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Panboola Wetland Rehabilitation Works

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This Project is part of a range of projects being implemented by DPIRD under the NSW Estuary Asset Protection (NEAP) program. The NEAP program is co-funded by the Australian and NSW Governments under Disaster Recovery Funding to support the repair, restoration and regeneration of priority riparian and estuarine areas in NSW. Further details regarding the program can be found here:

www.dpi.nsw.gov.au/dpi/fishing/estuary-asset-protection-program

We acknowledge the traditional owners of this land and pay our respect to Elders past, present and emerging. We recognise that the First Nations peoples of Australia have traditionally managed the resources of this land in a sustainable way, and that they are the original custodians of the Australian environment.

Table of contents

Acronyms and abbreviations	vii
1. Introduction.....	1
1.1 Purpose of the REF	1
1.2 Location of the activity	2
1.3 Definitions of the proposal.....	2
2. Need and options considered	6
2.1 Background.....	6
2.2 Strategic need and justification for the proposal	6
2.3 Existing infrastructure.....	7
2.4 Proposal objectives and development criteria.....	8
2.5 Consideration of alternatives and options.....	9
2.5.1 Do nothing.....	9
2.5.2 Option 1	9
2.5.3 Option 2.....	10
2.5.4 Conclusions of the options investigation	10
2.5.5 Design refinements.....	10
3. Description of the proposal.....	11
3.1 The proposal.....	11
3.2 Culvert removal – works within land managed by Panboola Land Managers.....	14
3.2.1 Works methodology.....	14
3.2.2 Construction plant and equipment.....	15
3.2.3 Source and quantity of materials.....	15
3.2.4 Earthworks	15
3.3 Levee works - works within Beowa National Park	16
3.3.1 Background.....	16
3.3.2 Design and methodology	16
3.3.3 Access	17
3.3.4 Rehabilitation.....	17
3.3.5 Works methodology.....	17
3.3.6 Construction plant and equipment.....	18
3.3.7 Source and quantity of materials.....	19
3.3.8 Earthworks	19
3.4 Traffic management and access	19
3.5 Site personnel	19

3.6	Construction timing.....	19
3.7	Ancillary facilities.....	19
4.	Legal and policy requirements	20
4.1	Planning approval process	20
4.2	Legal permissibility	20
4.2.1	Commonwealth law	20
4.2.2	NSW law.....	21
4.2.3	Local law	31
4.3	Confirmation of Part 5 assessment.....	32
5.	Consultation.....	33
5.1	Community consultation	33
5.2	SEPP (Transport and Infrastructure) consultation.....	33
5.3	Agency and Statutory consultation summary	35
6.	Environmental assessment.....	47
6.1	Topography, geology and soils.....	47
6.1.1	Existing environment.....	47
6.1.2	Potential impacts.....	53
6.1.3	Safeguards and mitigation measures	55
6.2	Hydrology, catchment values and water quality.....	59
6.2.1	Existing environment.....	59
6.2.2	Potential impacts.....	70
6.2.3	Safeguards and mitigation measures	74
6.3	Biodiversity	76
6.3.1	Approach.....	76
6.3.2	Results.....	78
6.3.3	Potential impacts.....	85
6.3.4	Safeguards and mitigation measures	98
6.4	Aboriginal heritage.....	99
6.4.1	Approach.....	99
6.4.2	Potential impacts.....	103
6.4.3	Safeguards and mitigation measures	104
6.5	Non-Aboriginal heritage	106
6.5.1	Approach.....	106
6.5.2	Existing environment.....	106
6.5.3	Potential impacts.....	110
6.5.4	Safeguards and mitigation measures	111

6.6	Noise and vibration.....	112
6.6.1	Approach.....	112
6.6.2	Existing environment.....	112
6.6.3	Criteria.....	114
6.6.4	Potential impacts.....	115
6.6.5	Safeguards and mitigation measures	118
6.7	Socio-economic, visual and access impacts	119
6.7.1	Existing environment.....	119
6.7.2	Potential impacts.....	120
6.7.3	Safeguards and mitigation measures	122
6.8	Climate and air quality	123
6.8.1	Existing environment.....	123
6.8.2	Potential impacts.....	124
6.8.3	Safeguards and mitigation measures	125
6.9	Waste minimisation and management	126
6.9.1	Policy	126
6.9.2	Potential impacts.....	126
6.9.3	Safeguards and mitigation measures	128
6.10	Cumulative impacts	130
6.10.1	Existing environment.....	130
6.10.2	Potential impacts.....	130
6.10.3	Safeguards and mitigation measures	130
7.	Summary of safeguards	131
8.	Summary of licences and approvals	140
9.	Conclusion	141
9.1	Principles of ecologically sustainable development.....	141
9.1.1	The precautionary principle	141
9.1.2	Inter-generational equity.....	141
9.1.3	Conservation of biological diversity and ecological integrity	141
9.1.4	Appropriate valuation of environmental factors.....	141
9.2	Justification of the proposal.....	141
10.	References	143
11.	Certification.....	146
11.1	Assessor Declaration	146
11.2	Determining Authority Declaration and Approval.....	146

Figures

Figure 1-1 Proposal study area.....	3
Figure 1-2 Proposal area	4
Figure 1-3 Land zoning and cadastral information	5
Figure 2-1 Southern culvert (Upstream and downstream).....	8
Figure 2-2 Eastern culvert (Upstream and downstream).....	8
Figure 2-3 Levee	8
Figure 3-1 Proposal site.....	12
Figure 3-2 Stockpiles, compounds and access routes.....	13
Figure 3-3 Proposed levee works.....	17
Figure 6-1 Soil landscapes within proposal area	48
Figure 6-2 Acid Sulfate soils Bega Valley LEP.....	50
Figure 6-3–Acid sulfate soil profiles and risk (Tulau, 1997) (Montaro 2024 Figure A – 12)	51
Figure 6-4–Soil and groundwater data measurement/sample location (Montaro 2024 - Figure B – 29).....	51
Figure 6-5–Soil profile data (for location refer to Figure 6-5) (Montaro 2024 Figure B – 30).....	52
Figure 6-6 Surface water and Strahler stream order nearby proposal site	60
Figure 6-7 KFH and Coastal Wetlands.....	61
Figure 6-8 Key features of Old Pambula Racecourse and elevation of the Old Pambula Racecourse with respect to measured tides (refer to chainages in key features of Old Pambula Racecourse for relevant elevation) (WRL 2024).	63
Figure 6-9 Likely interface between fresh and brackish/saline environments at Panboola (WRL 2024). Note: Area labelled as ‘freshwater environment’ protected by levee is incorrect. This is area has been confirmed by field survey as coastal saltmarsh.....	63
Figure 6-10 Groundwater boreholes and GDEs.....	66
Figure 6-11 Runoff inflows to Panboola (WRL Figure 3.1).....	68
Figure 6-12 Key floodplain features that would influence Panboola during floods (WRL Figure 3.2).....	69
Figure 6-13 Increased area of tidal extent (in yellow) (WRL page C-10)	71
Figure 6-14 Flow paths (WRL, 2025).....	72
Figure 6-15 Inundation extents for the 1% and 10% AEP flood events (WRL Figure 3.3).....	73
Figure 6-16 PCTs present in the proposal site	82
Figure 6-17 TECs present in the proposal site	83
Figure 6-18 Mosaic of low saltmarsh with bare ground and sedgeland	84
Figure 6-19 Open pools with grasses, shrubs and trees	85
Figure 6-20 Comparison of baseline aquatic vegetation to predictive 2030 modelling. See Appendix F for individual maps.....	88
Figure 6-21 Saltmarsh (Samphire <i>Sarcocornia quinqueflora</i>) located at an elevation of 1.4 m AHD adjacent to the proposal site in April 2023 (Montano, Chaaya, & Tucker, 2024)	89

Figure 6-22 Estimated tidal extent during average conditions under a global climate scenario where emissions continue uncontrolled (RCP8.5) for 2050 and 2100 – (Montano, Chaaya, & Tucker, 2024) Figure 2.10)	90
Figure 6-23 AHIMS sites surrounding the proposal area	101
Figure 6-24 AHIMS sites near the proposal area. Note 62-6-0157 is not plotted correctly and is located on Pambula Beach approximately 2.5 km east	102
Figure 6-25 1883 Pambula Parish map	107
Figure 6-26 Digital Elevation Modelling over the proposal area	108
Figure 6-27. 1989 historical aerial imagery over the proposal area	109
Figure 6-28 Sensitive receivers	113
Figure 6-29 Mean temperature data for Merimbula Airport AWS	123
Figure 6-30 Mean monthly rainfall data from the Merimbula Airport AWS	124

Tables

Table 3-1 Works methodology	14
Table 3-2 Works methodology	18
Table 5-1 Consultation summary	36
Table 6-1 Flood model results for Pambula River (Tetley, 2021) from Montaro 2024	67
Table 6-2 Database searches undertaken	76
Table 6-3 Species and communities highly likely (or known) to occur in the proposal site	78
Table 6-4 PCTs	79
Table 6-5 Extent of vegetation removal during construction phase	86
Table 6-6 Threatened species and communities potentially impacted by Proposal	91
Table 6-7 Predicted saltmarsh vegetation change in the racecourse area (total area = 21.68 ha) with installation of two channels	92
Table 6-8 Risk assessment of ‘do nothing’ and the proposal scenarios	95
Table 6-9 Breakdown of previously recorded Aboriginal sites in the region	100
Table 6-10 RBLs and NMLs for the proposal	114
Table 6-11 Construction noisiest associated plant and sound emissions	114
Table 6-12 Noise estimates for works during standard hours	116
Table 7-1 Key environmental safeguards	131

Appendices

Appendix A Plans of the proposal	A-I
Appendix B Section 171 checklist	B-I

Appendix C MNES C-I

Appendix D Consultation..... D-I

Appendix E Hydrology Assessment E-I

Appendix F Biodiversity Assessment..... F-I

Appendix G Aboriginal Heritage Due Diligence Assessment.....G-I

Appendix H Background searches H-I

Acronyms and abbreviations

ABS	Australian Bureau of Statistics
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ASL	Above Sea Level
AWS	Automatic weather station
ASSMP	Acid Sulfate Soils Management Plan
BA	Biodiversity Assessment
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	<i>Biosecurity Act 2015 (NSW)</i>
BOM	Australian Bureau of Meteorology
BV	Biodiversity Values
BVSC	Bega Valley Shire Council
CE	Critically Endangered
CEMP	Construction environmental management plan
CLM Act	<i>Contaminated Land Management Act 1997</i>
CNET	Construction Noise Estimator Tool
CNVG	Construction Noise and Vibration Guideline
CSSI	Critical State Significant Infrastructure
Cth	Commonwealth
CZMP	Coastal Zone Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW) (formerly DPE)
DCP	Development Control Plan
DP	Deposited Plans
DPE	(Former) Department of Planning and Environment (NSW) (now DCCEEW and DPHI)
DPHI	Department of Planning, Housing and Infrastructure (NSW) (formerly DPE)
DPIE	(Formerly) Department of Planning, Industry and Environment (NSW) (now DCCEE and DPHI)
DPI	Department of Primary Industries

DPIRD	Department of Primary Industries and Regional Development (formerly DPI Fisheries)
E	Endangered
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIS	Environmental impact statement
EPA	NSW Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2021 (NSW)
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
GDE	Groundwater Dependent Ecosystems
GIS	Geographic Information System
ha	hectares
HAT	Highest Astronomical Tide
Heritage Act	<i>Heritage Act 1977</i> (NSW)
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	Interim Construction Noise Guidelines
KFH	Key Fish Habitat (as defined in the Policy and guidelines for fish habitat conservation and management, NSW DPI 2013)
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LiDAR	Light Detection And Ranging
m	Metres
MNES	Matters of National Environmental Significance under the EPBC Act (c.f.)
NEAP	NSW Estuary Asset Protection Program
NMLs	Noise management levels
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
NPWS	National Parks and Wildlife Service
NSW	New South Wales

NVMP	Noise and Vibration Management Plan
OEH	(Former) Office of Environment and Heritage (NSW) (now DCCEEW)
PAD	Potential Archaeological Deposit
PMST	Protected matters search tool
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
ppt	<i>Parts per trillion</i>
Priority weed	Plants that have the potential to pose a biosecurity risk to human health, the economy, the liveability of our city and the environment. In NSW, the administration of priority weed control is a State Government responsibility under the <i>Biosecurity Act 2015 (NSW)</i> .
PWHR Managers	Pambula Wetlands and Heritage Reserve Land Managers
RAP	Rapid Assessment Point
RBL	Rating background level
REF	Review of Environmental Factors
R&H SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021 (NSW)
SCS	Soil Conservation Service
SHI	State Heritage Inventory
SHR	State Heritage Register
SIS	Species Impact Statement
SLR	Sea Level Rise
Sp/spp	Species/multiple species
S&RD	State and Regional Development
SSD	State Significant Development
SSI	State Significant Infrastructure
SVTM	State Vegetation Type Mapping
SWMP	Soil and Water Management Plan
TEC	Threatened ecological community
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021 (NSW)
V	Vulnerable
WARR Act	<i>Waste Avoidance and Resource Recovery Act 2001</i>
WM Act	<i>Water Management Act 2000</i>

1. Introduction

1.1 Purpose of the REF

This Review of Environmental Factors (REF) has been prepared by NGH Pty Ltd (NGH) for Department of Primary Industries and Regional Development (DPIRD). The purpose of the REF is to assess potential environmental impacts arising for proposed rehabilitation works at the Panboola Wetlands, Pambula New South Wales (NSW). The proposed rehabilitation works would involve:

- Removing two pipes and replacing them with alternative structures (shallow channels and timber and steel bridges) to facilitate increased tidal flow into the inner racecourse area owned by Crown Lands and managed by Panboola Land Managers (PWHR Land Manager)
- Removing part of a levee and reintroducing tidal flow to a 6,000 square metre (m²) area to the south of the racecourse on National Park Reserve (Beowa National Park).

The proposed works is part of a range of projects being implemented by DPIRD under the NSW Estuary Asset Protection (NEAP) program. The NEAP program is co-funded by the Australian and NSW Governments under Disaster Recovery Funding to support the repair, restoration and regeneration of priority riparian and estuarine areas in NSW.

DPIRD is both the proponent and the determining authority for this proposal. The REF satisfies DPIRD's duty under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

A portion of the works, the proposed levee works would occur within Beowa National Park as land reserved under the *National Parks and Wildlife Act 1974* (NPW Act). Therefore, for the levee works, NPWS is the co-determining authority for the activity.

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171(2) of the Environmental Planning and Assessment Regulation 2021 (NSW), the factors in *Guidelines for Division 5.1 assessments* (Department of Planning and Environment, 2022), the *Biodiversity Conservation Act 2016* (NSW) (BC Act), the *Fisheries Management Act 1994* (NSW) (FM Act) and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act including that DPIRD examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of this REF must be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened entities as defined by the BC Act and/or FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report (BDAR)
- The potential for the proposal to significantly impact a Matter of National Environmental Significance, including nationally listed threatened entities and Commonwealth land. Where a significant impact is considered likely either the proposal must be reconsidered or the matter should be referred to determine if a Commonwealth approval is required.

1.2 Location of the activity

The Panboola Wetland is an 97 hectare (ha) coastal wetland located approximately 1 kilometre (km) south of the Pambula town centre adjacent to Bullara Street (Figure 1-1). Pambula has a population of 1,627 forming part of the total population for the Bega Valley Local Government Area (LGA) which was estimated at 35,942 in 2021 (ABS, 2021).

The site is located in the upper tidal reaches and floodplain of the Pambula River (Figure 1-2).

The proposal site is identified as Lots 6 and 8 Deposited Plans (DP) 1166672 within Crown Land, which is managed by Pambula Wetlands and Heritage Reserve Land Manager (PWHR Land Manager) hereafter referred to as Panboola Land Managers, and Lot 1828 DP 1187859 within Beowa National Park (Figure 1-3) as land reserved under the NSW *National Parks and Wildlife Act 1974*, and managed by the NSW National Parks and Wildlife Service (NPWS) as the park authority.. The proposal site includes land zoned as C2 Environmental Conservation and C1 National Parks and Nature Reserves under the *Bega Valley Shire Local Environmental Plan (LEP) 2013*.

The land within the immediate vicinity of the site is used for nature conservation, protection of native flora and fauna and recreational activities including walking, cycling, bird watching, community education and passive enjoyment.

The closest residential receiver to the proposal site is 462 m north of the site. An industrial area is 668 m north east and the Pambula Township is 966 m north of the proposal site. The closest sensitive receivers would be users of the wetland.

1.3 Definitions of the proposal

The following definitions apply to this report:

- Proposal – the proposal as defined in Section 3.1
- Proposal site - the footprint of the proposed work including the extent of construction works and ancillary facilities
- Proposal area – land within 50 m of the proposal site, including adjacent areas of Crown Land and National Park
- Study area – land within 10 km of the proposal area.



Figure 1-1 Proposal study area



Figure 1-2 Proposal area

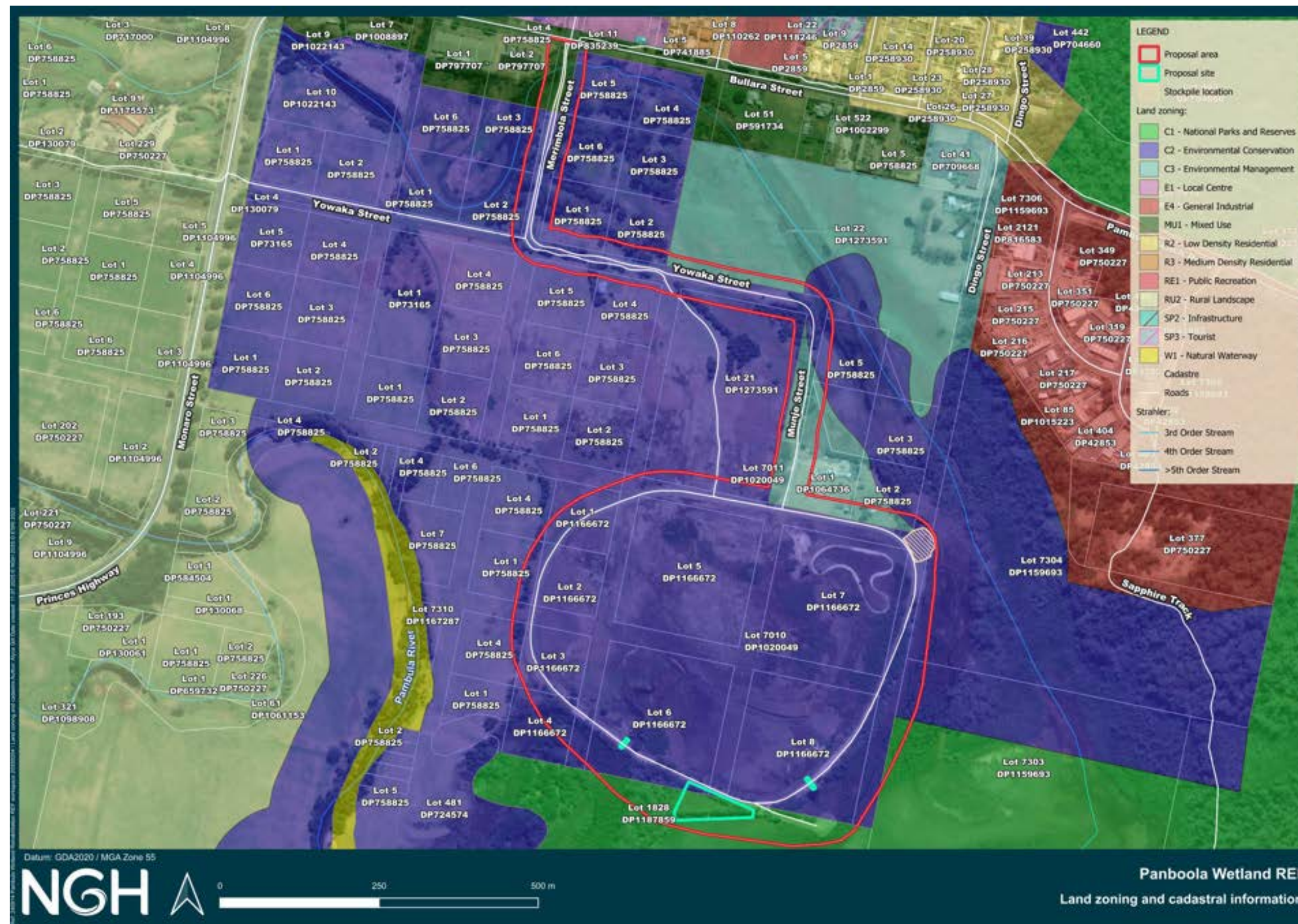


Figure 1-3 Land zoning and cadastral information

2. Need and options considered

2.1 Background

The Panboola Wetland Rehabilitation proposal is one of a range of projects being implemented by DPIRD under the NSW Estuary Asset Protection (NEAP) program. The NEAP program is co-funded by the Australian and NSW Governments under Disaster Recovery Funding Arrangements (as part of a two-year \$64 million Riparian Stabilisation Package) and would support the repair, restoration and regeneration of priority riparian and estuarine areas in NSW.

The NEAP is a targeted and evidence-based flood response to protect and recover the natural estuarine assets and the benefits they provide to the people of NSW and increase the resilience of natural systems to future flood events. The program includes a mix of targeted actions in priority locations that would reinstate or protect natural infrastructure, protect Aboriginal cultural assets, and address as built infrastructure that is threatening ecosystem health during flood events to protect NSW estuarine and floodplain environmental assets now and improve their resilience for the future.

DPIRD have developed an action plan to protect estuarine and coastal floodplain assets. It includes a mix of works and activities that support the recovery of estuarine ecosystems and reinstate their resilience to future disasters. NEAP projects include implementing on-ground works that would improve estuarine habitat condition and resilience, including coastal wetland reconnection and restoration. The Panboola Wetland proposal is one of the locations in which DPIRD is working with project partners to increase the environmental resilience of estuaries to floods and sea level rise through coastal floodplain wetland rehabilitation.

2.2 Strategic need and justification for the proposal

Coastal wetland environments like Panboola would become significantly impacted by sea level rise into the future and there is a need to ensure management actions are carried out to maintain their resilience to future impacts.

In 2006 the Panboola Plan of Management (Panboola 2006) was developed with the involvement of the Management Committee of Pambula Wetlands and Heritage Project and the Pambula Wetlands and Heritage Reserve Land Managers (PWHR Land Manager). The Plan contains a detailed works program for the area that has been progressively implemented over the last 18 years. The Plan includes as a Management Aim (Section 3) to 'restore the Pambula Floodplain as a significant natural wetland'. Section 8.6 (The Old Racecourse Reserve) of the Plan includes as future aims and actions:

- 'Consideration of restoration of tidal flow necessitating removal of levee bank'
- 'Coastal Saltmarsh recovery and undertake activities to promote this'
- 'Address the drainage and water flows, especially on the South West rim of track where water crosses causing damage to track'.

In 2024 DPIRD commissioned a study (funded by the NSW Marine Estate Management Strategy) to assess the hydrological processes at Panboola to identify new opportunities to improve the future management of the site and recommend specific management options including on-ground works (Montano et al 2024).

Five potential management options were identified for Panboola. The aim of these options is to improve water quality, promote tidal wetland habitat, and enhance the existing ecosystem aquatic health of the site whilst aligning with the existing community values for the site. Each option could be implemented individually or alongside other options. The potential management options identified for Panboola included:

- Option 1: Stormwater management

- Option 2: Waterway management
- Option 3: Increase tidal connectivity
- Option 4: Continue bank restoration of Pambula River
- Option 5: Plan for sea level rise.

Further information on each option is included in Montano et al 2024 (e.g. Figure 4.1).

The proposed management options align with the *Coastal Management Act 2016* objectives of rehabilitating and restoration of degraded wetlands, improving the resilience of coastal wetlands to the impacts of climate change, and supporting the social and cultural values of coastal wetlands.

The focus of this proposal and REF is to implement Option 3 (Increase tidal connectivity).

Option 3 - Increase tidal connectivity

During the investigation of the site hydrology at Panboola Wetland, it was identified that two existing pipe culverts connecting to the estuary are currently restricting tidal flows into the centre racecourse area of the wetland. It was also identified that an existing levee in Beowa National Park, near to the racecourse track is restricting natural tidal flow to a 6,000 m² area.

Option 3 proposes the removal of the pipe culverts and replacing them with alternative structures (e.g. rock channels with timber and steel bridges) to allow for increased natural tidal flow between the Pambula estuary and the Inner racecourse area within the Panboola Reserve. Preliminary estimates indicate that removal of these restrictions would extend the tidal wetland habitat with the inner racecourse by adding up to 2.5 ha of land subject to tidal influence. Part removal of the levee would also reintroduce natural tidal flow to a 6,000 m² area within Beowa National Park.

This option would gradually improve overall natural tidal flows and connectivity at Panboola and thereby improve and enhance the health and resilience of the existing aquatic ecosystems at the site including the 6,000 m² area of threatened coastal saltmarsh within Beowa National Park. Additionally, it would achieve increased floodplain resilience and improve drainage following large rainfall and flood events in the catchment.

While the proposed works are likely to lead to some localised ecological changes, overall they would increase the health of the existing coastal wetland area increasing its resilience, and that of the wider estuary, to future flood and sea level rise impacts.

2.3 Existing infrastructure

Panboola is located on the NSW South Coast, south of the town of Pambula. Panboola covers an area of 97 ha comprised of a combination of publicly owned land and private land which was donated by local benefactors to the Pambula Wetlands and Heritage Project. Since 2003, public and private land at Panboola has been administered by community volunteers for the purpose of conservation, protection, and restoration of habitat, as well as for community education and enjoyment. (Montano et al. (2024).

Figure 2-1 and Figure 2-2 show the existing eastern and southern pipe culverts proposed to be replaced.

The proposed levee to be partially removed is located within the Beowa National Park, adjacent to Panboola. Figure 2-3 shows the existing levee and area to receive tidal flows.



Figure 2-1 Southern culvert (Upstream and downstream)



Figure 2-2 Eastern culvert (Upstream and downstream)



Figure 2-3 Levee

2.4 Proposal objectives and development criteria

The objectives of the proposal are to improve Panboola wetland's biophysical condition, floodplain resilience and increase tidal connectivity by replacing two existing pipe culverts between the inner racecourse and the

estuary with open rock channels (and timber and steel bridges) and part removing an existing levee located within the Beowa National Park.

The specific objectives and expected benefits of the proposal are to:

- Improve water quality by increasing the volume of tidal flows and flushing of wetland areas
- Extend and improve fish habitat and fish passage by increasing the area that is frequently inundated by tidal flows and reducing velocities in the connections between the estuary and wetland areas
- Decrease the likelihood of water flow blockages which currently occur with the existing pipe culverts
- Improve drainage from the inner racecourse area following heavy rainfall events
- Increase the carbon sequestration potential of the area by extending the area of viable and healthy marine vegetation habitat (saltmarsh and mangroves).

A further objective of the project is to minimise the footprint of the earthworks in order to:

- Limit the impacts to coastal wetland (mangrove and saltmarsh) habitat during construction
- Keep construction costs to acceptable levels for the required infrastructure (i.e. channels and bridges).

(UNSW Water Research Laboratory 2024)

The proposed culvert replacement works are consistent with the management objectives of the relevant management plan for Panboola Wetland (Panboola 2006) and the proposed levee works are consistent with the management purposes and principles of the plan of management for Beowa National Park (NPWS 2021) (Section 4 of this REF).

2.5 Consideration of alternatives and options

Although five potential management options (refer to Section 2.2) were identified for Panboola during the site investigations for the proposal, only one of these options relates to increasing tidal connectivity (Option 3). Three options for increasing tidal connectivity were considered.

2.5.1 Do nothing

The 'do nothing' option would result in no improvements to tidal connectivity between the estuary and wetland areas at Panboola. This option does not meet the objectives of the proposal as it would not improve tidal flows at Panboola and would not improve and enhance the health and resilience of the existing aquatic ecosystems at the site, especially in relation to future predicted sea level rise. The 'do nothing' option may also result in a catastrophic failure of the levees at some stage in the future (in response to climate change extreme events impacts) which could lead to rapid ecological response and impacts and redistribution of aquatic vegetation, including possibly mass mortality of the saltmarsh which is a listed Threatened Ecological Communities (TEC). This option would also not achieve increased floodplain resilience and improve drainage following large rainfall and flood events in the catchment.

While this option would involve no disturbance to the site and therefore have less short term environmental impact than other options, the objectives of the proposal would not be met.

2.5.2 Option 1

This option involves removing two existing pipe culverts and replacing them with two alternative structures (shallow rock channels and timber and steel bridges) to facilitate increased tidal flow into the inner racecourse area owned by Crown Lands and managed by Panboola Land Managers (PWHR Land Manager). Additionally, this option would also remove part of an existing levee to reintroduce tidal flow to a 6,000m² area to the south of the racecourse on National Park Reserve.

This option would gradually improve overall natural tidal flows and connectivity at Panboola and thereby improve and enhance the health and resilience of the existing aquatic ecosystems at the site. Additionally, it would achieve increased floodplain resilience and improve drainage following large rainfall and flood events in the catchment. This option was recommended following detailed hydrological studies of the site (Montano 2024, UNSW Water Research Laboratory 2024). This option would meet the proposal objectives.

2.5.3 Option 2

The option to construct larger and/or an increased number of channels between the estuary and the inner racecourse area, and removal of the entire levee within the National Park, to increase tidal flows was considered. This option would require a substantial quantity of earthworks, a larger number of bridges and have much larger environmental and social impacts than Option 1. The likely hydrological effects of this option have not been investigated. Additionally, this option would involve significantly higher construction costs and restrict public access to the site for longer periods. This option is not considered feasible due to the environmental constraints and high costs involved and is not considered further.

2.5.4 Conclusions of the options investigation

Option 1 is the preferred option. This option is considered to be most appropriate in terms of achieving a gradual improvement in natural tidal flows and connectivity at Panboola and meets the proposals objectives. This option would have significantly less environmental and social impacts and construction costs than Option 2 and reduces the risk of future levee failures from the 'Do nothing' option.

2.5.5 Design refinements

No design refinements have occurred since selection of the preferred option.

3. Description of the proposal

3.1 The proposal

DPIRD propose to undertake wetland rehabilitation works comprised of:

1. Removal of two pipe culverts and replacing them with two alternative structures (shallow rock channels and timber and steel bridges) to facilitate increased tidal flow into the inner racecourse area owned by Crown Lands and managed by Panboola Land Managers (PWHR Land Manager)
2. Removal of one section of a levee located in Beowa National Park (formerly referred to as Ben Boyd National Park) to reintroduce tidal flow to a 6,000 m² area on the outside of the Panboola racecourse area to the south.

The proposal site is provided in Figure 3-1. The proposed channel and bridge designs are described and illustrated in Appendix A.

A stockpile area would be required near to the proposal site. This would be located on a grassed area of the Panboola Reserve to the east of the grandstand (Figure 3-2).



Figure 3-1 Proposal site



Figure 3-2 Stockpiles, compounds and access routes

3.2 Culvert removal – works within land managed by Panboola Land Managers

3.2.1 Works methodology

The works methodology for the works proposed within the proposal are outlined below in Table 3-2.

Table 3-1 Works methodology

Activity	Associated work
Pre-construction	• Notify Panboola Land Managers, National Parks and Wildlife Service (NPWS) and other stakeholders as required before work starts • Set out, demark and fence the site to establish routes, work accesses, and no-go zones. Close public access to the racecourse track • Install safety barriers and environmental controls (e.g. erosion and sedimentation controls) • Establish site facilities, such as stockpile area, materials storage and parking areas • Upgrade access roads with gravel.
Construction - Channels and Bridges	• Works in waterway to be timed to occur at or close to low tide • Install sediment booms adjacent to vegetated areas and other site erosion and sediment controls • Establish buffer areas 25 m wide either side of channels • Clear or trim vegetation from within the works footprint as required. This will include the removal of up to five young and mature mangroves (Grey Mangrove <i>Avicennia marina</i>) and removal of several <i>Melaleuca ericifolia</i> individuals (from Swamp Oak Floodplain Forest TEC) bordering the saltmarsh at the channels and disturbance of up to 100m² of aquatic vegetation comprised of saltmarsh plants (such as Samphire <i>Sarcocornia quinqueflora</i>) • Excavate pipe culverts using 16 tonne excavator • Transport excavated soil and pipes by dump truck to stockpile site. Spread and treat for acid sulfate soils if required • Excavate and shape southern Channel: 8-10 m wide with sloping banks, 18 m long – upstream invert 0.42 Australian Height Datum (AHD), downstream invert 0.42 AHD • Excavate and shape eastern Channel: 8-10 m wide with sloping banks, 22 m long – upstream invert 0.76 AHD, downstream invert 0.47 AHD • Install rock aprons and place rock and geofabric to line the excavated channels • Construct and install timber and steel bridges over southern and eastern Channels. The bridges will be 3.6m wide (15 tonne load rated vehicular bridge) constructed with timber decks over steel girders on concrete headstocks with concrete bored piers. The approaches on both sides will use fill that will be graded as per guidelines for disabled pedestrian and vehicle access. Further details in Appendix A.

Activity	Associated work
	Install floating booms and conduct filter plantings of vegetation along channels to slow movement of mangrove propagules and other floating debris into the racecourse area.
Demobilisation, remediation and rehabilitation	- Demobilise site facilities, remove traffic controls and fencing and re-open site to public access - Manage treated excavated soil as required - Remediate and rehabilitate all areas disturbed during construction including road surfaces to their pre-works condition as soon as practicable. - Construction erosion and sediment control structures would be maintained until the disturbed areas are stable.

3.2.2 Construction plant and equipment

Plant and equipment that would be utilised during construction includes, but would not be limited to:

- 5 Tonne Excavator
- 16 Tonne Excavator
- Dump/tipper Truck
- Bobcat
- Bog Mats
- Floating sediment Booms
- Generator (for power tools)
- Chain saws
- Hand tools

3.2.3 Source and quantity of materials

Materials that would be utilised during construction include, but would not be limited to:

- Rock (75/50mm crushed igneous rock)
- Geofabric
- Gravel (40/70 igneous rock and DGS40) for access road upgrades
- Timber, steel, concrete and footing system for bridge construction

Water would be sourced from the Pambula town supply.

3.2.4 Earthworks

The earthworks impact area is approximately 160 m³ of cut and 48 m³ fill. This includes excavation of southern and eastern channels and placement of rock lining along the south and eastern channels only.

Approximate cuts:

- Southern Channel = 72 m³
- Eastern Channel = 88 m³
- Levee = 160 m³

Estimated fills:

- Southern Channel = 21.6 m³
- Eastern Channel = 26.4 m³.

3.3 Levee works - works within Beowa National Park

3.3.1 Background

The proposed levee to be partially removed is located within the Beowa National Park, adjacent to Panboola. The existing earthen levee is approximately 140 m long and 4 m wide with an approximate volume of 800m³. There is no known or recorded history on the levee, it is assumed it was built to control floods that occur within the area when the site was operated for agriculture.

The levee consists of either imported clean fill including rock and clay road-base compactable material or materials sourced from onsite.

Geotechnical works would be undertaken prior to construction to confirm its composition.

Soil testing of the levee found no acid sulfate soils would be encountered above 0.8 m depth. The levee is approximately 600 mm high. A minor exceedance for acid sulfate soils was found below 0.8 m. It is considered unlikely acid sulfate soils would be disturbed by the levee partial removal due to the depth of excavations (above 0.8 m), however an Acid Sulfate Soils Management Plan would be prepared outlining how acid sulfate soils would be treated and managed if they are to be disturbed (refer to Section 6.1).

It is considered unlikely to contain aboriginal objects (refer to Section 6.4) due to the nature of the landscape being a waterway and flood zone and previous disturbance of the locality.

Currently the existing levee to be partial removed prevents tidal water entering the 6,000 m² area north of the levee. The Old Pambula Racecourse levee disconnects the proposed inundation site from the racecourse (Panboola Wetland), therefore there is no interaction or tidal connectivity into the racecourse at this location. The tidal connectivity into the racecourse is via the existing culverts to be replaced as part of this REF.

3.3.2 Design and methodology

It is proposed to remove a single section of the levee approximately 12 m wide base with 4:1 batters either side. The single section to be removed is located approximately 60 m along the levee from the racecourse (refer to Figure 3-3). An alternative location is also section in case the first selection doesn't end up being suitable. Only one option would be undertaken. Approximately 30 m³ of earth material would be removed from the one section and undertaken in one stage of works. The one portion of the levee to be removed is approximately 8.6% of the existing levee.

The works would be undertaken during low tides, therefore no coffer dam is required to be established. A 20 m floating sediment boom would placed downstream within the receiving waters to collect waterbourne sediments and left in place until no more sediment is released from site.

The works would be undertaken by an excavator and include removal of vegetation and earth materials within the portion of the levee to be removed. Excavated materials would be transported from the levee via the access established across the wetland (refer to Section 3.3.3 below) to the racetrack and placed at the Project stockpile site (refer to Section 3.7).



Figure 3-3 Proposed levee works

3.3.3 Access

One temporary access track, approximately 25 m long and 4 m wide, to the levee would be established (refer to Figure 3-3). It would involve the placement of bog mats to be tracked by machines from the racetrack across the existing vegetation to the levee. No vegetation clearing is proposed along the temporary access track. The route of least impact would be selected prior to construction and direct to the portion of the levee to be removed. The bog mats would be removed at the completion of works (approximately 3-4 days).

3.3.4 Rehabilitation

Post construction, the excavated areas will be stabilised and bog mats removed from the access track. It is not proposed to insert scour protection within the opening of the levee to allow natural regeneration. Erosion and sediment controls would be removed once the site has stabilised.

3.3.5 Works methodology

The works methodology for the proposal is outlined below in Table 3-2.

Table 3-2 Works methodology

Activity	Associated work
Pre-construction	• Complete permits, approvals and notifications (refer to Section 4 and 8) • Notify Panboola Land Managers, National Parks and Wildlife Service (NPWS) and other stakeholders as required before work starts • Carry out geotechnical investigations of levee to determine composition of material and contamination risk • Set out, demark and fence the site to establish routes, work accesses, and no-go zones. • Install safety barriers and environmental controls (e.g. erosion and sedimentation controls) • Establish site facilities, such as stockpile area, materials storage and parking (within the racecourse refer to Section 3.7).
Construction - Levee	• Works in waterway to be timed to occur at low tide • Install 20 m floating sediment boom adjacent to mangrove area and other site erosion and sediment controls • Place bog mats along access track for excavator access to levee • Clear vegetation from parts of the levee as required. This will include removal of Southern Estuarine Swamp Paperbark Creekflat Scrub that has colonised on the levee since its construction, and temporary disturbance of up to 100 m² of aquatic vegetation comprised of saltmarsh plants (such as Sea Rush <i>Juncus kraussii subsp. australiensis</i>). Noting bog mats would reduce potential lasting impacts to these plants • Excavate one portion (12 m wide) in levee and battering of levee sides at 4:1 using small excavator • Transport excavated soil by dump truck to stockpile site • Spread and treat for acid sulfate soils if required.
Demobilisation, remediation and rehabilitation	• Demobilise site facilities, remove traffic controls and fencing and re-open site to public access • Manage treated excavated soil as required • Remediate and rehabilitate all areas disturbed during construction including road surfaces to their pre-works condition as soon as practicable • Construction erosion and sediment control structures would be maintained until the disturbed areas are stable.

3.3.6 Construction plant and equipment

Plant and equipment that would be utilised during construction includes, but would not be limited to:

- 5 Tonne Excavator
- Dump/tipper Truck
- Bobcat
- Bog Mats
- Floating sediment Booms
- Generator (for power tools)
- Chain saws
- Hand tools

3.3.7 Source and quantity of materials

No proposed materials are required for the works.

3.3.8 Earthworks

The earthworks impact area is approximately 30 m³ of cut from the levee. No proposed fill is required.

3.4 Traffic management and access

Site access from Bullara Street, Pambula would be via Merimbola Street, Yowaka Street and Munje Street. Onsite access would be via existing access tracks onsite. Public access to a portion of the Panboola Racecourse track for the proposal would be closed during the works.

3.5 Site personnel

Generally, there would be approximately 4-5 employees and contractors required for the construction works.

3.6 Construction timing

Construction is estimated to commence in May 2025 and take approximately 6 weeks. The partial removal of the levee would take approximately only 3-4 days.

Construction would occur during the following working hours:

- Monday to Friday – 7am to 5pm
- Saturday – 7am to 1pm
- Sunday and public holidays – no work.

3.7 Ancillary facilities

The site compound and stockpile area would be located on a cleared grassed area east of the grandstand (approximately 500 m²). (Figure 3-2). This would be used to stockpile fill excavated from the levee bank and pipe culvert removal works. The excavated fill would be treated for acid sulfate soils at the stockpile site. Construction materials for the timber and steel bridges would also be stored in this area as required. At the completion of construction, the stockpile site and site access would be rehabilitated as appropriate.

4. Legal and policy requirements

4.1 Planning approval process

The Planning Approval process is summarised here and the legal permissibility of the proposal is further detailed in Section 4.2 below.

Part 5, Division 5.1 of the EP&A Act imposes environmental assessment obligations on determining authorities, which are usually public authorities and statutory state-owned corporations, but also include other specified agencies such as local government authorities. Part 5, Division 5.1 applies to activities (as defined in section 5.1) that:

- Are to be carried out by a Minister or public authority
- Are to be carried out on behalf of a Minister or public authority
- Which require the approval of a Minister or public authority.

This development is permitted without consent under Section 2.165 of the State Environmental Planning Policy (Transport and Infrastructure) 2021. Section 2.165 of the TISEPP applies to waterway or foreshore management activities. Under this section, development for the purpose of environmental management works may be carried out by or on behalf of a public authority without consent on any land.

The proposed site is located within zoning C2 Environmental Conservation and C1 National Parks and Nature Reserves and development is carried out by or on behalf of the public authority. DPIRD is the proponent and the determining authority. As such, the proposal is assessed under Part 5, Division 5.1 of the EP&A Act.

The proposed levee works would occur within Beowa National Park as land reserved under the NPW Act. Therefore for the levee works, NPWS is the co-determining authority for the activity.

Under section 5.5 of the EP&A Act, the proponent is responsible for assessing the impacts of its activities. This REF presents an assessment of the potential environmental impacts associated with the proposal. Section 171(2) of the Environmental Planning and Assessment Regulation 2021 (NSW) (EP&A Regulation) identifies the factors that must be considered. These factors are summarised in Appendix A.

4.2 Legal permissibility

The following section identifies the applicable local and regional planning instruments, the relevant State and Commonwealth environment and planning legislation, and discusses the relevant planning approval process applicable to the proposal.

4.2.1 Commonwealth law

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) regulates the assessment and approval of activities that would have or is likely to have a significant impact on Matters of National Environmental Significance (MNES), activities by Commonwealth government agencies and activities by any person on Commonwealth land.

Currently MNES include:

- World Heritage properties
- National Heritage places
- Wetlands of international importance (listed under the Ramsar Convention)

- Nationally listed threatened species and ecological communities
- Migratory species (protected under international agreements)
- Commonwealth marine areas
- Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

An EPBC Act protected matters search was undertaken on 21st November 2024. An assessment of the impacts of the proposal determined that the proposal does not constitute an activity which may have a significant adverse impact on any MNES (Appendix C). MNES relevant to the study area include:

- Nationally listed threatened species and ecological communities
- Migratory species (protected under international agreements).

A referral is not required for proposed activities that may affect nationally listed threatened species, endangered ecological communities and migratory species.

Potential impacts to these biodiversity matters are also considered as part of chapter 6.3 of the REF and Appendix C.

The proposal is located in or near an area listed as a nationally important wetland under the Directory of Important Wetlands in Australia - 'Pambula Estuarine Wetland NSW 122'. However, a referral to the Commonwealth is not required for proposed activities that may affect nationally important wetlands listed under this Directory.

Native Title Act 1993

The *Native Title Act 1993* (Cth) provides a legislative framework for the recognition and protection of common law native title rights. Native title is the recognition by Australian law that Indigenous people had a system of law and ownership of their lands before European settlement. Where that traditional connection to land and waters has been maintained and where government acts have not removed it, the law recognises the persistence of native title. Native title may exist in areas including some national parks.

A search of the National Native Title Register on 21 October 2025 found one Native Title Claim that covers the area- The South Coast Peoples (NC2017/003).

In accordance with subsection 24JB(6) of the Native Title Act (CW), registered native bodies corporate as well as registered native title claimants must be notified of the works proposed and provided an opportunity to comment if the works would potentially impact native title rights and interest. The proposed works is considered environmental protection works under Subdivision 24LA and are unlikely to impact on native rights and interests to the area. No further consultation during the REF process is required.

4.2.2 NSW law

Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act provides for a co-ordinated approach to development in NSW ensuring the proper management, development and conservation of natural and cultural resources and promoting social and economic welfare and a better environment.

This REF has been completed under Division 5.1 of the EP&A Act, and aims to address DPIRD's duty in respect to considering the environmental impact of the proposed activities under section 5.5 of the EP&A Act and section 171 of the EP&A Regulation.

Section 5.7 of the EP&A Act requires an Environmental Impact Statement (EIS) to be prepared (instead of or in addition to an REF) if an activity is likely to significantly impact threatened species as defined by Part 7 of the BC Act and/or Part 7A of the FM Act.

Section 7.8 of the BC Act also provides that if the activity is only likely to significantly affect the environment in respect of threatened species, then an EIS is not required (an REF is sufficient), provided a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) has been furnished. This is reiterated under section 5.7(1)(a) of the EP&A Act, which requires the accompaniment of an EIS (EP&A Act Section 5.8(8) notes that an EIS includes an SIS).

An activity is likely to significantly affect threatened species (BC Act Section 7.2) if:

- a) It is likely to significantly affect threatened species or ecological communities or their habitats, according to the test in section 7.3, or
- b) The development exceeds the biodiversity offsets scheme threshold if the biodiversity offsets scheme applies to the impacts of the development on biodiversity values, or
- c) It is carried out in a declared area of outstanding biodiversity value.

Section 5.7 of the EP&A Act also requires the concurrence of the Director-General of Planning and Environment (determining authority for the SIS/BDAR) if there is likely to be a significant impact to the above listed entities.

Section 221ZX of the FM Act requires that a species impact statement accompanies an environmental impact statement prepared under Part 5 of the EP&A Act if the activity is likely to significantly affect threatened species, populations or ecological communities. Section 221ZZ requires the determining authority to obtain the concurrence of the Fisheries Agency Head before it can carry out the activity, or grant an approval to carry out the activity, if the activity is likely to significantly affect threatened species, populations or ecological communities.

The proposal is not likely to significantly affect the environment. The proposal's impacts would be addressed under Division 5.1 of the EP&A Act.

Environmental Planning and Assessment Regulation 2021 (EP&A Regulation)

The Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) sets out the requirements and form for an REF and the consideration of matters to be addressed.

Section 170 refers to the REF Guidelines to be followed.

Section 171(2) refers to the environmental factors to be taken into account in the REF.

Section 171(4) requires publication of an REF for any activity with:

- A capital investment value of more than \$5 million
- An approval or permit for activity that requires approval under:
 - *Fisheries Management Act 1994* (NSW) sections 144, 201, 205 or 219
 - *Heritage Act 1977* (NSW) section 57
 - *National Parks and Wildlife Act 1974* (NSW) section 90
 - *Protection of the Environment Operations Act 1997* (NSW) sections 47-49 or 122
- If the determining authority considers it to be in the public interest.

This applies to the proposal unless, as noted under section 171(6), it:

- a) Belongs to a class specified by the Planning Secretary in a notice published on the Department's website for the purposes of this section, or
- b) An approved code under Division 6 applies.

Publishing of the REF must be undertaken either:

- a) Before the activity commences, or
- b) As soon as practicable, no later than one month after the activity commences.

The proposal would require a permit under Section 205 of the FM Act, therefore the REF would require publication as per Section 171(4) of the Regulation. Section 171(6) does not apply to this proposal. The REF will be published on the DPIRD website (as the determining authority). This REF has been prepared in accordance with the REF Guidelines and all Section 171(2) factors have been taken into consideration (refer to Appendix A).

State Environment Planning Policy (Transport and Infrastructure) 2021 (TISEPP)

The TISEPP aims to facilitate the effective delivery of infrastructure across the State. The TISEPP includes provisions for developments which may be carried out by, or on behalf of, a public authority without the requirement for consent.

Section 2.165 of the TISEPP applies to waterway or foreshore management activities. Under this section, development for the purpose of environmental management works may be carried out by or on behalf of a public authority without consent on any land.

State Environmental Planning Policy (Planning Systems) 2021

The State Environmental Planning Policy (Planning Systems) 2021 commenced on 1 March 2022, consolidating the previous State and Regional Development (S&RD) and other regional environmental plan SEPPs. The aims of the SEPP are:

- To identify development that is State significant development (SSD)
- To identify development that is State significant infrastructure (SSI) and Critical State significant infrastructure (CSSI)
- To identify development that is regionally significant development.

Under the SEPP, development is declared SSD, SSI or CSSI for the purposes of the Act where:

- (a) The development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
- (b) The development is specified in:
 - Schedule 1 or 2 – SSD
 - Schedule 3 – SSI
 - Schedule 5 – CSSI.

The proposal is permissible without consent, and is not SSD, SSI or CSSI.

State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP)

R&H SEPP provides a state-wide planning approach to Coastal Management areas (Part 2.2), Hazardous and offensive development (Chapter 3) and the remediation of contaminated land (Chapter 4).

It specifies when consent is required, and when it is not required.

The proposal is not located on mapped littoral rainforest land.

The proposal is located within mapped coastal wetlands and proximity to coastal wetlands. As per section 2.7 of the SEPP, if the development includes any of the following it is to be declared designated development:

- The clearing of native vegetation within the meaning of Part 5A of the *Local Land Services Act 2013*

- The harm of marine vegetation within the meaning of Division 4 of Part 7 of the *Fisheries Management Act 1994*
- The carrying out of any of the following:
 - Earthworks (including the depositing of material on land)
 - Constructing a levee
 - Draining the land
 - Environmental protection works
- Any other development.

However, in summary the works are not considered designated development as:

- The works within Panboola Wetland (as Crown Land managed by a Trust) is *environmental protection work* as per Section 2.7(3)(c) of R&H SEPP and the plan of management prepared and adopted under Division 3.6 of the *Crown Land Management Act 2016*, is in place and the activity is in accordance with that Plan.
- The activity on land reserved under the NPW Act is consistent with the adopted plan of management (PoM) prepared under that Act, as per Section 2.7(6) of the R&H SEPP as the *Beowa National Park and Bell Bird Creek Nature Reserve Plan of Management* (DCCEEW-NPWS, 2024 as amended)

This detailed further below.

Scope of works	Justification
Panboola Wetland – culvert removal	The proposal would involve harm of marine vegetation and environmental protection works. However, under subsection 3, development for the purpose of environmental protection works on land identified as coastal wetlands may be carried out or on behalf of a public authority without development consent if the development is identified in: • The relevant certified coastal management program, or • A plan of management prepared and adopted under Division 2 of Part 2 of Chapter 6 of the <i>Local Government Act 1993</i>, or • A plan of management under Division 3.6 of the <i>Crown Land Management Act 2016</i>. The proposed works within the racecourse would occur within Crown Land, that has a Plan of Management under Division 3.6 of the <i>Crown Land Management Act 2016</i>. The Panboola Plan of Management (2006) was developed with the involvement of the Management Committee of Pambula Wetlands and PWHR Land Managers. The Plan contains a detailed works program for the area that has been progressively implemented over the last 18 years. The Plan includes as a Management Aim (Section 3) to ‘restore the Pambula Floodplain as a significant natural wetland’. Section 8.6 (The Old Racecourse Reserve) of the Plan includes future aims and actions that would be directly addressed by the current proposal. These include: • ‘Consideration of restoration of tidal flow necessitating removal of levee bank’ • ‘Coastal Saltmarsh recovery and undertake activities to promote this’ • ‘Address the drainage and water flows, especially on the South West rim of track where water crosses causing damage to track’.

Scope of works	Justification
	The proposed works are clearly consistent with the aims and actions included in the relevant Crown Land management plan. As the proponent, DPIRD has confirmed that it is satisfied that the adopted Panboola Plan of Management 2006 is of sufficient standard and quality to address the requirements of Section 2.7 of the R&H SEPP in relation to the proposed works on Crown Land at Panboola.
Beowa National Park – levee works	Section 2.7 of the SEPP also does not apply to the carrying out of development on land reserved under the <i>National Parks and Wildlife Act 1974</i> if the proposed development is consistent with a plan of management prepared under that Act for the land concerned. The proposed levee works within the Beowa National Park are consistent with the management purposes and principles, and would protect the natural and cultural values included in the Beowa National Park and Bell Bird Creek Nature Reserve PoM (NPWS, 2025). Section 2.2. of the Beowa National Park and Bell Bird Creek Nature Reserve PoM (Management Purposes and Principles) states that under the NPW Act National Parks are managed to ‘conserve biodiversity, maintain ecosystem functions and protect the ecological integrity of one or more ecosystems for present and future generations’. Section 3.2 includes as specific objectives for the Park ‘protection of areas of...estuarine and floodplain wetlands....and their habitat value for native animals’. Section 3.3. includes as a major management strategy and program of the POM the conservation of populations of threatened species of animals and plants by ‘protecting relevant habitats and ecosystems’. Section 4 (Natural and Cultural Values) notes that an ecologically important estuarine wetland is located adjacent to Pambula Wetlands and Heritage Reserve in the northern section of the park that supports a number of vegetation communities, particularly saltmarsh <i>Sclerostegia arbuscula</i> and <i>Sarcocornia quinqueflora</i> and mangrove woodland of <i>Avicennia marina</i>. Desired outcomes include that native vegetation is managed to ‘maintain floristic and structural diversity, conserve threatened or uncommon communities and species, and maximise habitat values for native animal species’ and that all works are designed and undertaken in a manner which ‘minimises impacts on fossils and other geological features, soil erosion and water pollution’. The proposed levee works are aimed at restoring natural tidal flow to the adjacent wetland area which was altered by past human intervention to construct the levee. This proposal would restore and maintain natural ecosystem function and protect ecological integrity and habitat values for native species (including native vegetation and threatened species) in the wetland area with the National Park. The works would be conducted under a CEMP to ensure there is no impacts on fossils, soil erosion or water quality.

The proposal is located within mapped land in proximity to coastal wetlands. As per section 2.8 of the R&H SEPP development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” unless the consent authority is satisfied that the proposed development would not significantly impact on:

- The biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

- The quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The proposal aims to restore natural tidal flows to the coastal wetland areas which were altered by past human activities including construction of a racecourse, pipe culverts and a levee bank.

Sections 6.2 and 6.3 of this REF assesses the proposal's potential impacts on the coastal wetlands.

The proposal site is also mapped as coastal use area and coastal environment.

A Coastal Zone Management Plan (CZMP) for Pambula Lake Estuary (including Panboola Wetland) was developed in 2015 (Cavanagh and Richardson 2015). The CZMP recommended one action specifically relating to Panboola which was to 'protect, rehabilitate and enhance estuarine vegetation including seagrass, saltmarsh and mangroves' (Cavanagh and Richardson 2025). The proposal is therefore consistent with the CZMP.

The proposal is not considered hazardous and offensive development and does not involve the remediation of contaminated land.

Coastal Management Act 2016

The objects of the *Coastal Management Act 2016* are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State. The proposal is consistent with the following objects of the *Coastal Management Act 2016*:

- To protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience
- To support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety
- To mitigate current and future risks from coastal hazards, taking into account the effects of climate change
- To recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly
- To encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events.

Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (NSW) (BC 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.

Section 1.7 of the EP&A Act requires consideration of the significance of any impact on threatened species, defined by section 7.3 of the BC Act, in order to determine the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.

An assessment of the potential impacts of the proposed activity on threatened species, populations, ecological communities and critical habitat listed in the BC Act must be undertaken. This includes an assessment of the potential for a significant impact under section 7.3 (5 part test) and whether an impact is likely on an area of Outstanding Biodiversity Value.

A Biodiversity Assessment was conducted including a search of the OEH Bionet database which was undertaken on 27 November 2024 (Section 6.3). The proposal would not impact Outstanding Biodiversity Value areas. The potential for the proposal to impact threatened species, populations and endangered

ecological communities is assessed in Section 6.3 and Appendix F. Tests of Significance are provided in Appendix F.

Biosecurity Act 2015

The primary object of the *Biosecurity Act 2015* (NSW) is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. The biosecurity framework and tools safeguard our economy, environment and community and any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about.

A search of the Department of Primary Industries WeedWise database for regional priority weeds for the South East region was undertaken on 7 January 2025 (Appendix H).

Section 6.3 addresses impacts relating to priority weeds.

National Parks and Wildlife Act 1974

The objectives of the *National Parks and Wildlife Act 1974* (NSW) (NPW Act) are to conserve and preserve nature; conserve objects, places, or features (including biological diversity) of cultural value within the landscape; foster public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation; and provide for the management of land reserved under this Act.

Section 6.4 assesses the potential for the proposal to impact on Aboriginal heritage.

The proposal (proposed levee works) would also partly occur within the Beowa National Park (formerly referred to as Ben Boyd National Park), land owned by the NSW Minister for the Environment administering the NSW *National Parks and Wildlife Act 1974* (refer to Figure 1-3). Advice from consultation with NPWS and relevant guidelines has been used in the preparation of this REF (DPIE 2020, DPE 2022). A draft of the REF was also provided to NPWS for review. Proposed developments and activities within National Parks are assessed in relation to the objects (section 2A) and management principles (section 30E) of the NPW Act.

DPIRD require authorisation prior to construction to undertake the proposal within Beowa National Park.

This REF has been prepared in consideration of the following:

- *Developments adjacent to National Parks and Wildlife Service lands - Guidelines to guide consent and planning authorities in their assessment of development applications that are adjacent to land managed by the National Parks and Wildlife Service (DPIE, 2020)*
- *Guidelines for Preparing a Review of Environmental Factors - Assessing the environmental impacts of activities within NSW national parks (DPE, 2022).*

The objects of the NPW Act include

(a) *the conservation of nature, including, but not limited to, the conservation of—*

(i) *habitat, ecosystems and ecosystem processes, and*

(ii) *biological diversity at the community, species and genetic levels, and*

(iii) *landforms of significance, including geological features and processes, and*

(iv) *landscapes and natural features of significance including wilderness and wild rivers,*

(b) *the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to—*

(i) *places, objects and features of significance to Aboriginal people, and*

- (ii) places of social value to the people of New South Wales, and*
- (iii) places of historic, architectural or scientific significance,*
- (c) fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation,*
- (d) providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation.*

The proposed levee works are aimed to restore natural tidal flow to the adjacent wetland area which was altered by past human intervention to construct the levee. This proposal is consistent with the objects of the Act to conserve habitat, ecosystem processes and biological diversity. Restoring natural tidal flow and removing past human intervention has potential to improve to public appreciation, understanding and enjoyment of the location.

Section 30E(2) requires a national park to be managed in accordance with the following principles:

- a) the conservation of biodiversity, the maintenance of ecosystem function, the protection of geological and geomorphological features and natural phenomena and the maintenance of natural landscapes,*
- (b) the conservation of places, objects, features and landscapes of cultural value,*
- (c) the protection of the ecological integrity of one or more ecosystems for present and future generations,*
- (d) the promotion of public appreciation and understanding of the national park's natural and cultural values,*
- (e) provision for sustainable visitor or tourist use and enjoyment that is compatible with the conservation of the national park's natural and cultural values,*
- (f) provision for the sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to the conservation of the national park's natural and cultural values,*
- (g) provision for appropriate research and monitoring.*

The proposal is consistent with the management principles for the national park as it would restore and maintain natural ecosystem function and protect ecological integrity of the wetland ecosystem within the national park. It will additionally assist with the protection of ecological integrity for future generations with the restoration natural tidal flows to the wetland. The proposed works would not impact on NPWS promotion of public appreciation and understanding of the Park, provision of sustainable use or appropriate research and monitoring.

The proposal is also consistent with the management purposes and principles listed in the Beowa National Park and Bell Bird Creek Nature Reserve Plan of Management (NPWS, 2025) refer to R&H SEPP above.

Heritage Act 1977

The *Heritage Act 1977* (NSW) (Heritage Act) is a statutory tool developed to conserve the cultural heritage of NSW. It is used to regulate development impacts on the State's heritage assets. Administered by the NSW Heritage Office, the Act details the statutory requirements for protecting historic buildings and places and includes *any place, building, work, relic, movable object or precinct, which may be of historic, scientific, cultural, social, archaeological, natural or aesthetic value.*

Under the Heritage Act, a person must not disturb or excavate land if they know or have reasonable cause to suspect that they might discover, expose, move or damage a relic unless they have an excavation permit.

Items considered to be significant to the State can be listed on the State Heritage Register (SHR) and cannot be demolished, altered, moved or damaged, or their significance altered, without approval from the Heritage Council of NSW. Other items may be listed on the National and Commonwealth Heritage Lists, State Heritage Inventory (SHI) or by local Councils in LEPs. Additionally, under Section 170 of the Heritage Act, all government agencies are required to identify, conserve and manage heritage items in their ownership or control. Items are typically listed in a Heritage and Conservation Register and may also be included on the SHI.

The proposal is located within a heritage item listed under the *Bega Valley Local Environmental Plan 2013*, Racecourse, Grandstand, Show pavilion and associated buildings.

Section 6.5 addresses impacts associated with non-Aboriginal heritage.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) is the primary legislation regulating pollution control and waste disposal in NSW. It establishes a structure for regulating polluting activities through Environment Protection Licences (EPLs). Activities listed under Schedule 1 of the POEO Act are scheduled activities which require an EPL.

Section 148 of this Act requires notification of pollution incidents. DPIRD is obliged to notify the relevant authorities (e.g., EPA) when a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

Schedule 1 of the POEO Act describes activities for which an EPL is required. The proposal does not conform with the definition of a scheduled activity under this Act; therefore, a new EPL would not be required.

Waste Avoidance and Resource Recovery Act 2001

The objectives of the *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act) are:

- To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development
- To ensure that resource management options are considered against a hierarchy of the following order:
 - Avoidance of unnecessary resource consumption
 - Resource recovery (including reuse, reprocessing, recycling and energy recovery)
 - Disposal
- To provide for the continual reduction in waste generation
- To minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste
- To ensure the efficient funding of waste and resource management planning, programs and service delivery
- To achieve integrated waste and resource management planning, programs and service delivery on a state-wide basis
- To assist in the achievement of the objectives of the POEO Act.

Waste management is required to be undertaken in accordance with the WARR Act.

Waste management is discussed in Section 6.9.

Water Management Act 2000

The *Water Management Act 2000* (NSW) (WM Act) provides for the sustainable and integrated management of the State's water for the benefit of both present and future generations. The Act controls the extraction and use of water, the construction of water bodies such as weirs and dams and any activity that is in or near water sources in NSW.

Construction that is located within the 40m prescribed distance of waterfront land requires a controlled activity approval.

The proposal would involve the carrying out of work within 40 m of a waterway, and hence would be classed as a 'controlled activity'. However, DPIRD is exempt from the requirements to obtain a controlled activities approval for works within 40 m of a waterway, as it is a public authority (Clause 41 of the *Water Management (General) Regulation 2018*). No dewatering is required for this proposal.

Contaminated Land Management Act 1997

The objectives of the *Contaminated Land Management Act 1997* (NSW) (CLM Act) are:

- To set out accountabilities for managing contamination if the EPA considers the contamination is significant enough to require regulation under Division 2 of Part 3
- To set out the role of the EPA in the assessment of contamination and the supervision of the investigation and management of contaminated sites
- To provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land
- to ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.

Section 6.1 discusses potential impacts associated with contamination.

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (NSW) (FM Act) aims to conserve, develop and share the fishery resources of the State including to conserve fish stocks and key fish habitats, and conserve threatened species, populations and ecological communities of fish and marine vegetation. An assessment of the potential impacts of the Proposal on threatened species, populations, ecological communities and critical habitat listed in the FM Act must be undertaken in accordance with Section 5A of the EP&A Act.

If the following activities form part of a proposal, a permit from the Department of Primary Industries (DPI) under the FM Act is required:

- Aquaculture
- Dredging or reclamation
- Harm marine vegetation (mangrove, seagrass, seaweed, saltmarsh)
- Obstruct free passage of fish.

The proposal would involve dredging and reclamation works. Under Section 199 DPIRD (as the public authority proponent) is required to provide notification to the Minister.

The proposal would involve harm to marine vegetation (e.g. the removal of saltmarsh and/or mangroves) so a permit under section 205 of the Act is required.

The biodiversity assessment in Section 6.3 and Appendix F discusses the Proposal's potential impacts on marine vegetation and fish passage.

Part 7A Threatened Species Conservation, Division 6, outlines the licensing requirements from Fisheries, if the works would result with harm to threatened species, populations or ecological communities or damage to Habitat.

Section 1.7 of the EP&A Act requires consideration of the significance of any impact on threatened species, defined by section 220ZZ of the FM Act, in order to determine the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.

The potential for the proposal to impact threatened species, populations and endangered ecological communities listed under the FM Act is assessed in Section 6.3 and Appendix F.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* (NSW) aims to provide for ownership, use and management of Crown land in NSW.

The proposal would occur within Crown Land, which is managed by Panboola Land Managers (PWHR Land Manager). DPIRD would be required to obtain a licence under Section 2.20 and 3.17 of the Act to undertake the works (General Short-term Licence).

4.2.3 Local law

Bega Valley Local Environmental Plan 2013

The *Bega Valley Local Environmental Plan 2013* (Bega Valley LEP) aims to make local environmental planning provisions for land in the Bega Valley in accordance with the relevant standard environmental planning instrument under section 3.20 of the Act.

The particular aims of this Plan are as follows:

- To protect and promote the use and development of land for arts and cultural activity, including music and other performance arts
- 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
- 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
- To conserve and enhance environmental assets, including estuaries, rivers, wetlands, remnant native vegetation, soils and wildlife corridors
- To encourage compact and efficient urban settlement
- To ensure that development contributes to the natural landscape and built form environments that make up the character of Bega Valley
- To provide opportunities for a range of housing choices, including affordable and adaptive housing, in locations that have good access to public transport, community facilities and services, retail and commercial services and employment opportunities
- To protect agricultural lands by preventing land fragmentation and adverse impacts from non-agricultural land uses
- To identify and conserve the Aboriginal and European cultural heritage of Bega Valley
- To restrict development on land that is subject to natural hazards

- To ensure that development has minimal impact on water quality and environmental flows of receiving waters.

The proposal would be located on land zoned C2 Environmental Conservation, C1 National Parks and Nature Reserves and C3 Environmental Management. The proposal is an environmental protection work and is permitted without consent within each land zone.

Clause 5.12 of the Bega Valley LEP does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under TISEPP.

However, according to Section 2.7 of the TISEPP, provisions of TISEPP prevail over the LEP to the extent of any inconsistency.

Under Section 2.165 of TISEPP, the entire proposal is permissible without consent and falls under Division 5.1 of the EP&A Act.

The objectives of the C2 Environmental Conservation and C1 National Parks and Nature Reserves LEP zones would be preserved during construction and operation of the proposed works and the considerations of the Bega Valley LEP have been factored into this REF.

Bega Valley Development Control Plan 2013

To complement the Bega Valley LEP, the Bega Valley Development Control Plan (DCP) has been prepared to provide detailed guidance for the development and redevelopment of land within the LGA.

The proposal would be completed in accordance with the DCP requirements.

4.3 Confirmation of Part 5 assessment

Section 2.165 of the TISEPP permits development for the purpose of waterway or foreshore management activities, to be carried out by or on behalf of a public authority without consent. Section 2.7 of the R&H SEPP permits environmental protection works in coastal wetlands to be carried out by or on behalf of a public authority without consent.

The proposal is not SSD, SSI or CSSI.

DPIRD is the determining authority for the proposal. The proposed levee works would occur within Beowa National Park as land reserved under the NPW Act. Therefore for the levee works, NPWS is the co-determining authority for the activity. The proposal can therefore be assessed under Division 5.1 of the EP&A Act and development consent is not required.

The REF fulfils DPIRD's obligation under section 5.5 of the EP&A Act to take into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

5. Consultation

5.1 Community consultation

DPIRD with assistance of the Panboola Land Managers would inform the community of the proposed works and potential site closures through their respected websites and signage installed onsite.

5.2 SEPP (Transport and Infrastructure) consultation

Part 2.2 of the State Environmental Planning Policy (Transport and Infrastructure) (TISEPP) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is detailed below.

Is consultation with Council required under section 2.10 2.14 and 2.111 of the Transport and Infrastructure SEPP?	Yes/No
2.10(1)(a) Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No
2.10(1)(b) Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	No
2.10(1)(c) Will the works involve connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council?	No
2.10(1)(d) Will the works involve connection to, and use of a substantial volume of water from, any part of a water supply system owned by a Council?	No
2.10(1)(e) Will the works involve the installation of a temporary structure on, or the enclosing of, a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential?	No
2.10(1)(f) Will the works involve excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which council is the roads authority under the <i>Roads Act 1993</i> (NSW) (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath)?	No
2.11 Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential? Yes, the proposal is located within a listed heritage item under the Bega Valley LEP 2013; Racecourse, grandstand, show pavilion and associated buildings (I227). The proposal would involve excavations into the racecourse. Section 6.5 of the REF has assessed the impacts of the proposal on local heritage.	No

Is consultation with Council required under section 2.10 2.14 and 2.111 of the Transport and Infrastructure SEPP?	Yes/No
2.12 Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent? Works are to occur on flood liable land. The works are unlikely to change flood patterns to more than a minor extent. Based on the flood review (Montaro 2024), it is concluded that the proposed works are unlikely to change future flood patterns to more than a minor extent. All of Panboola Wetland and some urban areas within Pambula township would be inundated during the 1% and 10% AEP flood events. The proposal would have a negligible impact on flooding due to the small size of the proposed works.	No
2.14 Is the proposal within the coastal vulnerability area (identified under the <i>Coastal Management Act 2016</i> (NSW)) and inconsistent with a certified coastal management program applying to that land (identified under the <i>State Environmental Planning Policy (Resilience and Hazards) 2021 - Coastal Management</i>)? The proposal is likely to occur within a coastal vulnerability area identified under <i>the Coastal Management Act 2016</i>. The Bega Valley currently has no certified coastal management programs in place. Consultation would be undertaken with BVSC regarding the proposal.	Yes
2.111(1)(a) Does the proposal include a car park intended for the use by commuters using regular bus services?	No
2.111(1)(b) Does the project propose a bus depot?	No
2.111(1)(c) Does the project propose a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	No

Is consultation with public authorities other than councils required under section 2.13, 2.15 and 2.16 of the Transport and Infrastructure SEPP?	Yes/No
2.13 Are the works located on flood liable land (to any extent)? If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? Works are to occur on flood liable land. The works are however considered minor alterations to the existing racecourse and infrastructure.	No
2.15(2)(a) Are the works adjacent to a national park, nature reserve or other area reserved under the <i>National Parks and Wildlife Act 1974</i>, or on land acquired under Part A of that Act? Yes, the works are located within and adjacent to the Beowa National Park. Consultation has been undertaken with NPWS and detailed in Section 5.3.	Yes

Is consultation with public authorities other than councils required under section 2.13, 2.15 and 2.16 of the Transport and Infrastructure SEPP?	Yes/No
2.15(2)(b) Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone? Yes, the works are located within the Beowa National Park. Consultation has been undertaken with NPWS and detailed in Section 5.3.	Yes
2.15(2)(c) Are the works involving a fixed or floating structure in or over navigable waters?	No
2.15(2)(d) Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory).	No
2.15(2)(e) Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	No
2.15(2)(f) Are the works on land in a mine subsidence district within the meaning of the Coal Mine Subsidence Compensation Act 2017?	No
2.16(1) Are the works for the purpose of residential development, a health services facility, correctional centre or group home, in an area that is bush fire prone land?	No

5.3 Agency and Statutory consultation summary

The following consultation outlined in Table 5-1 was undertaken for the purpose of the proposed works.

In addition to the consultation detailed below, DPIRD undertook a community meeting on 27 August 2025 at the Pambula Surf Club. The meeting involved presentations regarding the Project by DPRID and SCS and NGH provided a presentation on the results of this REF. The meeting was attended by 20 people including members of the Panboola Land Mangers, NPWS and DPIRD Fisheries. BVSC and Eden LALC was also invited but were unable to attend.

Table 5-1 Consultation summary

Dates	Activity and comments	Response
Panboola Land Managers (Crown Land Managers)		
29/11/2024	NGH emailed the Panboola Land Managers introducing the Project, inviting them to the site inspection and providing them an opportunity to provide any comment on the proposal.	-
10/12/2024	Members of the Panboola Land Managers attended the site inspection with NGH and other stakeholders to discuss the proposal.	NGH recorded concerns and queries raised by the Panboola Land Managers, to ensure they were addressed in the REF.
13/01/2025	The Panboola Land Managers in response to the previous correspondence and site inspection, provided the following items they wanted addressed in the REF: - Mapping projections - can we see forecast mapping that details projected changes to both the Coastal Saltmarsh and Mangrove communities over the next 25, 50 and 75 years across 4 different scenarios 1. do nothing, 2. do nothing and sea level rise projections, 3. install 1 channel and sea level rise, and 4. install 2 channels and sea level rise. - Commentary regarding any contaminants that may be present on site (such as Acid Sulfate Soils) and the impact any disturbance of this may have on surrounding areas. - How the proposed changes will improve the ecological status of the area. - What is the impact of the proposed changes on Threatened and Migratory Species that now rely on the Coastal Saltmarsh EEC,	- Mapping projections are provided in the Biodiversity Assessment Appendix F and summarised in Section 6.3. The following maps have been provided: - A map showing the current baseline marine vegetation (saltmarsh) extent within the racecourse at the proposal site (Figure 6-17) - A map showing the predicted marine vegetation extent by 2030 within the racecourse area at the proposal site following the proposed activity (Figure 6-20). No sea level rise estimate has been included due to a lack of data and the short timeframe of just 5 years. (It is noted that the hydrology assessment found that there would be little difference in tidal inundation to the racecourse area with the installation of one vs two channels so the 2030 predicted extent of marine vegetation has been based on installation of two channels.

Dates	Activity and comments	Response
	and on the biodiversity that currently exists within the Old Pambula Racecourse. - What will be the impact upon other ecological communities that exist across the entire Panboola site, in particular those that are listed as Vulnerable or Critically Endangered under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> and those that are listed as threatened species or EEC's under the NSW <i>Biodiversity Conservation Act 2016</i> - How does the proposed project justify disturbance to, and potential loss of Coastal Saltmarsh EEC that will be compromised by Mangrove encroachment and proliferation. The email is provided in full within Appendix D of this REF.	- A map showing the projected sea level rise elevations at the proposal site for the worst case scenario (RCP8.5 - uncontrolled Greenhouse gas emissions) for 2050 and 2100. Sea level rise projections have been based on the years 2050 and 2100 as estimates are available for these years (CSIRO and BOM - RCP8.5 worst case estimates used – see section 6.3) - Contaminates and potential impacts are detailed in Section 6.1 - Proposed ecological changes and impacts to threatened species are detailed in Appendix F and summarised in Section 6.3.
17/07/2025	The draft REF was provided to the Panboola Land Managers for review and comment.	-
11/08/2025	The Panboola Land Managers provided an email commenting on the following issues: - Clarification that the correct current name for the managers of the Crown Land reserve at Panboola is Pambula Wetlands and Heritage Reserve Land Manager (PWHR Land Manager) not Panboola Trust. Suggested to use the generic name Panboola Land Managers in the REF for this proposal. - Noting that the correct date the racecourse ceased operating and moved to Kalaru was 1997 (not 1903). Also that the work of the Panboola Management Committee since the 1990s to manage	- Comments on the correct name of the Panboola Reserve managers noted. The general term 'Panboola Land Managers' has been used in the REF. - Section 6.5.2 edited to correct the date of racecourse move to Kalaru (1997) and include reference to the work of the Panboola Land Managers since the 1990s. - Remediation and rehabilitation of the racetrack surface following construction works is included in sections 3.2.1 and 6.1.3.

Dates	Activity and comments	Response
	the area for nature conservation, passive recreation and maintenance of its heritage be acknowledged. - Noting that erosion of the racetrack during floods and past use in the wet has been addressed by laying 1.7km of diamond grid on the surface and filling it with crushed granite. Concerned that the track surface could be damaged by heavy machinery etc. used during the construction phase. This should be addressed in the Safeguards and Mitigation measures. - Suggestion that nearby oyster farmers in Broadwater Lake be consulted about the proposed works. - Request that examples are provided in the REF of where the use of floating booms, filter plantings, etc has been successfully used to control mangrove propagule movement. - Clarification of who will be responsible for implementing and funding the 5 year monitoring programs for saltmarsh/mangroves and White-fronted Chats. - Request to see other stakeholders responses to the REF. The email is provided in full within Appendix D of this REF	- As noted in section 6.7.2 local oyster farmers will be sent a copy of the REF. - Appendix F (Biodiversity Assessment) page 25 describes the previous use of floating booms and filter plantings to control mangrove propagule movement at Tomago in the Hunter River estuary in NSW. - Section 6.3.4 edited to clarify that DPIRD is responsible for developing and implementing the 5 year monitoring programs for saltmarsh/mangroves and White-fronted Chats. - Stakeholder responses and comments are detailed in section 5.3 and Appendix D of the REF.
NPWS		
29/11/2024	NGH sent an email to NPWS introducing the Project, inviting them to the site inspection and providing them an opportunity to provide any comment on the proposal.	-

Review of Environmental Factors

Panboola Wetland Rehabilitation Works



Dates	Activity and comments	Response
10/12/2024	The Sapphire Coast Area Manager and Ranger attended the site inspection with NGH and other stakeholders to discuss the proposal. Items to be addressed within the REF included: • Objects of the <i>National Parks and Wildlife Act 1994</i> • Adopted Beowa National Park and Bell Bird Creek Nature Reserve Plan of Management • Impacts to natural and cultural values are adequately assessed • Acid Sulfate Soils Management Plan.	NGH recorded concerns and queries raised by NPWS, to ensure they were addressed in the REF. Where items are addressed in the REF: • <i>National Parks and Wildlife Act 1994</i> in Section 4.2.2 • R&H SEPP in Section 4.2.2 • Impacts are addressed in Section 6 • Mitigation measure for Acid Sulfate Soils Management Plan is detailed in Section 6.2.3.
17/07/2025	The draft REF was provided to NPWS for review and comment.	-
15/08/2025	The Sapphire Coast Team Leader Rangers provided an email advising that Sapphire Coast NPWS area staff have reviewed the REF however, as the REF and its appendices are very lengthy and highly technical documents, they will seek some additional input from subject matter experts within the department, which will take an additional few weeks. NPWS plan to attend the information session on the 27th August however they will not likely be able to provide final comment until the end of the month or early September.	-
17/09/2025	Sapphire Coast Team Leader Rangers provided comments on the REF.	NGH addressed comments and updated REF where required. Comments provided and how they have been addressed is provided in Appendix D.
Eden Local Aboriginal Land Council (LALC) and NSW LALC		

Review of Environmental Factors

Panboola Wetland Rehabilitation Works

Dates	Activity and comments	Response
29/11/2024	NGH sent an email to the Eden LALC introducing the Project, inviting them to the site inspection and providing them an opportunity to provide any comment on the proposal.	The Eden LALC responded outlining they were unable to attend the proposed site inspection date. NGH organised another date to undertake the site inspection.
20/01/2025	The CEO of the Eden LALC attended the site inspection with NGH to discuss the proposal.	NGH recorded concerns and queries raised by the Eden LALC, to ensure they were addressed in the REF.
20/01/2025	NGH sent an email to the NSWLALC introducing the Project and confirming the process regarding granting approval for the proposed works occurring on Aboriginal Land Claims	To date no response has been provided.
17/07/2025	The draft REF was provided to Eden LALC for review and comment.	No comments were received to date.
21/10/2025	NSWLALC provided no objection to the works via email. The email outlines the proposal was discussed with Eden LALC. They have recommended that DPIRD engage with Eden LALC regarding a Sites Officer being present for all earthworks. Email is provided in Appendix D.	An additional mitigation measure has been added to Aboriginal heritage to address this recommendation from NSWLALC and Eden LALC. Refer to Section 6.4.
DPRID (Fisheries), Coastal Systems Team		
29/11/2024	NGH sent an email to DPIRD (Fisheries) introducing the Project, inviting them to the site inspection and providing them an opportunity to provide any comment on the proposal.	
10/12/2024	A Fisheries Manager attended the site inspection with NGH and other stakeholders to discuss the proposal.	NGH recorded concerns and queries raised by DPIRD Fisheries, to ensure they were addressed in the REF.

Dates	Activity and comments	Response
16/12/2024	DPIRD (Fisheries) provided a letter with the following requirements and comments: - Part 7 Fisheries Permit& s.199 consultation - Works that will harm marine vegetation (mangroves and/or saltmarsh) will require a Harm Marine Vegetation Permit under s.205 of the FM Act. - Under s.199 of the FM Act, there is the need to consult with DPIRD Fisheries - Coastal Systems Team (with appropriate Ministerial delegations) regarding dredging and reclamation before issuing an authorisation for these works. - The REF must address at minimum Sections 3.3 and 3.2.3 of the Policy through an aquatic habitat /impact assessment, as these sections will inform the permit and s.199 assessment. - The above should be accompanied by a description of the influence of the hydrological changes on the resilience of this wetland over time and any predicted changes in the distribution of the types of marine vegetation. - DPIRD Fisheries requires proponents to avoid direct impacts to KFH as a priority. Where avoidance is impossible or impractical, the aim should be to minimise and mitigate any direct impact. It must be demonstrated how this hierarchy has been considered as part of the direct impacts. - Should offsets be required this will be determined at the permit stage. Proposal Justification - Justification of the proposed rehabilitation works and how they align with the <i>Coastal Management Act 2016</i> and State Environmental Planning Policy (Resilience and Hazards) 2021	- Permits and consultation requirements are summarised in Section 8 - Aquatic habitat impact assessment and influence of hydrological changes on the resilience of the wetland is detailed in Appendix F and summarised in Section 6.3 - Impacts on Key Fish Habitat (KFH) and mitigation measures are detailed in Section 6.2 and 6.3 - Project justification and proposed options are outlined in Section 2 - Proposed ecological changes and the proposal are detailed in Appendix F and summarised in Section 6.3 - Construction plans are provided in Section 3 and Appendix A.

Dates	Activity and comments	Response
	- noting that there is Coastal Wetland mapped on either side of the direct impacts (channels) and the works are intended to change the hydrology of the wetland. • Clear comparison of the proposed rehabilitation works and the 'do nothing' option in terms of the wetland's biogeophysical condition, floodplain resilience and changes in mangrove and saltmarsh distribution. This should consider the ecological value of saltmarsh vs mangrove habitat, and changes in habitat types including from saltmarsh to mangrove and freshwater to tidal. Within this, there should be consideration of implications for sea level rise. 3. Construction Methods • Ensure the design and construction of the works minimize impacts on water quality and habitat within the receiving environments. • The REF should include detailed construction plans for each channel and recommend erosion and sediment controls to mitigate impacts on the wetlands. The email is provided in full within Appendix D of this REF.	
17/07/2025	The draft REF was provided to DPIRD Fisheries for review and comment.	
6/08/2025	DPIRD (Fisheries) provided an email with the following comments: • The floating boom proposed to slow mangrove colonisation should not have attached silt curtain – if this action fails, other solutions may be needed. • As noted in the REF, a permit to harm marine vegetation will	Comments noted. Any references to attached silt curtain on floating booms have been removed. Text edited to confirm that CI171(6) of the EP&A Regulation does not apply to this proposal. The REF is required to be published under

Dates	Activity and comments	Response
	be required before works commence. Page 19 – EP&A Regs section (last sentence): states that ‘The proposal is exempt under Subsection 6’. We assume that this is referring to the publication of the REF on the planning portal. From our interpretation it seems that CI171(6) of the EP&A Regs would not apply to this proposal and that this REF would need to be published	CI171(4). DPIRD as the determining authority will place it on the Department’s website.
Conservation Programs, Heritage and Regulation Group (CPHR) NSW DCCEEW		
29/11/2024	NGH emailed CPHR (former Biodiversity and Conservation Service (BCS)) and introducing the Project, inviting them to provide any comment on the proposal.	CPHR provided a response on 6 December 2024 outlining key contacts within the department who would be able to assist with the REF and where to lodge the REF. Additionally raised the proximity of the Panboola Grey-headed Flying-fox camp to the site. There was no other threatened species of concern. CPHR provided an additional email on 28 January 2025 outlining results of a desktop assessment to determine potential threatened species and communities onsite. It also suggested a BDAR is prepared. NGH has determined a BDAR is not required (refer to Section 4.2.2 and 6.3). The email is provided in full within Appendix D of this REF.
2/02/2025	The Water, Floodplains and Coast division outlined that the following items be addressed within the REF: Demonstrate consistency with the CM Act (2016) objects and the objectives for coastal wetland and littoral rainforest areas, coastal use areas, and coastal environment areas in the RH SEPP (2021).	- Consistency with the <i>Coastal Management Act 2016</i> and RH SEPP is provided in Section 4.2.2 - Proposed works are detailed in Section 3 and plans are provided in Appendix A

Dates	Activity and comments	Response
	• Include a clear description of the proposed works and location. • Include an assessment of tidal dynamics for existing conditions and conditions post completion of the works. • Include an assessment of wetland species composition and how this may change in response to the proposed works, as well as long-term impacts through sea level rise in combination with increased tidal connectivity. • Include an assessment of the soil landscape and acid sulfate soil mapping, as well as an assessment how these will be affected by the proposed works. • Describe how the proposed works are impacted by catchment flooding (e.g. full range of events up to the Probable Maximum Flood), as well as how the proposed works impact flood behaviour in the surrounding area. • Describe background conditions for any water resource likely to be affected by the proposed works, as well as impacts of the works on water quality. This should include reference to the NSW Water Quality Objectives for Pambula River. • Include a Threatened and Migratory Species Impact Assessment (Flora and Fauna) – with particular reference to species observed at the site and reference to how anticipated changes in wetland species composition may affect these. • Document the proposal-specific legislative context and proposed approval pathway for the works implementation.	• Assessment on hydrology and tidal dynamics for existing conditions and conditions post completion of the work are provided in Section 6.2 and Appendix E • Proposed ecological changes and impacts to threatened species are detailed in Appendix F and summarised in Section 6.3 • Soil and acid sulfate soils are assessed in Section 6.1 • Flooding and water quality are addressed in Section 6.2 • Legislative context and planning pathway is provided in Section 4 • Consultation with other agencies are detail in this section of the REF.

Review of Environmental Factors

Panboola Wetland Rehabilitation Works

Dates	Activity and comments	Response
	It is noted that the above considerations are strictly from a coastal perspective and that it is strongly recommend enquiring additional inputs from other agencies (e.g. DPIRD Fisheries, NPWS). The email is provided in full within Appendix D of this REF.	
17/07/2025	The draft REF was provided to CPHR for review and comment.	
29/08/2025	CPHR reviewed the REF and considered that the assessment appropriately captures the potential impacts of the proposal. They agree that the proposal is likely to have minimal impacts on biodiversity, particularly in comparison to the 'Do nothing' approach, provided that the avoidance and mitigation measures outlined in Table 4-5 of the Biodiversity Assessment are fully implemented. The email is provided in full within Appendix D of this REF.	No updates required.
Crown Lands		
29/11/2024	NGH sent an email to Crown Lands introducing the Project, inviting them to the site inspection and providing them an opportunity to provide any comment on the proposal.	No response was provided to date
BVSC		
29/11/2024	NGH sent an email to BVSC introducing the Project, inviting them to provide any comment on the proposal.	No response was provided to date
NSW Water Group		

Dates	Activity and comments	Response
TBC	DPIRD and NGH will provide a final version of the REF to NSW Water Group for their information.	-
Department of Planning, Housing and Infrastructure (DPHI)		
2-4/12/2024	DPIRD emailed DPHI regarding the proposed works within mapped Coastal Wetlands and meeting requirements under Section 2.7 and 3 the R&H SEPP	DPHI response outlined for this project, where work is proposed in both the Coastal Wetland and proximity area, all parties must be satisfied that: • All relevant provisions of section 2.7 of the R&H SEPP can be satisfied to ensure the works are not classified as designated development • The works do constitute - environmental protection works means works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works and that section 2.8 of the R&H SEPP can also be satisfied.

6. Environmental assessment

This section of the REF provides the potential environmental impacts related to the construction and operation of the proposal. This includes consideration of matters under the EPBC Act as well as the factors specified in the guidelines *Is an EIS required?* (NSW Dept of Planning, 1995) and as required under section 171 of the Environmental Planning and Assessment Regulation 2021 considered in Appendix A.

6.1 Topography, geology and soils

6.1.1 Existing environment

The proposal site is located in the South East Coastal Ranges Interim Biogeographic Regionalisation for Australia (IBRA) sub-region within the broader IBRA South East Corner Bioregion, characterised by mountain ranges and the plateau of the Great Diving Range (NPWS, 2003). The site is flat and situated in a low-lying coastal wetland (Panboola Wetland) located approximately 1 km south of the Pambula town centre.

The Bega-Mallacoota 1:250,000 geological sheet indicates that the local geology near and around the proposal site consists of Cainozoic/Tertiary sediments and volcanics, specifically fluvial sands, grits and lacustrine clays (Lewis & Glen, 1995).

A search of the OEH eSPADE database on 29 November 2024 indicated that the proposal site is situated within two Soil Landscapes refer to Figure 6-1 including:

- Towamba River (tr) for the proposed channel works
- Penooka Swamp (ps) for the levee works.

Limitations of these soils include that they are subject to flood hazard, high run-on, water (streambank) erosion hazard, infertile or non-cohesive erodible materials, waterlogging, groundwater pollution hazard and foundation hazard.

A site inspection was undertaken on 10 December 2024 and identified the site to be flat. Groundcover was extensive adjacent to the racecourse walking track in undisturbed areas. Erosion is present at the existing outlets of the culverts. The existing levee is stable and covered in vegetation.



Figure 6-1 Soil landscapes within proposal area

Acid Sulfate Soils

The proposal site is mapped as Class 2 and 3 acid sulfate soils maps under the Bega Valley LEP and there is a high probability of acid sulfate soil occurrence at the proposal site (Figure 6-2). The definitions of these classes include acid sulfate soils potentially encountered:

- Class 2: Work below natural ground surface
- Class 3: Works beyond 1 m below natural ground surface

State-wide acid sulfate soil risk mapping indicates areas of high risk (1-2 m) in the east and southeast of the Panboola wetland area and low risk (1-4 m) the remaining of the site including most of the levee works (Figure 6-3).

Soil sampling by SCS and sent to the laboratory for assessment was undertaken within the levee on 17-19 November 2025. The sampling found if excavation remains above 0.8 m depth, any potential acid sulfate soils (PASS) would unlikely to be encountered. Below 0.8 m there is a minor exceedance of the NSW ASS action criteria for medium-textured soils (≥ 36 mol H^+/t) (Acid Sulfate Soil Manual; ASSMAC, 1998). The recorded value at 0.8–1.1 m was 37 mol H^+/t , which is only slightly above the threshold.



Figure 6-2 Acid Sulfate soils Bega Valley LEP

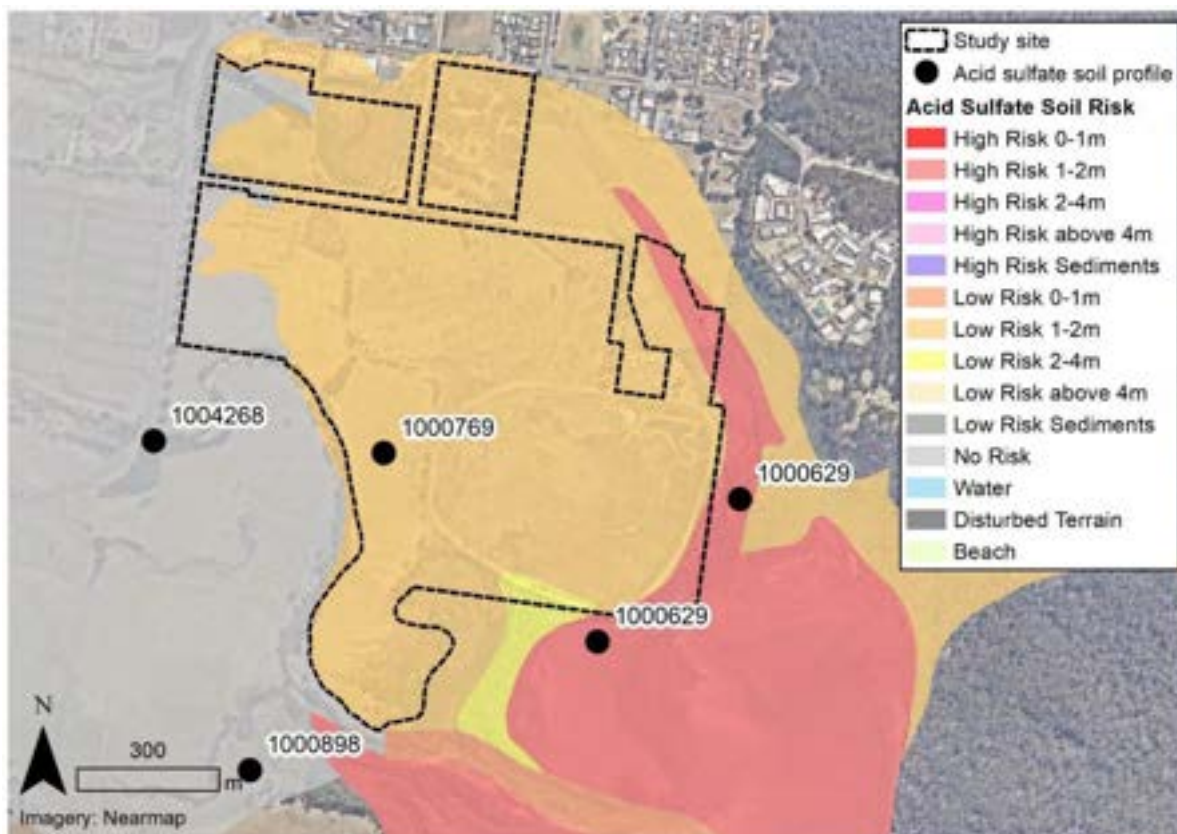


Figure 6-3—Acid sulfate soil profiles and risk (Tulau, 1997) (Montaro 2024 Figure A – 12)

During field investigations by WRL in 2023 a pit was excavated within the Panboola racecourse to provide a soil profile (Figure 6-4 and Figure 6-5). This indicated the soils within the proposal site are likely to contain sulfides based on the pH_{fox} being less than 4.



Figure 6-4—Soil and groundwater data measurement/sample location (Montaro 2024 - Figure B – 29)

Soil profile details:

Project Number: 2023011 Profile ID: Ksat Pit
River/estuary: Pambula Sample date: 19/04/23
Easting: 222112.8 Sampled by: TAT, FC
Northing: 5907214.1
Ground elevation (m AHD): 0.98
Hydraulic conductivity (m/d): Not measured



Water Research Laboratory
School of Civil and Environmental Engineering

Water quality:

Surface water EC ($\mu\text{S/cm}$): Not measured
Surface water pH: Not measured
Groundwater EC ($\mu\text{S/cm}$): 700
Groundwater pH: 5.9

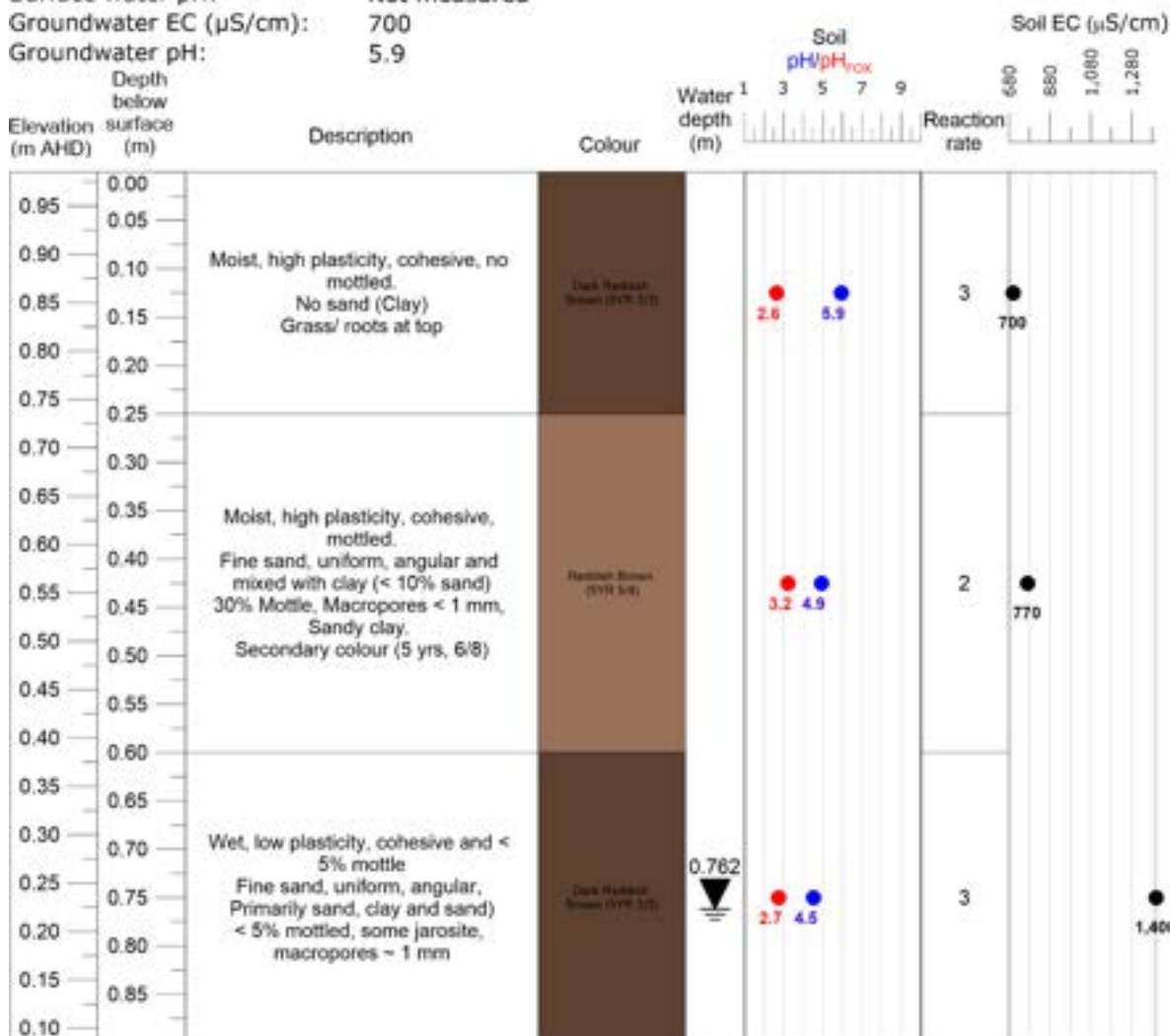


Figure 6-5–Soil profile data (for location refer to Figure 6-5) (Montaro 2024 Figure B – 30)

Contaminated land

A search was undertaken for the Contaminated Land Record of Notices, under section 58 of the *Contaminated Land Management Act 1997* (NSW) (CLM Act), accessed on 29 November 2024. The search was undertaken for Bega Valley LGA and returned three sites, none are located within Pambula.

A search was undertaken for the List of Notified Sites, under section 60 of the CLM Act, accessed on 29 November 2024. The search was undertaken for the suburb of Pambula. One site was listed and is outlined below:

- Offsite area (roadways) adjacent to United Service Station Pambula, corner of Quondola Street and Bullara Street.

The site is greater than 500 m from the proposal site and is unlikely a risk the proposed works (refer to Appendix I).

No evidence of contamination was observed during the site inspection.

The levee bank and racecourse track are likely to be previously constructed using fill and materials potentially not originating from the site. A geotechnical investigation undertaken for this proposal found that the subsurface profile generally comprises gravelly sand fill to 0.1 m/0.3 m depth, underlain by medium dense, gravelly sand fill to 0.2 m/1.6 m, underlain by loose to medium dense alluvial soils. No evidence of contamination was found in the samples taken however there is potential for unknown contaminants to occur within fill at the proposal site.

6.1.2 Potential impacts

Construction

The works would require localised ground disturbance of approximately 340 sqm (0.034 ha). This includes excavation of the southern and eastern channels and one channel in the levee. The cut and fill balance are detailed in Section 3.3.8.

The earthworks also include the installation of rock aprons on the excavated channels and construction of concrete abutments/headstocks with driven piles for two timber and steel bridges spanning the channels.

Spoil would be taken offsite for treatment and disposal. Excavated soil would be transported by dump truck to a stockpile area located on a grassed area of the Panboola Reserve to the east of the grandstand. Spoil would be spread and treated for acid sulfate soils if required.

Excavation works would involve removing vegetation that currently stabilises soils and would expose soils to weathering processes, increasing the risk of erosion and sedimentation. Vegetation removal and excavations would expose soils to erosive forces including water, wind and tidal flow which can increase the risk of erosion and lead to loss of valuable topsoil, particularly during times of heavy rainfall. Topsoil loss can result in reduced potential for rehabilitation and re-establishment of ground cover which provides stability. Areas subject to soil disturbance, including stockpiles, are likely to increase the sediment load of run-off from the proposal site, which could pollute nearby waterways.

In addition to potential erosion and sedimentation impacts, impacts on soils may also include:

- Soils subject to repeated heavy machinery and traffic use as well as material laydown areas can suffer compaction, affecting moisture penetration and ability to retain groundcover. This can be minimised by restricting site access for machinery and vehicles and confining traffic as much as possible to existing disturbed or hardstand areas
- Contamination from leakage and spillage of concrete or concrete wash, fuels and lubricants, used onsite could also adversely impact soil biota and subsequently, groundcover. Leakage and spills have potential to mobilise during rainfall events, polluting waterways, causing harm to aquatic species and risks to humans
- Excavations have potential to unearth and expose buried contaminants from historical uses and unknown fill used onsite.

During excavation works, there is potential to disturb acid sulfate soils. Acid sulfate soils are naturally occurring sediments, that generate acid when exposed to oxygen. This acid generation can kill immobile organisms (such as marine vegetation), kill mobile organisms if acidity is broadly distributed, corrode iron, concrete and some alloys and irritate skin and eyes of people. The proposal site does overlay a portion of high-probability soil, which means that acid sulfate soils are likely to occur where excavations works would occur below the natural ground level.

Based on soil sampling results for acid sulfate soils within the levee, the risk of intercepting acid sulfate soils is considered low due to the works occurring above the natural ground level, above 0.8 m (the levee is only 600mm) and not within water logged material. If excavations are to occur below 0.8 m there is potential to disturb potential acid sulfate soils that were found to be a minor exceedance above the NSW ASS action criteria threshold within the Acid Sulfate Soil Manual (ASSMAC, 1998). An Acid Sulfate Soils Management Plan would be prepared to guide construction works as required. The treatment of any potential acid sulfate soils intercepted would require a very low lime requirement of approximately 2.8 per tonne (includes 1.5 safety factor). Overall the risk by disturbing acid sulfate soils is low and manageable with the implementation of the Acid Sulfate Soils Management Plan.

Overall, short term risks to soils would be moderate to high, but localised. Medium to long term impacts would be low provided stabilisation strategies are effectively implemented.

These potential impacts are considered highly manageable. Management of these risks would centre on appropriate site management (for access and equipment, spoil management and treatment), and installation and maintenance of erosion and sediment controls until such time as disturbed areas have become stabilised.

Operation

Post construction impacts to soil would be largely concentrated to areas disturbed during construction. These areas have potential to continue to be susceptible to erosion until vegetation groundcover is restored. These impacts are expected to be minimal, due to the small spatial extent of works and proposed rehabilitation mitigation measures.

The channel outlets would be stabilised with rock aprons.

It is proposed to leave the opening excavated within the levee unlined to allow natural tidal flows and regeneration of vegetation species. This would allow the water to find its own natural path during future inundation and drainage.

UNSW WRL (2025) undertook an analysis to determine the mobilisation of sediments from the disturbance area into the Beowa National Park (Appendix E). It was found that some sediment movement may be experienced during incoming tides (e.g. into the inundation area) of fine sands (and small sediments) on the largest spring tides. Due to the asymmetry in the tides, the net sediment movement into to the area is more likely than downstream into the Beowa National Park. On outgoing tides, minor mobilisation of fine silts may occur on occasional spring tides. The possibility of sediment mobilisation could be further reduced by increasing the width of the cut out in the levee to 25 m. This would reduce the maximum bed shear stress in both directions, which would restrict sediment mobilisation to fine silts on both the incoming and outgoing tides.

The remaining sections of the levee would remain stable due to the presence of the existing vegetation adjacent to the openings which would be unaffected by the works. Monitoring of the levee during operation would be undertaken to identify any evidence of erosion. If erosion is identified, appropriate controls would be implemented to stabilise.

The proposal would not result in a substantive increase of non-porous surfaces.

6.1.3 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
General	A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.	X	X	X	X	
Soil management, erosion and sediment control	- Areas of potential soil exposure will be minimised - An Erosion and Sediment Control Plan (ESCP) is to be prepared. The plan will be site-specific, taking into account the specific nature of the works and surrounding environment at each alignment section. The plan will be prepared in accordance with the Blue Book (Landcom, 2004) - Sediment and erosion controls will be maintained during the construction works and adapted if required to ensure the objectives of the Blue Book (Landcom, 2004) are met - Construction works not to be carried out in periods of forecast heavy rains or strong/gale wind warnings - Works will be only undertaken during low tide - Where possible, topsoils and subsoils will be removed and stockpiled without mixing the two, in a location or manner that will facilitate the return of soils to a location as close as possible to their original sources. Disturbed areas will be dressed with top soil to assist rapid revegetation of the disturbed surfaces - Stockpiles will be appropriately controlled by sediment fencing or other materials identified in the Managing Urban Stormwater – soils and Construction Vols 1 and 2, 4th Edition (Landcom, 2004) – Blue Book to ensure sediments do not enter a waterway	X	X	X	X	

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	- Stockpiles will be covered within 10 days in accordance with the Blue Book (Landcom, 2004) - Vehicle and machinery movements will be restricted or rationalized to access tracks as far as possible - Vehicles and machinery must not be parked on native vegetated areas. Staff shall park at designated parking areas, existing cleared areas or exotic vegetated areas - Remediate and rehabilitate all areas disturbed during construction including road surfaces to their pre-works condition as soon as practicable but no more than 10 days after completion of excavation works.					
Pollution/contamination	- An Acid Sulfate Soils Management Plan will be prepared and implemented as part of the CEMP - Trucks and machinery will be checked for leaks as per maintenance schedule or prestart checks and appropriate spill skits will be available onsite at all times - All chemicals and fuels will be stored in suitable bunded areas away from waterways. The capacity of the bunded area will be at least 110 per cent of the largest chemical container stored within the bunded area - Excavated materials will be stored in suitable bunded areas away from waterways - Concrete washout shall be carried out offsite or in concrete washout areas described in the ESCP - The refueling of plant and maintenance of machinery will be undertaken in impervious bunded areas - Cease works immediately if contaminated soils are uncovered or suspected (due to odour, discolouration, presence of fill material and/or building demolition waste). Contact the Project Manager to determine the appropriate management requirements.	X	X	X	X	

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Pollution incidents	- A site-specific emergency spill procedure plan will be developed and included within the CEMP - Spill kits will be made available at the site at all times - All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills - Wherever possible, reduce the quantity of chemicals and fuel stored on site to minimum practical level - Notify the Project Manager immediately if a pollution incident occurs.	X	X	X	X	
Soil disposal	- A waste classification is required for all soil and soil impacted material that will require offsite disposal, including: - Assessment of material for waste classification prepared by a suitably qualified environmental consultant and comply with the NSW EPA Waste Classification Guidelines: Part 1 Classifying Waste (2009) - All other excavated material intended to be reused is to be managed in accordance with the Remediation Action Plan (if required) and the POEO Act.	X	X		X	
Rehabilitation	Rehabilitation of disturbed areas will be staged to occur during and post construction. Where required, locally sourced native seeding and mulching will be used to facilitate revegetation and establishment of the site. If concentrated flow paths for stormwater are expected across the rehabilitated areas, jute matting or similar will be used to minimise scouring as warranted.	X			X	
Rehabilitation monitoring	Monitoring of the levee openings will be undertaken monthly for the first 6 months post construction. Then annually for three years. If evidence of erosion or scouring is observed in the levee openings,		X			X

Review of Environmental Factors

Panboola Wetland Rehabilitation Works



Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	the erosion would be repaired and appropriate controls will be implemented to prevent further erosion risks and impacts.					

6.2 Hydrology, catchment values and water quality

6.2.1 Existing environment

Surface water

The proposal site is located at Panboola Wetland in the upper tidal reaches and floodplain of the Pambula River. The Pambula River has a 163 km² catchment and flows into Pambula Lake. Pambula Lake is an estuary which is permanently connected to the ocean on the southern side of Pambula Beach. The proposal involves construction within a section of the Panboola Wetland which is an 97 ha coastal wetland located approximately 1 km south of the Pambula town center adjacent to Bullara Street (Figure 6-6).

The proposed levee works are within and directly adjacent to the mapped intertidal area of Pambula River (Figure 6-6).

The Pambula River is classified as a 6th order Strahler watercourse at the location of the proposal site (Figure 6-6).

The proposal site is located within identified Key Fish Habitat (KFH) as shown in Figure 6-7. Key fish habitat is important for the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.

The proposal site is located within mapped Coastal Wetlands and proximity Coastal Wetlands under the R&H SEPP (Figure 6-7).



Figure 6-6 Surface water and Strahler stream order nearby proposal site



Figure 6-7 KFH and Coastal Wetlands

Panboola wetland

The proposal site at Panboola Wetland encompasses tidal, intertidal, and freshwater environments and has an elevation ranging from 0.3 m AHD in the upper Pambula River along the southern and eastern boundary to 1.5 m + along the northern and western boundary (Figure 6-8).

The hydrology at Panboola Wetland is primarily governed by elevation creating two environments:

1. Higher elevated land to the northwest of the site is predominantly influenced by catchment rainfall runoff and is characterised by freshwater vegetation
2. Lower elevated land to the southeast of the site is tidal, with varying connectivity to the downstream estuary and is characterised by saline and brackish vegetation.

A review of data and recent field investigations indicates that the interface between the upland freshwater and downstream brackish/saline environments fluctuates depending on the prevailing climate. Based on the review of rainfall data, the catchment is likely to be wetter during the months of February and March and drier during the months of August and September. Longer term climate drivers would also have a significant influence on the catchment. During drier El Niño events, the extent of tidal influence across the local floodplain would be maximised increasing the extent of brackish/saline habitat. Comparatively, during La Niña events, increased freshwater inflows would recharge the groundwater and move the brackish/saline limits at the site further downstream towards Pambula Lake increasing the extent of freshwater habitat (Montaro, 2024).

The likely existing interface between freshwater and brackish/saline environments is identified in Figure 6-9.



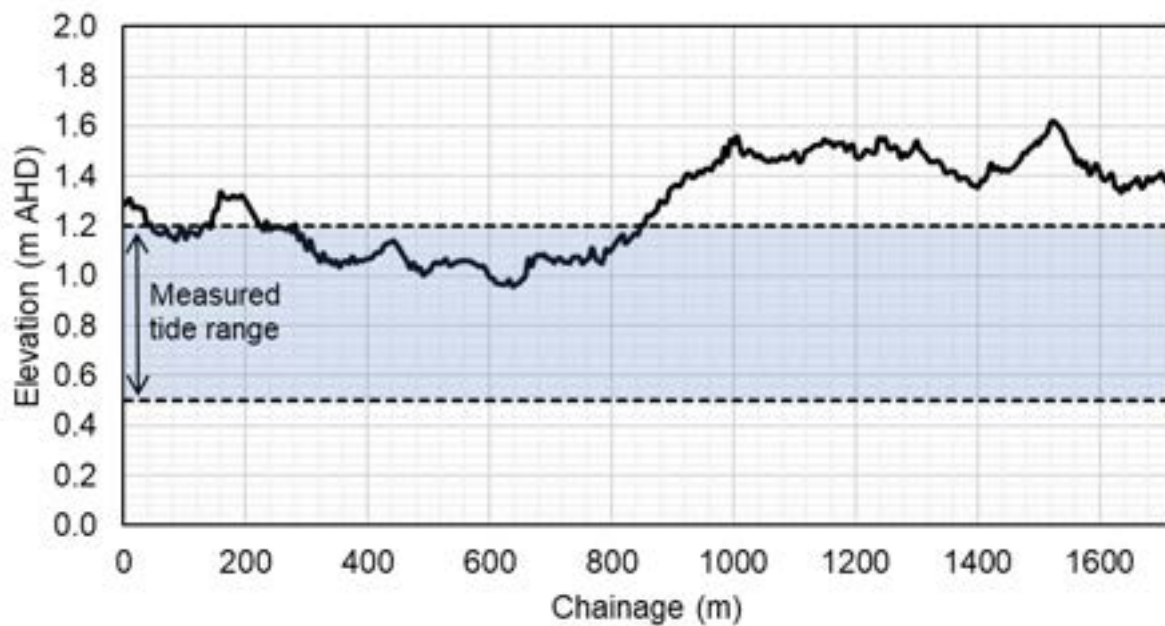


Figure 6-8 Key features of Old Pambula Racecourse and elevation of the Old Pambula Racecourse with respect to measured tides (refer to chainages in key features of Old Pambula Racecourse for relevant elevation) (WRL 2024).



Figure 6-9 Likely interface between fresh and brackish/saline environments at Panboola (WRL 2024). Note: Area labelled as 'freshwater environment' protected by levee is incorrect. This is area has been confirmed by field survey as coastal saltmarsh.

Saline/Brackish environment

Panboola Wetland is located on the Pambula River approximately 8.5 km upstream of the ocean entrance. The southeastern section of the study area is low-lying and tidal and connected to the downstream estuary. The site is influenced by a semidiurnal tide and salinities at the site can reach up to 33 parts per thousand (ppt) during dry times (Montaro 2024).

A review of tidal water level data collected in Pambula Lake downstream of the study area found that the Highest Astronomical Tide (HAT) between 2001 and 2020 was 0.94 m AHD (with a 95% confidence interval of ± 0.23 m). Water levels immediately downstream of Panboola measured a maximum tide height of 1.11 m AHD (Montaro 2024). This indicates that the tide may be amplified between Pambula Lake and the study area due to tidal anomalies or brackish water backing up from Pambula Lake that can further increase the extent of the brackish/saline environment across the proposal area. Based on this data and observations of saltmarsh vegetation, the current maximum extent of brackish/saline environments at Panboola Wetland is estimated to be between 1.1 and 1.5 m AHD.

Elevation surveys and water level measurements were taken in the floodplain area immediately downstream of the proposal site (dominated by mangrove vegetation). These found the mangroves downstream growing on mounds at an elevation between 0.4 and 0.7 m AHD that naturally restrict tidal flows upstream so that only tides above these elevations could flow to the Panboola Wetland site. While some level of tidal amplification occurs between Panboola and Pambula Lake, water level observations found that during neap tides there may not be any tidal influence on the study area (Montaro 2024).

The Old Pambula Racecourse plays a significant role in influencing the hydrology at Panboola Wetland by acting as a levee that creates a barrier to natural tidal flow (Figure 6-8). The southeastern side of the racecourse restricts tidal connectivity from the estuary to the centre of the racecourse to all but the highest tides. The lowest point of the racecourse has an elevation of 0.87 m AHD (Figure 6-8). Based on water level measurements sampled during May 2023, the levee would be overtopped during approximately 15% of high tide events (i.e. of the 60 tides that occurred during the month of May 2023 the racecourse overtopped on 9 occasions). The northwestern side of the racecourse acts as another tidal barrier restricting tidal ingress further upstream to a section of the floodplain locally known as the “frog ponds” (Figure 6-8) (Montaro 2024).

Two pipe culverts underneath the racecourse track provide hydraulic connectivity between the inner racecourse area and the estuary. These culverts perform two functions:

- They allow tidal inflows to the inner racecourse area from the downstream estuary when tides are above the elevation of the mangrove mounds
- They drain the area inside the racecourse following rainfall and catchment run-off or from spring tides that overtop the racecourse.

There is a lack of water level data available for the inner racecourse area. Based on an analysis of water levels collected for the month of May 2023 in Pambula Lake, it is estimated that flow through the existing southern pipe culvert (which has an invert at 0.41 m AHD) to the inner racecourse area only occurred for 45% of the tides in that month (i.e. of the 60 tides that occurred during the month of May 2023, flow through the culvert occurred on 27 occasions). Flow through the existing eastern pipe culvert (which has an invert of 0.54 m AHD) to the inner racecourse occurred for 52% of the monthly tides (31 of the 60 tides occurring in May 2023). Observations of intertidal saltmarsh vegetation and mangrove saplings also indicates that there is relatively frequent inundation of some sections of the inner racecourse floodplain via the culverts or overtopping of the levee (Montaro 2024).

Freshwater environment

The freshwater environment at Panboola Wetland occurs at higher elevations to the north and northwest of the study area that are not influenced by the tide. As noted above, the maximum extent of brackish/saline environments at Panboola is estimated to be between 1.1 and 1.5 m AHD. Land situated above this elevation can be characterised as a freshwater environment. These areas are predominantly influenced by freshwater inflows that occur due to rainfall on the catchment.

There is a lack of data on freshwater flows at the site. Flow of water through the freshwater parts of the Panboola Wetland floodplain is likely to be highly seasonal. This would influence both groundwater and surface water flows. The shallow aquifer would be recharged, and the water table elevation would increase during wet seasons when there are higher flow volumes through the catchment (i.e. February and March). During drier seasons with lower inflows (i.e. August and September) the water table would drop. Longer term wet and dry trends can also be expected to occur during La Niña and El Niño events, respectively. As identified previously, the location of the interface between brackish/saline and freshwater environments would be governed by the seasonal variation in catchment runoff volume and groundwater levels.

The racecourse also acts to restrict tidal flow further upstream to a section of the floodplain at Panboola Wetland locally known as the 'frog ponds' (Figure 6-8). While there is a small pipe culvert (0.25 m diameter) connecting this area to the inner racecourse, the low-lying sections of this land are only ever likely to be influenced by the tide during rare high tidal anomalies. The higher elevation and limited connectivity of most of this area means that it is predominantly a freshwater environment.

Beowa National Park

The hydrological assessment of the proposal site by UNSW Water Research Laboratory (Montaro 2024) initially identified the small area (6,000 m²) located behind a levee to the south of the racecourse at Panboola Wetland (Figure 6-6) as a freshwater environment. The elevation of the levee is estimated be around 1.56 m AHD (i.e. above the tidal limit). This levee acts to prevent natural tidal flow to this area (located within Beowa National Park). However, flora surveys carried out as part of this REF determined it is a saline/brackish environment (refer to Section 6.3.2 and Appendix F). This area is also isolated from the Panboola Wetland by the Old Pambula Racecourse levee located between the sites.

Water quality

A review of water quality data did not identify any publicly accessible data for Panboola Wetland. Water quality data has been collected in the past downstream in Pambula Lake. Overall, the water quality in Pambula Lake is rated as good and excellent (DPE, 2023).

Water quality at Panboola Wetland is generally considered good, however the area is subject to potential localised pollution from 14 stormwater outlets (five of which have sediment traps), that discharge from the town of Pambula into Panboola. Sewage overflows can also occur from a pumping station on Bullara Street resulting in discharge of raw sewage to the waterways within Panboola (Druce and Beadle 2012).

Groundwater

No groundwater data has been identified for the proposal site.

A search of the Bureau of Meteorology (BOM) Australian Groundwater Explorer on 7 February 2025 returned with 5 registered groundwater boreholes within 2 km of the proposal site. None occur within the proposal area.

Potential Groundwater Dependent Ecosystems (GDE) within the vicinity of the proposal site are mapped in the Groundwater Dependent Ecosystems Atlas (BOM, Groundwater Dependent Ecosystems Atlas, 2021a). There is medium potential for Aquatic GDEs around the proposal site. There is high potential for Terrestrial GDEs around the proposal site. Refer to Figure 6-10.

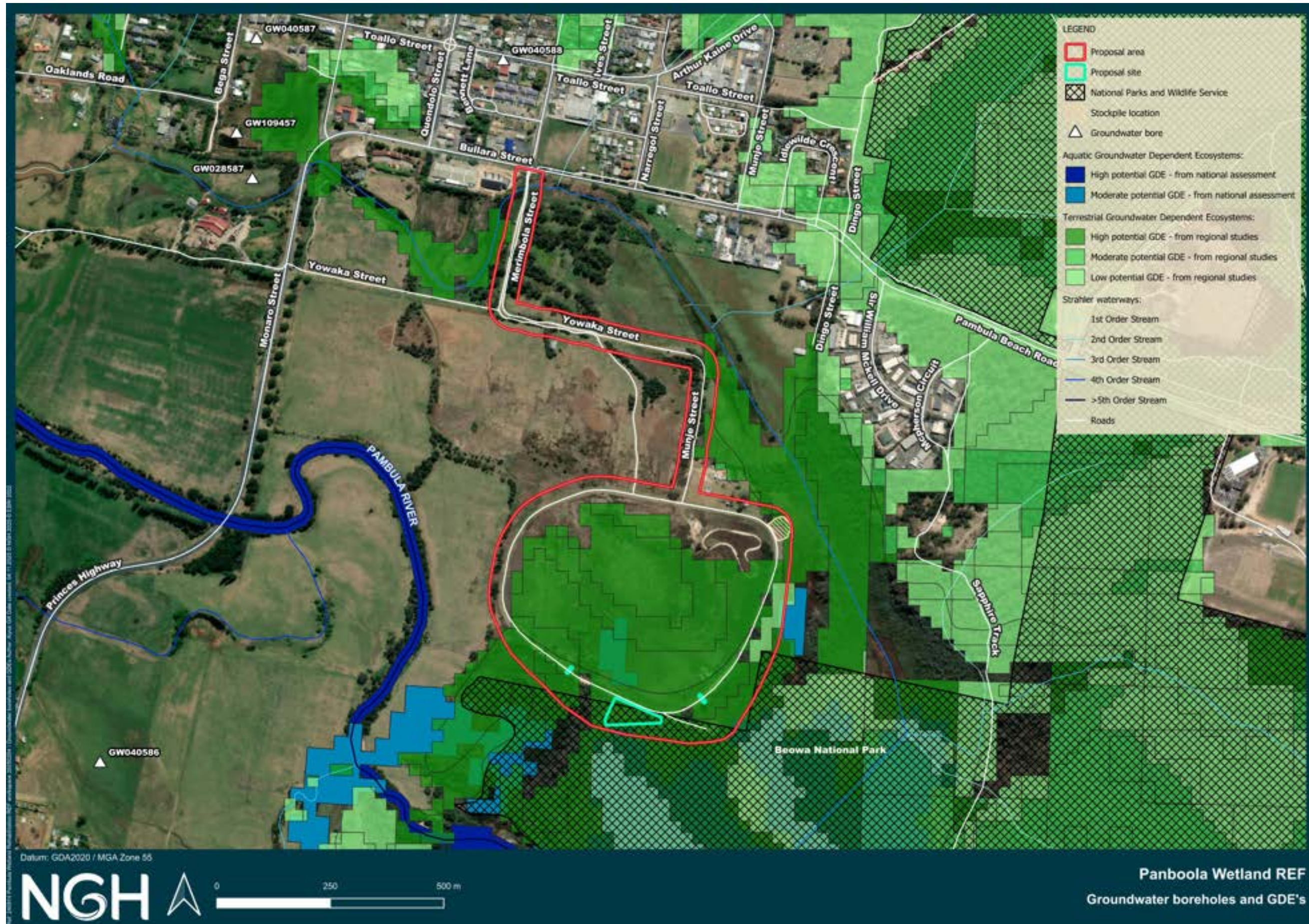


Figure 6-10 Groundwater boreholes and GDEs

Flood planning

The proposal area occurs within flood prone land (NSW Government, 2021). Works are to occur on flood liable land.

A review has been completed of the hydrological and flood conditions at the Panboola Wetland to ensure that the proposal would not cause any flooding impacts on neighbouring urban areas in Pambula (Montaro 2024). The review included:

- Identification of peak flows based on flood modelling
- Conceptual understanding of Panboola runoff during storm events considering peak discharges, hydraulic structures, channel bathymetry and land elevations
- Identification of the controls for inundation levels during flood events
- Identification of potential impacts in the flooding patterns considering changes in the hydraulic structures (discussed in Section 6.2.2).

Peak flood conditions

Key flooding attributes for the Panboola area were determined as part of the Pambula River, Pambula Lake and Yowaka River Flood Study, which was completed and endorsed by BVSC in July 2021 (Tetley, 2021).

Peak discharges and peak water levels relevant for Panboola Wetland are provided in Table 6-1 for various Annual Exceedance Probability (AEP) events.

Table 6-1 Flood model results for Pambula River (Tetley, 2021) from Montaro 2024

AEP	Pambula River at the Princes Highway		Pambula River immediately upstream of its confluence with the Yowaka River	
	Peak discharge (m ³ /s)	Peak water level (m AHD)	Peak discharge (m ³ /s)	Peak water level (m AHD)
10%	358	3.92	408	1.98
5%	437	3.98	498	2.28
2%	543	4.04	620	3.14
1%	621	4.08	710	3.40
0.5%	746	4.13	852	3.49
0.2%	908	4.19	1,037	3.59
Probable maximum flood	2,992	7.20	3,375	6.58

Hydrological model of Panboola inflows

Figure 6-11 identifies the catchment boundary for Panboola Wetland as well as the flow direction, and steepness for catchment runoff entering the floodplain. During rainfall events, Panboola receives flow from the north and east. The catchment is characterised by moderate (>10%) to steep (>18%) slopes. Review of

land use data for the catchment (DPE, 2020) found that 68.9% of the catchment is covered by woodland and forests, 22.4% by grazing, and 8.7% by rural residential areas, highlighting that the majority of the catchment is pervious.

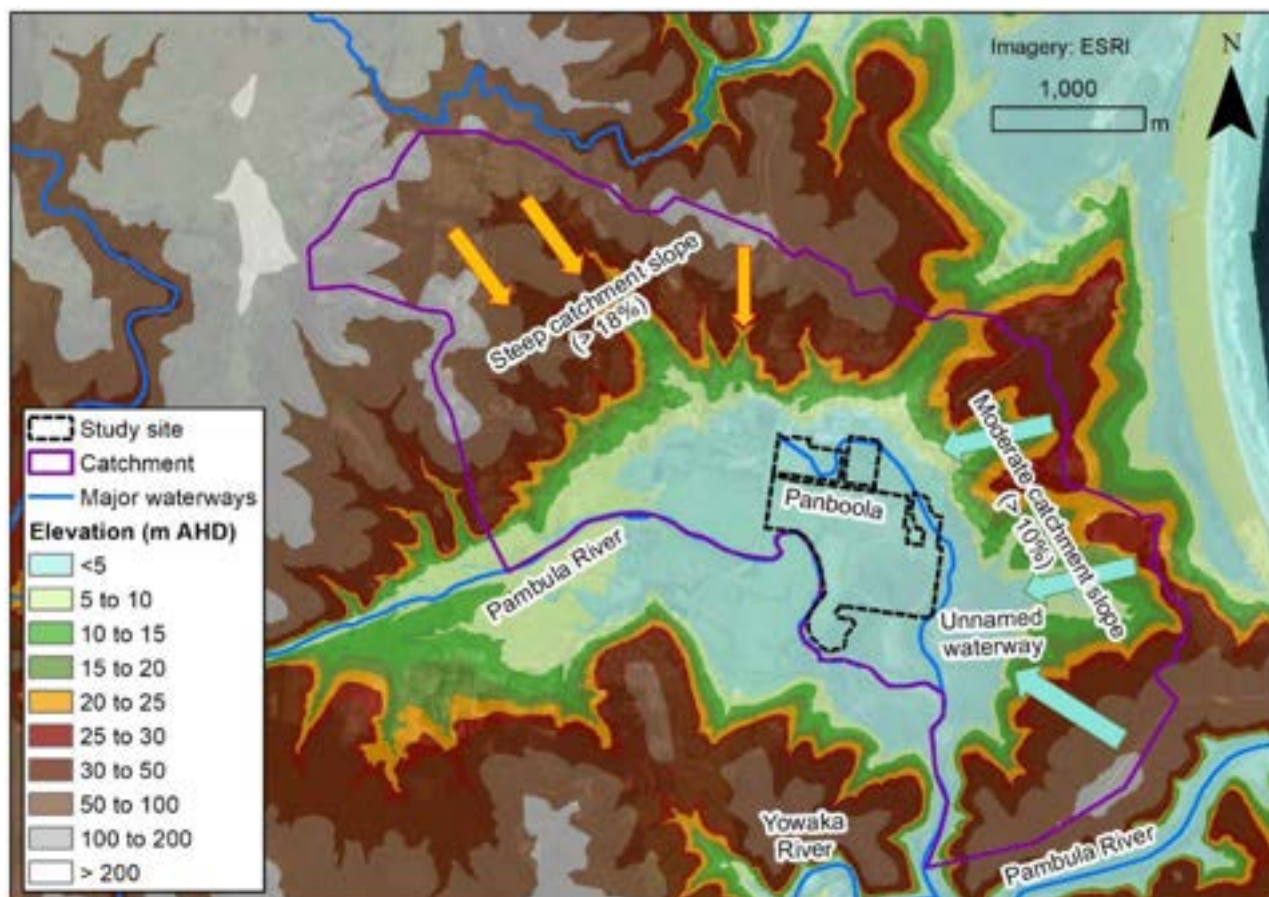


Figure 6-11 Runoff inflows to Panboola (WRL Figure 3.1)

There are two major flow paths at Panboola during floods (Figure 6-12- WRL 3.2):

- Pambula River to the south of the study area
- An unnamed creek that runs along the northern boundary and to the east of the study area.

The bank elevation of Pambula River ranges from 1.6 m AHD at its downstream extent to 2.5 m AHD at its upstream extent (i.e. at the Princes Highway). The bank elevation of the unnamed creek ranges from 1.1 m AHD at its downstream (southern) extent to 2.4 m AHD at its upstream extent (i.e. at the Princes Highway). When flood levels increase above these elevations, floodplain inundation would occur. Based on flood model data (Tetley, 2021), it is expected that this would occur for any events which have an AEP less than 10%. Increased channel roughness due to dense vegetation growth (i.e. phragmites) to the northeast of Panboola (within the unnamed channel) may further exacerbate flooding upstream, highlighting how antecedence conditions may influence flood events. No tidal intrusion is expected during floods as the large volume of freshwater would push the tide downstream.

Hydraulic structures located in the wetland are expected to be fully submerged during flood events (i.e. greater than a 10% AEP event).



Figure 6-12 Key floodplain features that would influence Panboola during floods (WRL Figure 3.2)

Controls on flood water level

To identify the locations across the floodplain that control water levels during flood conditions, the peak flows around Panboola during flood conditions have been estimated (refer to details in Montaro 2024 Appendix D). Estimates of peak flow were used to determine a normal flow depth at key locations surrounding Panboola. Noting that flows would not be steady during a flood event (i.e. peak flows would be transient), peak flows can still be used to identify the normal flow depth and flow controls across the floodplain (i.e. the likely causes of the maximum inundation levels during a flood). It should also be noted that during flood events, dynamic conditions that cannot be predicted using the method used in the review (Montaro 2024) may mean that peak flood levels would be higher than the estimated normal flow depths. Indeed, comparison of estimated normal flow depths to flood depths predicted by the Flood Study (Tetley 2021) show this is the case. Subsequently, the method used for the Panboola review is only suitable to identify locations across the floodplain that act as flow controls during floods and not for identifying peak flood levels (which has been completed already in the Flood Study (Tetley (2021)).

Based on the assessment by Montaro 2024, there are two key influences on water levels at Panboola Wetland during floods:

1. A restriction on flow within Pambula River as it passes through a gorge downstream of the proposal area would result in higher tailwater levels across Panboola (above 1.5 m AHD)
2. Pambula River and the unnamed waterway to the northeast of Panboola would spill their banks causing overland flow across the Panboola wetland area.

Further analysis showed that water levels in the upstream region of Pambula River during flood conditions are higher compared to the levels in the unnamed waterway to the northeast of Panboola. Therefore, the Pambula River water levels would likely govern the extent of inundation across the floodplain.

6.2.2 Potential impacts

Construction

The proposal would require localised disturbance of approximately 340 sqm (0.034 ha) of the Panboola Wetland floodplain. This includes excavation of the existing southern and eastern pipe culverts (and replacement with rock channels) and excavation of one channel in the levee. The works also include the installation of rock aprons on the excavated channels and construction of concrete abutments/headstocks with driven piles for two timber and steel bridges spanning the channels.

The proposal would involve dredging and reclamation works. Under Section 199 of the *Fisheries Management Act 1994*, DPIRD (as the public authority proponent) is required to provide notification to the Minister of the proposal.

The proposed works would likely involve some temporary changes to natural water flows during construction. Any restrictions on flow would be temporary and removed at the conclusion of the works.

Excavations in the waterway may result in expose and disturbance of acid sulfate soils which could lead to impacts on water quality. An Acid Sulfate Soils Management Plan would be prepared to guide construction works as required (refer to Section 6.1 for further impacts on soil and Acid Sulfate Soils).

Construction of the rock channels between the estuary and inner racecourse may potentially lead to increased erosion at both the upstream and downstream outlets impacting on water quality and aquatic habitats. The design of the new channels connecting the estuary and the inner racecourse has been undertaken to ensure the invert elevations are placed to avoid additional erosion from the changes to future water flows.

Partial removal of the levee within Beowa National Park has potential to erode impacting on water quality and aquatic habitats. Refer to Section 6.1.2 for further assessment of sediment mobilisation.

The proposal would be unlikely to negatively impact on any nearby GDEs or groundwater bores, as the proposal does not include any dewatering. The works within the channels and levee would be undertaken during low tides and around any water seepage into the excavations.

The proposed stockpile site is located in the 1 in 100 year flood level and has potential to be impacted by flooding. Flooding during construction has the potential to impact water quality through erosion of disturbed areas and subsequent sedimentation of Pambula River. There is a risk that stockpiled soils and materials could potentially be transported into Pambula River during a flood event. Some of these materials could include contaminants and excess nutrients, which would adversely impact water quality. Flood Contingency Protocols would be developed to manage the potential impacts of flooding on the construction site.

Operation

The objective of the proposal is to increase natural tidal flow and connectivity between the upper Pambula River estuary and upstream areas of the floodplain including Panboola Wetland which are currently being restricted by artificial structures (pipe culverts and levees). Consequently, water flows and the localised hydrology of the site would be altered by the works to promote increased and more regular flows both upstream and downstream.

The increased extent of tidal flow in the inner racecourse area from removal of the two pipe culverts has been estimated from GIS modelling to be up to 2.5 hectares (Figure 6-13) (Montaro 2024).

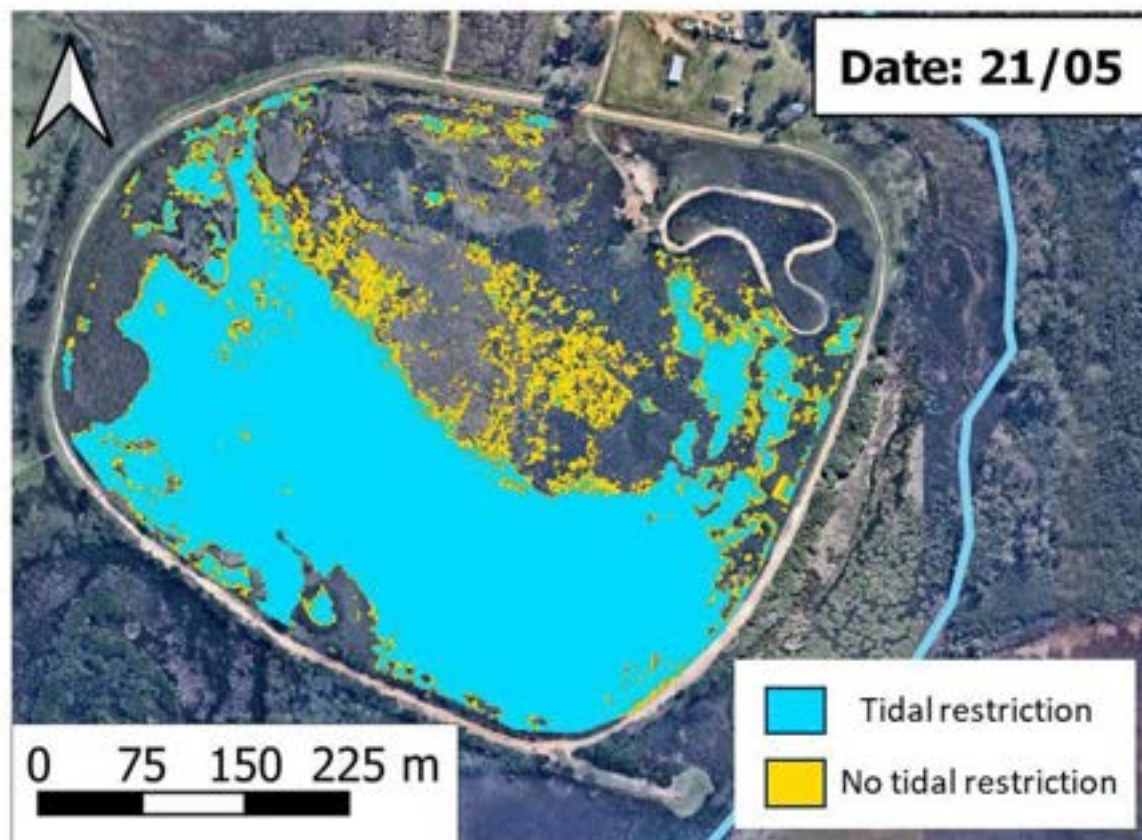


Figure 6-13 Increased area of tidal extent (in yellow) (WRL page C-10)

Increasing the tidal connectivity between the inner racecourse area and the estuary would:

- Improve water quality by increasing the volume and regularity of tidal flows. Increased exchange of water improves water quality
- Reduce the risks of long-term freshwater inundation associated with the existing culverts becoming blocked as channels are less likely to block compared to culverts. Long freshwater inundation times would occur less reducing the occurrence of stagnant low-oxygen water and build-up of nutrients
- Maintaining a raised water level from regular tides prevents the oxidisation of acid sulfate soils and export of acid.

Natural tidal flow would also be increased to the 6,000 m² environment area behind the levee south of the racecourse within Beowa National Park. This inundation area has been identified as containing saltmarsh vegetation (primarily Sea Rush *Juncus kraussii subsp. australiensis*) (refer to Section 6.3). Therefore, regular tides to this area would improve water quality. Sediment movements from the partial levee removal is discussed in Section 6.1.2.

As shown in Figure 6-14 currently, the old racecourse acts as a levee between the levee inundation area and the interior of the racecourse. This means the higher elevated racecourse levee will prevent proposed changes to increase tidal connectivity between the downstream estuary and interior racecourse (by converting two culverts to channels) from affecting the levee inundation area. Furthermore, the barrier created by the higher elevated racecourse would mean that changes to the minor levee (i.e. creation of a 12 m connection between levee inundation area and the intertidal area) would not change the current or potential tidal flows in or out of the racecourse. Further details are provided in Appendix E.

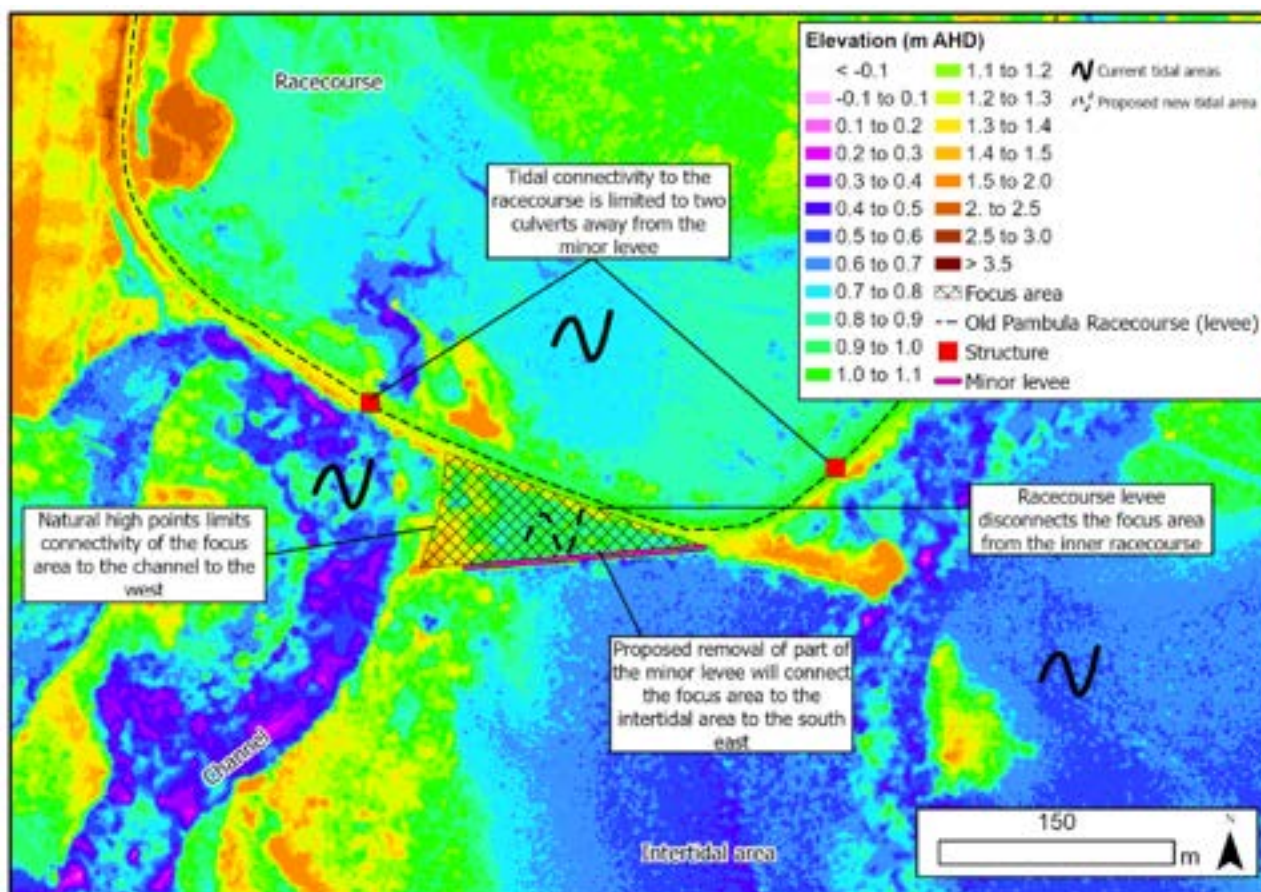


Figure 6-14 Flow paths (WRL, 2025)

As described in Section 6.2.1 (Flood planning), flows through Pambula River control the inundation levels at Panboola during floods. Figure 6-15(WRL 3.3) shows the predicted inundation extent for the 1% AEP and 10% AEP flood events as per the Flood Study (Tetley 2021). All of Panboola and some urban areas within Pambula township would be inundated during the 1% and 10% AEP flood events.

Based on the flood review, it is concluded that the proposed works are unlikely to change future flood patterns to more than a minor extent. All of Panboola and some urban areas within Pambula township would be inundated during the 1% and 10% AEP flood events. The proposed removal of the two pipe culverts and replacement with open channels at the Panboola racecourse, and the part removal of the levee bank south of the racecourse would have a negligible impact on flooding due to the small size of the proposed works.

For further details on the review and assessment of flood conditions for the proposal site refer to Section 3 and Appendix D in Appendix E (Montaro 2024).

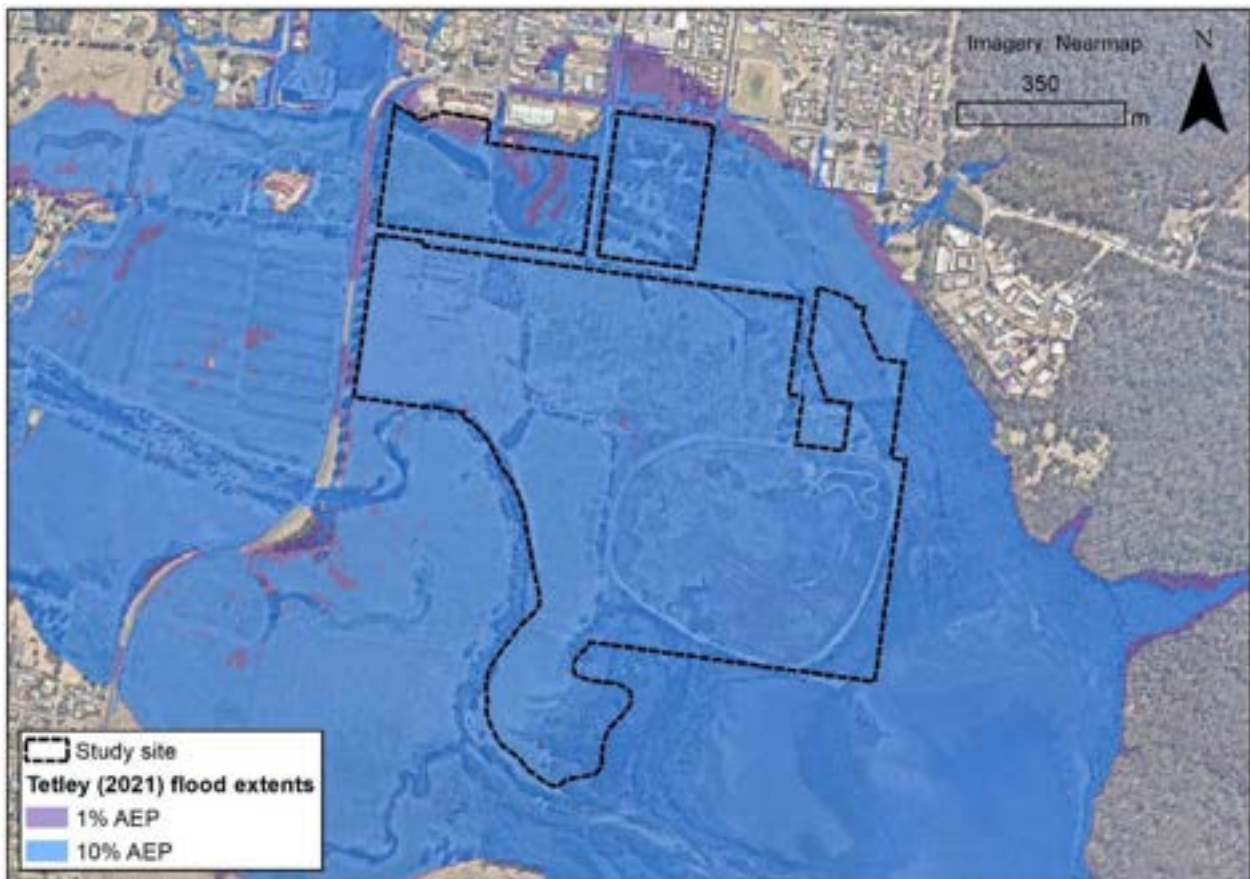


Figure 6-15 Inundation extents for the 1% and 10% AEP flood events (WRL Figure 3.3)

6.2.3 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Fish passage and fish habitat	Prior to works, a Fisheries Permit for harming marine vegetation (Section 205) and blocking passage (Section 219) under the <i>Fisheries Management Act 1994</i> would be obtained, and works would be undertaken in accordance with the permit.	X	X	X		
Dredging and Reclamation	Prior to works, notification will be given to the Minister for dredging and reclamation works under Section 199 of the <i>Fisheries Management Act 1994</i>	X	X	X		
Work within waterways	- Instream and bank work areas would be clearly delineated and other areas declared 'no go zones' - No dewatering is to occur - No machinery to enter the waterway unless it has been appropriately cleaned, degreased and serviced - Spill kits to be available onsite at all times during instream works - Only clean rock (no fines) to be used in rock armouring, if required - Geotextile fabric is to be used for the new southern and eastern channels to isolate the natural bed of the waterway from any imported clean rock fill or other material used within the bed of the waterway	X	X		X	
Water contamination	- Protection shall be provided for the works in the vicinity of waterways to minimise runoff from construction into these waterways and waterbodies - Work would not occur during high rainfall events and flooding - There is to be no release of dirty water into drainage lines and/or waterways	X	X		X	

Review of Environmental Factors

Panboola Wetland Rehabilitation Works



Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	Monitor the BOM to forecast heavy rainfall events in order to allow sufficient time to vacate and prepare the site prior to the commencement of heavy rainfall and flood events.					
Soil management, erosion and sediment control	- A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. - Mitigation measures described in Section 6.1 (Topography, geology and soils) will be implemented.	X	X		X	
Pollution/contamination	Mitigation measures described in Section 6.1 (Topography, geology and soils) will be implemented.	X	X		X	

6.3 Biodiversity

6.3.1 Approach

A Biodiversity Assessment was undertaken by qualified ecologists. It is summarised here and is provided in full in Appendix F.

Database searches and literature review

A review of existing vegetation mapping of the Study Area via the NSW State Vegetation Type Mapping (SVTM) (NSW DCCEEW, 2025b) was undertaken to identify vegetation communities, Threatened Ecological Communities (TECs) with the potential to occur within the proposal site. A full list of the database searches and the dates they were undertaken can be found below in Table 6-2.

In addition to the databases below, scientific journal articles, government publications, monitoring studies and other relevant reports were reviewed for relevant information and are cited in text as appropriate. Panboola Land Managers were also contacted to request site-specific information about bird species recorded during regular monitoring events. Information provided is included in Appendix A.3 of the Biodiversity Assessment (Appendix F).

Table 6-2 Database searches undertaken

Database	Target	Search date	Search area
Fisheries NSW Spatial Data Portal (DPI) (DPI, 2025b)	Key Fish Habitat/Threatened Aquatic Species	15/08/2023	Proposal site
NSW BioNet Atlas search (NSW DCCEEW, 2025c)	Threatened flora and fauna species, populations and ecological communities listed under the BC Act	27/11/2024	Study area
NSW SEED Data Portal (NSW DCCEEW, 2025b)	State Vegetation Type Mapping (SVTM) and geology mapping	11/11/2024	Study area
BioNet Vegetation Classification Database (NSW DCCEEW, 2025d)	Identification and classification of Plant Community Types (PCTs) mapped onsite	26/01/2025	Study area
EPBC Act Protected Matters Search Tool (Cwth DCCEEW, 2025)	Threatened flora and fauna, endangered populations and ecological communities and migratory species. MNES	03/12/2024	Study area

Database	Target	Search date	Search area
Biodiversity Values Mapping (NSW DCCEEW, 2025e)	Biodiversity Values (BV) with the potential for serious and irreversible impacts	21/11/2024	Study area
Atlas of Living Australia	Threatened flora and fauna species, listed under the BC Act and the EPBC Act.	24/02/2025	Study area
Coastal Risk Australia 2100	Predictive modelling for impacts of climate change on mean sea level	23/04/2025	Study area
Climate Central Coastal Risk Screening Tool	Sea level rise and coastal flood maps are based on peer-reviewed science in leading journals	23/04/2025	Study area

Habitat evaluation

Threatened species and communities listed under the EPBC Act and BC Act were evaluated for their likelihood of occurrence and impact in the proposal site. This sourced the NSW BioNet database search results, and the Commonwealth Protected Matters Search Tool (PMST) results, which were then compared to data from the field inspection and assessment of habitat suitability. The habitat evaluation can be viewed in Appendix B of the Biodiversity Assessment (Appendix F).

Spatial analysis

Elevation on the intertidal zone at Panboola Wetland is a key driver and overall limitation on the distribution of marine vegetation. By using elevation data collected using Light Detection and Ranging (LiDAR) for the proposal site combined with the usual elevation occurrence of mangroves and saltmarsh in southeast NSW (based on expert advice), it is possible to map the likely short term changes (up to 2030) of the proposal on the extent of marine vegetation at Panboola Wetland. LiDAR elevation data used was collected by the NSW Department Finance, Services and Innovation (DFS) Spatial Services on 11 March 2013 and has a vertical accuracy of ± 0.3 m (95% confidence interval) (<https://www.spatial.nsw.gov.au/>).

Field surveys

An initial field inspection of the proposal site was undertaken by an NGH Ecologist on 10 December 2024, with a follow-up flora survey by an NGH botanist on 25 January 2025. The initial field survey broadly identified areas of native vegetation and documented the ecological values on site with Rapid Assessment Points (RAP) taken using QGIS software. The follow-up flora survey used RAPs and random meanders to:

- Ground validate the mapped PCTs
- Provide detailed PCT mapping within a 100 m zone of the RAP locations
- Identify areas containing TECs.

6.3.2 Results

Background searches

PMST and BioNet atlas searches found 137 threatened species recorded within a 10 km buffer of the proposal site. The NSW Bionet search identified 72 threatened species (41 birds, 19 mammals, two amphibians, one Reptile and 9 flora species) that have been recorded within 10 km of the proposal site.

The EPBC search indicated five TECs, 16 threatened flora species and 79 threatened fauna species (49 birds, seven fish, five amphibians, 13 mammals and five reptiles) have the potential to occur in the study area. (Please note, some of these threatened species will have also been found in the BioNet search.)

Panboola Land Managers have provided information on the known population of White-fronted Chats, which have been seen across the year since 2020, in the western portion of the inner racecourse area. Juveniles have been recorded in 2022 and 2024, so it is assumed that the birds are breeding on site although nests have not been seen due to the difficult access.

Likelihood of occurrence

Based on BioNet and Atlas of Living Australia records, habitat on site and information from Panboola Land Managers, the following two communities and four species are considered **highly likely** to occur in the proposal area, as listed in Table 6-3.

Table 6-3 Species and communities highly likely (or known) to occur in the proposal site

Species/community	NSW status	Cwth status	Habitat
Coastal Saltmarsh	E	V	Recorded on site
Swamp Oak Floodplain Forest of the New South Wales North Coast	E	Not listed	Recorded on site
Red Knot <i>Calidris canutus</i>	Not listed	E	Tidal mudflats, sandflats, beaches, saltmarshes, flooded pastures, ploughed lands (Pizzey & Knight, 2012)
Curlew Sandpiper <i>Calidris ferruginea</i>	E	CE	Tidal mudflats; saltmarsh, salt fields; fresh, brackish or saline wetlands; sewage ponds (Pizzey & Knight, 2012).
White-fronted Chat <i>Epthianura albifrons</i>	V	Not listed	Recorded on site by Panboola Land Managers Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. (OEH, n.d).

Species/community	NSW status	Cwth status	Habitat
Eastern Curlew <i>Numenius madagascariensis</i>	Not listed	CE	Estuaries, tidal mudflats, sandspits, saltmarshes, mangroves; occasionally fresh or brackish lakes; bare grasslands near water (Pizzey & Knight, 2012).

PCTs and TECs

Six PCTs were identified onsite, these are outlined Table 6-4 and presented in Figure 6-16. The number of PCTs present demonstrates that the site is dynamic area and includes a complex tidal zone.

The field survey confirmed that the 6,000 m² behind the levee to the south of the racecourse contains saltmarsh vegetation (primarily Sea Rush *Juncus kraussii subsp. australiensis*), and it is not freshwater vegetation has previously reported by UNSW Water Research Laboratory (Montaro 2024).

As outlined in Table 6-4, there are two TECs (Figure 6-17):

- Saltmarsh:
 - BC Act - Coastal Saltmarsh in NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered)
 - EPBC Act - Subtropical and Temperate Coastal Saltmarsh (vulnerable).
- Swamp Oak Floodplain Forest: BC Act - Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered).

Table 6-4 PCTs

PCT ID	PCT name and description	TEC	Area within proposal area (ha)	Area within proposal site (ha)	Within National Park
4054	South Coast Tidal Flats Samolus Paperbark Forest This is a mid-high to tall sclerophyll open forest of damp, moderately saline river flats and coastal lake margins with species tolerant of waterlogging and moderate salinity commonly recorded. With increasing salinity this community may be replaced by PCT 4091 (mangroves) or PCT 4097 (samphire) (NSW DCCEEW, 2025d).	No	- Occurs adjacent to the site.	-	Yes
4056	Southern Estuarine Swamp Paperbark Creekflat Scrub A low to mid-high swampy open forest of slightly saline, near-permanently waterlogged margins of estuaries and coastal lagoons. It generally occurs at	Yes BC Act - Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and	4.72	0.74	No

PCT ID	PCT name and description	TEC	Area within proposal area (ha)	Area within proposal site (ha)	Within National Park
	elevations of below 5 metres asl on deep, organic-rich deposits of mixed estuarine and alluvial sediments. Benchmark species richness is 31 (NSW DCCEEW, 2025d).	South East Corner Bioregions (endangered)			
4091	Grey Mangrove-River Mangrove Forest A low, mid-high or tall mangrove open forest or woodland, sometimes including a saltmarsh ground layer, occurring on tidal flats of the NSW coast (NSW DCCEEW, 2025d).	No	58 (Mangroves in Pambula River estuary)	0.0005	Yes
4094	Estuarine Club Rush-Arrowgrass Wetland A mid-high to tall forbland or sedgeland occurring in waterlogged areas on tidal flats, estuarine swamps and low-lying floodplains very close to sea level. The community forms a mosaic with other saltmarsh PCTs occurring in permanent brackish to saline pools in depressions or drainage runnels where it fringes the banks. Benchmark species richness is 11 (NSW DCCEEW, 2025d).	Yes BC Act - Coastal Saltmarsh in NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered) EPBC Act - Subtropical and Temperate Coastal Saltmarsh (vulnerable)	36.6 (Coastal saltmarsh in Pambula River estuary)	8.84 (combined with 4096 and 4097)	Yes
4096	Prickly Couch-Sea Rush Saltmarsh A saline grassland or rushland, or low open woodland in estuarine environment close to sea level with low median species richness (usually fewer than 12). Usually occurs in well-drained upper marsh habitats subject to infrequent submergence often on sandy substrates (NSW DCCEEW, 2025d).	Yes BC Act - Coastal Saltmarsh in NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered) EPBC Act - Subtropical and Temperate Coastal Saltmarsh (vulnerable)	36.6 (Coastal saltmarsh in Pambula River estuary)	8.84 (combined with 4094 and 4097)	Yes

PCT ID	PCT name and description	TEC	Area within proposal area (ha)	Area within proposal site (ha)	Within National Park
4097	Samphire Saltmarsh A mid-high saline forbland, closed forbland or sparse to open tall shrubland, featuring <i>Sarcocornia quinqueflora subsp. quinqueflora</i> and occurring on littoral salt flats, estuaries, saline lagoons or tidal creek flats along the NSW coast at or very close to sea level. This community occurs at locations that are intermediate between PCT 4091 (mangrove) and PCT 4103 (a <i>Sporobolus / Juncus</i> dominated saltmarsh) in frequency or duration of tidal inundation. Occurs at sites with less frequent or shorter periods of tidal inundation than PCT 4091. Median species richness is seven (NSW DCCEEW, 2025d).	Yes BC Act - Coastal Saltmarsh in NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered) EPBC Act - Subtropical and Temperate Coastal Saltmarsh (vulnerable)	36.6 (Coastal saltmarsh in Pambula River estuary)	8.84 (combined with 4094 and 4096)	No

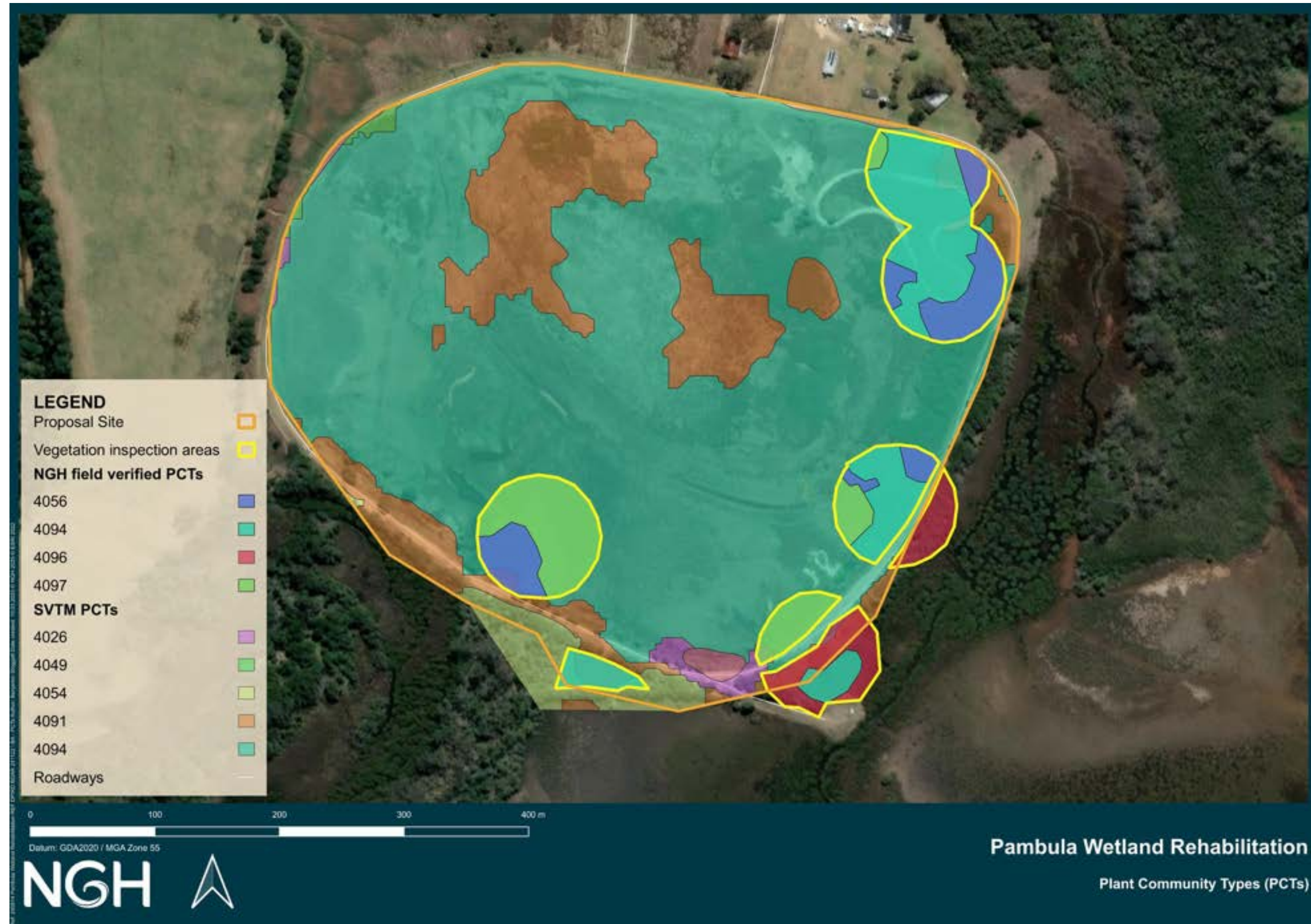


Figure 6-16 PCTs present in the proposal site

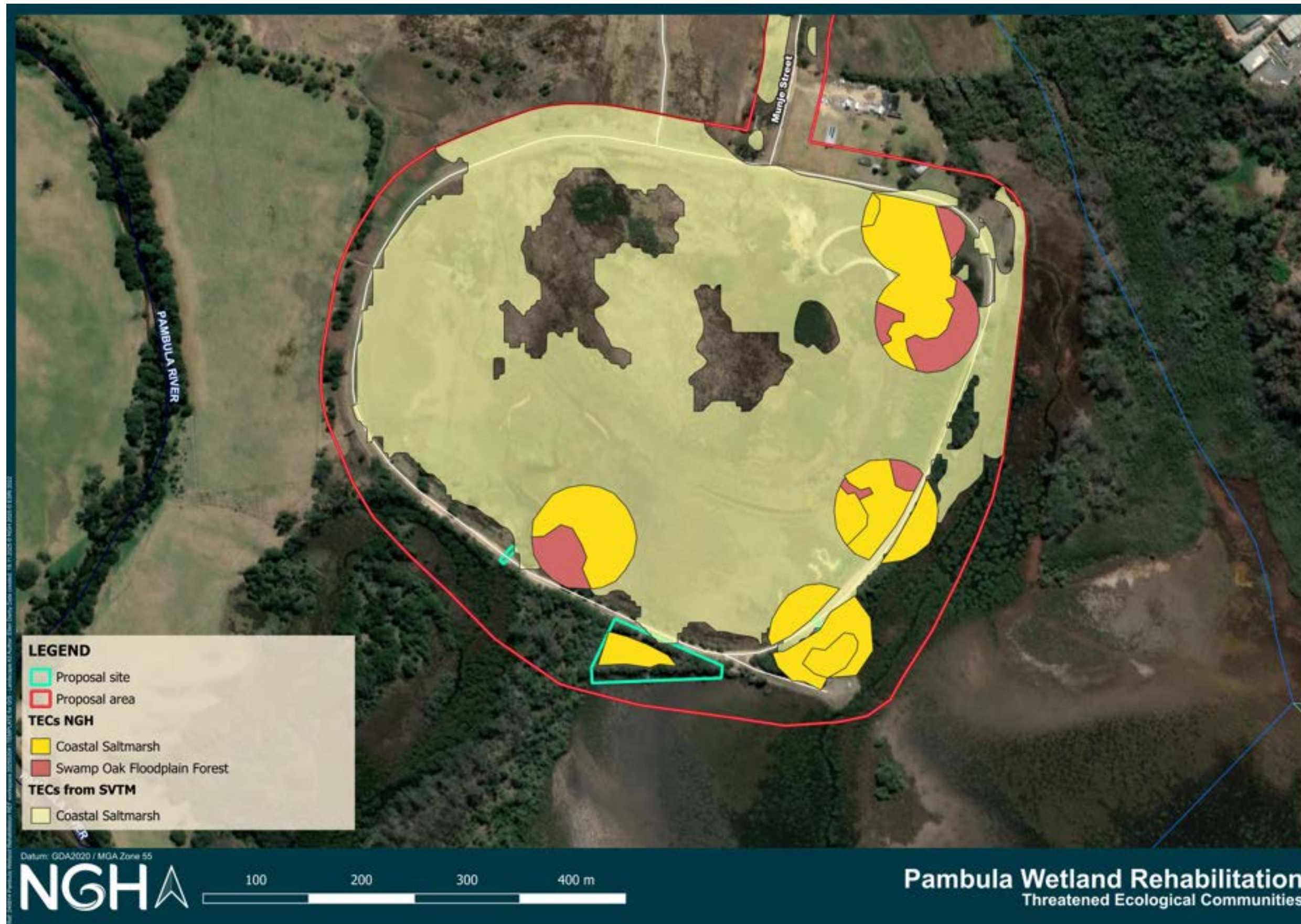


Figure 6-17 TECs present in the proposal site

Threatened species habitat

Habitat in the racecourse area is a mosaic of open low saltmarsh with bare patches of sandy/muddy ground and dense tall sedgeland, along with small stands of trees and shrubs. Small pools of open water occur in varying degrees of salinity depending on recent rainfall and high tides. In the proposal site, to the south of the racecourse track, mangrove vegetation dominates with bordering tea tree scrub. At the north end of the proposal site where the stockpile areas would be, habitat is open with short (mown) exotic-native mix of grasses and forbs.

The habitat within the proposal site houses a small population of White-fronted Chats (*Epthianura albifrons*). The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands (Higgins PJ, Peter, & Steele, 2001). Along the coastline, White-fronted Chats are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, saltlakes and salt pans that are along the margins of rivers and waterways (North, 1904), (Higgins PJ, Peter, & Steele, 2001), (Barrett, Silcocks, Barry, Cunningham, & Poulter, 2003). The species is sensitive to human disturbance and is not found in built areas (Jenner, 2008).

Within the proposal site the White-fronted Chat population has been known to occur within the former racetrack areas along the muddy edges of wet ponds, in the centre of the racecourse and the saltmarsh habitat areas. The species has been recorded within the wetlands since 1997 in both wet and dry conditions although they have been displaced during times when water levels were very high. Following the establishment of the saltmarsh community, the species began to be recorded as breeding, with juveniles recorded on several occasions (*pers.comm* Robyn Kesby 14/02/2025, 30/04/2025 by email).



Figure 6-18 Mosaic of low saltmarsh with bare ground and sedgeland



Figure 6-19 Open pools with grasses, shrubs and trees

6.3.3 Potential impacts

The types of impacts associated with the proposal are distinctly different for the construction phase and the operational phase. These are described and discussed below.

Construction (direct)

Compaction and soil disturbance

Construction activities during the construction phase would temporarily disturb sediments as heavy machinery would be required to facilitate excavation. The main impact from these activities would be to estuarine water quality and benthic fauna. Disturbance of waterway sediment and erosion has the potential to cause localised increased turbidity downstream of excavation and construction activities. This in turn has the potential to smother benthic fauna, sessile invertebrates and filter feeders as sediments settle. The sediments in the Proposal site comprise of fine silts and mud that are easily and frequently disturbed by tidal and catchment flood flow, as such the benthic fauna in the Proposal site is adapted to these disturbances and the sensitivity of the receptor is low. Construction activities would be intermittent, short term and reversible. The impact to water quality and aquatic fauna is minor.

Additionally, soil compaction may occur in the fine silt and mud sediment from heavy machinery and vehicles during the construction phase. Soil compaction would reduce the ability of water to infiltrate the soil, increasing pooling or runoff rate, as well as reduce plant growth / recruitment post construction. The Proposal includes the use of bog mats to minimise disturbance from movement of heavy machinery and suspending works in wet weather when soil damage may result. This will reduce the chance of soil compaction.

These direct impacts to estuarine water quality, benthic fauna and of soil compaction may occur within the National Park to the south of the Racecourse within the Proposal Site and potentially to the south of the western channel due to access and construction requirements. However, these impacts would be monitored

and mitigated as per Section 4.4. Additionally, the impacts are considered minor as Benthic fauna are expected to be adapted to frequent disturbance.

Loss of native vegetation

The proposed works would result in the removal of up to five young and mature mangroves at the channels, several *Melaleuca ericifolia* individuals (from Swamp Oak Floodplain Forest TEC) bordering the saltmarsh in the National Park at the south of the proposal site and disturbance of up to 100 m² of aquatic vegetation comprised of saltmarsh plants (such as Samphire *Sarcocornia quinqueflora* and Sea Rush *Juncus kraussii* subsp. *australiensis*)) within the proposal site (see Table 6-5). No seagrass would be directly disturbed by the Proposal.

Mangroves and marine vegetation are protected under the *Fisheries Management Act 1994* and must not be harmed unless under the authority of a permit issued by the Minister under section 205 of this Act. Harm would be both direct from the construction works and indirect from resulting changes to tidal flows, noting that the definition of 'harm' includes any activity that 'alters tidal flows to marine vegetation' (Cl. 229 FM General Regulation 2019).

All vegetation within the National Park is protected under the NPW Act and must not be harmed unless approval is provided by the National Parks and Wildlife Services. Direct harm to the National Park is expected to include several *Melaleuca eriffolia* individuals and up to 100m² of aquatic vegetation comprised of saltmarsh plants, these impacts would occur due to the required access track and partial levee removal.

Table 6-5 Extent of vegetation removal during construction phase

PCT ID	PCT name	Area to be cleared (m2)
4091	Grey Mangrove-River Mangrove Forest	5
4056	Swamp Oak Floodplain Forest	2
4094, 4096, 4097	Coastal Saltmarsh (combined)	100

Operation (indirect)

Types of impacts for operational phase are discussed below.

Changed hydrological regime

Changes to the hydrological regime refers to alteration to the pattern, timing and availability of water with an ecosystem. Changes to the frequency and duration of inundation can shift species condition and ecosystem function. Changes in hydrological regime can also affect sediment deposition patterns and water quality (such as salinity). Depending on the magnitude of change, hydrological changes can dramatically change vegetation communities.

The change to the hydrological regime may cause direct impacts to areas of vegetation within the National Park south of the western channel and Proposal Site. The partial removal of the levee would likely result in hydrological changes within the Proposal Site, potentially impacting the mapped Coastal Saltmarsh areas. The seal-level rise and aquatic vegetation modelling discussed below show impacts to the National Park area

to be minimal following the partial removal of the levee. Nevertheless, if impacts were to occur due to the change in hydrological conditions PCTs 4054, 4091 and 4097 have the potential to be impacted. These PCTs include one TEC - *Coastal Saltmarsh in NSW North Coast, Sydney Basin and Southeast Corner Bioregions (endangered)*. Impacts to this TEC as a result of hydrological change is further discussed below with a Test of Significance completed in Appendix D of the BA.

Change in vegetation composition and structure

The proposal site is currently characterised by extensive areas of coastal saltmarsh within the inner racecourse area) and abundant mangroves downstream of the racecourse track. The changes to tidal flow and extent are likely to lead to impacts on the vegetation composition and structure in the proposal site, as discussed in Section 3.2 of Appendix F. The rate and extent of change will affect the significance of this impact.

Short-term (2030) Saltmarsh and Mangroves

The concept design study for the proposal has estimated that by replacing the two culverts with channels, the water levels across the floodplain can increase by up to 0.15 m and reach an elevation of 1.02 m AHD. The largest difference can be seen during higher spring tide events. The current saltmarsh extent within the racecourse area is shown in Figure 6-20, as sourced from NSW Fisheries (Fisheries NSW, 2025 in Appendix F).

Figure 6-20 shows the predicted marine vegetation extent by 2030 within the racecourse area following the proposed activity. No sea level rise estimate has been included. The proposal is likely to lead to mangroves more easily migrating into the lower elevation areas of the inner racecourse area.

A concern raised by PWHP is that there is insufficient space for saltmarsh retreat, and that changes would lead to significant loss. However, field surveys and GIS analysis identified adjacent higher elevation areas available at Panboola Wetland for saltmarsh migration and retreat. One example is that despite the existing tidal restrictions some saltmarsh plants (e.g. Samphire *Sarcocornia quinqueflora*) have already established at an elevation of 1.4 m AHD on private property to the northeast of Panboola (Figure 6-21). It should also be noted that saltmarsh communities naturally undergo succession phases due to their dynamic habitat. Interim habitats are valuable too, but may not be aesthetically attractive to all stakeholders (Hudson, Kenworthy, & Best, 2021).



Figure 6-20 Comparison of baseline aquatic vegetation to predictive 2030 modelling. See Appendix F for individual maps.



Figure 6-21 Saltmarsh (Samphire *Sarcocornia quinqueflora*) located at an elevation of 1.4 m AHD adjacent to the proposal site in April 2023 (Montano, Chaaya, & Tucker, 2024)

Swamp Oak Floodplain Forest

With the change of tidal flows into the proposal site from the Pambula River, the composition of floodplain vegetation communities will be likely to change. The southern areas of Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions TEC would be inundated at high tide during the operational phase of the proposal. This inundation is unlikely to adversely impact this TEC as it is known to commonly occur on floodplains where soils are at least occasionally saturated, water-logged or inundated (OEH, 2025). The extent of this TEC within the racecourse area is expected to decline, although the rate of change (from channels rather than climate related stochastic event) may allow migration to higher elevation. The TEC present is associated with PCT 4056 within the proposal site where the canopy is composed of Swamp paperbarks (*Melaleuca ericifolia*) and groundcover contains *Juncus kraussii*.

The occurrence of this vegetation type in the racecourse area may be viewed as artificially supported by the existing culvert imposed tidal regime, with its' natural distribution tending to higher elevation sites.

Long-term changes (2050-2100)

Over the long term, it is expected that that sea level rise (SLR) due to climate change would result in tidal inundation at Panboola Wetland extending further upstream than has occurred in the past. The hydrological study (Montano, Chaaya, & Tucker, 2024) has mapped the projected sea level rise elevations for the worst case scenario (RCP8.5 - uncontrolled Greenhouse gas emissions). (Figure 6-22). This shows that SLR will significantly impact on Panboola Wetland in the future. The proposal is intended to provide an acclimatisation pathway for Panboola Wetlands toward the longer term effects of sea level rise and other climate change related events. Due to the many unknowns and limitations, predictions of operational impacts of the proposal on vegetation beyond 2030 have not been attempted.

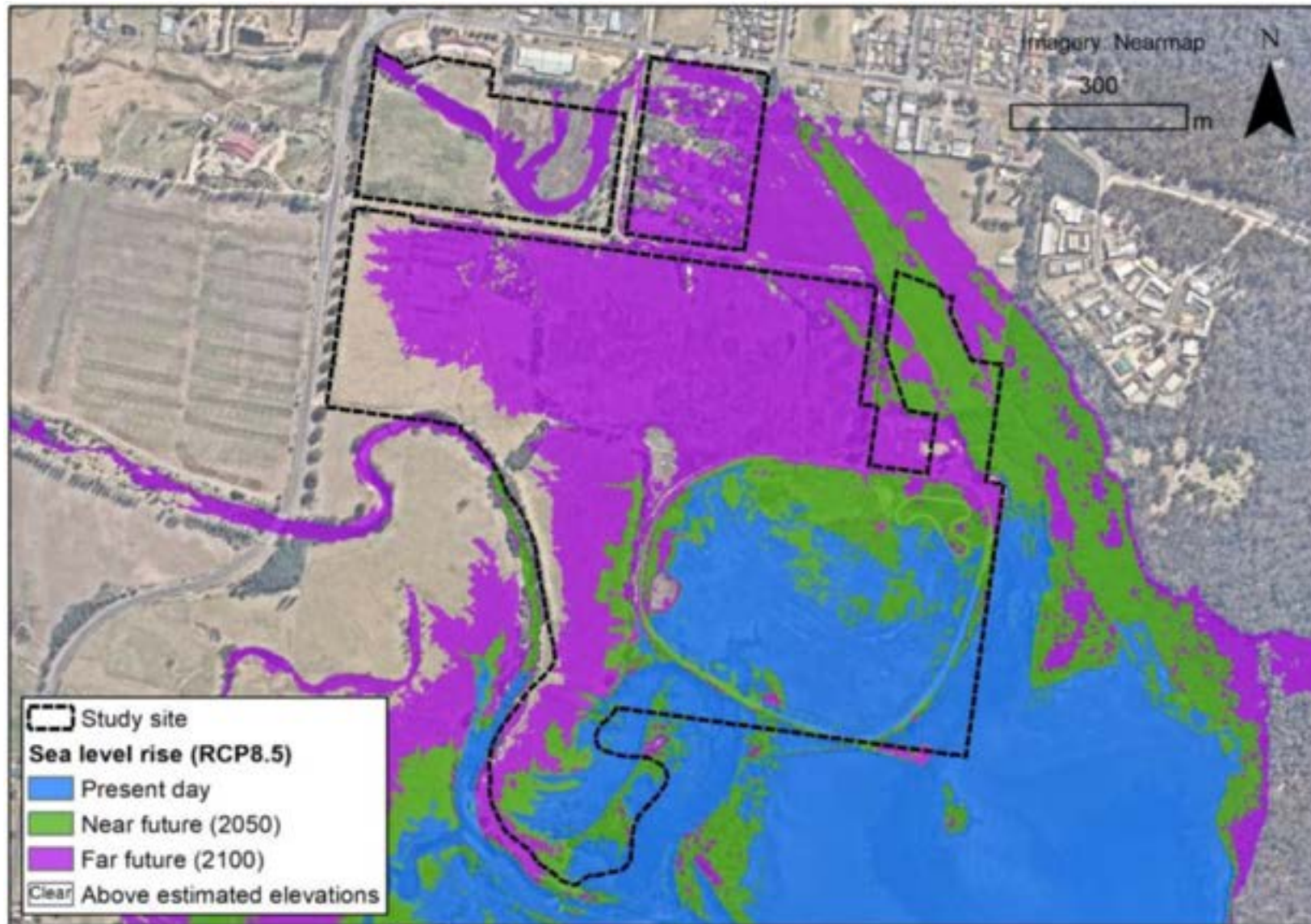


Figure 6-22 Estimated tidal extent during average conditions under a global climate scenario where emissions continue uncontrolled (RCP8.5) for 2050 and 2100 – (Montano, Chaaya, & Tucker, 2024) Figure 2.10)

Rate of change

The rate at which the predicted changes to marine vegetation at Panboola Wetland may occur is unknown and difficult to accurately predict with any certainty. Following the completion of the works to replace the pipe culverts and create an opening in the levee, mangrove seeds would have an increased opportunity to be transported with incoming tides into the inner racecourse area and behind the levee. Establishment and growth of mangrove propagules can be quite rapid and may occur within a short time (months or years) following the completion of the proposed works. At Panboola Wetland there are many mature mangroves located downstream and adjacent to the racecourse area which will provide a source of propagules for future local expansion. For dispersal to occur into the upper intertidal zone the release of propagules must coincide with the presence of spring tides (Dixon 2017).

Threatened species and communities

The magnitude and characteristics of impacts for the 'do nothing' approach as well as the construction and operational phase of the proposal are assessed below for threatened species and communities. Of the species and communities known or highly likely to occur, two were considered to have a moderate potential for impact (Eastern Curlew and Curlew Sandpiper) and two were considered to have a high potential for impact (Coastal Saltmarsh and White-fronted Chat). These species are listed in Table 6-6 along with the expected impact phase. These species and communities are all expected to be impacted by the proposed hydrological and subsequent vegetation changes. This is discussed in Section 4.3 of Appendix F.

Table 6-6 Threatened species and communities potentially impacted by Proposal

Species/community	NSW status	C'wth status	Impact phase
Coastal Saltmarsh	E	V	Operational
Swamp Oak Floodplain Forest	E	Not listed	Operational
Curlew Sandpiper	E	CE	Operational
White-fronted Chat	V	Not listed	Operational
Eastern Curlew	Not listed	CE	Operational

The 'Do nothing' approach

The 'do nothing' approach would result in no intervention occurring. This option would involve no construction disturbance to the site and therefore have fewer short term environmental impact than other options. Due to no initial changes to hydrology, the Proposal site will be subject to several issues in relation to current and future hydrological regimes.

The 'do nothing' option would result in no improvements to tidal connectivity between the estuary and wetland areas at Panboola. Tidal flow, at least in the short term will continue to be limited to pre-existing culverts. The area will continue to be subjected to long inundation times following local rain events as well as blockages or failures following storm events which may lead to accumulation of nutrients and contaminants

within the area, as well as pooling of stagnant water with reduced oxygen levels. This poor water quality will limit suitable fish habitat within the wetlands. Additionally, the existing culverts require high maintenance to clear obstructions following storm and rain events. Thus the PoM aims to increase floodplain resilience, improve drainage following large rainfall and flood events in the catchment, improve water quality and fish habitat would not be achieved.

The 'do nothing' approach leaves the Panboola Wetlands vulnerable to the threat of climate related stochastic events, as discussed earlier. Such events could lead to failure of the levees at some stage in the future, which could lead to rapid ecological response with potential for mass saltmarsh mortality, and/or rapid mangrove encroachment without allowing time for saltmarsh communities to securely establish at higher elevations, leading to a greater loss of the saltmarsh community in the short term.

Construction phase

There were no species that had a high likelihood of construction impacts from the development itself. The construction phase would be conducted according to best practice for soil management, ASS and entails minimal direct vegetation removal (see Table 6-5 above)

Operational phase

A summary of anticipated impacts upon threatened communities and species is provided below, followed by risk assessment (based on Section 4.3.4 of Appendix F) and a summary of the results of the Tests of Significance (BC Act) and Assessments of Significance (EPBC Act) (Appendix F) .

Coastal Saltmarsh

Saltmarsh currently occupies 8.84 ha of the racecourse area and mangroves 0 ha. By 2030 saltmarsh and combined saltmarsh/mangrove areas are predicted to cover 8.09 ha, retreating to the north-western half of the racecourse area. Mangroves are predicted to migrate into 13.57 ha of the racecourse area. However, these calculations are coarse estimates and do not take into account measures to slow mangrove propagule movement discussed in Section 4.3.3 of Appendix F nor the complex feedback loops involved in sediment accumulation and surface undulation. The actual extent of saltmarsh change by 2030 is likely to be much lower.

Table 6-7 Predicted saltmarsh vegetation change in the racecourse area (total area = 21.68 ha) with installation of two channels

Vegetation type	Current area	Predicted 2030 area	Change
Saltmarsh	8.84 ha	5.19 ha	-3.65 ha
Saltmarsh / Mangrove	0	1.33 ha	+1.33 ha
Mangrove / Saltmarsh	0	1.57 ha	+1.57 ha
Total Saltmarsh	8.84 ha	8.09 ha	-0.75 ha
Mangrove	0	13.57 ha	+13.57 ha

The total extent of saltmarsh in the Pambula River estuary is estimated at 36.6 ha (0.366 km² in (Williams, West, Morrison, & Creese, 2006). The estimated reduction in saltmarsh extent in the racecourse area by 2030 of -0.75 ha represents a 2% loss in saltmarsh within the Pambula River estuary (Table 6-7).

White-fronted Chat

White-fronted Chats (*Epthianura albifrons*) have been recorded using the saltmarsh habitat in the racecourse area (see Section 6.3.2). Observations include juvenile White-fronted Chats, indicating that a breeding population is present (breeding occurs late July through to early March). The species is gregarious, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs and feeding mainly on flies and beetles caught from or close to the ground (DCCEEW, 2006). As the species is mostly sedentary and likely isolated from other populations (based on records from BioNet and the Atlas of Living Australia), changes to the saltmarsh habitat during the operational phase have potential to impact the White-fronted Chat population.

The NSW Species Profile for the White-Fronted Chat (DCCEEW, 2006) lists mangrove encroachment and sea-level rise as a threat for the conservation of the species due to its impacts on their preferred habitat. It is thus necessary in this assessment to differentiate the level of threat from 'do nothing' versus the Proposal.

Eastern Curlew & Curlew Sandpiper

The Eastern Curlew (*Numenius madagascariensis*) & Curlew Sandpiper (*Calidris ferruginea*) are Migratory shorebirds that migrate to the Australian coast during the Australian summer. Neither species breed within Australia as all breeding occurs almost exclusively in Siberia. Both species use intertidal sandflats, mudflats and saltmarsh as foraging and/or roosting habitat. While neither species have been recorded within the Proposal site; the closest recent records for both species occurs within the Merimbula Lake area, approximately 4.5 km north of the Proposal site.

The anticipated changes in vegetation composition during the operational phase may change the foraging and roosting habitat, with increased area and condition of tidal pools, inter-tidal mudflats and inter-tidal vegetation diversity, and improved ecosystem functionality (e.g. biota - crabs, worms, yabbies, etc.) and may have the effect of actually increasing foraging habitat quality for these species.

Risk assessment

A risk assessment is presented below (Table 6-8) to elucidate the risks associated with 'do nothing' approach versus the proposal scenarios. In terms of consequence descriptors (see Section 2.1.4 of Appendix F), 'the objective' is the conservation of threatened species and communities. In terms of likelihood descriptors (see Section 2.1.4 of Appendix F), 'the timeframe' for 'do nothing' approach is 25 years (2050), unless otherwise specified. The timeframe for proposal impacts is five years, unless otherwise specified.

The likelihood of an event occurring is based on the following climate projections taken from (CSIRO, 2025), unless otherwise referenced:

- Increased intensity of extreme rainfall events is projected, with *high confidence*.
- Time spent in drought is projected, with *medium confidence*, to increase over the course of the century.
- Extreme temperatures are projected to increase at a similar rate to mean temperature, with a substantial increase in the temperature reached on hot days, the frequency of hot days, and the duration of warm spells (*very high confidence*).
- By 2030 the projected range of sea-level rise for the cluster coastline is 0.07 to 0.19 m above the 1986–2005 level

- Mean sea level will continue to rise and height of extreme sea-level events will also increase (*very high confidence*).
- Incidence of cyclones is highly uncertain and unlikely to occur/increase in our region over the next 25 years (World Bank Group, 2021).

Under the 'do nothing approach, the unmitigated risk to conservation of saltmarsh, Swamp Oak Forest, White-fronted Chat, Curlew Sandpiper and Eastern Curlew from drought or extreme precipitation and sea level rise over the next 25 years is high to very high. Under the proposal, the unmitigated risk to conservation of the above entities is moderate to high. With mitigation measures, all these risks can be reduced although the treatment for the risk of 'do nothing' is the proposal itself.

Table 6-8 Risk assessment of 'do nothing' and the proposal scenarios

Threat	Consequence	Likelihood	Initial Risk Rating (low, medium, high, very high)	Potential Risk treatment	Consequence (2)	Likelihood (2)	Residual Risk Rating (low, medium, high, very high)
'Do nothing' approach							
Saltmarsh mass mortality event due to drought or extreme precipitation and flooding	Severe	Likely	Very high	Improve wetland drainage and tidal flow	Major	Possible	High
Sudden loss of Swamp Oak Forest due to drought or extreme precipitation and flooding	Severe	Possible	High	Improve wetland drainage and tidal flow	Major	Unlikely	Moderate
Sudden loss of saltmarsh habitat for White-fronted Chat and other birds	Severe	Likely	Very high	Improve wetland drainage and tidal flow	Major	Possible	High
Incremental loss of saltmarsh, Swamp Oak Forest and habitat due to sea level rise (overtopping levees)	Major	Possible	High	Increase tidal inundation at a slower incremental rate with engineering solutions (e.g. channels) ahead of sea level rise	Moderate	Possible	Moderate
Displacement of saltmarsh due	Major	Probable	Very high	Engineering solution to	Moderate	Probable	High

Threat	Consequence	Likelihood	Initial Risk Rating (low, medium, high, very high)	Potential Risk treatment	Consequence (2)	Likelihood (2)	Residual Risk Rating (low, medium, high, very high)
to mangrove encroachment with sea level rise				gradually introduce mangroves to site ahead of sea level risk			
Proposal – create channels							
Sudden loss of saltmarsh (and habitat) due to increased tidal inundation	Moderate	Possible	Moderate	Allow deposition to keep pace with tidal inundation rate	Moderate	Possible	Moderate
Significant loss of saltmarsh due to mangrove encroachment	Major	Possible	High	Engineering solution to slow transfer of mangrove propagules into racecourse area	Moderate	Possible	Moderate
Tidal wash causes erosion, lowering elevation in racecourse area and exacerbating habitat loss for saltmarsh	Major	Possible	High	Channels monitored and if required, lined to minimise erosion	Moderate	Unlikely	Low

Tests of Significance - Summary

Four Tests of Significance and two Assessments of Significance were undertaken to determine the significance of the Proposal on BC Act and EPBC Act listed threatened species and threatened ecological communities. The significance assessments take into consideration the above risk assessment, specifically that the 'do nothing' approach outweighs the risks posed by the Proposal. A summary of outcomes is provided below; see Appendix F for full ToS and AoS conducted.

Tests of Significance were conducted for the following five species / TECs:

- White-fronted Chat (*Epthianura albifrons*)
- Eastern Curlew (*Numenius madagascariensis*) & Curlew Sandpiper (*Calidris ferruginea*) (assessed together)
- Coastal Saltmarsh in NSW North Coast, Sydney Basin and South East Corner Bioregions, and Subtropical and Temperate Coastal Saltmarsh
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions

Tests of Significance determined that the White-fronted Chat population would move with the habitat changes in the racecourse areas as well as utilise saltmarsh habitat in the greater Pambula River wetland. Eastern Curlew (*Numenius madagascariensis*) & Curlew Sandpiper (*Calidris ferruginea*) were both determined not likely to face adverse impacts due to the proposed development as both species are highly mobile and part of a migratory population, and changes to local foraging and roosting habitat will be minimal in relation to the suitable habitat present within the Study area (namely, Merimbula Lake) and the closest record of either species within the last 10 years on both BioNet or ALA are approximately 4.5km from the Proposal site.

Coastal Saltmarsh TEC is expected to see a decrease in extent within the Proposal site as Grey Mangrove habitat replaces some of the saltmarsh habitat. It is predicted that lower elevation areas in the next five years post-Construction phase within the Operation phase will shift to mangrove habitat, reducing the saltmarsh habitat in the Proposal site by approximately by 0.75 ha. Within the Pambula River estuary system, the loss will account for approximately 2% of the TECs local extent. This TEC is unlikely to become extinct within the locality due to the Proposal and therefore a significant impact is not likely.

The Swamp Oak Floodplain Forest TEC in the racecourse area consists of *Melaleuca* and *Juncus* spp., which while saline tolerant will not tolerate long periods of saline inundation. This TEC is likely to be replaced by mangrove and/or saltmarsh in the southern portion of the Proposal area, leading to an estimate of 13% local loss although this is based on association with only one PCT. A significant impact is not considered likely because the patch in the racecourse area is likely an early succession community and as such contributes little to seed banks, and is considered of low importance.

6.3.4 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Vegetation management	Construction areas shall be stabilised as soon as practicable (progressively where possible).	X	X		X	
Aquatic habitat	- To minimise and document impact to saltmarsh, an operational Saltmarsh Management Plan would be developed by DPIRD prior to construction completion. It would run for five years and include: - Floating booms and vegetation plantings along the channels to reduce mangrove propagule movement. - Monitoring of mangrove health and extent at the Proposal site, including encroachment into the inner racecourse area. - Monitoring of saltmarsh health and extent at the Proposal site.	X	X	X	X	X
	A Section 205 permit under FM Act for harm to marine vegetation would be obtained prior to works, and works would be undertaking in accordance with the permit.	X	X	X	X	X
Threatened fauna	Liaise with Panboola Land Managers to develop a White-fronted Chat monitoring program for implementation post-construction by DPIRD, to document response of this species to hydrological and vegetation changes.	X		X	X	X

6.4 Aboriginal heritage

6.4.1 Approach

A Due Diligence assessment for Aboriginal heritage sites was undertaken by qualified archaeologists. It is summarised here and is provided in full in Appendix G.

The Aboriginal Due Diligence assessment was conducted in keeping with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (The Code of Practice). The Code of Practice provides a five-step approach to determine if an activity is likely to cause harm to an Aboriginal object, as defined by the *NSW National Parks and Wildlife Act* (1974).

The Code of Practice is aimed at providing an assessment of the potential for an activity to impact either a known Aboriginal object, or whether it is likely that unrecorded Aboriginal objects are present that may be impacted. The result of the process is aimed at providing the proponent with information about the likelihood that their activity would impact an Aboriginal object and whether an Aboriginal Heritage Impact Permit may be required.

Database search

A search of relevant heritage registers for Aboriginal sites and places provides an indication of the presence of previously recorded sites. A register search is not conclusive evidence of the absence of Aboriginal Objects, however, as it this would require archaeological survey. However, as a starting point, the search indicates whether any sites are known within or adjacent to the investigation area and provide oversight regarding the site types most commonly recorded within the locality. The Aboriginal Heritage Information Management System (AHIMS) provides a database of previously recorded Aboriginal heritage sites. A search provides basic information about any sites previously identified within a search area. The results of the search are valid for 12 months for the purposes of a due diligence level assessment.

On 27th November 2024 a search of the AHIMS database was undertaken over a 100 km² centred on the study area, as follows:

- Client Service ID: 954642
- MGA Zone 55
- Lat/Long: -36.9733, 149.8095
- Lat/Long: -36.9047, 149.9331
- Aboriginal objects:
 - 93
- Aboriginal Places:
 - 0

There were 93 Aboriginal sites recorded within this search area and 0 declared Aboriginal Places. Table 6-9 below shows the breakdown of site types and Figure 6-23 and Figure 6-24 show the location of the AHIMS sites in relation to the proposal area.

Table 6-9 Breakdown of previously recorded Aboriginal sites in the region

Site type	Number	Site type	Number
Artefact	23	Hearth, Artefact and Shell	1
Artefact and Fish Trap	1	Modified Tree	2
Artefact and Potential Archaeological Deposit (PAD)	3	PAD	3
Artefact and Shell Midden	36	Shell Midden	16
Burial	1	Restricted Site	4
Fish Trap	2	Total	93
Grinding Groove	1		

None of the archaeological sites currently recorded on AHIMS are located within or directly adjacent to the proposal area. One site (shown in Figure 4-2) appears within 1 km south of the proposal area, however it has been identified that eastings and northings for this site are inaccurate. . The site in question is 64-6-0157 (Pambula Beach 2) and is an open camp site located on Pambula Beach approximately 2.5 km east of the proposal area. There are no previously recorded sites within 1 km of the proposal area. This is likely due to both a lack of previous work in the area and due to the low-lying landscape having low potential to contain Aboriginal objects.

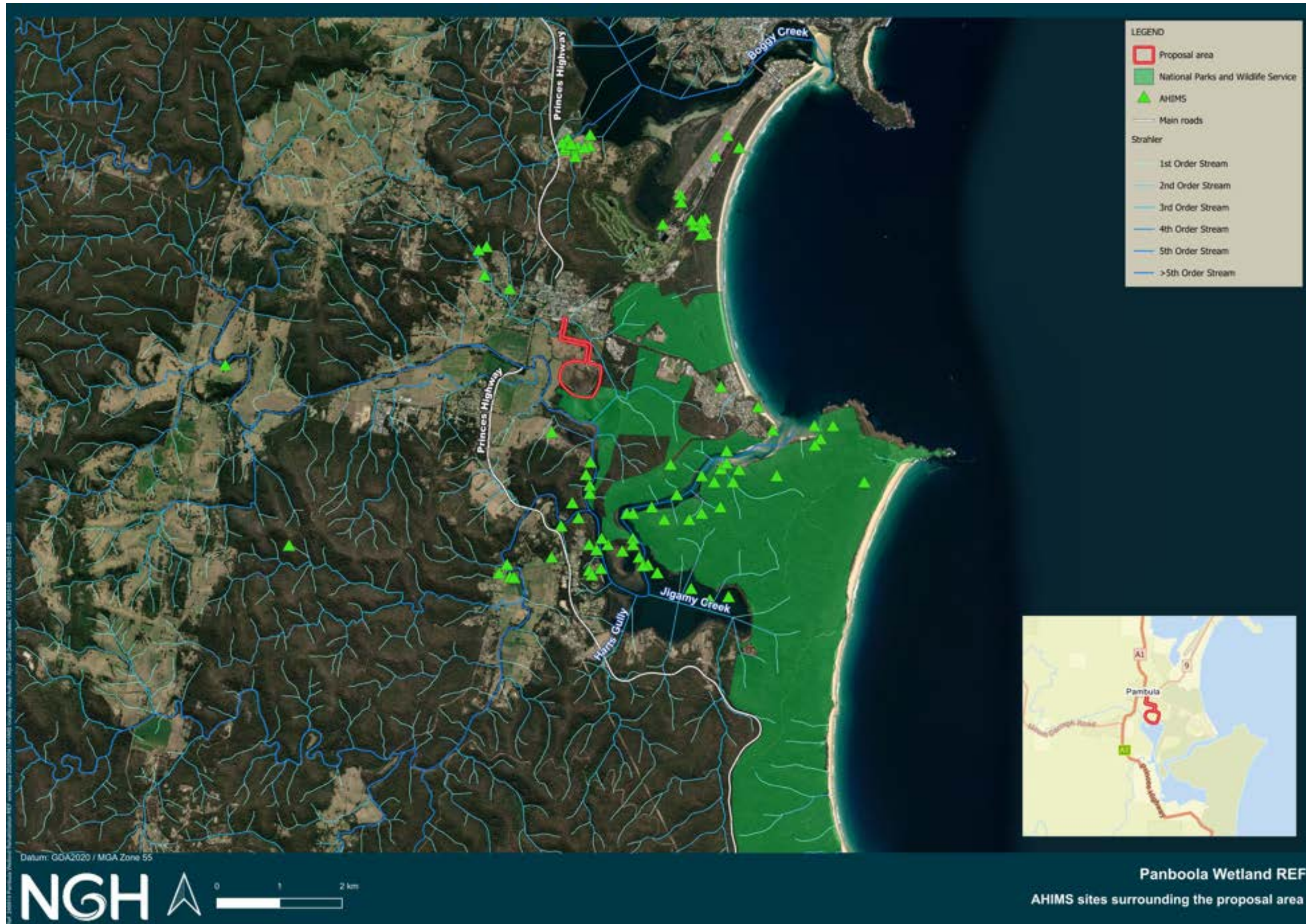


Figure 6-23 AHIMS sites surrounding the proposal area



Figure 6-24 AHIMS sites near the proposal area. Note 62-6-0157 is not plotted correctly and is located on Pambula Beach approximately 2.5 km east

Desktop assessment

The Due Diligence Code outlines a range of general landscape features that are more likely to contain Aboriginal objects. These include land that is:

- Within 200m of water
- Located within a sand dune system
- Located on a ridge top, ridge line or headland
- Located within 200m below or above a cliff face
- Within 20m of a cave, rock shelter or cave mouth.

The proposal area is located within an area of reclaimed land that is a part of the Pambula Wetlands. In addition to the land reclamation the racecourse was built between 1880- 1885.

Based upon the initial desktop assessment, using satellite imagery and topographic data, it appears that there is very low potential for Aboriginal objects to occur within the proposal area. The initial desktop assessment has not identified any sites located within or around the Pambula Wetlands, although this is unlikely to be a true representation of the presence or absence of sites. The paucity of registered sites in the immediate area is more likely due to a lack of previous development in the area that would require an Aboriginal heritage assessment. However, despite the high potential for Aboriginal sites to occur within 200 m of a water source, there is low potential within the proposal area. This is due to the topography being very low which is one of the factors contributing to this area being classed as a wetland. Typically habitation sites occur on elevated areas within close proximity to water sources and as there are no elevated areas within the Proposal Area the potential for habitation sites is low.

In addition to the low lying landform that contributes to the Pambula Wetlands some works have occurred within the proposal area in the past to modify the landscape. These modifications were undertaken in an effort to reclaim the land for use by the European settlers in the area. Land on the banks of the Pambula River to the west of the proposal area was previously used for the establishment of the Pambula Village (Figure 6-25). Although there is no evidence of any structures being built in this area the land was set aside as a recreation area and subsequent modifications were made to reduce flooding to the racecourse.

In summary, although the desktop assessment indicates that the Pambula River has high potential to contain Aboriginal objects, the proposal area itself has low potential to contain Aboriginal objects. Further, the previous modifications that have taken place since European occupation have had a significant impact to the landform and there is no potential for Aboriginal objects to occur. The nature of the proposed works being undertaken at this site would involve moderate ground disturbance and it is unlikely that it would impact on Aboriginal heritage objects.

A field assessment was not required in this instance due to the nature of the landform.

6.4.2 Potential impacts

As indicated above, the landform present within the proposal area is not conducive to human habitation. Therefore Aboriginal objects and the potential for Aboriginal objects are unlikely to occur. Further there are no mature trees suitable for modification likely to be present within the proposal area. The proposal area is a swampy landform at the interface between the Pambula River and the floodplain to the north of the river. It is likely that the area was used for resource gathering however, evidence of this is also unlikely to occur.

In summary, the swampy nature of the proposal area precludes the occurrence of Aboriginal objects. The nature of the proposed works is to remove previous land modifications including reclaimed land and therefore there is negligible potential for Aboriginal objects to be impacted.

The works can proceed with caution as there were no Aboriginal objects or areas of archaeological potential identified.

6.4.3 Safeguards and mitigation measures

The recommendations are based on the following information and considerations:

- Background Aboriginal heritage research into the area
- Assessment of landscape
- Land use and disturbance assessment
- Consideration of the impact of the proposed works
- Legislative context for the development proposal.

Review of Environmental Factors

Panboola Wetland Rehabilitation Works



Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Aboriginal heritage	- All works must be constrained to the areas of existing disturbance and any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment - DPIRD are to engage with Eden LALC regarding a Sites Officer being present for all earthworks - All access to the site and laydown areas must be within existing tracks and disturbed areas otherwise visual inspection of the sites by a qualified archaeologist is required - If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and the NSW Environment Line (1300 361 967) notified.	X	X	X	X	

6.5 Non-Aboriginal heritage

6.5.1 Approach

A desktop assessment was undertaken to determine the heritage values of any objects or places within the proposal site. Heritage database searches were conducted on 18th December 2024 and included:

- The NSW State Heritage Inventory (SHI) (for items listed on the State Heritage Register, Heritage and Conservation Registers of State Government agencies and local heritage items on the Bega Valley Council Heritage Schedule)
- The Australian Heritage Database (for items listed on the National and Commonwealth Heritage Lists and World Heritage List).

Australian Heritage Database

Within the area of the Bega Valley LGA there are 92 items listed as Indicative Places on the (non-statutory) Register of the National Estate with the exception of the Bundian Way Area (Bombala) which is located on the National Heritage List. Within the surrounds of the Pambula township 9 items are listed on the Register of the National Estate. None of these listings are located within, or adjacent to the proposal area.

State and local heritage

There are 43 items of State or Local heritage significance within or immediately adjacent to the proposal. Racecourse, grandstand, show pavilion and associated buildings (LEP #1227) is the closest listed item of non-Indigenous heritage, located within the proposal site.

6.5.2 Existing environment

The site of Pambula Village was originally located on the flats on the northern side of the Pambula River as can be seen in Figure 6-25. The village was later moved to higher ground after a couple of floods changed the course of the river in 1851 and 1860. The proposal area appears to have been included within the original Pambula village bounds but was reserved for recreation in 1879 (Figure 4-3). This was made official in 1880 by the Governor of NSW with the purpose being for its use as a racecourse and racehorse training ground (southeasthistoricheritage.blogspot.com). An addition to the recreation area was added in 1892. The racecourse was constructed in 1880 but was continually inundated with water and an “embankment” was built to stop the tidal flow in 1891. In 1997 race meets moved to the new facilities in Kalaru due to continued periodic inundation. In addition to its use as a racecourse the Pambula Rifle Club also used the area as a rifle range from 1893 to 1919 (southeasthistoricheritage.blogspot.com). Since the 1990s the area has been managed by the Panboola Land Managers for nature conservation, passive recreation and maintenance of its heritage. The racetrack has been maintained and stabilised, distance markers and some of the running rails restored, weeds and feral animals controlled, native vegetation reestablished and protected (including saltmarsh) and visitor use managed. Figure 4-4 illustrates disturbance within the Proposal Area caused by the racecourse and levees clearly visible through digital elevation modelling.

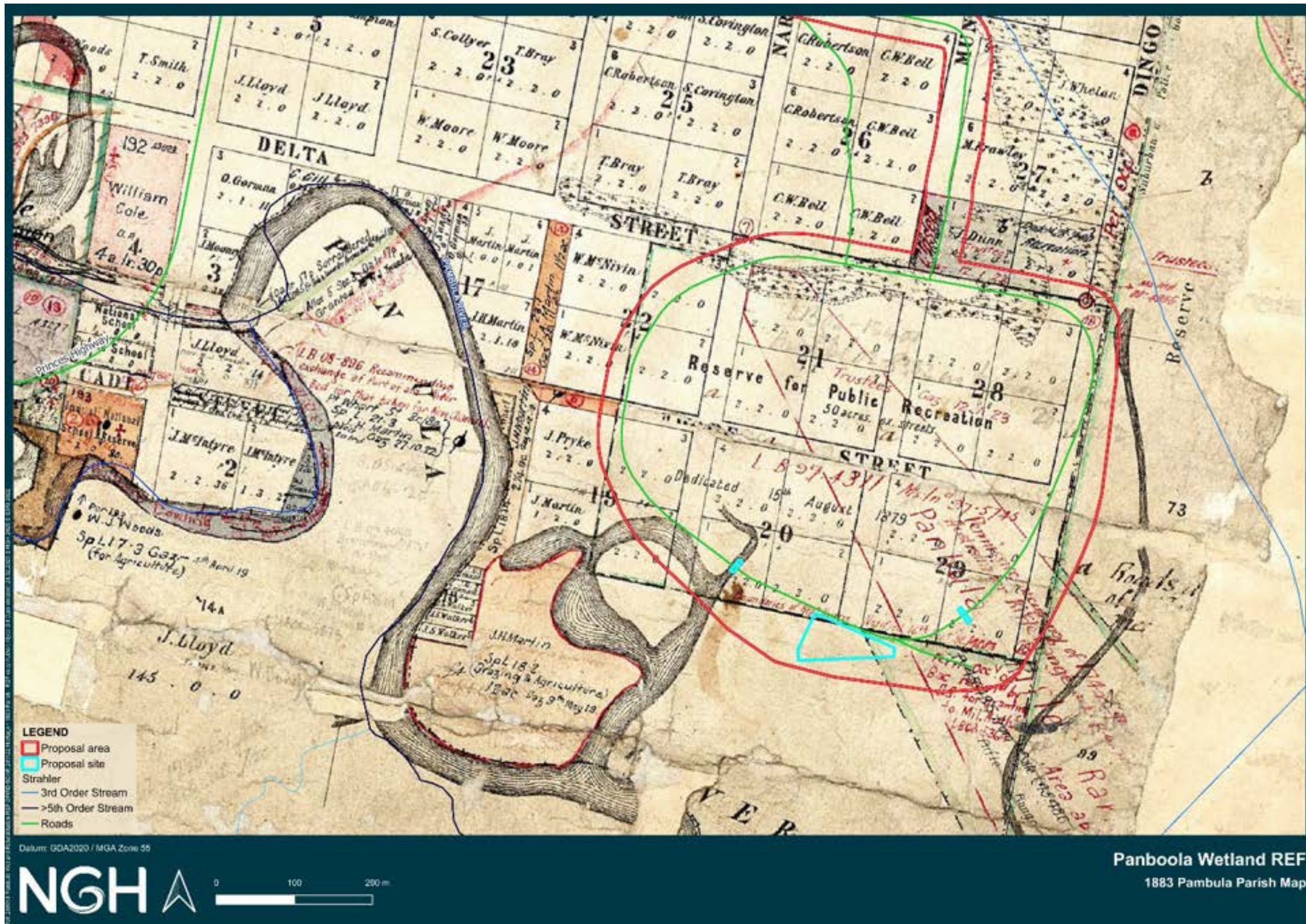


Figure 6-25 1883 Pambula Parish map

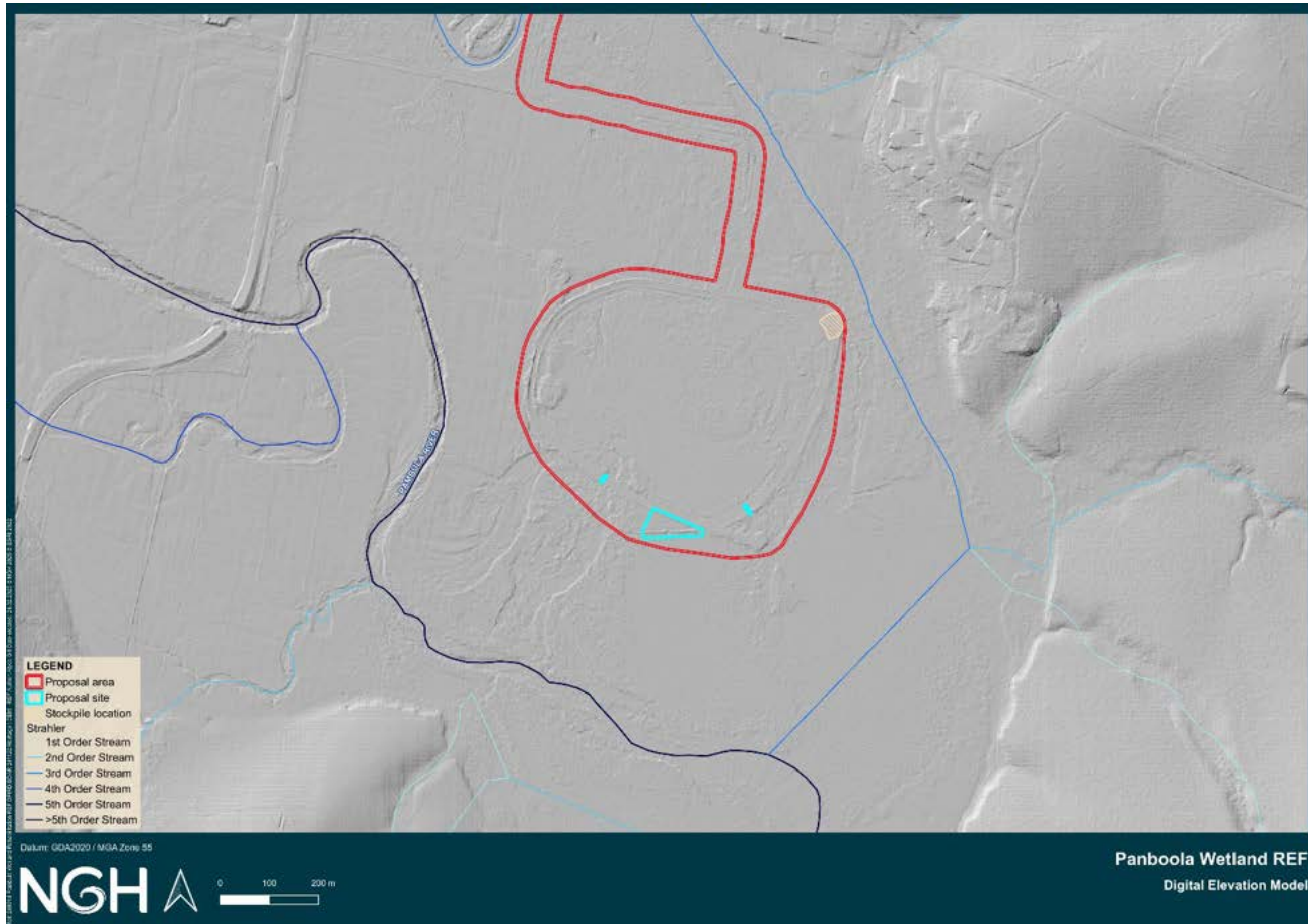


Figure 6-26 Digital Elevation Modelling over the proposal area



Figure 6-27. 1989 historical aerial imagery over the proposal area

6.5.3 Potential impacts

The proposal would involve the replacement of existing pipe culverts intersecting the locally listed heritage racecourse (LEP #I227). The proposal is unlikely to impact any other infrastructure components heritage listed for the site ie grandstand, show pavilion and associated buildings. The proposed impacts to the racecourse track would include removal of the existing culverts and portion of the racetrack surface. The racetrack would be replaced with a timber steel bridge over a channel in the culvert replacement locations only. In recent years the racetrack has undergone previous works including the placement of fibre reinforced plastic boardwalk to assist with stabilisation and drainage.

The introduction of the bridges would not differ to the recent upgrades that have occurred across the racetrack. The proposed upgrades to the racetrack surface following replacement of the culverts have been designed to minimise impacts to the aesthetic value of with the heritage listed item.

The proposed levee works would not impact on any heritage items and this includes no impacts to the racecourse.

Further assessment of heritage impacts relating to the proposed works is not warranted. The proposal is not considered likely to have a significant impact in accordance with the NSW *Heritage Act 1977*, the EP&A Act, or the EPBC Act, in terms of heritage.

6.5.4 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Unexpected Heritage Finds Procedure.	- In the event that any unexpected substantial intact historic archaeological relics of State or local significance are unexpectedly discovered during the project, the following management protocols will be implemented: - Works at that identified heritage location will cease with an appropriate buffer zone of at least 20 m to allow for the assessment and management of the find. All site personal will be informed about the buffer zone with no further works to occur within the buffer zone. - A heritage specialist shall be engaged to inspect and assess the item. - For items determined to be historic relics, work must remain ceased in the affected area and the Heritage Council must be notified in writing. This is in accordance with Section 146 of the <i>Heritage Act 1977</i> (NSW). - Depending on the nature of the discovery, additional assessment may be required prior to the recommencement of work in the area. At a minimum, any find should be recorded by an archaeologist.	X	X	X	X	

6.6 Noise and vibration

6.6.1 Approach

The proposal has the potential to affect the community due to noise and vibration during construction. The TfNSW Construction Noise Estimator Tool (CNET) was used to assess the worst-case noise impact scenario during construction as per the TfNSW Construction Noise and Vibration Guideline (CNVG) (2016) and Interim Construction Noise Guidelines ((ICNG) (DECC, 2009).

The following key factors were identified during assessment:

- Appropriate background noise levels
- Noise management levels (NMLs)
- Potential noise and vibration impacts
- Reasonable safeguards and mitigation measures.

The CNET was used to identify these factors for each time period of the proposal's construction. Noise area category R1 was chosen as the representative noise area for the proposal due to the following factors determining background noise levels:

- Negligible transportation

The rating background level (RBL) for Category R1 as per the CNET is as follows:

- Day (standard hours): 40 dB(A)
- Evening (outside standard hours): 35 dB(A)
- Night (outside standard hours): 30 dB(A).

The proposed works were modelled to determine the noise impact on nearby receivers during construction. The three noisiest plant required for the works are assumed to operate concurrently as the 'worst case scenario' and are shown in Table 6-11.

A desktop assessment of construction vibration impacts was undertaken using the minimum working distances defined in *BS 7385 Evaluation and Measurement for Vibration in Buildings*.

6.6.2 Existing environment

The proposal is located in a rural recreational area within the Bega Valley LGA. The surrounding land use is recreation and agriculture on the outskirts of the Pambula township. Construction activities would traverse the following land zoned under the Bega Valley LEP 2013: C2 Environmental Conservation and C1 National Parks and Nature Reserves.

The closest residential receiver to the proposal site is 462 m north of the site and 146 m west of the compound site (R1). The closest sensitive receivers would be the users and visitors of the wetland. An industrial area is 668 m north east of the proposal site and the Pambula Township is 966 m north of the proposal site. See Figure 6-28 below for the locations of these receivers.

The dominant sources of noise experienced in the proposal area include:

- Local traffic noise
- Sounds associated with a recreational area
- Sounds associated with a rural environment (e.g. farm machinery and livestock)
- Sounds associated with a natural environment (e.g. wind, vegetation movement and birdsong).



Figure 6-28 Sensitive receivers

6.6.3 Criteria

During construction the NMLs are set as per the ICNG (DECC, 2009) to be 10dB(A) above the RBL during standard hours and 5dB(A) above the RBL for out of hours for residential and industrial areas. Recreational areas have set NMLs outlined in the ICNG (DECC, 2009).

As such, based on the existing background noise levels provided in Chapter 6.6.1, the NMLs outlined in Table 6-10 would apply to the proposal:

Table 6-10 RBLs and NMLs for the proposal

Location	Time of day	RBL dB(A)	NML dB(A)
Residential receivers	Day (0700-1800)	40	50
	Evening (1800-2200)	35	40
	Night (2200-0700)	30	35
	Highly noise affected	NA	75
Industrial area	Day (0700-1800)	55	65
	Evening (1800-2200)	50	60
	Night (2200-0700)	45	55
Passive recreation area	Day (0700-1800)	NA	60
	Evening (1800-2200)		
	Night (2200-0700)		NA

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives and British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

Section 3.2.2 and 3.3.6 provides a list of general plant and equipment that may be used to carry out the proposed works. The works have been separated into three scenarios based on the equipment to be used and distance from receivers. The lists of items that have been selected as the three noisiest equipment used to model the ‘worst-case’ noise scenario per scenario in the CNET is outlined in Table 6-11.

Table 6-11 Construction noisiest associated plant and sound emissions

Noisiest associated plant/equipment	Sound emission ((dB(A))	Total Sound emission ((dB(A)) (from CNET) including penalties
Scenario 1: Channel and bridge construction within Panboola Wetland		
Pile driver	121	122

Noisiest associated plant/equipment	Sound emission ((dB(A))	Total Sound emission ((dB(A)) (from CNET) including penalties
Skidsteer	110	
Dump truck	110	
Scenario 2: Levee works in Beowa National Park		
Tracked Excavator (5T)	95	113
Skidsteer	110	
Dump truck	110	
Scenario 3: Stockpile activities		
Tracked Excavator (20 T)	105	114
Skidsteer	110	
Dump truck	110	

6.6.4 Potential impacts

Construction noise

The magnitude of off-site noise impact associated with construction would be dependent upon several factors:

- The intensity and duration of construction activities
- The location of construction activities
- The type of equipment used
- Intervening terrain
- The prevailing weather conditions.

The CNET model provides a conservative estimate of noise generation, assuming that noise is generated uniformly and consistently over the proposal site. However, construction machinery would likely move about the proposal area, variously altering the directivity of the noise source with respect to individual receivers. During any given period, the machinery items to be used in the proposal area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Finally, certain types of construction machinery would be present in the study area for only brief periods during construction. Hence, noise impacts are likely to be less severe and widespread than modelled.

The construction activities are anticipated to be undertaken during standard daytime hours, therefore only day NML have been used. Table 6-12 present the predicted noise levels of the works at each identified receiver. The distance for the recreational users of the site from the proposal site and stockpile site, is based on the closest location on where the site would be closed to the public (Figure 3-2).

Table 6-12 Noise estimates for works during standard hours

Sensitive receivers	Distance from Scenario (m)	NML, db(A)	Predicted noise level	NML Exceedance db(A)
Scenario 1: Channel and bridge construction within Panboola Wetland				
Recreational users	185	60	73	23
R1	462	50	63	13
Industrial area	668	65	59	-
Pambula residences	966	50	55	5
Scenario 2: Levee works in Beowa National Park				
Recreational users	328	60	53	-
R1	500	50	49	-
Industrial area	760	65	44	-
Pambula residences	1000	50	41	-
Scenario 3: Stockpile activities				
Recreational users	320	60	54	-
R1	146	50	62	12
Industrial area	275	65	56	-
Pambula residences	572	50	48	-

During Scenario 1, NML's expected to be exceeded for the recreational users, R1 and Pambula residences. The exceedances for Pambula residences are considered minor and unlikely to be noticeable. The potential exceedances for the R1 and recreational users would be moderate. No receivers would be highly affected by noise (>75 db(A)). The exceedances during this scenario are like due to the piling works, which would approximately take 2 -3 days to complete at each bridge site. Therefore, any noise exceedances would be short term and limited to this scenario. Additional mitigation measures should be implemented, as per the CNVG, such as notification to the receivers.

Works at the stockpile site (Scenario 3) has potential to have noise impacts on R1 during construction. Additional mitigation measures should be implemented, as per the CNVG, such as notification to the receivers. Noise impacts from the stockpile site would be minimal for all other receivers.

Modelling of anticipated construction noise showed noise impacts on nearby sensitive receivers for Scenario 2 within Beowa National Park would be minimal with no predicted noise exceedances. It requires no more than standard mitigation measures be implemented.

The proposal has potential to impact on wildlife and visitors to Beowa National Park via the generation of noise. The works are considered short term and temporary (6 weeks) and manageable with the implementation of measures proposed below. It is considered unlikely the noise generated would have a significant impact wildlife within Beowa National Park during construction.

Construction vibration

The minimum working distances from sensitive receivers for typical items of vibration intensive plant are called “cosmetic” damage. The minimum working distances for cosmetic damage must be complied with at all times, unless otherwise approved by DPIRD or under the environmental license as relevant. Cosmetic damage distance applies to cosmetic damage of typical buildings under typical geotechnical conditions.

Generally, the proposed plant and equipment for the proposal would not be expected to result in potential cosmetic damage given the minimum working distances as defined in *BS 7385 Evaluation and Measurement for Vibration in Buildings*. No equipment proposed to be used onsite is considered vibration intensive plant.

Operation

The proposal is not anticipated to change the existing noise of the site.

6.6.5 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	X	X	X	X	
	All sensitive receivers likely to be affected will be notified at least 14 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	X	X	X		

6.7 Socio-economic, visual and access impacts

6.7.1 Existing environment

Community and land use

The proposal site is located on the outskirts of Pambula (Figure 1-1). Pambula has a population of 1,627 forming part of the total population for the Bega Valley LGA which was estimated at 35,942 in 2021 (ABS, 2021).

The three largest sectors of employment within the Bega Valley LGA are Healthcare and Social Assistance, Retail Trade and Construction, combined employing 36.7% of the working population in the LGA.

The area surrounding the proposal comprises of land zoned as C2 Environmental Conservation and C1 National Parks and Nature Reserves. The main stakeholders in the vicinity of the proposal site include the Panboola Land Managers (PWHR Crown Land Managers), NPWS and recreational users of the Panboola wetlands.

Panboola Wetland is maintained by a group of volunteers and is being rehabilitated for the purposes of nature conservation, protection and restoration of habitat for birds and other indigenous flora and fauna, and for community education and passive enjoyment. It has a system of walking tracks leading visitors to saltmarsh, historic points, information panels and bird watching areas.

The proposal area and land within the immediate vicinity of the site is used for nature conservation, protection of native flora and fauna and recreational activities including walking, cycling, bird watching, community education and passive enjoyment. The racecourse is used weekly as a Park Run course.

The Pambula River, which is adjacent to the proposal site is an important waterway within the region, socially and economically. Downstream of the proposal site, oyster leases occupy the river and estuary and it is a popular fishing, boating and recreation area for the region. The closest oyster lease is 700 m south of the proposal site.

Landscape character

Visual amenity is subjective to the extent that landscape features can be perceived differently by different people. What some people may deem to be visually attractive, others may perceive as visually intrusive.

The landscape consists of a coastal environment with evidence of previous human disturbance and use of the site. The wetland is dominated by saltmarsh and circled by the old racecourse track. The adjacent National Park is a vast tidal aquatic landscape of wetlands and mangroves. The higher areas of the proposal area are swamp scrub or freshwater wetlands that flow into agricultural paddocks and Pambula township. A previous go kart track is located within wetland area. Previous buildings associated with the racecourse are still presented including pavilion and grandstand in the north of the proposal area.

The only receivers that would have views of the proposal site are the recreational users along the racecourse. Due to the topography of the site and existing vegetation no residences or vehicles would have views.

Traffic and access

The proposal site would be accessed from existing vehicular access to the Panboola Wetlands from Bullara Street, which is a sealed two lane local road. Within the proposal area, Merimbola Street and Munje Street are unsealed one way tracks to a gate entry onto the racecourse. These would only be used by visitors and volunteers to the wetland.

There is no vehicular traffic on the racecourse. The racecourse and adjacent to the Merimbola Street and Munje Street tracks within the proposal area are pedestrian and cyclist paths.

There is one private driveway within the proposal area, along Munje Street.

6.7.2 Potential impacts

Construction

The following socio-economic impacts are assessed in other sections of the REF:

- Noise and vibration, including sleep disturbance (Section 6.6).

During construction, a portion of the racecourse would not be accessible to the public (refer to Figure 3-2). This would impact recreational users of the wetland, however the closure would be temporary and other sections of the wetland including walking tracks would remain open for use. Notification to recreational users including Park Run organisers would be provided prior to works commencing. The closure of the proposal site would ensure safety of the public from the movement of machinery and excavation works.

The proposal would not require the acquisition or access of any part of adjacent private properties as part of the proposal.

If soil and water impacts are not managed appropriately, they have potential to impact oyster leases downstream of the proposal. Decreasing the water quality has potential to impact oyster health and production and if significant impacts occur, can stop the harvest of some leases. This would create financial and economic impacts for the local growers and industry. The potential impacts on water quality are considered manageable with the implementation of measures outlined in Section 6.1 and 6.2 of this REF. Local oyster farmers will be sent a copy of the REF for information.

Construction of the proposal would result in changes to the landscape primarily through:

- Vegetation removal
- Establishment of construction compound and stockpile site
- Earthworks/excavations
- Vehicles and machinery use and storage.

The most noticeable vegetation removal would be trees on sections of the levee to be removed. The two culvert replacements require minimal vegetation removal, however would involve further excavations and ground disturbance. It is unlikely the proposal site would be visible to recreational users as this section of the racecourse is to be closed off from the public during the works. Movement of machinery and equipment may be visible across the wetland to the proposal site from recreational users. These expected impacts during the construction phase would be temporary and confined to the construction period.

The proposal would be expected to have minimal impact on local traffic conditions during construction. There would be a minor increase in traffic at the start and end of construction with the delivery and removal of equipment and materials offsite. The compound and stockpile site are located within the proposal area and would be closed off to the public.

It is considered unlikely to be any traffic disruptions to local traffic from the proposal.

As above the dedicated cycleways or pedestrian footpaths within the proposal site would be closed to the public but other areas within the proposal area would remain open for use. Access for the adjacent private residence along Munje Street would be maintained throughout construction.

Operation

The proposal is unlikely to change the accessibility of the proposal area. The two culvert replacements within the racecourse would change those portions of the racecourse surface from dirt to timber and steel bridges. This would not prohibit current use of the racecourse by pedestrians and cyclists. The bridges would break up the views of the currently racecourse dirt track. It is likely the culvert replacements would improve access into the future with sea level rise as the channels would provide better movement of tidal flows into the wetland rather than overtopping the racecourse walking track.

The proposed small levee works are unlikely to change the visual character of that site. The levee would still exist and be occupied by vegetation. The vegetation behind the levee may change composition slightly with the increase of tidal inundation. However, the species present already are influenced by tide. This change and potentially impacts are further discussed in Section 6.3. There is potential that the increase in tidal inundation into the inner racecourse wetland would gradually change the vegetation composition from saltmarsh to mangroves and potentially the visual character of the site. Changes in vegetation composition can potentially change the bird and other fauna that visit the wetland and attract visitors to the site. This change and predicted impacts are further discussed in Section 6.3. In regard to socio-economic impacts, it would potentially impact the use of the site into the future. The site is unlikely to change its recreational use, however the existing bird watching areas for certain species may adjust over time with the vegetation changes and sea level rises. However, it is considered the proposal would improve the health of the existing coastal wetland area and increase its future resilience to climate change impacts. Improving the health and resilience of the site has the potential to improve the overall biodiversity and recreational values of the site, including introduce other fauna species to the site.

All temporary traffic and access management features would be removed after completion. Any stockpile and compounds or disturbed areas would be returned to its original state after construction and no materials or waste would be left behind.

6.7.3 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Land Use	Any land that is required for access as part of the proposal should be rehabilitated and restored to its prior condition on completion of the works.	X	X		X	
Visual	- Work areas shall be maintained in an orderly manner - On completion of the works, all vehicles, construction equipment, materials, and refuse relating to the works shall be removed from the work site(s) and any adjacent affected areas - All exposed areas shall be stabilised and revegetated with groundcover as soon as possible. Remove temporary erosion and sediment controls from the site once landforms have been assessed as stable.	X	X		X	X
Access	- Access to properties with driveways beginning in the proposal site will need to be maintained throughout the period of works - Recreational users will be notified before commencement of works about the proposed works and any necessary changes to access.	X	X		X	

6.8 Climate and air quality

6.8.1 Existing environment

A search of the Australian Government's National Pollutant Inventory's 2022/2023 data within the Bega Valley LGA was undertaken on the 3 February 2025.

According to the results, the largest pollutants emitted in the LGA are carbon monoxide, particulate matter <10µm and oxides of nitrogen. The closest emitter is the Merimbula Sewage Treatment Plant, approximately 2.7 km north of the proposal site. Some dust generation could be expected from adjacent rural activities and use of unsealed roads during dry weather periods.

Considering the low density of settlement and lack of polluting industries in the general locality of the proposal site, the existing air quality is generally likely to be of high quality. This is verified by air quality readings at Merimbula Airport, which show air quality has been 'good' for at least the last seven days (as of 3 February 2025).

Figure 6-29 below shows the average minimum and maximum temperatures for the region (taken from the Merimbula Airport Automatic Weather Station (AWS)). The region experiences moderately warm weather during the summer months. Panboola wetland is characterised by temperate climate with lower rainfall compared to other towns along the coast of NSW (Cavanagh and Richardson, 2015). The median daily rainfall was similar throughout the year with wetter periods during summer months and drier periods during winter and spring months (Figure 6-30).

Evaporation data for Panboola was available from the SILO dataset provided by QLD Government (2023). The daily evaporation data shows a clear relation between seasonality and evaporation rates. Higher daily evaporation rates are observed in summer (4 to 8 mm/day) and the lower evaporation rates are observed in winter (1 to 2 mm/day).

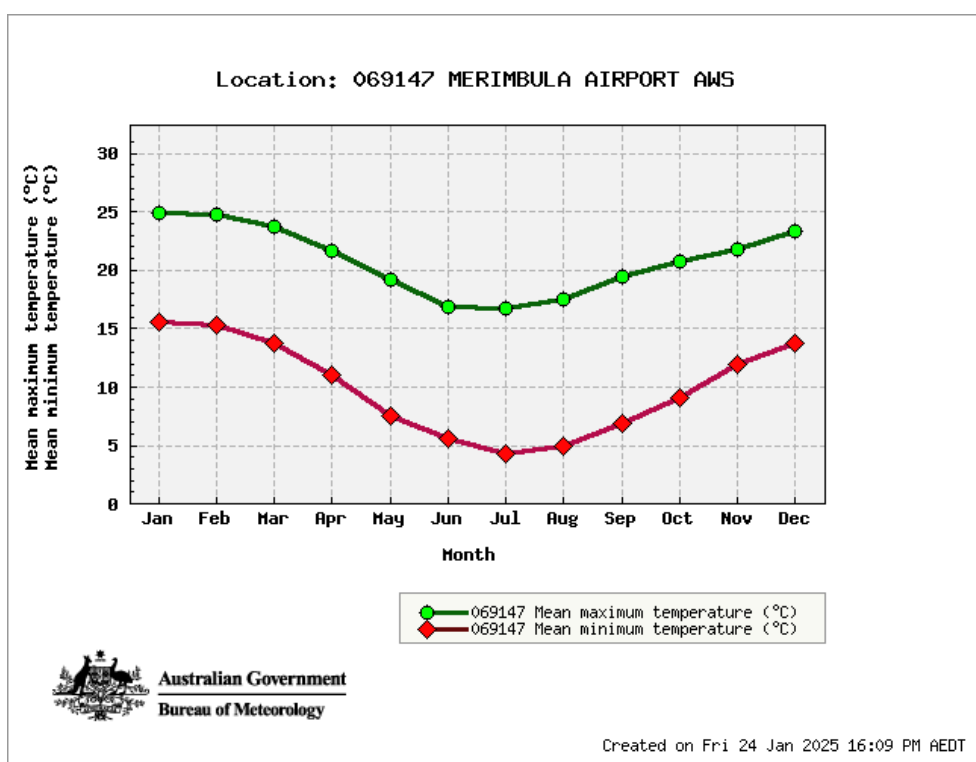


Figure 6-29 Mean temperature data for Merimbula Airport AWS

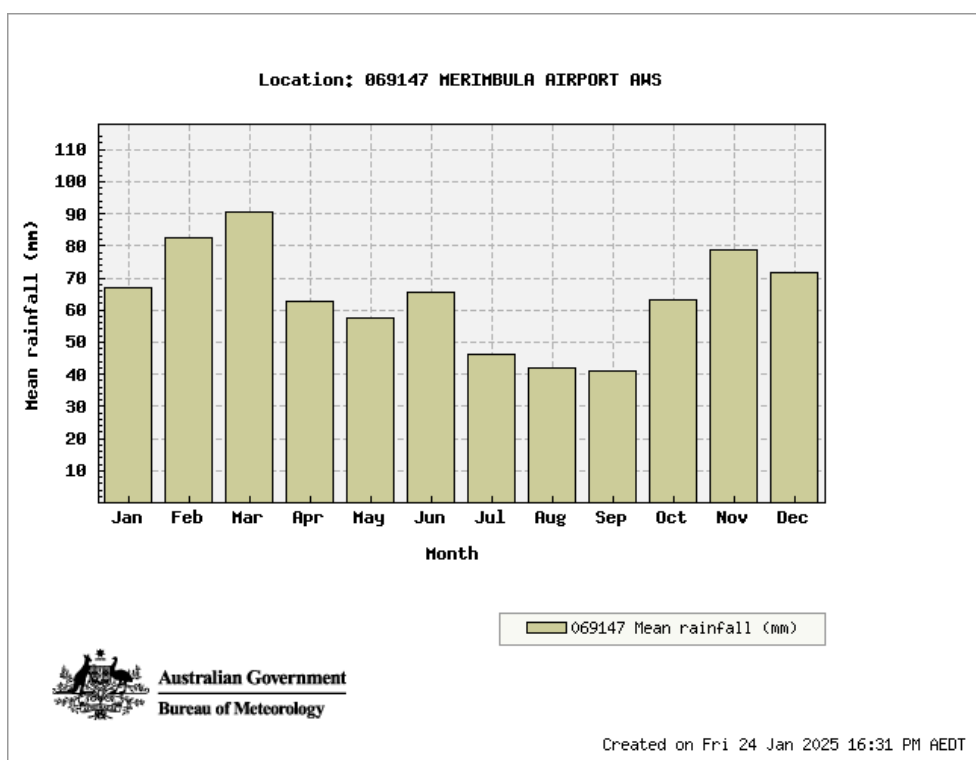


Figure 6-30 Mean monthly rainfall data from the Merimbula Airport AWS

Climate change and sea level rises in regard to this proposal are discussed in Section 6.2 and 6.3 of this REF.

6.8.2 Potential impacts

Construction

During construction the following activities would potentially result in air quality impacts:

- Stripping and stockpiling topsoil
- Earthworks
- Transport and handling of soils and other materials
- Use of construction vehicles and equipment, generating exhaust fumes.

Air quality impacts to sensitive receivers would be considered unlikely given the distance from and vegetation screening between likely excavation areas the closest sensitive receivers. The works area would also be closed off to the public and not accessible.

There would also be potential air quality impacts associated with exhaust fumes from machinery (e.g. delivery vehicles, construction plant and equipment). Emissions from construction vehicles/equipment would be minor and short term.

With the implementation of mitigation outlined below, air quality impacts arising from the works would be considered minor.

Operation

No impacts anticipated.

6.8.3 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Air quality	• Works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates can not be controlled • Vegetation or other materials are not to be burnt on site • Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation • Vehicles and equipment are to be maintained in good working order • Smoky emissions would be kept within the standards and regulations under the Protection of the Environment Operations Act 1997 that no vehicle shall have continuous smoky emissions for more than 10 seconds • Monitor work areas and stockpiles for dust generation and seed/cover/spray to suppress • Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust • Do not leave vehicles idling.	X	X	X	X	

6.9 Waste minimisation and management

6.9.1 Policy

Waste Management would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act). The objectives of this Act are:

- To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development
- To ensure that resource management options are considered against a hierarchy of the following order:
 - Avoidance of unnecessary resource consumption
 - Resource recovery (including reuse, reprocessing, recycling and energy recovery)
 - Disposal
- To provide for the continual reduction in waste generation
- To minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste
- To ensure the efficient funding of waste and resource management planning, programs and service delivery
- To achieve integrated waste and resource management planning, programs and service delivery on a state-wide basis
- To assist in the achievement of the objectives of the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act).

6.9.2 Potential impacts

Construction

Waste would be generated during excavation and construction/installation activities. It is expected that the following waste would be generated:

- Solids and rock from excavations
- Spoil from partial levee removal
- Concrete and rock from pipe removal
- Packaging of equipment and building supplies
- Excess material such as cement, concrete, timber
- General waste from staff (lunch packaging, portable toilets etc)
- Vegetation cleared from construction sites. This may include weeds, the management of which must be undertaken in accordance with local control plans and/or the weed's classification as per the *Biosecurity Act 2015* (NSW)
- General solid waste.

Impacts relating to clearing of vegetation are covered in Section 6.3. Cleared vegetation would be mulched and reused on site where possible to stabilise disturbed areas. Any excess vegetation would be taken to a waste facility.

There are not expected to be either significant quantities of waste, or any problems with its storage, transport or disposal. All excavated material would be reused on site where practicable.

Waste that is not adequately managed can have a range of potential impacts, including:

- Loss of potentially recoverable resources
- Contamination of the site and surrounding environment (including potential visual and ecological impacts)
- Offsite contamination due to inappropriate disposal or handling by unlicensed operators.

Under the POEO Act, it is an offence to 'without lawful authority, wilfully or negligently dispose of waste in a manner which harms or is likely to harm the environment'. The requirements of the POEO Act would be met during the proposed works. The impacts of waste generation from the proposed works would not have a significant impact on the environment. Any potential impacts would be minimised through the implementation of the mitigation measures below.

Where possible, all of the new and purchased materials to be used would be sourced within the Bega Valley and wider South Coast region, as close to the work site as practical to reduce transport costs, including fuel usage.

Operation

No impacts anticipated.

6.9.3 Safeguards and mitigation measures

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Waste generation	- Waste shall be managed in accordance with the <i>Protection of the Environment Operations Act 1997</i>. A Waste Management Plan shall be prepared for construction as part of the CEMP which includes the following: - Identify all potential waste streams associated with the works - Identify opportunities to minimise the use of resources, and to reuse and recycle materials - Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities. Waste must be disposed of at a facility able to accept the waste - Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) - Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>). - Demolition and waste materials would be characterised in accordance with the NSW EPA Waste Classification Guidelines 2014 and segregated to ensure opportunities for reuse, recovery and recycling of wastes are optimised in accordance with the POEO Act - General waste and recycling receptacles will be provided onsite - Working areas shall be maintained free of rubbish and cleaned up at the end of each working shift - Toilets (e.g., portable toilets) will be provided for construction workers.					
		X	X	X	X	

Review of Environmental Factors

Panboola Wetland Rehabilitation Works

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Contaminated soil, water and materials	If during construction activities contaminated soils are uncovered or are suspected to have been uncovered due to odour or discolouration of soils, works will cease immediately, the Project Manager will be contacted and the appropriate management requirements determined.	X	X		X	

6.10 Cumulative impacts

There is a requirement under section 171(2) of the Environmental Planning and Assessment Regulation 2021 to take into account any cumulative environmental impacts with other existing or likely future activities. Cumulative impacts relate to the combined potential effects of different impact areas of the proposed works as well as the potential interaction with other proposals in the local area.

6.10.1 Existing environment

The Bega Valley Shire Council DA Tracker was searched on the 3 February, and there is numerous residential development applications, however they are unlikely to cause cumulative impacts with the proposal.

A search of the NSW Major Projects Portal yielded no results in the Bega Valley LGA that are current project or would contribute to cumulative impacts.

6.10.2 Potential impacts

Key adverse cumulative impacts for the proposed works relate to the combined impact from proposed construction activities on the local environment. This is namely potential loss of a small area of vegetation and potential water quality risks and loss of topsoil through excavation activities. Additionally, there may be cumulative social impacts, related to access impacts, noise and dusts, for users of the wetland.

There is unlikely to be a cumulative impact of the proposal with another proposal within the area, due to the small scope of works and isolation of the worksite.

The positive cumulative impacts associated with the proposal would increase the health of the existing coastal wetland area increasing its resilience, and that of the wider estuary, to future flood and sea level rise impacts. These benefits offset to some degree the environmental impacts of the works and therefore the cumulative impacts of this proposal on balance, are considered to be acceptable.

6.10.3 Safeguards and mitigation measures

No additional mitigation measures are required to manage cumulative impacts

7. Summary of safeguards

Table 7-1 Key environmental safeguards

Timing: P - Preconstruction, C - Construction, O - Operation

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
General	A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.	X	X	X	X	
Soil management, erosion and sediment control	- Areas of potential soil exposure will be minimised - An Erosion and Sediment Control Plan (ESCP) is to be prepared. The plan will be site-specific, taking into account the specific nature of the works and surrounding environment at each alignment section. The plan will be prepared in accordance with the Blue Book (Landcom, 2004) - Sediment and erosion controls will be maintained during the construction works and adapted if required to ensure the objectives of the Blue Book (Landcom, 2004) are met - Construction works not to be carried out in periods of forecast heavy rains or strong/gale wind warnings - Works will be only undertaken during low tide - Where possible, topsoils and subsoils will be removed and stockpiled without mixing the two, in a location or manner that will facilitate the return of soils to a location as close as possible to their original sources. Disturbed areas will be dressed with top soil to assist rapid revegetation of the disturbed surfaces	X	X	X	X	

	• Stockpiles will be appropriately controlled by sediment fencing or other materials identified in the Managing Urban Stormwater – soils and Construction Vols 1 and 2, 4th Edition (Landcom, 2004) – Blue Book to ensure sediments do not enter a waterway • Stockpiles will be covered within 10 days in accordance with the Blue Book (Landcom, 2004) • Vehicle and machinery movements will be restricted or rationalized to access tracks as far as possible • Vehicles and machinery must not be parked on native vegetated areas. Staff shall park at designated parking areas, existing cleared areas or exotic vegetated areas • Remediate and rehabilitate all areas disturbed during construction including road surfaces to their pre-works condition as soon as practicable but no more than 10 days after completion of excavation works.					
Pollution/contamination	• An Acid Sulfate Soils Management Plan will be prepared and implemented as part of the CEMP • Trucks and machinery will be checked for leaks as per maintenance schedule or prestart checks and appropriate spill kits will be available onsite at all times • All chemicals and fuels will be stored in suitable bunded areas away from waterways. The capacity of the bunded area will be at least 110 per cent of the largest chemical container stored within the bunded area • Excavated materials will be stored in suitable bunded areas away from waterways • Concrete washout shall be carried out offsite or in concrete washout areas described in the ESCP • The refueling of plant and maintenance of machinery will be undertaken in impervious bunded areas	X	X	X	X	

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	Cease works immediately if contaminated soils are uncovered or suspected (due to odour, discolouration, presence of fill material and/or building demolition waste). Contact the Project Manager to determine the appropriate management requirements.					
Pollution incidents	- A site-specific emergency spill procedure plan will be developed and included within the CEMP - Spill kits will be made available at the site at all times - All staff will be appropriately trained through toolbox talks for the minimisation and management of accidental spills - Wherever possible, reduce the quantity of chemicals and fuel stored on site to minimum practical level - Notify the Project Manager immediately if a pollution incident occurs.	X	X	X	X	
Soil disposal	- A waste classification is required for all soil and soil impacted material that will require offsite disposal, including: - Assessment of material for waste classification prepared by a suitably qualified environmental consultant and comply with the NSW EPA Waste Classification Guidelines: Part 1 Classifying Waste (2009) - All other excavated material intended to be reused is to be managed in accordance with the Remediation Action Plan (if required) and the POEO Act.	X	X		X	
Rehabilitation	Rehabilitation of disturbed areas will be staged to occur during and post construction. Where required, locally sourced native seeding and mulching will be used to facilitate revegetation and establishment of the site. If concentrated flow paths for stormwater are expected across the rehabilitated areas, jute matting or similar will be used to minimise scouring as warranted.	X			X	

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Rehabilitation monitoring	Monitoring of the levee openings will be undertaken monthly for the first 6 months post construction. Then annually for three years. If evidence of erosion or scouring is observed in the levee opening, the erosion would be repaired and appropriate controls will be implemented to prevent further erosion risks and impacts.		X			X
Fish passage and fish habitat	Prior to works, a Fisheries Permit for harming marine vegetation (Section 205) and blocking passage (Section 219) under the <i>Fisheries Management Act 1994</i> would be obtained, and works would be undertaken in accordance with the permit.	X	X	X	X	
Dredging and Reclamation	Prior to works, notification will be given to the Minister for dredging and reclamation works under Section 199 of the <i>Fisheries Management Act 1994</i>	X	X	X		
Work within waterways	- Instream and bank work areas would be clearly delineated and other areas declared 'no go zones' - No dewatering is to occur - No machinery to enter the waterway unless it has been appropriately cleaned, degreased and serviced - Spill kits to be available onsite at all times during instream works - Only clean rock (no fines) to be used in rock armouring, if required - Geotextile fabric is to be used for the new southern and eastern channels to isolate the natural bed of the waterway from any imported clean rock fill or other material used within the bed of the waterway	X	X		X	
Water contamination	- Protection shall be provided for the works in the vicinity of waterways to minimise runoff from construction into these waterways and waterbodies - Work would not occur during high rainfall events and flooding	X	X		X	

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	- There is to be no release of dirty water into drainage lines and/or waterways - Monitor the BOM to forecast heavy rainfall events in order to allow sufficient time to vacate and prepare the site prior to the commencement of heavy rainfall and flood events.					
Soil management, erosion and sediment control	- A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction. - Mitigation measures described in Section 6.1 (Topography, geology and soils) will be implemented.	X	X		X	
Pollution/contamination	Mitigation measures described in Section 6.1 (Topography, geology and soils) will be implemented.	X	X		X	
Vegetation management	Construction areas shall be stabilised as soon as practicable (progressively where possible).	X	X		X	
Weed and pathogen management	Clean machinery prior to bringing to site to minimise weed importation.	X	X		X	X
Aquatic habitat	- To minimise and document impact to saltmarsh, an operational Saltmarsh Management Plan would be developed by DPIRD prior to construction completion. It would run for five years and include: - Floating booms and vegetation plantings along the channels to reduce mangrove propagule movement. - Monitoring of mangrove health and extent at the Proposal site, including encroachment into the inner racecourse area. - Monitoring of saltmarsh health and extent at the Proposal site.	X	X	X	X	X

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
	A Section 205 permit under FM Act for harm to marine vegetation would be obtained prior to works, and works would be undertaken in accordance with the permit.	X	X	X	X	X
Threatened fauna	Liaise with Panboola Land Managers to develop a White-fronted Chat monitoring program for implementation post-construction by DPIRD, to document response of this species to hydrological and vegetation changes.	X		X	X	X
Aboriginal heritage	- All works must be constrained to the areas of existing disturbance and any activity proposed outside of the current assessment area should also be subject to an Aboriginal heritage assessment - DPIRD are to engage with Eden LALC regarding a Sites Officer being present for all earthworks - All access to the site and laydown areas must be within existing tracks and disturbed areas otherwise visual inspection of the sites by a qualified archaeologist is required - If any items suspected of being Aboriginal in origin are discovered during the work, all work in the immediate vicinity must stop and the NSW Environment Line (1300 361 967) notified.	X	X	X	X	
Unexpected Heritage Finds Procedure.	- In the event that any unexpected substantial intact historic archaeological relics of State or local significance are unexpectedly discovered during the project, the following management protocols will be implemented: - Works at that identified heritage location will cease with an appropriate buffer zone of at least 20 m to allow for the assessment and management of the find. All site personal will be informed about the buffer zone with no further works to occur within the buffer zone.	X	X	X	X	

	○ A heritage specialist shall be engaged to inspect and assess the item. ○ For items determined to be historic relics, work must remain ceased in the affected area and the Heritage Council must be notified in writing. This is in accordance with Section 146 of the <i>Heritage Act 1977</i> (NSW). ○ Depending on the nature of the discovery, additional assessment may be required prior to the recommencement of work in the area. At a minimum, any find should be recorded by an archaeologist.					
Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009) and identify: • All potential significant noise and vibration generating activities associated with the activity • Feasible and reasonable mitigation measures to be implemented • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria.	X	X	X	X	
	All sensitive receivers likely to be affected will be notified at least 14 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	X	X	X		

Impact	Safeguards and mitigation measures	Work component		Timing		
		Channels	Levee	P	C	O
Land Use	Any land that is required for access as part of the proposal should be rehabilitated and restored to its prior condition on completion of the works.	X	X		X	
Visual	- Work areas shall be maintained in an orderly manner - On completion of the works, all vehicles, construction equipment, materials, and refuse relating to the works shall be removed from the work site(s) and any adjacent affected areas - All exposed areas shall be stabilised and revegetated with groundcover as soon as possible. Remove temporary erosion and sediment controls from the site once landforms have been assessed as stable.	X	X		X	X
Access	- Access to properties with driveways beginning in the proposal site will need to be maintained throughout the period of works - Recreational users will be notified before commencement of works about the proposed works and any necessary changes to access.	X	X		X	
Air quality	- Works are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates can not be controlled - Vegetation or other materials are not to be burnt on site - Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation - Vehicles and equipment are to be maintained in good working order - Smoky emissions would be kept within the standards and regulations under the <i>Protection of the Environment Operations Act 1997</i> that no vehicle shall have continuous smoky emissions for more than 10 seconds - Monitor work areas and stockpiles for dust generation and seed/cover/spray to suppress	X	X	X	X	

	- Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust - Do not leave vehicles idling.					
Waste generation	- Waste shall be managed in accordance with the <i>Protection of the Environment Operations Act 1997</i>. A Waste Management Plan shall be prepared for construction as part of the CEMP which includes the following: - Identify all potential waste streams associated with the works - Identify opportunities to minimise the use of resources, and to reuse and recycle materials - Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities. Waste must be disposed of at a facility able to accept the waste - Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) - Disposal is undertaken as a last resort (in accordance with the <i>Waste Avoidance & Resource Recovery Act 2001</i>). - Demolition and waste materials would be characterised in accordance with the NSW EPA Waste Classification Guidelines 2014 and segregated to ensure opportunities for reuse, recovery and recycling of wastes are optimised in accordance with the POEO Act - General waste and recycling receptacles will be provided onsite - Working areas shall be maintained free of rubbish and cleaned up at the end of each working shift - Toilets (e.g., portable toilets) will be provided for construction workers.	X	X	X	X	

8. Summary of licences and approvals

It has been identified that the proposal would require the following notifications, licences and permits:

- Notification of dredging and reclamation under Section 199 of the *Fisheries Management Act 1994*
- Permit to harm marine vegetation under Section 205 of the *Fisheries Management Act 1994*
- Licence under Sections 2.20 and 3.17 of the *Crown Land Management Act 2016*
- Authorisation to access Beowa National Park to undertake the proposed levee work under either Section 34 of the NPW Regulation or Section 151 of the NPW Act
- Publication of the REF under Section 171(4) of the Environmental Planning and Assessment Regulation 2021.

9. Conclusion

9.1 Principles of ecologically sustainable development

9.1.1 The precautionary principle

According to the precautionary principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

This REF has been prepared utilising the precautionary principle. That is, if threats are perceived as possibly leading to serious or irreversible environmental damage, then either the proposed works would not go-ahead, or the development would be modified to ensure that such serious threats do not exist. The assessment of potential risks associated with the proposed works assessed in this REF are considered to be adequately manageable.

9.1.2 Inter-generational equity

Intergenerational and intra-generational equity requires that the present generation would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of the present and future generations. The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

It is unlikely that the proposed works would impact on natural features to a level that would impact on the health, diversity or productivity of the environment to a level that would impact on future generations.

9.1.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity are fundamental consideration of ESD.

An assessment of the existing local environment has been undertaken in order to identify and manage any potential impacts of the proposal on local biodiversity. With the implementation of the proposed mitigation measures in section 6.3, the impacts of the proposal on local populations of threatened species and communities are unlikely to have a significant impact on the conservation of biological diversity and ecological integrity of the area.

9.1.4 Appropriate valuation of environmental factors

This principle requires that “costs to the environment should be factored into the economic costs of a proposal”.

This REF has examined the environmental consequences of the proposal and identified mitigation measures for factors which have the potential to experience adverse impacts. The implementation of these mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

9.2 Justification of the proposal

The proposal is subject to assessment under Division 5.1 of the EP&A Act and has been prepared with due consideration of the Environmental Planning and Assessment Regulation 2021. A section 171(2) checklist has been completed and is provided in Appendix A. This REF has examined and taken into account to the

fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

The proposal was found to have the potential to cause soil and water, biodiversity and community impacts. A range of safeguards have been developed for the potential impacts identified. These would ensure that the negative impacts of the proposal are prevented, mitigated or limited as far as practical. Additional input is required for soil and water management with a Fisheries Permit required for instream works, as well as community consultation. Of benefit, the rehabilitation works would potentially improve the resilience of the Panboola Wetland with future sea level rises and improve the overall health of the ecosystem.

As part of the design development and options assessed some potential environmental impacts were avoided or reduced. Where potential environmental impacts have been identified, safeguards and mitigation measures have been proposed to ameliorate or minimise the expected impacts.

The proposal would not result in any significant impacts to threatened species, populations or ecological communities listed on the *Biodiversity Conservation Act 2016* (NSW), *Fisheries Management Act 1994* (NSW), or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The proposal would achieve the identified objectives and, with the implementation of the mitigation measures identified in this REF, it is unlikely that these proposed works would result in a significant impact to the environment.

An environmental impact statement is not required to be prepared. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act.

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11. Certification

11.1 Assessor Declaration

The REF provides a true and fair assessment of the proposed activity in relation to its likely effects on the environment. It examines and takes into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed activity.

Based on the information provided in the REF, it is concluded that:

1. The proposed activity is not likely to have a significant impact on the environment, and an Environmental Impact Assessment is not required.
2. The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats or impact biodiversity values. A Species Impact Statement (SIS) is not required.
3. The proposed activity is not likely to significantly affect any Matters of National Environmental Significance, nor is the activity being carried out on or is it likely to impact Commonwealth land.

Based on the information presented in this REF, it is concluded that by adopting the mitigation measures identified in this assessment, it is unlikely that there would be significant adverse environmental impacts associated with the project. I have considered all environmental impacts and safeguards to the best of my knowledge and have sought advice where required. Attainment of the DPI Fisheries permit are required.

Designation	Technical Lead – Environmental Management
Organisation	NGH Pty Ltd
Signature	
Date	8/12/2025

11.2 Determining Authority Declaration and Approval

I have reviewed the document and considered that the proposal (including the controls and mitigation measures specified in this REF) is not likely to significantly affect the environment, including threatened species or ecological communities, or their habitats. AS such it is not necessary for further assessment under section 5.7 of the EP&A Act. It is recommended that the proposal can proceed subject to the implementation of all safeguards and mitigation measures in the REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

Role	Project Manager/Senior Fisheries Manager Flood Recovery
Name	Max Osborne
Company	Department of Primary Industries and Regional Development
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