are unlikely, nevertheless BVSC have sought an AHIP associated with the works.
f.	Will there be any impact on the habitat of any protected fauna (within the meaning of the *Biodiversity Conservation Act, 2016*)? [1] ☐ **n/a or negligible** ☐ positive ☒ low adverse ☐ medium adverse ☐ high adverse Comment: Access Localised and transient areas of damage to woodland vegetation communities during access of the excavator may result in short term damage for threatened mammal species. These impacts will be minimised by the careful selection of the access route so as to use existing cleared/disturbed areas. While it is inevitable that some ground cover and small shrubs will be damaged or removed during the process, any impacts to threatened mammals are expected to be very minimal due the extensive availability of alternative habitat throughout the surrounding localised woodland community. The temporary and low adverse impacts that would be generated are supported by the conclusions of the expert assessment undertaken by Envirokey (2016) and presented in Appendix C. Excavation While it is recognised that access across the dune creates the potential for significant adverse impacts on ground nesting species such as the Pied Oystercatcher and Hooded Plover by disrupting breeding activity including pair formation, nesting and fledging, with the mitigation and adaptive management measures stipulated in Section 3.6.7 and the Policy, these impacts will be reduced to low adverse. Nevertheless, any loss of a breeding colony would be considered significant and as a result Test of Significance assessments are contained in Section 3.8. It is very unlikely that mechanical opening of the entrance would have any significant impacts on the Green and Golden Bell Frog, as there will be no significant changes to the lake's typical hydrologic regime (the lake is typically open to the sea). In reality, closure of the lake entrance and lake water levels that are significantly higher than normally experienced with an open entrance would present potential impacts. As a precautionary measure, a Test of significance for the Green and Golden Bell Frog is contained in Section 3.8.

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g.	Will there be any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? ☐ **n/a or negligible** ☐ positive ☒ low adverse ☐ medium adverse ☐ high adverse Comment: It is very unlikely that mechanical opening of the entrance would have any significant impacts on the endangered ecological communities listed in Section 3.8 (i.e. Coastal Saltmarsh and Bangalay Sand Forest) or the Green and Golden Bell Frog, as there will be no significant changes to the lake's typical hydrologic regime (the lake is typically open to the sea). In reality, closure of the lake entrance and lake water levels that are significantly higher than normally experienced with an open entrance would present potential impacts. As a precautionary measure, Test of Significance assessments for these communities and species are contained in Section 3.8. While it is recognised that there is the potential for significant adverse impacts on ground nesting species such as the Pied Oystercatcher and Hooded Plover by disrupting breeding activity including pair formation, nesting and fledging, with the mitigation and adaptive management measures stipulated in Section 3.6.7 and the Policy, these impacts will be reduced to low adverse.
h.	Will there be any long-term effects on the environment? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Access Areas of Bangalay Sand Forest EEC disturbed by machinery accessing the beach would be expected to recover rapidly and there should be no long-term impacts through this part of the proposal. Excavation The works should not result in any long term negative impacts on the lake or beach/entrance berm area. If the entrance opening is successful, the regular tidal cycle to which the ecosystem has adapted will be restored.
i.	Will there be any degradation of the quality of the environment? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Access There will be no future reduction in the environmental quality, as the proposed access route is an existing and already disturbed track. Excavation

	There will be no degradation of the environment resulting from excavation works. Natural coastal processes will rapidly re-position excavated marine sand and stabilise the position of the entrance channel adjacent to Baycliff.
j.	Will there be any risk to the safety of the environment? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: It is unlikely that the environment will be any less 'safe' as a result of undertaking the entrance opening works. Council's established lake opening procedures will be put in place, and experienced or well briefed machinery operators will be used. These procedures address environmental protection, public and operator safety. Site fencing and signage will also be erected. The robustness or ability of the environment to withstand environmental fluctuations is unlikely to be compromised.
k.	Will there be any reduction in the range of beneficial uses of the environment? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: There will be no reduction in the range of beneficial uses of the environment apart from those discussed under point d) above. More likely implementation of the Policy will result in improved use of the environment for both recreational and commercial purposes.
l.	Will there be any pollution of the environment? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Machinery will be inspected prior, during and following works to ensure there are no fuel/oil leakages that may be a minor point source pollutant. Noise emitted from the works will only affect the localised area of the access path and the entrance area. As the excavated material is clean and moist marine sand there will be no dust created from the excavation.
m.	Will there be any environmental problems associated with the disposal of waste? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: There will be no problems associated with waste as a result of this project.
n.	Will there be any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: The proposed works will not increase the demands of any resources such that they become in short supply.

o.	Will there be any cumulative environmental effect with other existing or likely future activities? ☒ **n/a or negligible** ☐ positive ☐ low adverse ☐ medium adverse ☐ high adverse Comment: Although it is difficult to predict what other future activities might take place, it is unlikely that this activity (that is, implementation of the Policy) would have a cumulative effect with these other activities. Other activities are likely to be based in the catchment or upper areas of the estuary.
p.	Will there be any impact on coastal processes and coastal hazards, including those under projected climate change conditions? ☐ **n/a or negligible** ☐ positive ☒ low adverse ☐ medium adverse ☐ high adverse Comment: The works may have a slight impact on natural coastal processes. This impact may occur as the opening process if successful will scour a channel in the beach bar, redepositing the sediment in the near shore active zone. As these works pre-empt a natural opening the impact should be minimal. Over the long-term the influx of marine sediment into the estuary and the widening of the beach berm may alter sediment processes in the coastal zone, impacting future coastal processes. Though unlikely, altering the entrance behaviour of the estuary may indirectly impact foreshore erosion processes at North Wonboyn, and an additional study would be required to investigate this. The policy encourages the development of alternative techniques to maintain the oyster industry during periods of extended lake closure in the longer term.

3.8 Test of Significance for Threatened Species, Populations and Ecological Communities under the NSW Biodiversity Conservation Act 2016

3.8.1 Hooded Plover (Thinornis rubricollis) and Pied Oystercatcher (Haematopus longirostrus).

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

The life cycle of these species is not likely to be disrupted to any significant extent provided the Policy and associated mitigation measures are followed.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

No endangered populations have been recognised in the BVSC LGA for these species.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed is likely to substantially and adversely modify the

composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

N/A. These species do not constitute an EEC.

(d.i) In relation to the habitat of a threatened species, population or ecological community, detail the extent to which habitat is likely to be removed or modified as a result of the action proposed;

No area of habitat for this species is to be removed. A localised section of potential habitat will be modified during the activity, in that the activity will involve the excavation of a pilot channel with heavy machinery to allow a lake entrance opening to be initiated. As a result, habitat in the form of sediment will be redistributed in the nearshore active coastal zone through channel scouring.

(d.ii) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community;

There will be no isolation of habitats created.

(d.iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The localised habitat that will be modified is a part of a larger habitat area that is essential to these species particularly between August and April for breeding activity such as pair formation, nesting and fledging.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

No areas of critical habitat have been identified at Wonboyn Lake.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

The activity is inconsistent with the Priority Action Statements for these species if works were to be undertaken during breading periods between August and April and appropriate mitigation and adaptive management measures were not adhered to.

(g). Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process;

Alteration to the natural flow regimes of lakes, rivers and streams and their floodplains and wetlands is recognised as a threatening process. As these works involve the artificial opening of Wonboyn Lake to the sea, this constitutes a moderate alteration to the natural flow regimes. However, the typical hydraulic regime for the Wonboyn Lake entrance is for the lake to be open to the sea.

3.8.2 Endangered Green and Golden Bell Frog (*Litoria aurea*).

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

The life cycle of this species is unlikely to be disrupted by implementing the Policy, as the proposed entrance management works return the lake's hydrologic regime to its typical form

(entrance open to tidal exchange). Not implementing the Policy would allow lake water levels to significantly exceed typical values, which may potentially result in adverse effects on the life cycle.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

No endangered populations have been recognised in the BVSC LGA for this species.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

N/A. This species does not constitute an EEC.

(d.i) In relation to the habitat of a threatened species, population or ecological community, detail the extent to which habitat is likely to be removed or modified as a result of the action proposed;

No area of habitat for this species is to be removed. Implementation of the Policy will be beneficial by maintaining habitat that would otherwise have been significantly impacted by elevated lake water levels.

(d.ii) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community;

There will be no isolation of habitats created.

(d.iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

The habitat that will be maintained by implementing the policy is of critical importance to this species, particularly between August and March for breeding activity.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

No areas of critical habitat have been identified at Wonboyn Lake.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

The activity is not inconsistent with the Priority Action Statement and Recovery Plan for this species if works were to be undertaken.

(g). Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process;

Alteration to the natural flow regimes of lakes, rivers and streams and their floodplains and wetlands is recognised as a threatening process. As these works involve the artificial opening of Wonboyn Lake to the sea, this constitutes a moderate alteration to the natural flow regimes. However, the typical hydraulic regime for the Wonboyn Lake entrance is for the lake to be open to the sea.

3.8.3 Endangered Ecological Communities – Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;

N/A. These are Endangered Ecological Communities, not threatened species.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;

N/A. These are Endangered Ecological Communities, not threatened species.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;

These EECs have developed and evolved around Wonboyn Lake during a period when the lake has been open to the sea and tidal exchange on a near permanent basis. The proposed entrance opening works will maintain the lake in its 'typical' hydraulic regime, and therefore help to maintain the existing state of the EECs.

(d.i) In relation to the habitat of a threatened species, population or ecological community, detail the extent to which habitat is likely to be removed or modified as a result of the action proposed;

Localised areas of damage to Bangalay Sand Forest vegetation communities during access of the excavator may result in damage of habitat for threatened mammal species. These impacts have been minimised through careful selection of an existing and already disturbed access track. However, it is inevitable that some ground cover and small shrubs will be damaged or removed during the process. Any impacts are not expected to be long term due the extensive localised area of this EEC. The temporary and low adverse impacts that would be generated are supported by the conclusions of the expert assessment undertaken by Envirokey (2016) and presented in Appendix C.

Given that the proposal seeks to make the restore the 'typical' tidal cycle, it is assumed that this will only benefit the fringing vegetation communities of the lake including saltmarsh.

(d.ii) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community;

No EECs are likely to become isolated as a result of the works.

(d.iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;

There is expected to be very minimal short term impact to the Bangalay Sand Forest over a very localised area. As this EEC is extensive and extends over a much larger area, it is expected that the works will have an insignificant long term impact on this EEC.

As discussed in (d.i), the proposed works will assist in minimising damage to Coastal Saltmarsh through prolonged periods of lake entrance closure, by maintaining lake water level fluctuations within a more "typical' range.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);

No areas of critical habitat have been identified at Wonboyn Lake.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

The activity is a threatening process and as a result would be inconsistent with these plans.

(g). Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process;

Alteration to the natural flow regimes of lakes, rivers and streams and their floodplains and wetlands is recognised as a threatening process. As these works involve the artificial opening of Wonboyn Lake to the sea, they are considered to be an interference with natural processes. However, the works will maintain the lake processes within the 'typical' regime for tidal flows exchange and water levels.

3.9 Conclusion

The proposed entrance management works are primarily required to reduce flooding impacts on both public and private assets around Wonboyn Lake. The Policy involves a staged approach allowing openings at lower water levels for an initial five year period to provide time for both the oyster industry and private land holders to adjust infrastructure to withstand higher water levels and extended periods of closure. In exceptional circumstances openings may be permitted for water quality if conditions meet those stated in the Policy. In implementing the proposed Wonboyn Lake Entrance Management Policy, there are two notable potential impacts. These are:

1. Potential direct impacts to a localised section of Bangalay Sand Forest EEC on the northeastern side of the lake, associated with access of the excavation plant;
2. Potential direct impacts to threatened shorebird species.

With regards to damage to the Bangalay Sand Forest EEC, a Flora and Vegetation Community Impact Assessment was undertaken by Envirokey (2016) to further investigate. The assessment found that while there will be minor transitory environmental impacts to a very localised section of the Bangalay Sand Forest EEC on the northeastern side of the lake, machine access was unlikely to have a significant effect on threatened species, populations and communities.

With regards to potential impacts to threatened shorebirds, the Policy has been developed in such a way so as to both minimise risk and consequence of any such impacts. This includes specific selection of an excavator access route that minimises impacted areas that are potentially significant to shorebirds, as well as an entrance opening process that includes a

range of mitigation and adaptive management measures. If the Policy and proposed mitigation measures are adhered to, then potential impacts to shorebirds will be minimal.

While the current Policy advocates artificial opening of the Wonboyn Lake entrance upon realisation of certain triggers, it needs to be recognised that the ongoing mechanical opening of the lake is logistically difficult, expensive and unsustainable during long periods of drought which are predicted to potentially worsen with ongoing climate change. The difficulty lies in:

- the distance the machinery is required to travel from the nearest trafficable road;
- no well-established access route to the beach;
- determining a route to the beach which avoids cultural sites and threatened shorebird nesting sites; and
- the relatively low water levels in the lake at the time of opening (if opening on water quality grounds), which will likely result in only a shallow entrance channel being scoured.

Due to these limitations, the formal Entrance Management Policy (Appendix A) advocates a minimal entrance intervention in the long term, with preference for returning to a “natural as possible” breakout regime. However, as there are no viable alternatives to the proposed entrance management in the short term, the proposed Wonboyn Lake Entrance Management Policy should be approved, conditional upon:

- The works being implemented in accordance with the proposed Policy and the mitigation measures it contains;
- Infrastructure around the lake is progressively raised to withstand higher water levels and extended periods of closure
- The local oyster farming industry investigate alternative methods to retain oyster survival when the lake is closed, e.g. transporting to another lake, raising oyster bags etc.;
- Bega Valley Shire Council plan and implement modifications to the low lying assets that are affected by inundation when lake water levels are high;
- Maintaining a buffer of no new development within close proximity to and below an elevation of 3.0 m AHD around Wonboyn Lake.

Appendix A

Wonboyn Lake Entrance Management Policy

Appendix B

Aboriginal Cultural Heritage Assessment Report

Appendix C

Wonboyn Lake Access Track Flora & Vegetation Impact Assessment