Beach to Beach – Shared User Path

Environmental Impact Statement



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Environmental Impact Statement

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Acknowledgments

KBR acknowledges the Traditional Custodians throughout Australia and their continuing connection to land, water, culture, and community, and pays respect to their Elders past, and present.

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to provide an environmental impact assessment in accordance with the scope of services set out in the contract between KBR and Port Macquarie-Hastings Council ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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Revision History

Revision	Date	Comment	Signatures			
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List of abbreviations

%	Percentage
dB	Decibel
ha	hectares
km	kilometres
m	metres
m/s^2	metre per second squared
pH_F	Field pH
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACM	Asbestos Containing Material
AEP	Annual Exceedance Probability
AH	Aboriginal Heritage
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AHIMS	Aboriginal Heritage Information Management System
ALR	Aboriginal Land Rights
ARI	Average Rainfall Interval
AS	Acid Sulfate
ASS	Acid Sulfate Soils
ASSMAC	Acid Sulfate Soils Management Advisory Committee
BAL	Bushfire Attack Level
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method – Calculator
BC	Biodiversity Conservation
BD	Biodiversity
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Scheme
BRW	Biodiversity Risk Weighting
BS	British Standard
CapEx	Capital Expenditure
CCP	Community Participation Plan

CE	Critically Endangered
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CH	Chainage
CLM	Crown Land Management
CNVA	Construction Noise and Vibration Assessment
CrS	Chromium Reducible Sulfur
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DP	Deposited Plan
DPI	Department of Primary Industries
DPE	Department of Planning, Industry and Environment
DUAP	Department of Urban Affairs and Planning
E	Endangered
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
EP&A	Environmental Planning and Assessment
ES	Erosion and Sediment
FFDI	Forest Fire Danger Index
FHHP	Fish Habitat Protection Plan
FL	Flood
FM	Fisheries Management
FRA	Flood Risk Assessment
HO	Heritage Office
IBRA	Interim Biogeographically Regionalisation of Australia
KBR	Kellogg Brown & Root Pty Ltd
KCl	Potassium Chloride
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local Government Area
MHW	Mean High Water
Mml	Manning-Macleay Coastal Alluvial Plains

MNES	Matters of National Environmental Significance
NA	Non-Aboriginal Heritage
NATA	National Association of Testing Authorities
NML	Noise Management Level
NSW	New South Wales
NPWS	National Parks and Wildlife Service
NOSHC	National Occupational Health and Safety Commission
NV	Noise and Vibration
NVMP	Noise and Vibration Management Plan
OEH	Office of Environment and Heritage
OISAS	Oyster Industry Sustainable
P	Protected
PASS	Potential Acid Sulfate Soils
PBP	Planning for Bushfire Protection
PCT	Plant Community Types
PMF	Probable Maximum Flood
PMH	Port Macquarie Hastings
PMP	Probably Maximum Precipitation
POAA	Priority Oyster Aquaculture Areas
Pmr	Port Macquarie Coastal Ramp
RAPS	Regional Aboriginal Parties
RBL	Rating Background Level
RFS	Rural Fire Service
RNP	Road Noise Policy
SAIIs	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environment Planning Policy
SES	State Emergency Services
SOFF	Swamp Oak Floodplain Forest
SRM	Sewer Rising Main
SSFF	Swamp Sclerophyll Floodplain Forest
SUP	Shared User Path
TA	Traffic and Access
TAA	Titratable Actual Acidity
TEC	Threatened Ecological Communities

TfNSW	Transport for New South Wales
V	Vulnerable
VA	Visual Amenity
VEC	Vulnerable Ecological Community
VDV	Vibration Dose Level
VIA	Visual Impact Assessment
VIS	Vegetation Information System
VMP	Vegetation Management Plan
WM	Water Management
WQ	Water Quality

Executive Summary

This Environmental Impact Statements (EIS) has been prepared under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in support of the proposed development of a 11 km shared user path between North Haven Beach and Pilot Beach in Dunbogan (the site).

This EIS describes the project, provides an assessment of all potential environmental and community impacts that could occur as a result of its construction and operation, and identifies measures that would be implemented to avoid and minimise those impacts.

WHAT IS PROPOSED

The proposal site is located within the boundaries of Port Macquarie Hastings Council Local Government Area and is approximately 30km south of the Port Macquarie township in the connecting suburbs of North Haven, Camden Haven, Laurieton, and Dunbogan. The proposal consists of the completion of the remaining five path alignment sections, which make up a total of 2.9km of the 11km shared user path (SUP).

The SUP is a community-based project that aims to deliver 11kms of uninterrupted footpath/cycleway between North Haven Beach and Pilot Beach in Dunbogan. The objective of the project is to provide infrastructure that benefits the community through several positive outcomes.

These include:

- Connecting existing splintered shared paths to establish an uninterrupted 11km shared path which connects North Haven, Laurieton, Dunbogan and Camden Head.
- Encouraging safe pedestrian and bicycle access and the promotion of healthy activities, exercise, and non-motor vehicle travel.
- Attracting cycle related tourism into the area with flow-on benefits for local businesses, Council, and the community.

The current Laurieton, Dunbogan and Camden Head shared path network is made up of five existing unconnected sections. The Laurieton paths also connect to a further path in North Haven. Ultimately the continuous network will connect the North Haven Breakwall to Camden Haven and the Pilot Beach Breakwalls having a total length of 11km.

This proposal involves the following works:

Path Section D3

The 360m alignment identified as Path Section D3 is located in Dunbogan, directly east of Camden Haven Inlet and runs in an almost south to north direction (refer to Figure ES1). The alignment begins adjacent to the south of The Boulevarde and Scarborough Way intersection, traverses the unsealed Scarborough Way and curves into a low-lying inter-tidal estuarine landscape on the western side of The Boulevarde. The alignment exits the low-lying area at Bay Street and continues along the northbound shoulder of The Boulevarde for approximately 220m to the existing path at Section D4. The topography of the alignment is relatively flat and level, and a boardwalk will be utilised, allowing the SUP to have minimal change relative to the existing natural surface.

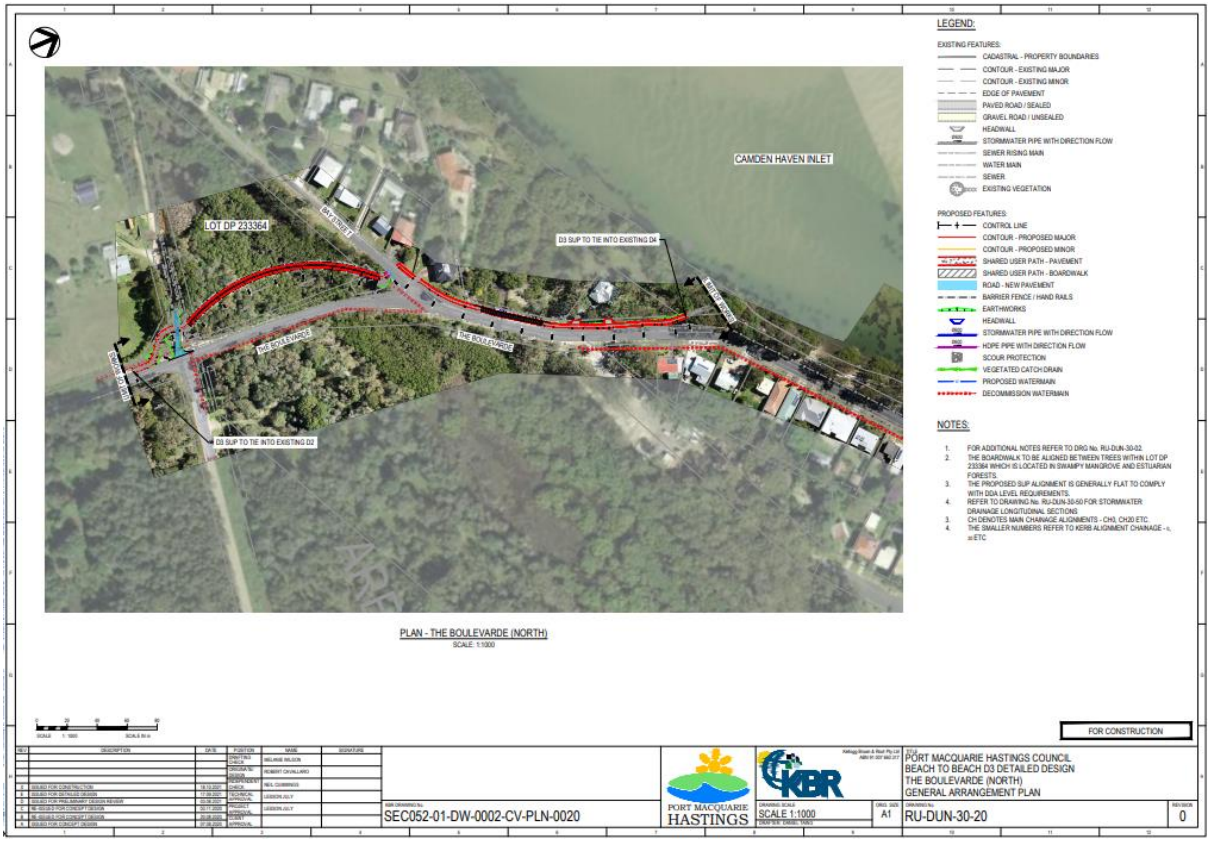


Figure ES1 - Path Section D3

Path Section D5

The 160m alignment identified as Path Section D5 is located in Dunbogan and runs in a southwest to northeast direction (refer to Figure ES2). The alignment is a raised boardwalk and viewing platform over the estuary (Camden Head Inlet). The large water body of Camden Head Inlet hosts a range of recreational activities by local residents and tourists, through which path section D5 traverses. The section starts at the end of D4 SUP on the western side of The Boulevarde just before the intersection of Longworth Road. The proposed alignment merges into the existing D6 SUP section located to the west of the Boulevarde and Longworth Road intersection. The boardwalk is proposed to increase views of the Camden Haven Inlet and aesthetics of the path along the route.

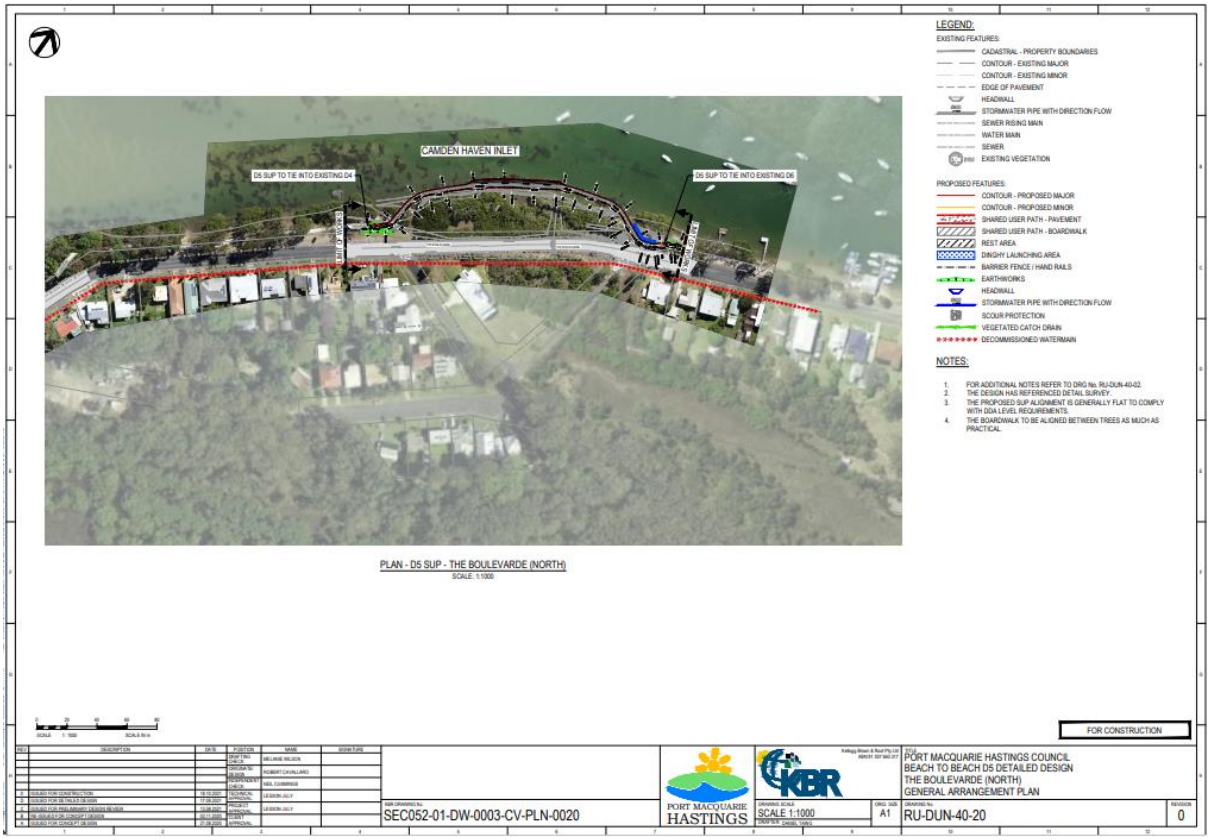


Figure ES2 - Path Section D5

Path Section D8

The 800m alignment identified as Path Section D8 is located along Camden Head Road, parallel to Gogleys Creek, which flows into Gogleys Lagoon (refer to Figure ES3, and ES4). The alignment runs in a northwest to southeast direction and begins at the end of the D7 SUP section on the eastern side of the park/boat ramp area where Dunbogan Jubilee Hall is located. The path crosses the one-way exit road used for accessing the boat ramp and the park, traverses along the northern side of the carriageway (Camden Head Road) and merges into the existing path (D8-D9 section tie-in)to the east of the Camden Head Road and Scarborough Way intersection.

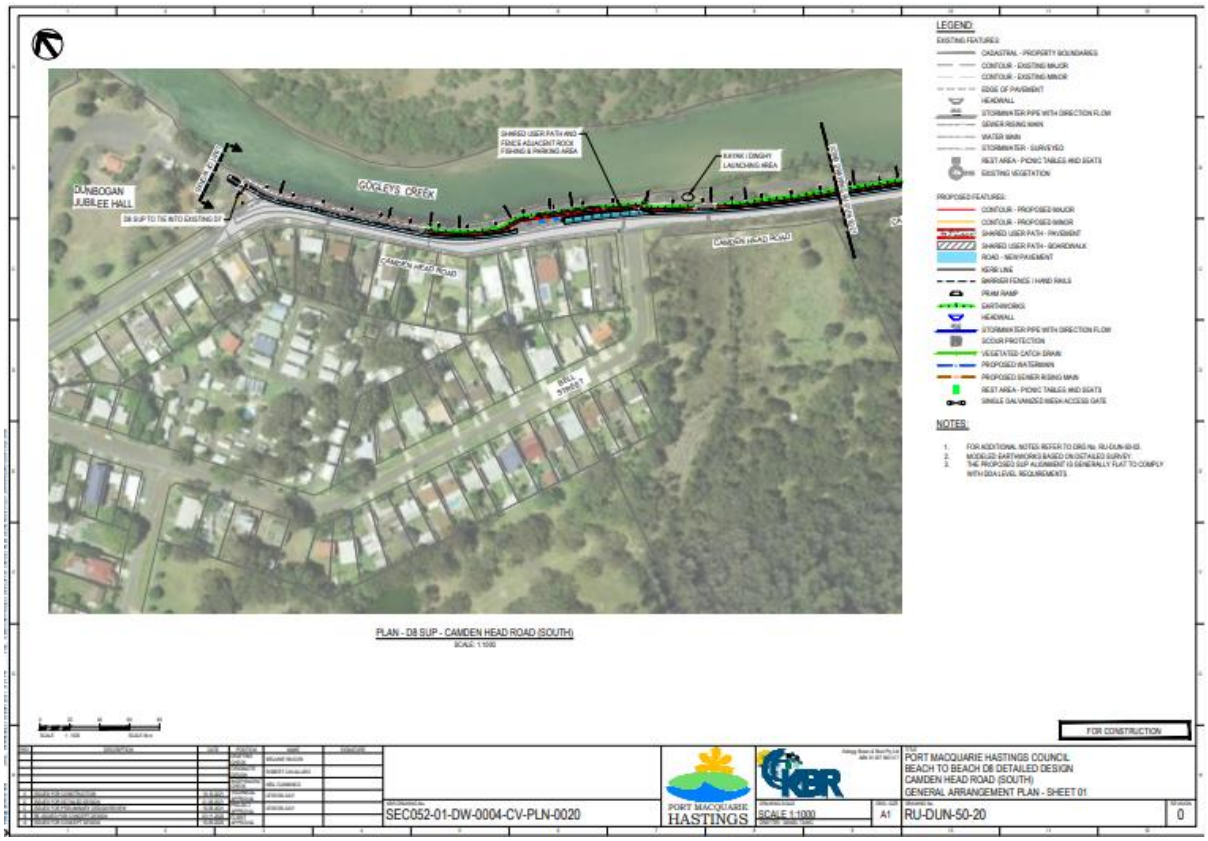


Figure ES3 - Path Section D8 (ch0 – ch380)

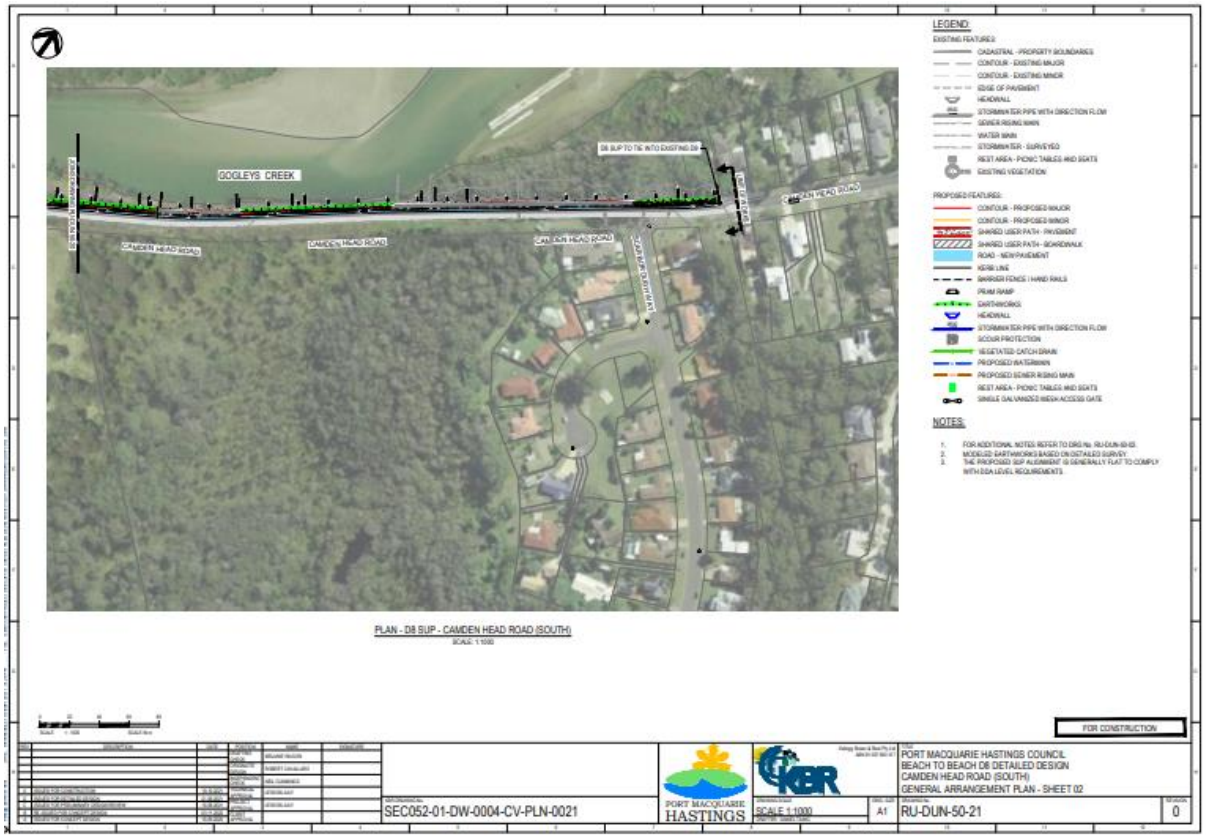


Figure ES4 - Path Section D8 (ch390 – ch843)

Path Section D10

The 1500m alignment identified as Path Section D10 comprises sections of pavement and boardwalk in Dunbogan and Camden Head, and traverses along the western side of the carriageway (Camden Head Road) (refer to Figure ES5 and Figure ES6). The SUP starts at the end of the existing D9 section, approximately 120m northeast of the intersection with Seaview Avenue. The SUP runs along the north western side of Camden Head Road and tracks along an existing unsealed access track for approximately 145m until it re-emerges with Camden Head Road and continues until the intersection with Bergalia Crescent. The path continues past an existing sewer pump station and ends just before the Camden Head and Pilot Beach Roads intersection.

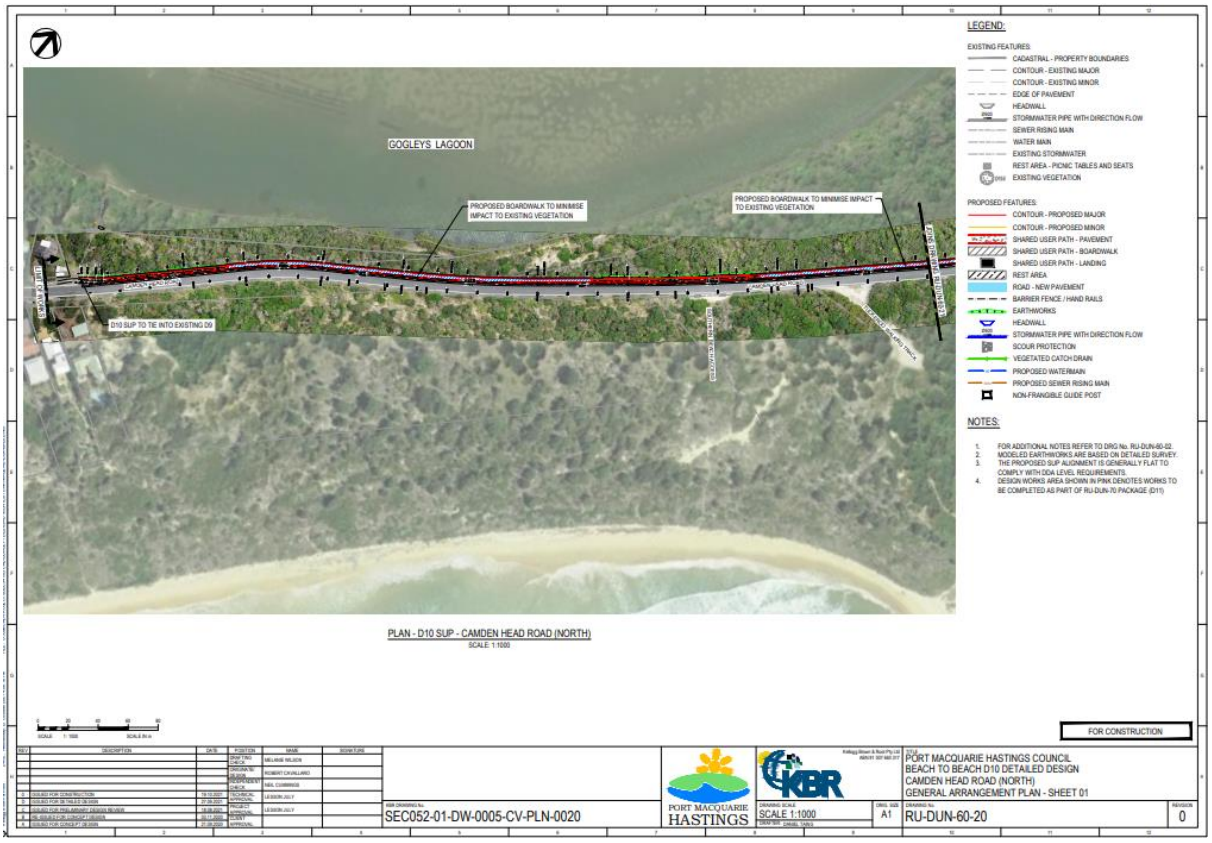


Figure ES5 - Path Section D10 (ch0 – ch580)

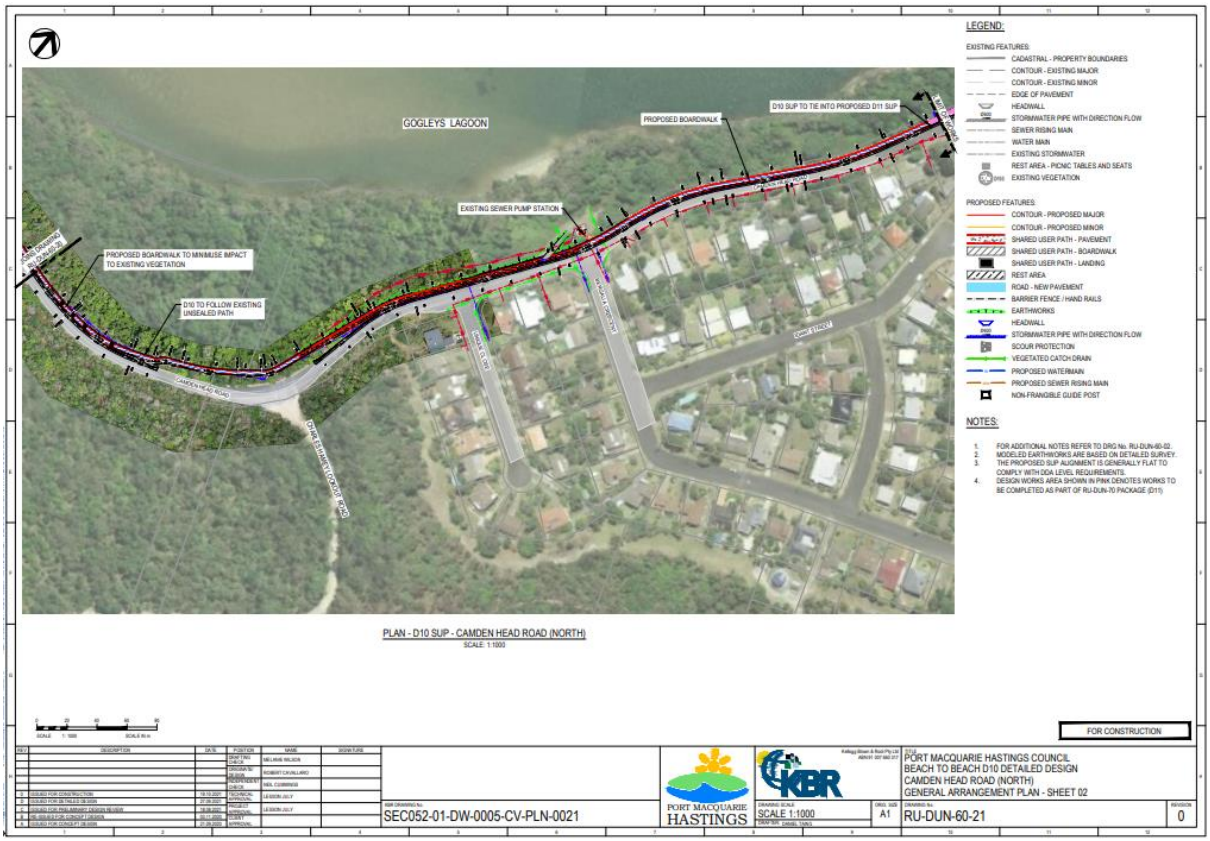


Figure ES6 - Path Section D10 (ch580 – ch1230)

Path Section D11

The 700m alignment located in Camden Head identified as Path Section D11 commences at the end of the new D10 section and tracks along the western edge of Pilot Beach Road, crossing an existing unsealed road used to access the Camden Haven Oyster Supply Sheds and a 'second' unsealed access road (refer to Figure ES7). The SUP follows Pilot Beach Road along the northern edge of the carriageway and crosses the road leading to Camden Head breakwall path and the breakwall access road. The SUP terminates at the breakwall.

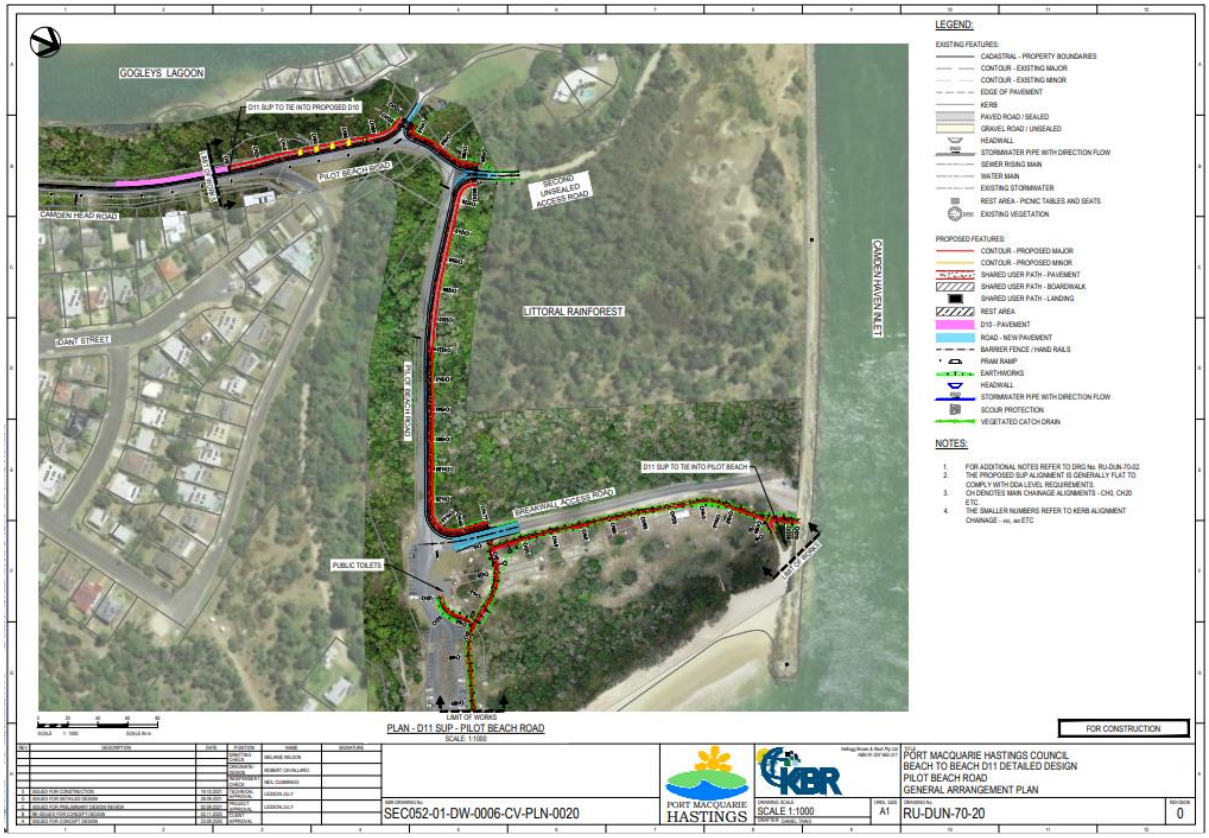


Figure ES7 - Path Section D11

HOW DID THE COMMUNITY PARTICIPATE?

An extensive consultation program has been carried out in 2020, including community updates, media releases, and community feedback sessions to support project development discussions encompassed the preferred route, concept design and environmental assessment.

Community consultation has been extensive and has driven many of the design revisions. Issues raised during consultation periods have been investigated and considered as part of the development of the concept design, including incorporating design elements introduced to reduce potential environmental impacts. Council will continue to provide opportunities for the community to participate in the design process. Comments received in response to the EIS exhibition will be considered and the project would be refined as appropriate.

WHAT ARE THE EXPECTED KEY IMPACTS?

The project has sought to avoid or minimise environmental and social impacts through evaluation of alternatives, development of route options and design refinements. However, given the project's size and setting there will be impacts on the environment and community. Where impacts are expected, a range of environmental management measures have been developed to manage these impacts. The key impacts of the project, including measures to manage these impacts, are summarised below.

Biodiversity

The concept design was developed to avoid and minimise impacts on biodiversity. A key decision to realign the project was made in 2020 to minimise impacts to coastal wetland areas. Where possible, the project has been aligned with existing infrastructure, pre-cleared land and along the edges of existing developed land, resulting in minimal impacts to vegetation connectivity.

The assessment has identified all reasonable measures and strategies to avoid and minimise impacts to biodiversity associated with the project. Mitigation measures proposed include revegetation of disturbed areas of the project site, which will enhance the condition and structural complexity of the vegetation onsite, as well as enhance habitat connectivity for threatened fauna and flora across the site and broader locality.

Offsets for impacts to marine vegetation have been calculated in accordance with the Fisheries NSW policy and Biodiversity Offsets have been calculated to offset the residual impacts of the project.

Noise and vibration

The project is closely aligned to existing infrastructure, including roads. Accordingly, sensitive receivers at locations such as Dunbogan, and Camden Head, are subject to existing noise impacts from existing infrastructure. A Construction Noise and Vibration Management Plan would be prepared to manage noise and vibration impacts during project construction. The management plan would include consideration of different plant and equipment, scheduling of noise intensive equipment to occur during lessor sensitive periods (i.e. standard construction hours), and noise and vibration monitoring.

Aboriginal heritage

Extensive engagement with the local Aboriginal community, including archaeological investigations, was carried out during project development, and has improved the knowledge of Aboriginal cultural heritage in the locality of the project. Management measures to control impacts to Aboriginal sites have been developed in consultation with the local Aboriginal community and include the collection of surface artefacts, and long-term management of collected artefacts.

HOW WOULD THE IMPACTS BE MANAGED?

This EIS identifies a comprehensive range of environmental management measures to avoid, manage, mitigate, offset and/or monitor impacts during the design, construction and operation of the project. These include construction and environmental management plans, noise mitigation measures, and design treatments. Further opportunities to minimise the environmental and social impacts of the project are likely to be identified during detailed design, construction planning and in consultation with the community and relevant stakeholders. The conditions of approval for the project may also identify additional management measures to be implemented by the project.

Thorough consideration of the environmental impacts of the proposal has been undertaken in the environmental impact assessment process and in the preparation of the EIS. In assessing the impacts of the proposal, consideration has been given to relevant social, economic, and environmental matters. The proposal is not considered to represent an environmental risk.

WHY IS AN EIS REQUIRED?

This proposal is deemed to be 'designated development' under Clause 2.7 of the State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP Resilience and Hazards) arising from the proposals interaction with mapped coastal wetland and littoral rainforest areas. As such, this EIS must be prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs), refer Appendix B.

Furthermore, the proposed works do not contravene the objectives of the SEPP Resilience and Hazards, or the Port Macquarie Hastings Local Environmental Plan and/or Development Control Plan. The proposed works are deemed suitable for the subject site, having regard to its regional and local context and would not result in any significant environmental impacts.

1 Introduction

This chapter provides an overview of the SUP, including its key features, need, and identifies the structure of this EIS. Under the *Environmental Planning and Assessment Act 1979* (EP&A Act), it is required that a request for Secretary's Environmental Assessment Requirements (SEARs) be made prior to the lodgement of any application for designated development. The SEARs were requested for the proposed development, reference: SEAR 1391, and later issued by the then NSW Department of Planning, Industry and Environment, now the Department of Planning and Environment (DPE) on the 6 November 2019, refer Appendix B.

All relevant Federal and State legislation, as well as local environmental planning instruments, have been considered in the preparation of this EIS. The proposal is satisfactory in terms of its legislative context, on the basis that:

- the proposal is permissible according to the land use zone or SEPP
- the objectives of the zone are satisfied
- the range of applicable SEPPs have been considered
- strategic documents that apply to the locality and wider region have identified that the proposal is consistent with the strategic context of the area.

A range of authorities have been consulted with during the preparation of this application. This consultation is detailed throughout this report.

1.1 PRELIMINARY

Kellogg Brown & Root Pty Ltd (KBR) has been engaged by Port Macquarie Hastings (PMH) Council to prepare an EIS to accompany a Development Application under the EP&A Act for the construction of a SUP in the suburbs of Dunbogan and Camden Head.

The Development Application seeks the development for:

- earthworks and associated excavation for site preparation and construction
- clearing/removal of vegetation
- construction of an SUP (boardwalk and pavement) and associated works.

The purpose of the EIS is to describe the proposed designated development and address the SEARs, documenting all potential impacts of the proposal on the environment, and detailing protective measures to be implemented to avoid, reduce, and mitigate environmental impacts.

1.2 PROJECT CONTEXT

The Beach-to-Beach SUP is a community-based initiative that aims to deliver the remaining five sections of 11 km of uninterrupted footpath/cycleway between North Haven Beach and Camden Head (Pilot Beach). The SUP is intended to provide infrastructure that benefits the community through positive outcomes that includes:

- A route which provides a safe, uninterrupted shared path which connects the communities of North Haven, Laurieton, Dunbogan, and Camden Head.
- Encouraging safe pedestrian and bicycle access to community centres, schools and shopping centres.

- Promotion of healthy activities, exercise, and non-motor vehicle travel within the local communities.
- Attracting cycle related tourism into the area with flow on benefits for local businesses, Council, and community.

The SUP would fulfill a significant gap in the existing community infrastructure and satisfy community needs, as well as improve the operational efficiencies of recreational activities within the local area. Moreover, it would assist in appropriately responding to the increased need for recreational facilities, in line with State and Federal Government objectives, particularly around 'physical activity is important for good health and wellbeing'.

Several sections of the Beach-to-Beach SUP have already been constructed. The current Dunbogan and Camden Head shared path network is made up of four existing unconnected sections. The Laurieton path also connects to a further path in North Haven. Ultimately, the completed project will provide a continuous path network around the Camden Head Inlet, connecting North Haven Beach (in North Haven) to Pilot Beach (in Camden Head) via the shoreline of Gogleys Lagoon.

As such, the works required for the construction of the remaining 2.9km of shared path (Path Sections D3, D5, D8, D10 and D11) of the 11km Beach to Beach SUP is the subject of this EIS (herein referred to as 'the project').

1.2.1 Regional Setting

The project site is situated midway between Sydney and Brisbane, on the New South Wales (NSW) Mid-North coast. Port Macquarie located 25km north of the project site, as shown in Figure 1.1, has developed into a desirable location as well as an equally popular tourist destination. The area and surrounds boast extensive pristine beaches and untouched waterways. Camden Head is 360km north of Sydney and 590km south of Brisbane off the Pacific Highway.

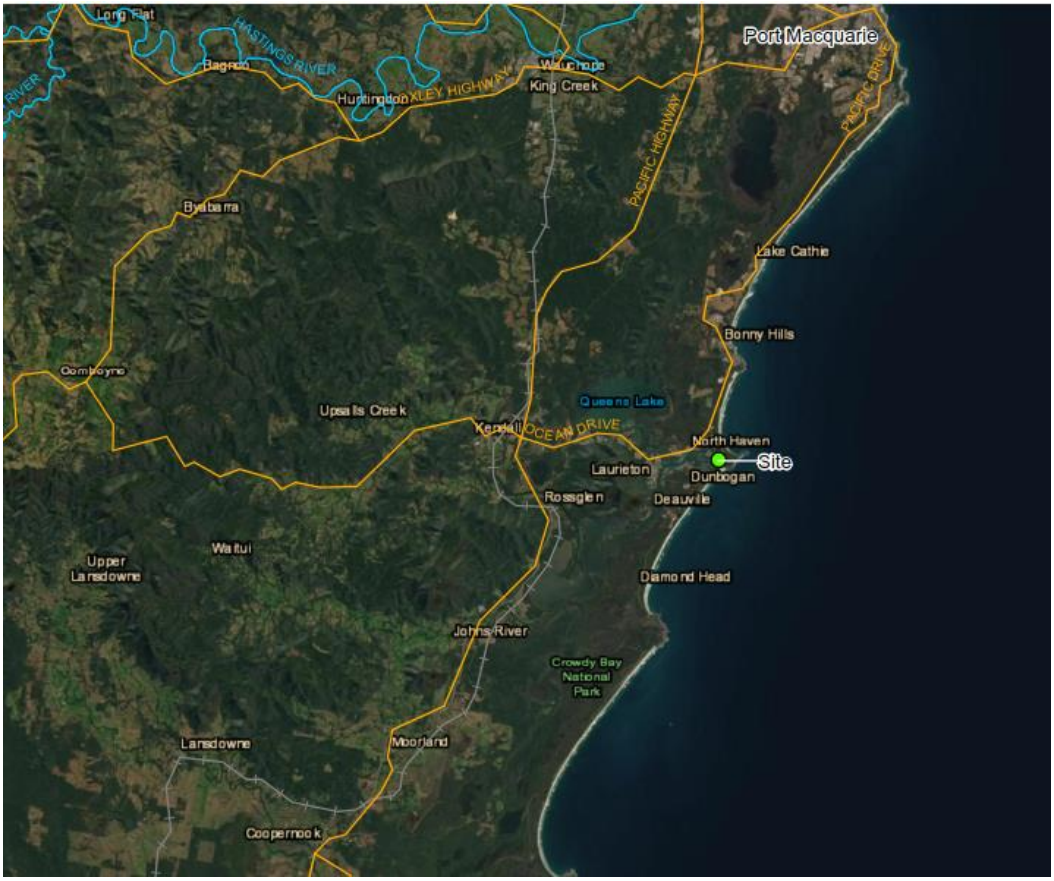


Figure 1.1 – Regional Location of the Project Site

1.2.2 Local Setting

The Beach-to-Beach SUP is located in the PMH Council Local Government Area (LGA) as shown on Figure 1.2. The path alignment will follow the banks of the local Camden Haven River system creating a scenic route that begins in North Haven, traverses through Laurieton and Dunbogan, and terminates at Pilot Beach in Camden Head.

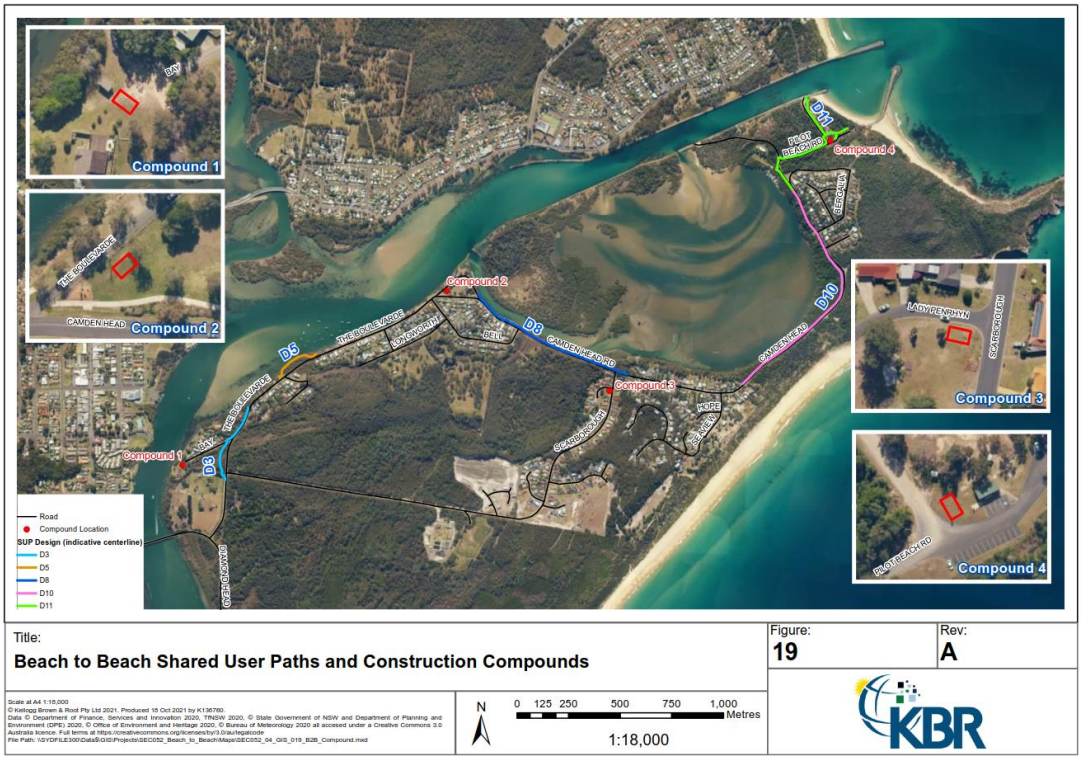


Figure 1.2 – Location of Shared User Paths and Site Compounds

1.3 LAND OCCUPATION

The project traverses several land allotments and intersects with existing infrastructure assets as summarised in Table 1.1.

Table 1.1 Summary of Land Ownership and Assets

Path Alignment	Suburb	Land Ownership and Key Assets
Section D3	Dunbogan	The Boulevarde (carriageway) Lot 1 Deposited Plan (DP) 233364 Edge of Lot 7036 DP 1019545
Section D5	Dunbogan	Edge of Lot 7036 DP 1019545 Lot 7050 DP 1108435 Boardwalk and viewing platform over estuary (Camden Head Inlet)
Section D8	Dunbogan	Edge of Lot 7018 DP 1024347 Lot 7016 DP 1024342 Camden Head Road (carriageway) Lot 1 DP 1173780
Section D10	Dunbogan and Camden Head	Camden Head Road (carriageway) Lot 7037 DP 1024352 Lot 8 DP 754405

Path Alignment	Suburb	Land Ownership and Key Assets
		Lot 7314 DP 1199592 (past sewer pump station on Lot 1 DP 598224)
Section D11	Camden Head	Lot 7314 DP 1199592 Edges of Lot 7314 DP 1199592 and Lot 200 DP 754405 Lot 7021 DP 1001334 including Pilot Beach Road and Breakwall Access Road

1.4 PURPOSE AND STRUCTURE OF THIS ENVIRONMENTAL IMPACT STATEMENT

This EIS has been prepared to:

- Address the SEARs issued by the DPE on 6 November 2019 (refer Appendix B)
- Satisfy the relevant provisions of Division 2 of the *Environment Planning and Assessment Regulation 2021* (EP&A Regulation).

Following the Executive Summary and Chapter 1 Introduction, this EIS report is structured as follows (Table 1.2) and comprised technical assessments that form the basis of the information in this report.

Table 1.2 Structure and Content of this report

Chapter	Title	Description
Chapter 1	Introduction	Provides an overview of the project, its key features from a regional and local context, and identifies the structure of the EIS.
Chapter 2	Project Description	Provides a detailed description of the project including details of construction and an analysis of the project alternatives.
Chapter 3	Project Development and Alternatives	Describes the alternatives to the project that were considered as part of the project development process and explains how and why the project was selected as the preferred option.
Chapter 4	Planning and Assessment Process	Describes the statutory planning and assessment process and identifies NSW and Commonwealth legislation that may apply to the project.
Chapter 5	Community and Stakeholder Engagement	Describes the consultation process and activities that were and would continue to be undertaken for the project. It summarises the issues raised by the community and stakeholders and where they are addressed in this EIS.
Chapter 6	Environmental Assessment	Provides an assessment of the key environmental issues for the project.
Chapter 7	Environmental Management Measures	Presents a summary of the mitigation measures and recommendations that have been developed and identified as part of the impact assessment process and other chapters of this EIS.
Chapter 8	Project Justification and Conclusion	
Chapter 9	References	
Appendix A	Proposed Plans	
Appendix B	Secretary's Environmental Assessment Requirements	
Appendix C	Community Engagement Report	
Appendix D	Biodiversity Assessment Report	
Appendix E	Aboriginal Cultural Heritage Assessment Report	

Chapter	Title	Description
Appendix F	Geotechnical Report	
Appendix G	Acid Sulfate Soil Management Plan	
Appendix H	Flood Risk Assessment	
Appendix I	Construction Noise and Vibration Assessment	
Appendix J	Visual Impact Assessment	
Appendix K	Stakeholder and Agency Communication	
Appendix L	Correspondence with Crown Land	

2 Project Description

This chapter provides a detailed description of the project including project needs and objectives, the development alternatives considered, and the refinements made through the design process.

2.1 PROJECT OUTLINE

The new Beach-to-Beach SUP aims to address the current demand to connect the existing shared paths to provide the community and visitors a unique facility that caters to the population and tourism growth in the area. At present, the shared path network at Dunbogan and Camden Head is made up of four unconnected sections. This project will connect those 'separate' sections and provide a continuous shared path network from North Haven to Camden Head. Prior to the construction of the shared paths, new watermain and sewer rising main (SRM) will be installed under or along the respective path sections, as described below.

Path Section D3

The 360m alignment identified as Path Section D3 is located in Dunbogan, directly east of Camden Haven Inlet and runs in an almost south to north direction, as shown in Figure 2.1. The alignment begins adjacent to the south of The Boulevarde and Scarborough Way intersection, traverses the unsealed Scarborough Way and curves into a low-lying inter-tidal estuarine landscape on the western side of The Boulevarde. The alignment exits the low-lying area at Bay Street and continues along the northbound shoulder of The Boulevarde for approximately 220m to the existing path at D4. The topography of the alignment is relatively flat and level, and a boardwalk will be utilised allowing the SUP to have minimal change relative to the existing natural surface. At this section of the shared path, the new watermain will be relocated and installed mostly under the proposed path from about chainage (ch) 220 (Bay Street and The Boulevarde intersection) to the end of path section D3.

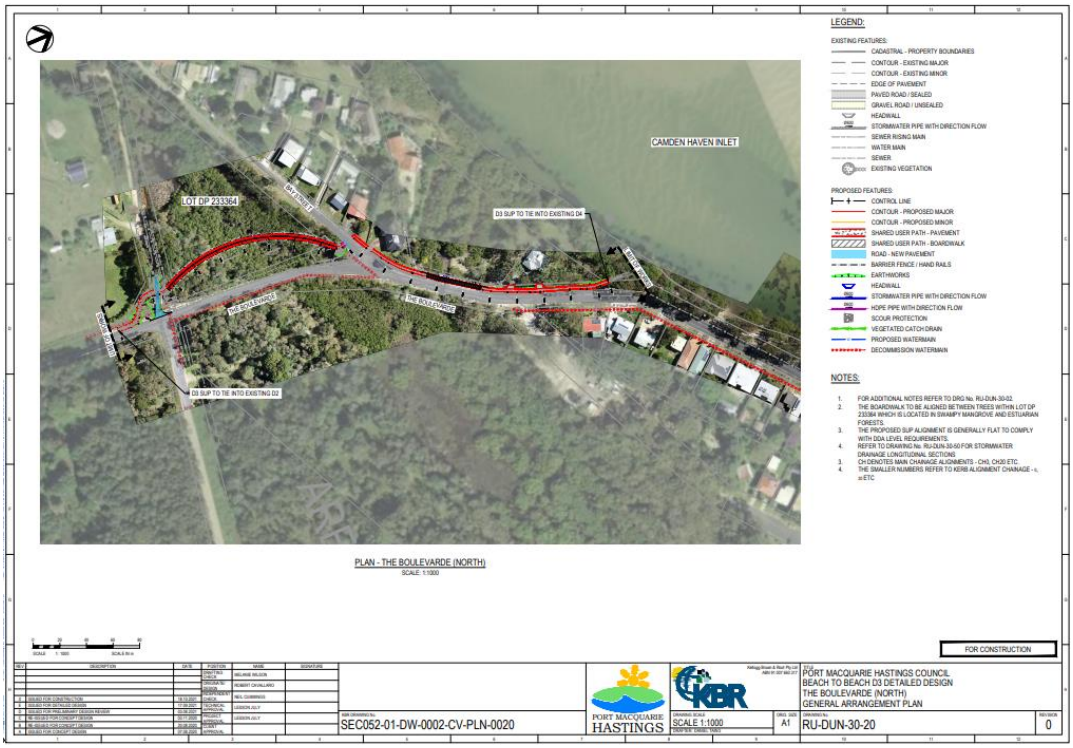


Figure 2.1 - Path Section D3

Path Section D5

The 160m alignment identified as Path Section D5 is in Dunbogan and runs in a southwest to northeast direction as shown in Figure 2.2. The alignment comprises a raised boardwalk and viewing platform over the estuary (Camden Head Inlet). The large water body of Camden Head Inlet hosts a range of recreational activities by local residents and tourists, which path section D5 traverses. It starts at the end of the D4 SUP section on the western side of the Boulevarde just before the intersection of Longworth Road. The proposed alignment merges into the existing D6 SUP section located to the west of The Boulevarde and Longworth Road intersection.
The boardwalk is proposed to increase views of the Camden Haven Inlet and aesthetics of the path along the route.

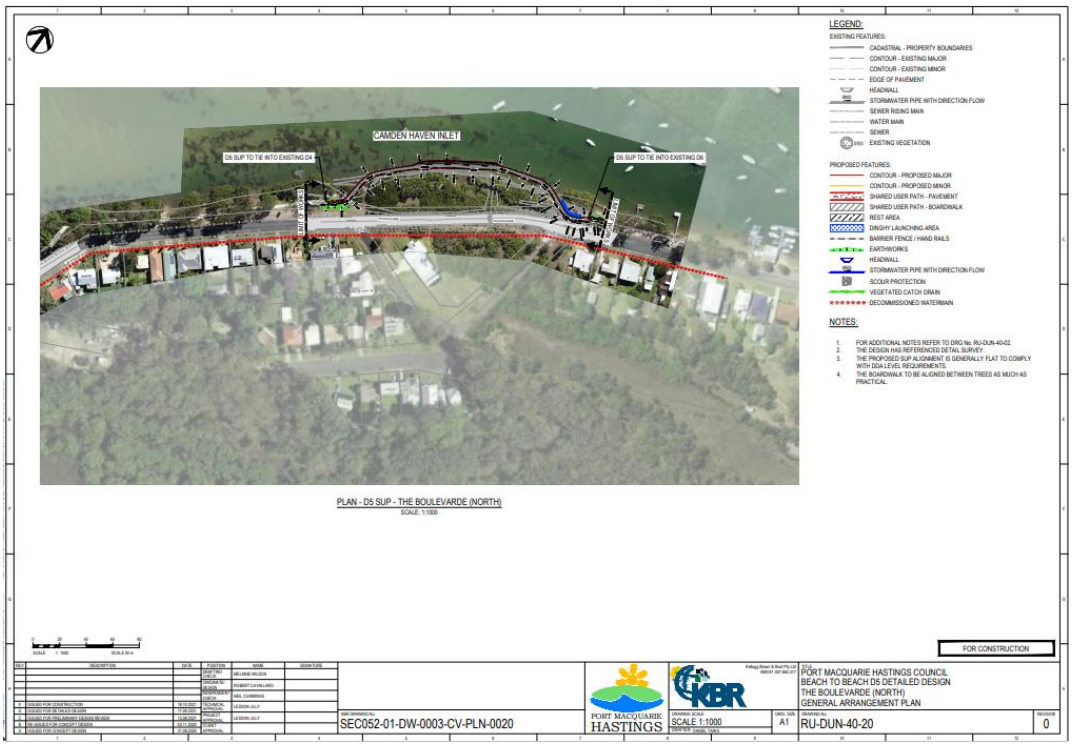


Figure 2.2 - Path Section D5

Path Section D8

The 800m alignment identified as Path Section D8 is located along Camden Head Road, parallel to Gogleys Creek which flows into Gogleys Lagoon as shown in Figure 2.3 and 2.4. The alignment runs in a northwest to southeast direction and begins at the end of D7 SUP section on the eastern side of the park/boat ramp area where Dunbogan Jubilee Hall is located. The path crosses the one-way exit road used for accessing the boat ramp and the park, traverses along the northern side of the carriageway (Camden Head Road) and merges into the existing path (D8-D9 section tie-in) to the east of the Camden Head Road and Scarborough Way intersection. At this section, two new watermains (100mm and 200mm) will be installed along and/or under almost the entire length of the shared path. The alignment of the watermains will meander in and out of the proposed path section to avoid damaging existing underground utilities.

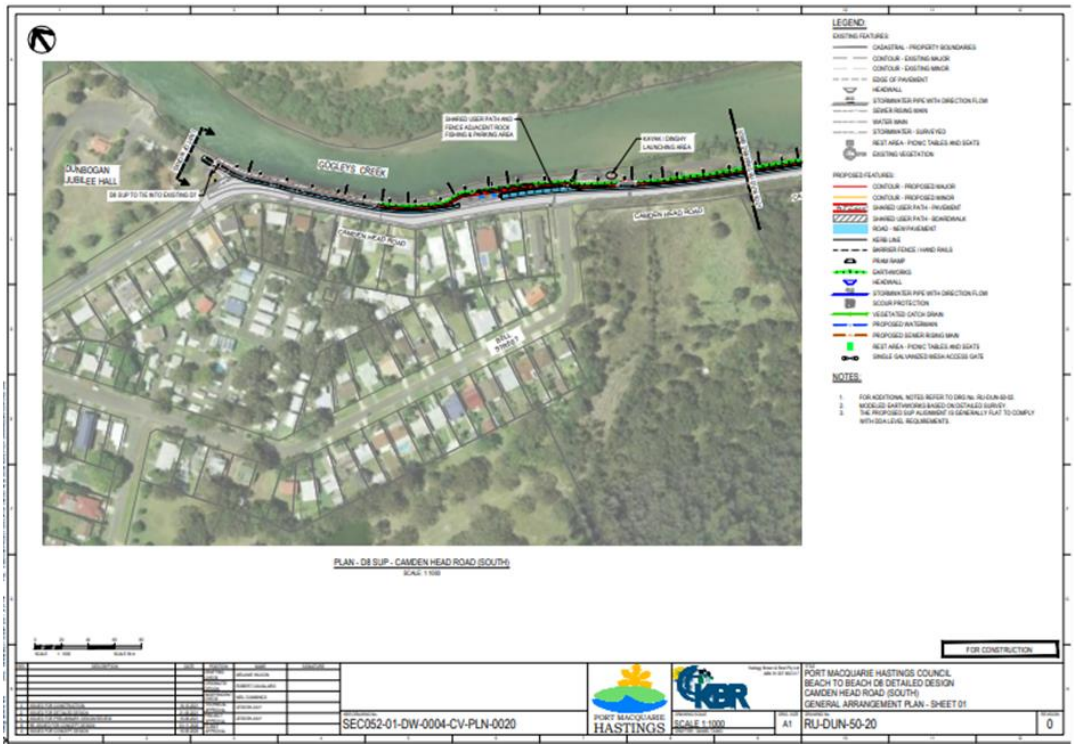


Figure 2.3 - Path Section D8 (ch0 – ch380)

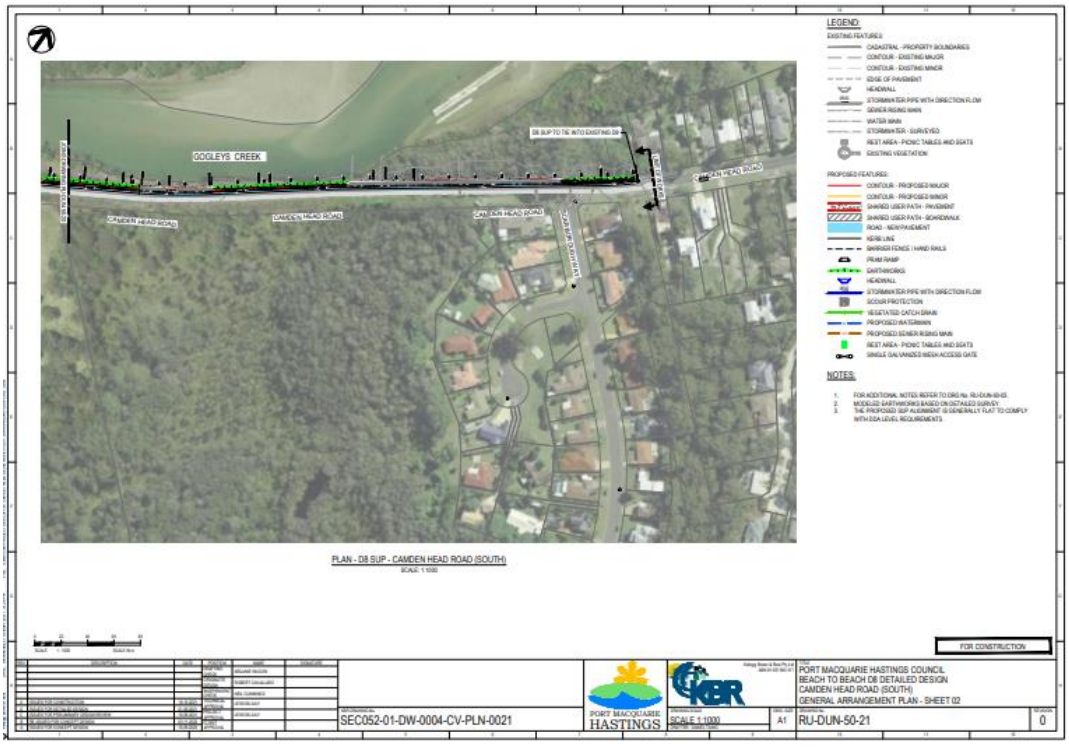


Figure 2.4 - Path Section D8 (ch390 – ch843)

Path Section D10

The 1500 m alignment identified as Path Section D10 comprises sections of pavement and boardwalk in Dunbogan and Camden Head, and traverses along the western side of the carriageway (Camden Head Road) as shown in Figure 2.5 and 2.6. The shared path starts at the end of the existing D9 SUP section, approximately 120m northeast of the intersection with Seaview Avenue. The path runs along the north western side of Camden Head Road and tracks along an existing unsealed access track for approximately 145m until it re-emerges with Camden Head Road and continues until the intersection with Bergalia Crescent. The path continues past an existing sewer pump station and ends just before the Camden Head and Pilot Beach Roads intersection. At this shared path section, new watermains will be installed under the proposed path (from ch0 to the path limit of ch1230 where path sections D10/D11 tie-in). In addition, a SRM will be installed (in the same watermain trench) to replace the old SRM from ch0 to the pump station at approximately ch990.

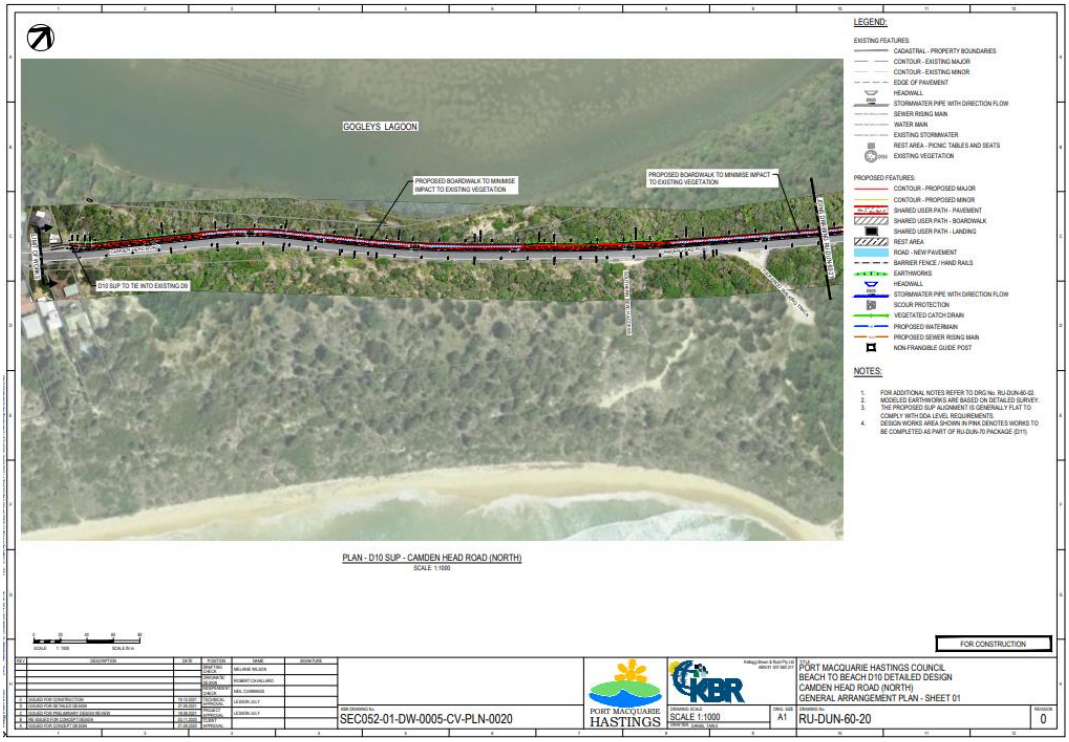


Figure 2.5 - Path Section D10 (ch0 – ch580)

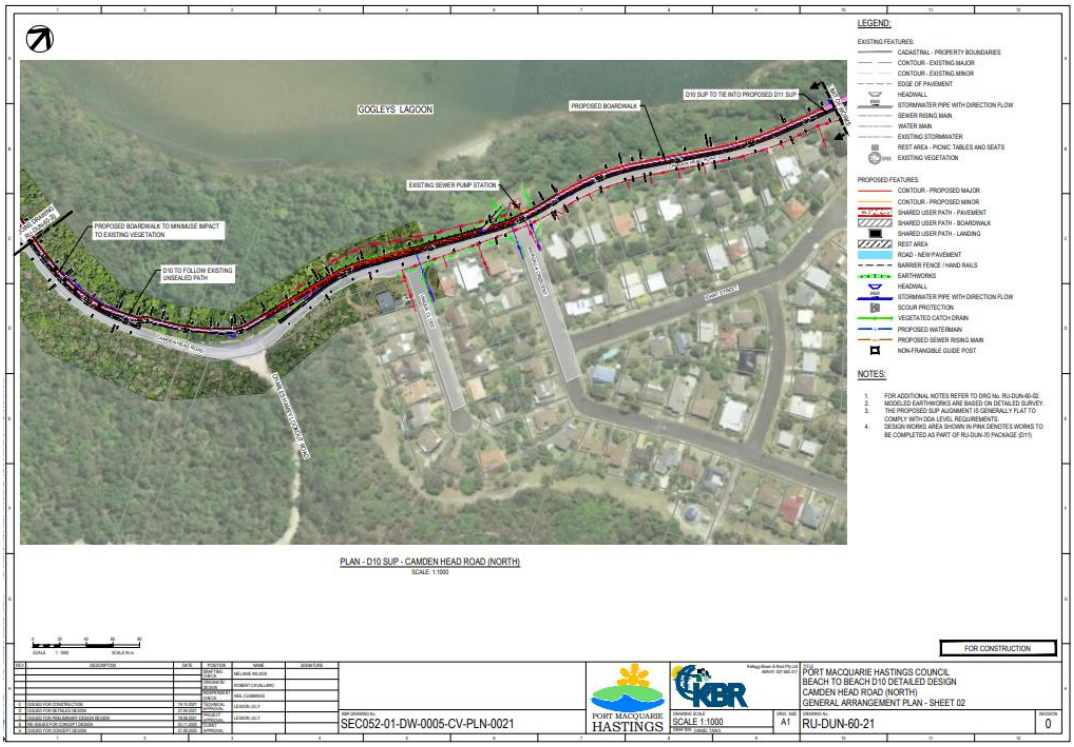


Figure 2.6 - Path Section D10 (ch580 – ch1230)

Path Section D11

The 700m alignment identified as Path Section D11 is in Camden Head, starting at the end of the new D10 SUP section and tracking along the western edge of Pilot Beach Road, crossing an existing unsealed road used to access the Camden Haven Oyster Supply Sheds and a 'second' unsealed access road, as shown in Figure 2.7. The SUP follows Pilot Beach Road along the northern edge of the carriageway and crosses the road leading to Camden Head breakwall path and the breakwall access road. The SUP terminates at the breakwall. From the proposed path section D10/D11 tie-in (at ch0), the watermains installation will continue under the SUP to approximately ch55, where it crosses Pilot Beach Road and connect to the existing watermains on Camden Head Road.

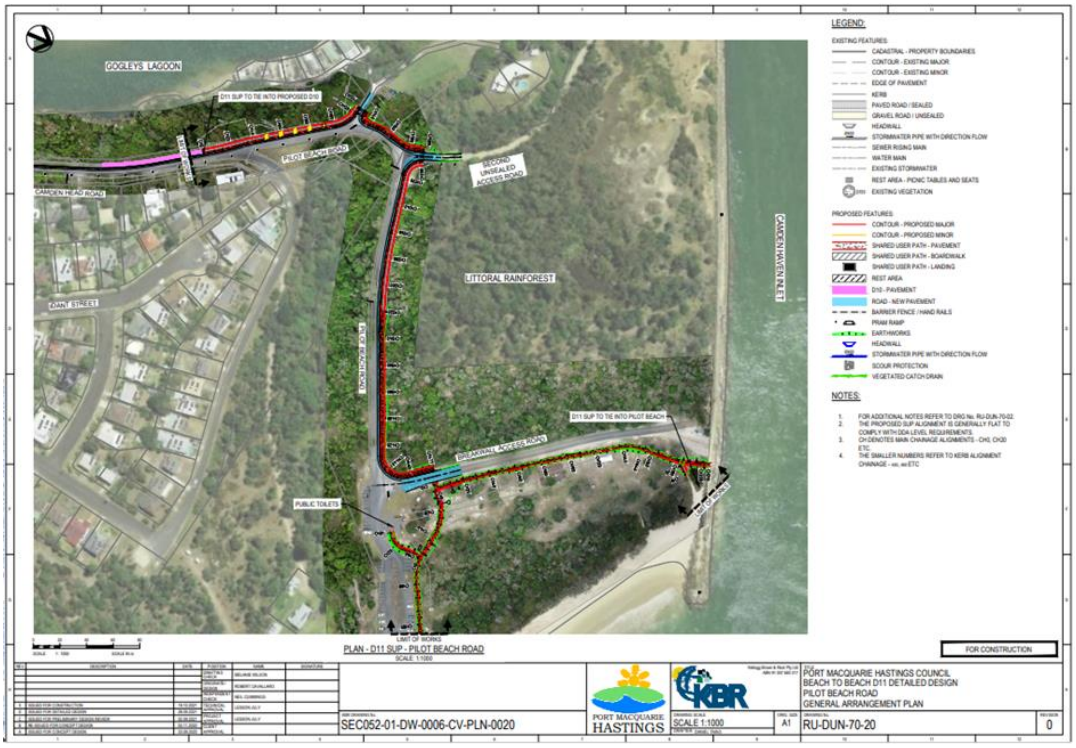


Figure 2.7 - Path Section D11

2.2 NEED FOR THE PROJECT

PMH Council has committed to completing the Beach-to-Beach SUP network. The un-interrupted SUP would provide safe pedestrian and bicycle access to community centres, schools and shopping centres. Moreover, the 11km scenic route would attract cycle-related tourism into the area, creating jobs, and boosting the vitality of the town centres, thus adding value to neighbourhoods and communities. Public health in the local communities would also improve through participation in cycling, exercise, and non-motor vehicle travel on the shared path.

Overall, the project would fulfill a significant gap in the existing community infrastructure and satisfy community needs, as well as improve the operational efficiencies of recreational activities within the local area. The new Beach-to-Beach SUP would assist in appropriately responding to the increased need for recreational facilities, in line with State and Federal Government objectives, particularly around 'physical activity is important for good health and wellbeing'.

As such, with the community's support, PMH Council is committed to undertaking the project as soon as practical.

2.3 PROJECT OBJECTIVES

The objectives of the project are to:

- Create shared paths for use by cyclists and pedestrians, as well as users of mobility aids (such as prams, strollers, scooters, wheelchairs, and assistance animals) at any one time.
- Provide opportunities for physical activity or exercise that can improve people's health and reduce the risk of developing health issues. Physical activity and exercise can have immediate and long-term health benefits and most importantly, regular activity can improve a person's quality of life. This is supported by more than four decades of research that have established the role of regular physical activity as an important determinant of health and functioning as people age, including:
  - exercise may block negative thoughts or distract a person from daily worries.

  - exercising with others provides an opportunity for increased social contact.
  - increased fitness may lift a person's mood and improve sleep patterns.
  - exercise may also change the level of chemicals in a person's brain, such as serotonin, endorphins, and stress hormones.
- Provide important tourism offerings and opportunities for people to explore multiple sites and landscapes. The path enables a clustering of experiences, facilitating tourism business ventures and benefits the local population and stakeholders. The SUP promotes the surrounding area as a tourist destination and diversifies the local communities' offering and spread of economic and social benefits.
- Provide environmental protection to the natural environment. The proposed boardwalk would protect the rough ground and sensitive/fragile natural environment from direct impacts by foot or cycle traffic. The SUP (boardwalk) would provide effective protection to allow vegetation to regenerate.
- Provide educational benefits using signage identifying flora and fauna species or through vegetation viewing areas, and to recognise and acknowledge the key events in Aboriginal and Torres Strait Islander history that have taken place within the area and the history of the Aboriginal community's displacement, and their part in the creation of a diverse and inclusive community.

2.4 CONSTRUCTION DETAILS

The construction work is based on the project's design (alignment as described in Section 2.1) and included in the design plans, refer to Appendix A.

The new watermain and SRM along and/or under path sections D3, D5, D8 and D10 will be installed prior to construction of the shared paths. Detailed construction planning would occur before construction commences and would consider methods and scheduling to mitigate community and environmental issues including noise, access, amenity, and general disruption.

Equipment and plant requirements would be refined during detailed design and during the development of the construction methodology by the construction contractor. Details of the construction would be detailed in the Construction Environmental Management Plan (CEMP; see Section 7.1).

The construction strategy for the shared paths has been designed to ensure the construction occurs in a safe and efficient manner while managing identified constraints and minimising environmental impacts. The general principles of the construction strategy are to:

- Achieve safe and convenient access for construction vehicles and the public, plant, and equipment along each length of the path alignment, and to and from public roads whilst simultaneously minimising impacts.
- Consider impacts on road users, the effect on urban amenity and the suitability of local road pavements.
- Manage impacts on existing infrastructure including local roads, utilities, and services (example, culverts).
- Recognise that modifications to existing infrastructure comes with increased safety risks to road users and construction personnel and can result in the need to undertake work at night or to implement traffic switches.
- Manage community and environmental issues including noise, access, amenity, and general disruption.

2.4.1 Construction Footprint

The total area required to construct the project is referred to as the 'construction footprint'. Generally, the construction footprint includes the area required for road works, pavement and boardwalk works, access for construction vehicles and plant, utilities and services adjustments, temporary stockpiles, and temporary ancillary facilities.

The total construction footprint (including compound and laydown sites) is estimated at 1.3 ha and is shown on Figure 1.2. The construction footprint will be refined during detailed design phase.

2.4.2 Typical Construction Methods

The proposed shared path will have a width of 2.5 m and be constructed using a combination of sealed concrete paths and raised boardwalks. Raised boardwalk construction would be used in areas with steep gradients and to minimise impacts to sensitive environments including coastal wetlands and littoral rainforests. Typical sections used along the length of the shared path are shown in Figure 2.8 and Figure 2.9.

The proposed construction methodology is meant to provide site access whilst minimising impacts to the existing environment. Top-down construction is a method where a small, efficient machines with specific attachments drives on top of the newly constructed section of the boardwalk surface to place the next section of foundation components followed by beams, joist and deck.

The following construction steps are proposed:

1. Site preparation for abutments (away from the swampy areas). Clear and remove existing grass for setting out. A 4m clearance has been allowed for to support construction of a proposed 2.5m wide path.
2. Introduce fill material in line with set-out markings and compact material in layers of 150mm to achieve the design California Bearing Ration (CBR).
3. Drive columns/ stumps into the ground to the correct depths and install bearers and joist to lay the first Fibre Reinforced Panels (FRP) anti-slip deck grating.
4. Approaching swampy areas move the mini crawler crane with specific attachments over the abutment and newly installed boardwalk to lay the next new segments.
5. Once one section is finished, move the machine forward on the newly placed walking surface to continue installing the next portion. The process will continue incrementally until the boardwalk is complete.
6. Construct scour protection around abutments and install boardwalk finishes as per the design drawings.

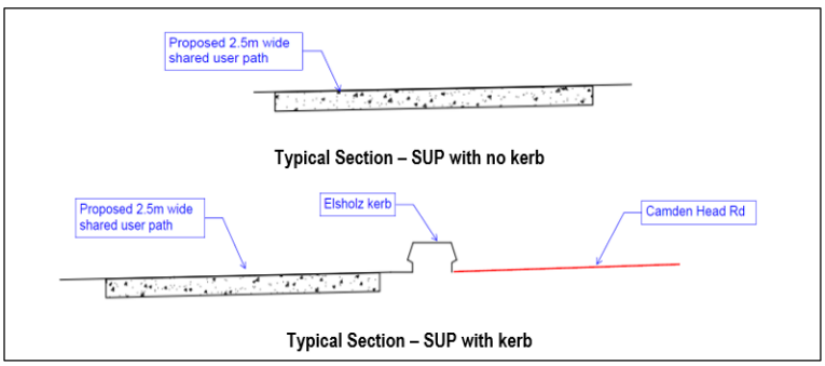


Figure 2.8 - Typical Section of the Concrete Path Construction

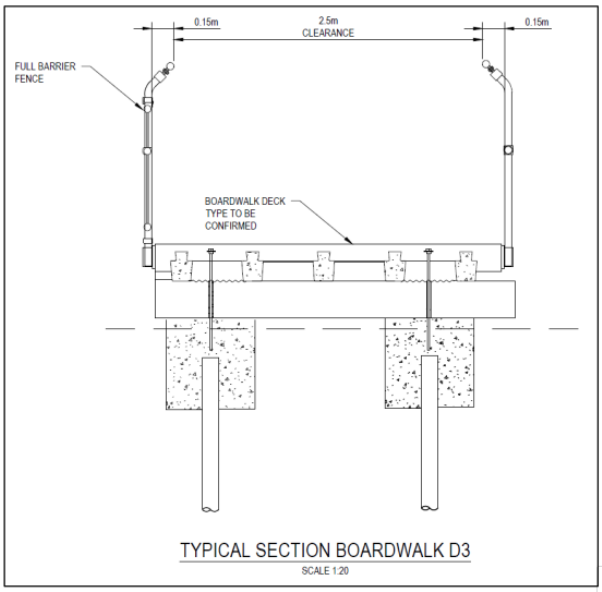


Figure 2.9 - Typical Section of Boardwalk Construction

2.4.3 Overview of Construction Activities

Construction of the project would generally include the following key activities:

- Early works and property adjustments
- Traffic management and access
- New road (re-surfacing of existing unsealed access road) and intersection works
- Installation of erosion and sediment controls
- Set up of construction compounds and progressive site establishment including temporary access tracks within the path alignment
- Grubbing and clearing of existing vegetation and roots for onsite mulching
- Demarcation of existing services
- Construction of pavements and boardwalks
- Relocation of noise mitigation measures
- Finishing work including rehabilitation of all exposed surfaces with appropriate ground cover, removal of temporary erosion and sediment controls once stabilised, and removal of all traffic and environmental controls.

Construction is expected to commence in 2022. Construction is expected to take 12 months for completion.

Construction Equipment

The typical equipment and materials required during construction are:

- Traffic control equipment
- Erosion and sediment control devices (silt fences, sandbags, pickets, rip rap)
- Chain saw/tree lopper
- Mulcher
- Water cart

- Delivery and waste/earth removal dump trucks
- Light vehicles including utility vehicles
- Excavator/backhoe (including excavation and hammer attachments)
- Skid Steer loader
- Hand tools (grinding power tools, welding equipment)
- Concrete delivery trucks
- Compactor
- Paints
- Fuel for plant.

Imported materials will likely include:

- Concrete
- Bitumen
- Gravel and fine crushed rock for path reconstruction
- Aggregates and sand
- Water during construction (for dust suppression. Will be sourced and transported to the construction site, as required).

3 Project Development and Alternatives

This chapter describes the alternatives to the project that were considered as part of the project development process and explains how and why the project was selected as the preferred option.

3.1 BACKGROUND

In 2019, an investigation into the missing path sections of the Beach-to-Beach SUP was undertaken, with the findings documented in the PMH Council – Beach to Beach Shared Path Alignment Study and Environmental Approvals Path (GHD, 2019). Five path sections were considered where potential alternative routes, preliminary design and costings were assessed. The investigation (GHD, 2019) served as the primary scoping study and business case for the design and construction of the missing sections.

The investigation identified possible alignment options including the development of boardwalk over the water in Camden Haven Inlet. The inception of the Beach-to-Beach SUP community group and consultation commenced in 2019. It was identified that the construction of the missing sections of the shared path alignment would have several community benefits associated with the construction, including community engagement and enhancement of visual connections around Camden Haven Inlet and recreational amenity of the Camden Head, Dunbogan, Laurieton, and North Haven areas. The study and community consultation undertaken to support the business case demonstrated that the construction of the new sections would be the preferred option. Following further consideration of the proposed alignments, and consultation with the community group, the final preferred alignments were chosen.

3.2 ALTERNATIVES CONSIDERED

Given the scope and objectives of the project is centred on the benefits the continuous shared path infrastructure would bring to the communities of North Haven, Laurieton, Dunbogan and Camden Haven, the following alternatives to the project were considered:

- Alternative 1 – the base case or 'do nothing'
- Alternative 2 – the subject proposal (with various alignment options)
- Other alternatives – early consideration.

3.2.1 Alternative 1 – Do Nothing

If the project does not proceed, there would be no safe, usable, and continuous path connecting North Haven and Camden Head. This would necessitate the use of the incomplete path by residents and visitors. The current investment by PMH Council into the existing path would be compromised and create inconvenience for residents and visitors and a likely long-term outcome would be to discourage useability. Additionally, the area would lose the tourism benefits associated with the path to other locations in NSW and interstate. The 'do nothing' option would therefore be inconsistent with the objectives of the project and is not considered feasible.

3.2.2 Alternative 2 – Subject Proposal

The merits of the project were considered in the context of the various path/direction in which the alignment traverses and the complex nature of the area and surroundings. Ultimately, this alternative would connect the existing sections of the shared path from North Haven through to Camden Head.

This alternative would generally include:

- Construction of road pavements, boardwalk through the low-lying inter-tidal estuarine landscape, and shared user pavement along The Boulevarde in Path Section D3 of the project.
- Construction of a boardwalk and viewing platform over the estuary (Camden Head Inlet) in Path Section D5 of the project.
- Construction of boardwalk and pavement sections along Camden Head Road (in Dunbogan and Camden Head) in Path Section D8 of the project. A section of the pavement (runs water side away from the road) adjacent to the rock fishing and parking area will be fenced.
- Construction of pavement and boardwalk sections along the Camden Head Road in Path Section D10 of the project. A section of the path meanders slightly into the bushland is a proposed boardwalk to minimise impact to existing vegetation.
- Construction of pavement along Pilot Beach Road through to the Breakwall Access Road in Path Section D11 of the project.

3.2.3 Other Alternatives – Early consideration

Other potential alternatives (alignment options) that were discarded, and were not considered in the alternatives and options assessment process:

- Alignment A starts in the same manner, however, diverts down the unsealed Camden Haven Oyster Supply Sheds access road. The alignment generally follows that of the existing roadway until it meets with the existing natural batter. From there the path would travel northeast, cutting across the face of the batter to then connect into the unsealed road and to the Camden Head Breakwall path.
- Alignment B starts in the same manner, however after crossing the access to the Camden Haven Oyster Supply Sheds, follows the unsealed road then crossing the unsealed road proceeds into the bushland. The alignment through the bushland follows a north-east direction towards Pilot Beach Reserve. Upon emerging from the bushland, the alignment crosses the Camden Head Breakwall access road, and through the reserve and connecting to the Camden Head Breakwall path.

These options did not meet the design requirements, were expensive to construct and included land ownership concerns.

3.3 EVALUATION OF OPTIONS FOR THE PROPOSED ALIGNMENT

While a ‘do nothing’ is not feasible, it is recognised that the subject Proposal would result in greater footprint related impacts than the ‘do nothing’ alternative.

In the investigation (GHD, 2019) a preliminary order of magnitude cost was undertaken for the purpose of comparing relevant path options for the proposed SUP sections. The options (pavement type, boardwalk, retaining walls, road crossings, rest areas, Section D3 and D11 routes, and opportunities for improvement) were evaluated against the following criteria:

- Capital expenditure (CapEx) - likely relative construction costs.
- Durability and maintenance - expected long term durability/maintenance issues in the highly corrosive coastal and marine environments.
- Sustainability - what are the impacts to the environment during construction.
- User functionality and attractiveness - does it allow for lower skilled cyclists or low mobility pedestrian use?

A summary of the option assessment of the proposed SUP and recommendations are presented in the (GHD, 2019) investigation.

4 Planning and Assessment Process

This chapter describes the statutory context of the project, including the environmental impact assessment, approval process, and identifies NSW and Commonwealth legislation that may apply.

4.1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

The SEARs relating to the planning and assessment process, and where these requirements are addressed in the EIS (this report), are provided in Table 4.1.

Table 4.1 EIS Secretary's Environmental Assessment Requirements

Item	Description	Where addressed in EIS
General Requirements	The EIS must meet the minimum form and content requirements in sections 190, 192, and 193 *Environmental Planning and Assessment Regulation 2021*.	This report
Strategic and Statutory Context	• A detailed justification for the proposal and suitability of the sites for the development. • Demonstration that the proposal is permissible under and consistent with all relevant planning strategies, environmental planning instruments, development control plans (DCPs), or justification for any inconsistencies. • Consideration of impacts of 'no action' and consideration of alternative options as well as construction and operation technologies. • A list of any approvals that must be obtained under any other Act or law before the development may lawfully be carried out.	Sections 2 and 3
Biodiversity	• A description of the ecological value of the identified coastal wetland and littoral rainforest. • A detailed assessment of the potential impacts on biodiversity values to determine if the proposed development is 'likely to significantly affect threatened species for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act). If the proposed development is likely to significantly affect threatened species, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared in accordance with Part 6 of the BC Act. • A detailed assessment of the potential impacts and offsetting (direct and indirect) to the coastal wetland and littoral rainforest, including impacts on marine vegetation (seagrass, mangroves, and saltmarsh areas), aquatic species and key fish habitat listed under the *Fisheries Management Act 1994* and aquaculture activities (oyster leases) in the area.	Section 6.1 Appendix D
Aboriginal Heritage	• The assessment for impacts on Aboriginal heritage (including cultural and archaeological significance) undertaken consistent with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011), as well as any other relevant guidelines and requirements. • Consultation with Aboriginal people regarding the proposal, including the significance of any Aboriginal cultural heritage values and likely impact of the proposal on their cultural heritage.	Section 6.2 Appendix E

Item	Description	Where addressed in EIS
Hazards and Risk	• The effects of coastal processes and coastal hazards including the effects of sea level rise and climate change. • Consistency with coastal zone management plans, floodplain risk management plans and flood hazards associated with the land. • Flooding, with consideration of the impacts of the proposal on the hydraulic and hydrology regime. • An assessment of the risk of bushfire, including addressing the requirements of Planning for Bush Fire Protection 2006 (RFS).	Section 6.4 Appendix H
Soil and Water	• Detailing the disturbance of soils and potential impacts from erosion, sediment, and leachate. • An assessment of potential impacts on receiving water courses, wetlands, estuaries, marine waters, and floodplain areas. • An assessment of potential impacts on stormwater management. • An assessment of potential impacts in accordance with the relevant guidelines in the Acid Sulfate Soils Manual (Stone et al. 1998) and the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004) for the presence and extent of acid sulfate soils (ASS) and potential acid sulfate soils (PASS) on the site.	Section 6.5
Traffic and Transport	• An assessment of the traffic impacts on the surrounding land uses during construction (access to and from the site) and operation, including consideration of connectivity, public transport, and active transport modes such as walking and cycling.	Section 6.6
Noise and Vibration	• A description of all potential noise and vibration sources during construction, including hours of construction. • Assessment of the likely noise impacts on nearby sensitive receivers during construction in accordance with the *Interim Construction Noise Guideline* (DECC, 2009).	Section 6.7 Appendix I
Waste Management	• Identifying, characterising, and classifying all waste in accordance with the *Waste Classification Guidelines* (EPA, 2014) and providing details of waste quantities and handling including, transport, identification, receipt, stockpiling and quality control including off-site reuse and disposal. • The measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives and guidelines in the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21* (EPA, 2014).	Section 6.9
Visual	• Consideration of the proposal on the overall visual amenity of the foreshore.	Section 6.8 Appendix J
Land Use	• The assessment for impacts of construction and operation on and from surrounding land uses, including issues relating to managed adjoining areas and an analysis of site suitability with respect to potential land use conflicts. Particular attention should be made to potential impacts upon any adjoining and/or nearby Office of Environment and Heritage (OEH) estate, Crown Land, National Parks and Wildlife Service (NPWS) lands, business and aquaculture operations (oyster leases), residential and educational land uses, as well as recreational and tourism activities that may be carried out in the locality. • Details on any land acquisition required for the proposal.	Section 5 Appendix K

Item	Description	Where addressed in EIS
Environmental Management and Monitoring	• The EIS must describe and appraise in detail what measures would be implemented to manage, mitigate, or offset the potential impacts (including cumulative impacts) of the proposal (as identified above) during construction and operation as relevant, and where required, describe how the environmental performance of the proposal would be monitored and managed over time. Where possible, reasonable, and feasible mitigation measures should be developed in consultation with surrounding affected landowners and relevant public authorities.	Sections 6.11 and 7
Environmental Planning Instruments and other policies	The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to: • *State Environmental Planning Policy (Coastal Management) 2018* • State Environmental Planning Policy (Biodiversity and Conservation) 2021 • Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update) • *Crown Land Management Act 2016* • Port Macquarie-Hastings Local Environmental Plan 2011 • North Coast Regional Plan 2036 • Port Macquarie-Hastings Council Urban Growth Management Strategy 2017- 2036 • Port Macquarie-Hastings Council Flood Policy (September 2015) • Camden Haven Floodplain Risk Management Plan (March 2004) • Camden Haven River Estuary Management Plan (June 2002) • Port Macquarie-Hastings Development Control Plan 2013 • Relevant section 94 plans.	Section 4
Guidelines and Agency Issues	During the preparation of the EIS you should consult the Department's Register of Development Assessment Guidelines which is available on the Department's website at planning.nsw.gov.au. Whilst not exhaustive, this Register contains some of the guidelines, policies, and plans that must be considered in the environmental assessment of the proposed development. Matters to be considered and guidelines identified in consultation with agencies in the preparation of these requirements should also be addressed.	Section 4
Plans and Documents	The EIS must include all relevant plans, diagrams and relevant documentation required under Schedule 1 of the Regulation. These items are to be provided as part of the EIS rather than as separate documents.	Section 2 Appendix A
Consultation	During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the: • Environment Protection Authority (EPA) • Department of Planning, Industry and Environment (DPE), specifically: – Environment, Energy and science Group (Biodiversity and Conservation)	Section 5 Appendix C Appendix K Appendix L

Item	Description	Where addressed in EIS
	– Water Group – Crown lands – Regions, Industry, Agriculture and Resources Group (DPI Fisheries). – Transport for New South Wales (TfNSW) (Former Roads and Maritime Services) • NSW Rural Fire Service (RFS) • NSW State Emergency Services (SES) • Special interest groups, including Birpai Local Aboriginal Land Council and Registered Aboriginal Parties • utilities and service providers • the surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultation carried out and issues raised must be included in the EIS.	
Further Consultation After Two Years	If you do not lodge an application under Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* within 2 years of the issue date of these SEARs, you must consult with the Planning Secretary in relation to any further requirements for lodgement.	--

4.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) are the primary pieces of legislation regulating land use planning and development assessment in NSW. This legislation is supported by a range of environmental planning instruments including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).

Table 4.2 Response to the Objects of the EP&A Act

	Objects of the EP&A Act	Response
(a)	To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources	The project will promote the social and economic welfare of the community, as it has significant employment-generating potential, social and health benefits. The creation of employment opportunities would have a direct impact on both the local and broader communities. In its current form, the subject site remains void from meeting its strategic objective. The proposed works would afford the subject site the potential for greater use and achieve an outcome that would allow the subject site to meet its strategic obligation and promote useability and visibility of the State's natural resources.
(b)	To facilitate ecologically sustainable development by integrating relevant economic, environmental, and social considerations in decision-making about environmental planning and assessment	The intent of the project is to facilitate works that will allow the subject site to be used to a greater potential, while ensuring that economic and social obligations are met, and environmental impacts minimised.
(c)	To promote the orderly and economic use and development of land	In its existing state, the subject site is considered to not meet its full potential as a recreational driver. Through the proposed works, the subject site can be developed

	Objects of the EP&A Act	Response
		in line with the orderly economic use of land, thus promoting the following objectives: • It would deliver employment-generating opportunities in both the construction and operational phases in the area. • It would provide a new economically and ecologically sustainable development, delivering new recreational and tourism facilities. • It would deliver a facility with enhanced access, providing improved connectivity to the wider locality. • It would have minimal impact on the environment.
(d)	To promote the delivery and maintenance of affordable housing	Not applicable. The project does not seek consent for housing although it does provide opportunities for recreational pursuits for residents.
(e)	To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats.	The Biodiversity Assessment Report (Appendix D) has examined the project's impact on the existing natural environment. The biodiversity assessment has found that the project is unlikely to have a significant impact on areas of high biodiversity value in NSW and MNES and a Commonwealth referral under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* is not warranted. Further analysis of the project site's biodiversity is included in this EIS.
(f)	To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	An Aboriginal Cultural Heritage Assessment (Appendix E) has been prepared to determine if Aboriginal objects were likely to be located at the subject site, and if so, whether the project had the potential to harm those objects. The findings identified nine sites through the Aboriginal Heritage Information Management System (AHIMS) that were located within the subject site with a buffer of 50 m, however none were determined to be directly impacted by the project. It was concluded that considerable disturbance to, and adjoining, the project site has occurred since European colonisation and further impacts to the site are unlikely to disturb Aboriginal heritage.
(g)	To promote good design and amenity of the built environment	The project creates a quality of built form that will integrate with the surrounding landscaping and environment. The SUP has been designed to align with the natural profile of the landscape.
(h)	To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants	The project will facilitate the development of a shared path and will be constructed to industry's best practice standards and measures, ensuring health and safety measures are achieved.
(i)	To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State	The project is a positive outcome for the surrounding area, from both a local and state government perspective. It is consistent with levels of legislation identified by the supporting specialist reports and this EIS. Where possible impacts have been identified, appropriate mitigation measures have been applied accordingly.

	Objects of the EP&A Act	Response
(j)	To provide increased opportunity for community participation in environmental planning and assessment	The community and stakeholder engagement activities undertaken for the project are summarised in the Community Engagement Report (Appendix C). It was concluded that the project is a highly appealing and much needed piece of infrastructure for the Camden Haven area, which will be beneficial for tourism, the economy, residents' recreational opportunities and the safety of the town. In addition to the community desiring the shared path to be constructed as soon as possible, residual concerns particularly regarding the endangered Littoral Rainforest areas remained an important aspect for the project to balance the needs between environmental impacts, pedestrian safety, costs and visual amenity.

4.3 STATE ENVIRONMENTAL PLANNING POLICY (RESILIENCE AND HAZARDS) 2021

The aim of this Policy (SEPP Resilience and Hazards) is to promote an integrated and coordinated approach to land use planning in the coastal zone. A large extent of the project traverses land mapped as either Coastal Wetlands and Proximity Area for Coastal Wetlands and areas of Littoral Rainforest. Part 2.2 Division 1 of the SEPP Resilience and Hazards is relevant for any works within this mapped area whereby all development subject to some qualifications, will be declared 'designated development' for the purposes of the EP&A Act.

The relevant clauses of Division 1 Coastal wetlands and littoral rainforests area of the SEPP Resilience and Hazards are extracted and discussed below.

2.7 Development on certain land within coastal wetlands and littoral rainforests area

(1) The following may be carried out on land identified as 'coastal wetlands' or 'littoral rainforest' on the Coastal Wetlands and Littoral Rainforests Area Map only with development consent:

(a) the clearing of native vegetation within the meaning of Part 5A of the Local Land Services Act 2013,

(b) the harm of marine vegetation within the meaning of Division 4 of Part 7 of the Fisheries Management Act 1994,

(c) the carrying out of any of the following:

(i) earthworks (including the depositing of material on land),

(ii) constructing a levee,

(iii) draining the land,

(iv) environmental protection works,

(d) any other development.

(2) Development for which consent is required by subclause (1), other than development for the purpose of environmental protection works, is declared to be designated development for the purposes of the Act.

(3) Despite subclause (1), development for the purpose of environmental protection works on land identified as 'coastal wetlands' or 'littoral rainforest' on the Coastal Wetlands and Littoral Rainforests Area Map may be carried out by or on behalf of a public authority without development consent if the development is identified in:

(a) the relevant certified coastal management program, or

(b) a plan of management prepared and adopted under Division 2 of Part 2 of Chapter 6 of the Local Government Act 1993, or

(c) a plan of management approved and in force under Division 6 of Part 5 of the Crown Lands Act 1989.

(4) A consent authority must not grant consent for development referred to in subclause (1) unless the consent authority is satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological, and ecological integrity of the coastal wetland or littoral rainforest.

(5) Nothing in this clause requires consent for the damage or removal of a priority weed within the meaning of clause 32 of Schedule 7 to the Biosecurity Act 2015.

(6) This clause does not apply to the carrying out of development on land reserved under the National Parks and Wildlife Act 1974 if the proposed development is consistent with a plan of management prepared under that Act for the land concerned.

The project involves subclause (1)(d) 'any other development' and is declared to be 'designated development' as the project falls within a local development by PMH Council. In accordance with Clause 2.7 (4) the consent authority must not grant consent if sufficient measures have not been taken to protect the biophysical, hydrological, and ecological integrity of the coastal wetland or littoral rainforest. The project area will encroach areas mapped as 'Coastal Wetland' and 'Littoral Rainforest'.

Path Sections D3, D5 and D8 present impacts to mangroves and saltmarsh areas (coastal wetland). In addition, potential impacts to seagrasses are associated with the raised boardwalk in Section D5, likely to result from piling (where seagrass patches occur) or because of overshadowing. Sections D10 and D11 of the project will impact on areas of 'Littoral Rainforest'.

The measures to avoid and minimise impacts to coastal wetland and littoral rainforest areas include consideration of the number and type of credits required to offset the project impacts, which will result in a long-term, net gain within the project site and locality. Revegetation of areas within the project site will enhance the condition and structural complexity of the vegetation within the project footprint, as well as enhance the habitat connectivity for threatened fauna and flora across the site and broader locality. Mitigation measures to minimise impacts would be implemented through a CEMP to be developed for the project works. The CEMP should include Vegetation Clearing Limits and no-go zones to exclude access during construction, and other habitat protection measures.

2.8 Development on land in proximity to coastal wetlands or littoral rainforest

(1) Development consent must not be granted to development on land identified as 'proximity area for coastal wetlands' or 'proximity area for littoral rainforest' on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:

(a) the biophysical, hydrological, or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The entire site (except for the mapped 'Coastal Wetland' and 'Littoral Rainforest' areas) is mapped as being a 'proximity area' to either coastal wetland or littoral rainforest. As stated above, the proposal is accompanied by a BDAR (Appendix D). The biodiversity of the site has been a key consideration in the design and development of the SUP.

4.4 STATE ENVIRONMENTAL PLANNING POLICY (BIODIVERSITY AND CONSERVATION) 2021

This Policy (SEPP Biodiversity and Conservation), seeks to address the declining status of koalas in NSW through better conservation and management of koala habitat as part of the planning and assessment process. Within the SEPP Biodiversity and Conservation, Chapter 3 – 'Koala habitat protection 2020' contains provisions from the Koala SEPP 2020 and, as an interim measure, applies in the NSW core rural zones of RU1, RU2 and RU3, except within the Greater Sydney and Central Coast areas.

Chapter 4 contains the 'Koala habitat protection SEPP 2021', which describes the land-use planning and assessment framework for koala habitat within Metropolitan Sydney and the Central Coast and applies to all zones except RU1, RU2 and RU3 in the short term. Once the koala SEPP 2020 is repealed the 2021 SEPP will apply to all zones. The koala SEPP 2021 re-establishes the provisions contained in the previous Koala SEPP 44 (2019).

Under the Biodiversity and Conservation SEPP, within the Port Macquarie-Hastings LGA, Chapter 3 applies to land zoned RU1, RU2 and RU3, whereas Chapter 4 applies to the remaining land use zones.

The definition of core koala habitat under this Policy is:

a) *An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or*

b) *An area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.*

This Policy applies to all LGAs listed on Schedule 1, except land dedicated or reserved under the *National Parks and Wildlife Act 1974* or the *Forestry Act 2012*. The identification of koala management area is determined by the presence of koala use tree species listed within Schedule 2 of the Policy.

The BDAR prepared by Accuplan (refer to Appendix D) describes highly suitable koala habitat as 'areas where 15% or greater of the total number of trees within any PCT are the regionally relevant species of those listed in Schedule 2 of the Policy'. The Schedule 2 listed koala use tree species are largely absent from the project area, however a small number of *Melaleuca quinquenervia* (Broad-leaved Paperbark) associated with PCT 1724 occurs at the eastern end of Section D8. The project may result in the removal of approximately 196 m^2 of this habitat, occurring along the northern side of Camden Head Road and potential removal of a small number of *Melaleuca quinquenervia*. No other areas of highly suitable koala habitat occur within the project area.

The proposed SUP footprint is narrow and is unlikely to restrict koala movement throughout the local area or increase the risk of vehicle strike. It is considered that the potential impact of the project to local koalas is low.

4.5 STATE ENVIRONMENTAL PLANNING POLICY (TRANSPORT AND INFRASTRUCTURE) 2021

SEPP (Transport and Infrastructure) 2021 aims to facilitate the effective delivery of infrastructure across the State and outlines provisions that allow various road and road infrastructure facilities to be carried out by or on behalf of a public authority without consent on any land.

However, as discussed in section 4.3, as the works affected an area of coastal wetlands and littoral rainforest, the provisions and development consent requirements of the SEPP Hazards and Resilience 2021 prevail. Consent is therefore required for the works.

4.6 BIODIVERSITY CONSERVATION ACT 2016 (BC ACT)

The purpose of the 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. The BC Act contains provisions relating to:

- Threatened species and ecological community listings and assessment;
- Section 1.7 of the EP&A Act; and
- Repealing the Threatened Species Conservation Act 1995 (TSC Act).

The BC Act provides a Biodiversity Offsets Scheme (BOS) incorporating a single Biodiversity Assessment Methodology (BAM), calculation and retirement of biodiversity credits and biodiversity assessment and approvals. The BC Act also contains measures for threatened flora and fauna protection, repealing parts of the NPW Act. Part 5 'activities' under the EP&A Act are also excluded from assessment under the BAM, however authorities may choose to opt into the scheme.

Residual direct impacts to vegetation and habitats, which cannot be avoided or minimised, are proposed to be offset in accordance with the NSW BOS. As outlined in the proposal a submission of a Biodiversity Development Assessment Report (BDAR) has been conducted for the project. The full BDAR can be found in Appendix D of this EIS. The BDAR has identified several direct and indirect impacts that may be associated with the proposal.

Direct impacts of the proposal will be irreversible and would include removal of some terrestrial biodiversity within the development footprint, including removal of:

- Native vegetation, including threatened ecological communities;
- Threatened flora and their habitats; and
- Threatened fauna habitats.

The calculated areas of impact are provided in Section 6.1 of this EIS.

4.7 NATIONAL PARKS AND WILDLIFE ACT 1974 (NPW ACT)

The NPW Act aims to conserve the natural and cultural heritage of NSW. The NPW Act governs the establishment, preservation and management of national parks, historic sites and conservation areas. The NPW Act also provides the basis for the legal protection and management of Aboriginal items and sites within NSW. In accordance with the relevant parts of the NPW Act, an Aboriginal Cultural Heritage Assessment (ACHA) has been prepared for the Proposal and is provided in Appendix E of this EIS.

Consideration has been given to the issues outlined in the *Guidelines for developments adjoining National Parks and Wildlife Service lands* (DPE 2020).

Pre-construction: This phase has involved the following activities:

- Ecological surveys of the vegetation communities present within the construction footprint.
- Design survey to inform appropriate design of the SUP.
- Aboriginal Cultural Heritage Assessment to ensure the SUP will not directly impacting Aboriginal heritage items.

Once approval is obtained for the SUP PMHC will develop Erosion and Sediment Control Plans (ESCP) for the scope of works and submit for approval to NPWS prior to works proceeding. In addition, PMHC will survey set-out boundary and set-out excavations, install erosion and sediment controls, install temporary fencing to exclude any unauthorised people or fauna from entering the work area and undertake vegetation removal activities within the designated areas only.

Construction: Once development approval is granted to construct the SUP the construction phase will involve mobilising plant, removing topsoil and storing it and where possible for re-use when reinstating the area. In addition, the SUP will be constructed in a number of stages.

To avoid unnecessary removal or damage to any adjoining vegetation, the clearing/construction boundaries will be clearly demarcated and signed, to ensure no vegetation beyond these boundaries is removed.

Prior to the commencement of any works fauna pre-clearance surveys will be undertaken by a suitably qualified ecologist within one week of any clearing activities.

To minimise impacts to native fauna species, clearing will be undertaken in the following two staged process under the supervision of a suitably qualified ecologist:

- The initial phase of clearing will involve clearing around the habitat features demarcated during the pre-clearance assessment. These features are to be left overnight to encourage any resident fauna to self-relocate; and

- The second stage will involve clearing of the habitat features left overnight followed by an inspection. Prior to felling, where possible, the habitat trees will be knocked using an excavator to promote any resident fauna to self-relocate. No habitat tree is to be felled without the attending ecologist providing approval to the excavator/machine operator.

Operation and remediation: Once the SUPs are operational, PMHC will reinstate the area with recovered topsoil and/ or imported topsoil, replanting the area from the NPWS approved species selection list, and conduct weed management and ongoing monitoring program as part of its Biodiversity Offset Strategy.

4.8 CROWN LAND MANAGEMENT ACT 2016 (CLM ACT)

The CLM Act and the *Crown Land Legislation Amendment Act 2017* came into effect on 1 July 2018, repealing and consolidating seven pieces of legislation, including the *Crown Lands Act 1989*. The CLM Act is intended to ensure that Crown land is managed to benefit the people of NSW and provides for the proper assessment and management of Crown land. The CLM Act sets out the conditions under which Crown land is permitted to be occupied, used, sold, leased, licensed, or otherwise dealt with.

The CLM Act provides a framework that:

- Significantly improves the way Crown reserves are managed and facilitate better decision making about the future use of Crown land.
- Requires that important decisions under the CLM Act comply with a community engagement strategy that provides for meaningful community engagement in appropriate circumstances.
- Acknowledges the spiritual, social, cultural, and economic importance of Crown land to Aboriginal people and recognises and facilitates Aboriginal involvement in the management of Crown land.
- Continues to support community involvement in the management of Crown land
- Allows land of local significance to be transferred to local councils, supporting the Crown Land Management Review recommendation for local councils to own such land, enabling decisions to reflect local concerns and benefit local communities. State significant land will be retained for the benefit of the people of NSW.
- Applies more consistent management across Crown land through consistency in tenures and rents and standardising lease and license arrangements.
- Provides a Crown reserve management model that better recognises the diversity and capability of current managers.
- Introduces modern governance and compliance provisions.

It is an offence to reside, erect a structure, graze or drove livestock, clear, dig up, cultivate, or enclose public land without lawful authority. Under Part 3 of the Crown Lands Act, the land must be assessed to consider capacities and suitable uses prior to any allocation action of Crown land including lease, sale, reservation, dedication, licence, or permit. Ministerial approval is required to grant a 'relevant interest' (such as for a lease, licence, permit, easement or right of way) over a Crown Reserve, if required. The proposal site is within Crown land.

Crown roads are generally unformed ('paper roads') that provide lawful access to freehold or leasehold land where little or no subdivision has occurred since the original Crown subdivision of NSW in the early 19th century. The Minister is the authority for all Crown roads. An assessment of the Crown land roads likely to be impacted by the Proposal and associated mitigation measures are discussed in this EIS. Consent will be applied under Section 138 of the Roads Act to authorise the carrying out of any works within the road reserves.

Throughout the development of the EIS, consultation with Crown Land was undertaken to understand the land status, as reported in the Community Engagement Report (Appendix C) and communication with Crown land (in Appendix L).

4.9 *ROADS ACT 1993* (ROADS ACT)

The Roads Act commenced 1 July 1993 and superseded the roads provisions of *the Crown and Other Roads Act 1990*, the *State Roads Act 1986*, the *Local Government Act 1919*, the *Public Gates Act 1901*, the *Width of Roads and Lanes Act 1902* and the *Traffic Safety (Lights and Hoardings) Act 1951*. It sets out procedures for opening and closing public roads, and establishes the authorities responsible for roads, i.e. the Transport for New South Wales (TfNSW), the Council of an LGA, Lord Howe Island Board or Crown Lands on behalf of the Minister Administering the Crown Land Management Act 2016. Key provisions include:

- Road opening/closing applications made before 1 July 1993 will continue under the provisions of the prior Act which created them.
- Road opening applications by Councils will be lodged directly with NSW Land Registry Service.
- Only road authorities may apply to close a road. Applications must be made to Crown Lands.

Approval to connect to a public road and to undertake work in, on or over a public road is required under section 138 of the Roads Act, which is an application for provisions of private access through Council. Formal applications for road upgrades under section 138 of the Roads Act will be undertaken during the post-approval agency liaison process.

4.10 *WASTE AVOIDANCE AND RESOURCE RECOVERY ACT 2001* (WARR ACT)

The WARR Act introduces a scheme to promote extended producer responsibility for the life-cycle of a product. The objectives of the WARR Act are:

(a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,

(b) to ensure that resource management options are considered against a hierarchy of the following order:

(i) avoidance of unnecessary resource consumption,

(ii) resource recovery (including reuse, reprocessing, recycling and energy recovery),

(iii) disposal,

(c) to provide for the continual reduction in waste generation,

(d) 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,

(e) to ensure that industry shares with the community the responsibility for reducing and dealing with waste,

(f) to ensure the efficient funding of waste and resource management planning, programs and service delivery,

(g) to achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,

(h) to assist in the achievement of the objectives of the Protection of the Environment Operations Act 1997.

The WARR Act sets out the priorities and mechanisms by which waste reduction is to be achieved in NSW. The waste hierarchy is a set of priorities for the efficient use of resources, which underpins the objectives of the WARR Act and is summarised as:

1. Avoidance – including action to reduce the amount of waste generated by households, industry, and all levels of government
2. Resource recovery – including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources
3. Disposal – including management of all disposal options in the most environmentally responsible manner

The WARR Act requires the development of a waste strategy for NSW, which is contained in the current *NSW Waste Avoidance and Resource Recovery Strategy 2014 – 2021* (Waste Strategy 2014). The Waste Strategy 2014 provides guidance for key industry, local government and State agencies and groups to assist in minimising environmental harm from waste disposal and the conservation and efficient use of resources. The waste hierarchy and the provisions of the Waste Strategy 2014 have been considered as part of this EIS.

4.11 *FISHERIES MANAGEMENT ACT 1994* (FM ACT)

The objects of the FM Act in particular, include:

a) *To conserve fish stocks and key fish habitats, and*

b) *To conserve threatened species, populations and ecological communities of fish and marine vegetation, and*

c) *To promote ecologically sustainable development, including the conservation of biological diversity.*

Part 7 of the FM Act identifies requirements for the protection of aquatic habitats while Part 7A of the FM Act lists threatened species, populations and ecological communities and key threatening processes for species, populations, and ecological communities in NSW waters. Section 221ZV of the FM Act considers for the purposes of determination, whether a proposed development is likely to significantly affect the threatened species, populations, or ecological communities.

Key fish habitats identified within the project area, mapped by DPE, and are described in Section 6.1.2 of the EIS (this report).

The FM Act sets out provisions to protect marine vegetation (mangroves, seagrass, and seaweeds whether alive or dead) from 'harm'. 'Harm' under the FM Act means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it. For the purposes of the FM Act, macro algae and mangroves are defined as 'marine vegetation'.

The project is likely to impact Marine Vegetation in Sections D3, D5 and D8. A permit is required under Section 205 (of Part 7) of the FM Act in relation to any activity that is likely to impact on marine vegetation. Furthermore, permits are required under Sections 200 and 201 (of Part 7) of the FM Act in relation to any reclamation work.

The FM Act regulates matters to be considered for the purposes of determining whether a proposed development is likely to significantly affect threatened species, populations or ecological communities listed under the FM Act. A biodiversity assessment (refer to Appendix D) of potential habitat for threatened species likely to inhabit the project area indicated not more than a 'low' chance of occurrence for any listed threatened marine species. No endangered populations or communities exist in the project area.

Having regard to matters under Section 221ZV of the FM Act, the project is unlikely to have a significant impact on any threatened species, populations, or ecological communities.

4.12 *ABORIGINAL LAND RIGHTS ACT 1983* (ALR ACT)

The ALR Act is administered by the Department of Human Services: Aboriginal Affairs NSW and establishes the NSW Aboriginal Land Council and local Aboriginal land councils. The ALR Act requires these bodies to take action to protect the cultural and heritage of Aboriginal persons in the council's area and promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area. Consultation with the Aboriginal community to understand the cultural heritage values that exist in the project area was undertaken, as reported in the Aboriginal Cultural Heritage Assessment (refer to Appendix E).

4.13 *WATER MANAGEMENT ACT 2000* (WM ACT)

The WM Act is based on the concept of ecologically sustainable development, whereby development today will not threaten the ability of future generations to meet their needs. The Act recognises the following:

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

The project footprint ventures onto land described as 'waterfront land' as per the WM Act and is therefore a controlled activity under the Act. Under the *Water Management (General) Regulations 2018* a public authority is exempt from requiring a controlled activity approval under Section 91E (1) of the WM Act to undertake works on waterfront land.

4.14 *HERITAGE ACT 1977* (HERITAGE ACT)

The objects of the Heritage Act are to:

The objects of this Act are as follows—

(a) to promote an understanding of the State's heritage,

(b) to encourage the conservation of the State's heritage,

(c) to provide for the identification and registration of items of State heritage significance,

(d) to provide for the interim protection of items of State heritage significance,

(e) to encourage the adaptive reuse of items of State heritage significance,

(f) to constitute the Heritage Council of New South Wales and confer on it functions relating to the State's heritage,

(g) to assist owners with the conservation of items of State heritage significance.

It is considered very unlikely that proposal would impact any significant historical archaeological sites or listed heritage items within the proposal area. Due to the minimal archaeological

potential of the area and the late date of the site's establishment it is concluded that the proposal is unlikely to encounter 'relics' as defined by the Heritage Act.

4.15 NORTH COAST REGIONAL PLAN 2036

Released in March 2017, the North Coast Regional Plan 2036, aims to guide the NSW Government's land use planning priorities and decisions in the North Coast region to 2036. The vision for the North Coast is to become the best region in Australia to live, work and play thanks to its spectacular environment and vibrant communities. The proposed development of the remaining shared path is consistent with the directions outlined in the Plan, as presented in Table 4.3.

Table 4.3 Project-relevant Directions of the North Coast Regional Plan 2036

Directions		Comment
2.	Enhance biodiversity, coastal and aquatic habitats, and water catchments	The project maintains the existing biodiversity values for area of the site. The project protects the elements of the surrounding biodiversity, habitats, and water catchments. Maintaining these areas has been a primary design consideration to minimise impact to flora and fauna as well as opportunities to showcase the natural environmental in which the shared path is located.
5.	Strengthen communities of interest and cross-regional relationships	The existing path currently provides limited facilities for the community to use. The project comprising the construction of the remaining of the 2.9 km of the shared path will further improve connection with the community. The development will provide the opportunity for more community interaction and overall facility versality.
15.	Develop health, safe, socially engaged and well-connected communities	The completion of the remaining SUP sections will expand on the existing recreational walking and cycling trails thus allowing the community to experience the surrounding local towns and wonderful natural areas. The continuous shared path will improve user safety and foster healthy living through physical activity and social interaction.
16.	Collaborate and partner with Aboriginal communities	The PMH Council has an active relationship with the local Aboriginal community and proposes to continue this relationship. The Aboriginal community was engaged as part of the community consultation process. The Aboriginal Cultural Heritage Assessment (refer to Appendix E) informed the design of planning and development of the project so that impacts to Aboriginal cultural heritage are minimised and appropriate heritage management mechanisms are identified.
18.	Respect and protect the North Coast's Aboriginal heritage	
21.	Coordinate local infrastructure delivery	The project will improve the local recreational infrastructure and upgrade the current facilities. As part of the proposed development, parts of the existing roads and verges will be upgraded, thus maximising the efficient use of land, reduce costs and limit environmental impacts.

4.16 PORT MACQUARIE HASTINGS COUNCIL URBAN GROWTH MANAGEMENT STRATEGY 2017-2036

The Urban Growth Management Strategy was adopted by PMH Council in August 2018 and conditionally approved by the NSW State Government in November 2018. The goal of the Strategy is to identify opportunities for new economic development and housing that will meet the future needs of the growing community.

In 2017, the PMH LGA had over 1000ha of undeveloped residential land, with capacity for around 9000 new dwellings. The main areas planned for new residential development are in Port Macquarie, Lake Cathie/Bonny Hills, Kew and Camden Haven. Collectively these areas have capacity to provide an 18-year housing supply.

The proposed development of the SUP will support the population growth of the area and is near residential populations and smaller areas of growth such as Laurieton and Dunbogan.
The development will complement the character of the existing area and not detract from the local environment that is valued by the community. A large percentage of the population of Laurieton and Dunbogan will be aged between 0–17 years and over 70 years of age. This further illustrates the need to enhance the outdoor facilities to not only accommodate the current population but the predicted growth throughout the region.

4.17 TOWARDS 2030 COMMUNITY STRATEGIC PLAN

The proposed development of the SUP satisfies the key strategies of this Plan for both 'business and industry' and 'natural and built environment' in that it will:

- provide for employment opportunities
- provide for effective management and maintenance of urban infrastructure and services
- facilitate development that is compatible with the natural and built environment
- provide for the effective integration with surrounding development
- protect natural areas, consistent with biodiversity objective.

4.18 PORT MACQUARIE HASTINGS COUNCIL FLOOD POLICY (SEPTEMBER 2015)

The purpose of the Policy is to outline matters to be taken into consideration by PMH Council when exercising its environmental assessment and planning functions in relation to Development in the PMH LGA. The Policy addresses the new directions in flood risk management that are embodied in the NSW Government's *Flood Prone Land Policy,* and which are emphasised in the 2005 edition of the government's Floodplain Development Manual. It also draws from the latest flood modelling results documented in government funded flood and floodplain management studies that have been completed in the region.

The primary objectives of this Policy in terms of achieving sound flood management are to:

(i) To maintain the existing Flood regime and flow conveyance capacity.

(ii) to reduce the impact of Flooding and Flood liability on individual owners and occupiers of Flood prone property.

(iii) to reduce private and public losses resulting from Floods

(iv) to increase public safety with respect to Flood events.

(v) to protect the operational capacity of emergency services and emergency response facilities during Flood events.

(vi) to increase public awareness of the potential for Flooding across the range of Flood events up to the Probable Maximum Flood level.

(vii) to inform the community of Council's policy in relation to the use and Development of Flood Prone Land.

(viii) to ensure that planning and Development of essential services and land use makes appropriate provision for Flood related risk.

(ix) to utilise best engineering practice for determination of Flood conditions, impact, and risk.

(x) to utilise ecologically positive methods of Flood protection wherever possible.

(xi) to ensure that any New Development or modifications to existing Development must, as far as practical, result in a reduction in the existing Flood Risk, and in no circumstances should the Flood Risk be made worse.

(xii) to deal equitably and consistently with all matters requiring Council approval on land affected by potential Floods, in accordance with the principles contained in the NSW Government's Floodplain Development Manual (2005).

This Policy applies to the project as much of the land is affected by flooding within the PMH LGA. The policy applies where the proposed SUP is located on flood prone land as is for Sections D3, D5, D8 and D11 that are within flood affected areas; that is on land at or below the level of the probable maximum flood (PMF). Notwithstanding, there will be instances, such as where the provision of Safe Access to Flood Refuges is required, where even though the Development is on flood free land (i.e. above the PMF), this Policy must be applied, refer Flood Risk Assessment (Appendix H).

4.19 CAMDEN HAVEN FLOODPLAIN RISK MANAGEMENT PLAN (MARCH 2004)

The Camden Haven Floodplain Risk Management Plan outlines the best measures to reduce flood risks for the study area, based on consideration of environmental, social, economic and engineering issues. The objectives of the Camden Haven Floodplain Risk Management Study (presented as a separate document) and Plan include:

- a review of previous flood investigations
- quantification of the flood problem in Camden Haven
- a review of potential floodplain management measures to reduce the risks of flooding, especially catchment-wide measures such as flood warning, emergency management and planning controls
- a consultation program involving the community through the progress of the study
- the development of a recommended floodplain risk management plan for the study area outlining the best measures to reduce flood risks, based on consideration of environmental, social, economic, and engineering issues.

The prime responsibility for planning and management of flood prone lands in NSW rests with local government. The NSW Government provides aid on state-wide policy issues and technical support. Financial assistance is also provided to undertake flood and floodplain management studies, such as the subject study, and for the implementation of works identified in these studies.

A flood damages database of potentially flood affected buildings has been prepared for the study area. The database provides details of those properties likely to be inundated in different sized floods and allows the quantification of potential flood damages. Where the project is concerned, key results from the database indicated:

- 1106 residential homes and 70 commercial buildings would be flooded above floor level in a probable maximum flood.
- 653 residential homes and 46 commercial buildings would be flooded above floor level in a 100-year flood.
- Of those homes flooded in a 100-year flood, 380 are located at North Haven, 156 located at Dunbogan, 61 located at Laurieton, 49 located at Kendall and rural surrounds, and 7 located elsewhere.
- The majority of homes in Dunbogan (103) are inundated by over 1.0 m in the 100-year flood
- The predicted flood damage in the 100-year flood is $34M, whilst the average annual flood damage is estimated at $2.8M and the present value of flood damages is estimated at $30M.

The Camden Haven floodplain has been divided into three flood risk areas (high, medium, and low). Different development controls are proposed for the catchment, depending on the type of development and the flood risk area that the development is located.

A summary of the principal components of the Plan include:

- implementation of planning and development controls
- development and implementation of public awareness program
- improved flood level information in certain parts of the catchment
- implementation of a comprehensive flood warning scheme
- improved emergency management measures
- improved flood access provisions for Dunbogan and North Haven, to remove low points in the main access roads and provide a constant grade to higher ground
- a voluntary house raising scheme, construction of a small levee in Lakewood Village, and works to seal the northern training wall.

The total cost of implementing the Camden Haven Flood Risk Management Plan is approximately $1.4M, plus additional expenditure for road raising and house raising.

4.20 CAMDEN HAVEN RIVER ESTUARY MANAGEMENT PLAN (JUNE 2002)

The Camden Haven Estuary Management Plan incorporates both long-term and short-term strategies for managing the estuary. The Plan has been structured to provide a list of strategic measures that can be implemented to meet objectives.

In 1992, the NSW State Government introduced an Estuary Management Policy that was aimed at managing the growing pressures on estuarine ecosystems. The policy forms part of a suite of catchment management policies, which are consistent with the *Catchment Management Act 1989.*

A range of key issues have been identified that have the potential to confront the sustainable management of the Camden Haven River estuary and lakes system into the future. These are as follows:

- Development and Human Impacts, expansion of urban growth within the immediate estuarine catchment.
- Water quality, stormwater and acid runoff influences on water quality.
- Bank erosion, continued erosion of estuary shoreline, particularly at specific sites such as along Stingray Creek at Henry Kendall Reserve.
- Estuary sedimentation, infilling of the estuary, particularly at locations where navigation is important such as the entry to the Camden Haven River from Watson Taylors Lake.
- Fisheries, the decline in fish stocks which could have adverse impacts on the local economy.
- Recreation, provision of sufficient facilities to enable recreation and to minimise conflicts of recreational use.
- Wetland, Mangrove and Saltmarsh Preservation.
- Seagrass preservation.
- Maintenance of the aesthetic attributes of the estuary.

Table 4.4 shows the path sections located within the vicinity of the respective estuary management strategies (as depicted in Figure 3 of the Camden Haven River Estuary Management Plan).

Table 4.4 Selected Estuary Management Strategies in the Project Area Vicinity

Strategy	Path Section
Strategy 20 – Undertake maintenance dredging to improve navigation at low tide	D8
Strategy 29 – Undertake bank stabilisation works	D8
Strategy 32 – Repair existing rock stabilisation either side of Dunbogan boatshed	D5

4.21 PORT MACQUARIE HASTINGS LOCAL ENVIRONMENTAL PLAN 2011 (PMH LEP)

The PMH LEP applies to the land identified in the Land Zoning Map. For the purposes of the LEP, the project sites (subject land) are within the respective zones of the Land Zoning Map (refer to Table 4.5).

Table 4.5 Path Sections subject to Land Use Zones

Section	Land Use Zones		Permissibility
D3	RU1	Primary Production (Rural)	Part section ancillary to a 'Road' within The Boulevarde road reserve.
	E3	Environmental Management	Part section 'Recreation area'
	E2	Environmental Conservation	Part Section 'Recreation area'
	R1	General Residential	Part section ancillary to a 'Road' within The Boulevarde road reserve.
D5	R1	General Residential	Part section 'Innominate' use not inconsistent with the zone objectives.
	W1	Natural Waterways	Part section 'Environmental facilities'
D8	RE1	Public Recreation	Part section 'Recreation area' and part section ancillary to a 'Road' within Camden Head Road reserve.
	R1	General Residential	Part section ancillary to a 'Road' within Camden Head Road road reserve.
	RU1	Primary Production (Rural)	Part section ancillary to a 'Road' within Camden Head Road road reserve.
	E2	Environmental Conservation	Part section 'Recreation area'
D10	E2	Environmental Conservation	Part section ancillary to a 'Road' within Camden Head Road road reserve and part section 'Recreation area'
	E1	National Parks and Nature Reserves	Part section 'Environmental facilities'
	R1	General Residential	Part section ancillary to a 'Road' within Camden Head Road road reserve.
D11	R1	General Residential	Part section ancillary to a 'Road' within Camden Head Road road reserve.
	E2	Environmental Conservation	Part section 'Recreation area'
	RE1	Public Recreation	Part section 'Recreation area'

The objectives of the land use zones indicated in Table 4.6 are outlined in Table 4.7.

Table 4.6 Objectives of the Respective Land Use Zones Relevant to the Project

Land Use Zone	Objectives of zone
RU1 Primary Production	• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To encourage diversity in primary industry enterprises and systems appropriate for the area. • To minimise the fragmentation and alienation of resource lands. • To minimise conflict between land uses within this zone and land uses within adjoining zones.
R1 General Residential	• To provide for the housing needs of the community. • To provide for a variety of housing types and densities. • To enable other land uses that provide facilities or services to meet the day to day needs of residents.
RE1 Public Recreation	• To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes.
E1 Natural Parks and Nature Reserves	• To enable the management and appropriate use of land that is reserved under the *National Parks and Wildlife Act 1974* or that is required under Part 11 of that Act. • To enable uses authorised under the *National Parks and Wildlife Act 1974.* • To identify land that is to be reserved under the *National Parks and Wildlife Act 1974* and to protect the environmental significance of that land.
E2 Environmental Conservation	• To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage or otherwise have an adverse effect on those values • To protect coastal wetlands and littoral rainforests. • To protect land affected by coastal processes and environmentally sensitive land. • To prevent development that adversely affects, or would be adversely affected by, coastal processes. • To enable development of public works and environmental facilities where such development would not have an overall detrimental impact on ecological, scientific, cultural or aesthetic values.
E3 Environmental Management	• To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values. • To provide for a limited range of development that does not have an adverse effect on those values.
W1 Natural Waterways	• To protect the ecological and scenic values of natural waterways. • To prevent development that would have an adverse effect on the natural values of waterways in this zone. • To provide for sustainable fishing industries and recreational fishing.

Whilst the project is related to recreational facilities and the relevant zone objectives are primarily geared towards infrastructure, recreational activities and environmental protection, the project would not hinder the achievement of these objectives. The proposed development of the SUP is a

recreational link, which is consistent with the intent and objectives of the PMH LEP more broadly and the works would be undertaken in a manner to minimise risk or impact to the environment.

The project is consistent with the relevant clauses of the PMH LEP, as discussed in Table 4.7.

Table 4.7 Summary of Consistency with Port Macquarie Hastings LEP 2011

LEP Instruments and Controls	Comments
Clause 5.5 Development within the Coastal Zone	The objective of this clause is to: • Provide for the protection of the coastal environment of the State for the benefit of both present and future generations through promoting the principles of ecologically sustainable development. • Implement the principles in the NSW Coastal Policy. • The project is within the NSW Coastal Zone, however due to the nature of the project and scope of works, no adverse impacts are expected, and the development would be consistent with the objectives and principles of the NSW Coastal Policy.
Clause 5.7 Development below mean high water mark	The objective of this clause is to ensure appropriate environmental assessment for development carried out on land covered by tidal waters. Land surface elevations adjacent to the proposed Sections D3 and D5 are less than 1m AHD and are subject to tidal conditions (at 20% AEP; 1-in-5 years event). The proposed development of low-lying areas would potentially involve works below the mean high water (MHW) mark. The EIS has undertaken the relevant environmental assessment of the works and provides appropriate measures to ensure the works are undertaken in a manner that does not adversely impact the environment.
Clause 5.9 Preservation of Trees or Vegetation	The objective of this clause is to preserve the amenity of the area, including biodiversity values through the preservation of trees and other vegetation. Approximately 0.48 ha of native vegetation has been assessed as being impacted by the project. A clearing and grubbing plan with reference to the Vegetation Clearing Limit and other habitat protection measures would be developed and documented in the CEMP. A Biodiversity Assessment Report (in Appendix D) has been prepared with a summary in Section 6.1. The findings suggest there would be no significant impact and appropriate mitigation measures have been recommended to ensure this.
Clause 5.10 Heritage conservation	The objectives of this clause are as follows: • To conserve the environmental heritage of Port Macquarie Hastings. • To conserve the heritage significance of heritage items and heritage conservation areas including associated fabric, settings and views. • To conserve archaeological sites. • To conserve Aboriginal objects and Aboriginal places of heritage significance. The survey and community consultation has identified considerable disturbance to, and adjoining, the project area since European colonisation and further impacts to the area are unlikely to disturb Aboriginal heritage. An Aboriginal Cultural Heritage Assessment (Appendix E) has been prepared with a summary in Section 6.2. The findings suggest no impact to Aboriginal heritage is expected to occur in the assessed areas and appropriate mitigation measures such as unexpected finds have been recommended to ensure this.
Clause 5.11 Bush fire hazard reduction	The project site is located within the areas identified as containing bushfire prone land, as mapped on the NSW Rural Fire Service land maps. Overall, the bushfire assessment concluded that the project is unlikely to create or expose property or persons to high bushfire risk as detailed in Section 6.4.1.

LEP Instruments and Controls	Comments
Clause 7.1 Acid Sulfate Soils	The project site is located within land mapped as Classes for the potential ASS; these are largely limited to low-lying areas within Sections D3, D5, D8 and D11. The proposed works have the potential to disturb ASS and appropriate measures would be put in place to address this (refer to Section 6.5.1).
Clause 7.2 Earthworks	The main objective of this clause is to ensure that earthworks for which developmental consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land. The project would involve minor earthworks, which would be undertaken and managed in a manner to ensure no significant off-site impacts. This is further addressed in Section 6.5.2.
Clause 7.3 Flood planning	The objectives of this clause are as follows: • To minimise the flood risk to life and property associated with the use of land. • To allow development of land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change. • To avoid significant adverse impacts on flood behaviour and the environment. The project does occur on land within the flood planning area shown on the PMH LEP maps. The project is intended to reduce the flood susceptibility of the shared path and improve evacuation access. The project has been considered in response to flood planning, which is assessed in further details in Section 6.4.2.
Clause 7.5 Koala habitat	The proposed SUP footprint is narrow and is unlikely to restrict koala movement throughout the local area or increase the risk of vehicle strike. It is considered that the potential impact of the project to local koalas is low and no further assessment under the provisions of this Policy is warranted. The CEMP to be developed during detailed design would look to ensure that no significant trees along section D8 are removed, including utilising suitable boardwalk option for the SUP construction to avoid impacts to trees.

4.22 PORT MACQUARIE HASTINGS DEVELOPMENT CONTROL PLAN 2013

The PMH Development Control Plan (DCP) 2013 supports the provisions of the LEP and provides a set of development objectives and provisions for development. An overview of the relevant components of the DCP and the project's consistency with the provisions is provided in Table 4.8.

Table 4.8 Port Macquarie Hastings DCP 2013 Assessment

DCP Reference	Comment
Part A8 – Community Participation	A Community Participation Plan (CPP) 2019 was adopted by PMH Council on 20 November 2019 and became operational on 29 November 2019. The CPP replaces any previous community notification requirements for development within the DCP. The project would be subject to exhibition in accordance with designated development requirements under Part 4 of the EP&A Act and Part 3 Division 5 of the EP&A Regulation.
Part B2 – Environmental Management	The project is generally consistent with the purpose and objectives of the environmental provisions set out in the DCP which are based on achieving a balance between assisting in appropriate development whilst conserving the most important biodiversity assets and maintaining the ecological processes that sustain them. Despite the proximity of the proposed shared paths to water land/estuarine resources and given it traverses land mapped under SEPP Resilience and Hazards

DCP Reference	Comment
	as coastal wetland and littoral rainforest, as assessed in Section 6.1 and in Appendix D, the environmental measures provided in this EIS would aid in avoiding, minimising, and mitigating potential impacts. No significant impacts to the environment would result with the effective implementation and management of the proposed mitigation measures.
Part B3 – Hazards Management	This Part of the DCP relates to the management of hazards, both natural and those from human activities, including flooding and coastline hazards. The work sites are subject to some of these identified potential hazards and a thorough assessment of such relevant factors is provided in Section 6 of this report. The works would be undertaken in a manner to ensure they do not adversely affect, nor are affected by, such potential hazards. In addition, flora and fauna matters have been addressed in Section 6.1 and in Appendix D. Whilst trees are to be retained during construction, the project involves vegetation removal including disturbance to mangroves, where appropriate mitigation measures would be implemented to ensure no unreasonable impacts and to assist in the offset of potential impacts.
Part B4 – Transport, Traffic Management, Access, and Car Parking	Traffic and access are addressed in Section 6.6 of this report. No significant impacts are anticipated, and traffic and access would be managed throughout the works. During operation, traffic volumes would be consistent with existing levels and there would be no significant operational impacts.
Part B5 – Social Impact Assessment and Crime Prevention	The socio-economic matters have been considered in Section 6.10. No significant adverse impacts are expected, and appropriate measures would be employed to manage any potential impacts. The project would be in the public interest and results in positive socio-economic outcomes for the community. The project is not expected to influence crime. The shared path would be adequately designed for the context.

4.23 OTHER NSW LEGISLATION

4.23.1 *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)

The EPBC Act establishes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. Under the EPBC Act, a referral to the Commonwealth Department of Agriculture, Water and Environment (DAWE) is required for proposed 'actions' that have the potential to significantly impact on any 'matter of national environmental significance' (MNES) or the environment of Commonwealth land (including leased land). MNES protected under the EPBC Act are:

- World heritage properties.
- National heritage places.
- Wetlands of international importance (often called 'RAMSAR' wetlands after the international treaty under which such wetlands are listed).
- Nationally listed threatened species and ecological communities.
- Listed migratory species.
- Commonwealth marine areas.
- The Great Barrier Reef Marine Park.
- Nuclear actions (including uranium mining).
- A water resource, in relation to coal seam gas development and large coal mining development.

Consideration has been given to the provisions of the EPBC Act and issues with respect to MNES are discussed in Section 6.7.3 of BDAR (Appendix D). The project was considered unlikely to have a significant impact on any relevant MNES (nationally listed threatened species and ecological communities or migratory species) within the project study area, therefore a Commonwealth referral under the provisions of the EPBC Act was not warranted.

4.23.2 *Native Title Act 1993* (Native Title Act)

The Native Title Act provides the Commonwealth legislative framework to recognise and protect native title, establishes ways in which future dealings affecting native title may proceed and to set standards for those dealings, including providing certain procedural rights for registered native title claimants and native title holders in relation to actions which affect native title. Searches of the registers maintained by the National Native Title Tribunal indicate there are no native title claims or any indigenous land use agreements registered with respect to land within the proposed shared path sites (refer to Table 2 of the Aboriginal Cultural Heritage Assessment Report in Appendix E).

4.23.3 *Disability Discrimination Act 1992* (Disability Discrimination Act)

The Disability Discrimination Act aims to eliminate as far as possible discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services, and land. The project has been and would continue to be designed to be independently accessible in compliance with the objectives and requirements of the Act.

5 Community and Stakeholder Engagement

Community and stakeholder engagement and regular communication with interested groups are essential to the development of the project. The PMH Council will continue to engage, inform, and involve the stakeholders and the community regarding the project and provide opportunities for feedback. Issues raised during the engagement will be provided to the project team to inform project development, environmental assessment, and the further development of the EIS. Since consultation began in late-2019, the project team have already developed strong working relationships with stakeholders and community groups and will continue to build upon these relationships during the exhibition period for the EIS.

5.1 ENGAGEMENT OBJECTIVES AND PRINCIPLES

As the community and stakeholder engagement lead for the project, PMH Council has developed a clear and comprehensive approach to engaging with the community and stakeholders for the project. This approach is based around the principles of:

- Regular communication.
- Being responsive to all stakeholders.
- Providing information about the project and its impacts.
- Explaining how community feedback is used.
- Providing ongoing opportunities for feedback.

The COVID-19 pandemic and the necessary precautionary actions means that PMH Council has had to consider alternative strategies for consultation and engagement with the community and stakeholders, to continue progressing the project and the environmental assessments wherever possible and safe. The following is a summary of the community and stakeholder engagement strategy adopted during the preparation of the EIS.

The communication and engagement objectives for the project are to:

- Inform interested and affected communities and stakeholders about the design, development and potential impacts of the project.
- Build community and key stakeholder relationships and maintain goodwill.
- Encourage participation and obtain government, community and stakeholder input for consideration in development of the project.
- Provide information about the planning approval process and encourage community participation.
- Understand community and stakeholder priorities and concerns so they can be considered in the ongoing development and delivery of the project.

During the development and scoping of the project, the project team activated engagement strategies with a focus on culturally appropriate engagement and collaboration. Preparation for these engagement activities involved collaboration with local Aboriginal Elders and key community groups to inform project planning and delivery. The following approaches were employed to provide information about the project and to obtain views about the project's design and construction, including environmental aspects of the project:

- Phone, email, or letter contact with stakeholders and community members.

- Direct contact and meetings with stakeholder groups and the local council.
- Community information sessions to keep the community informed as the project progresses through to the development of the EIS.
- Community information and updates at the PMH Council project webpage.

5.2 CONSULTATION

Engagement activities were undertaken to consult with the community from Thursday 19 November to Tuesday 22 December 2020. Three separate video conference meetings were held on the 1, 3 and 15 December 2020. The intent of this consultation was to inform stakeholders of the new concept designs for the remaining sections of path along the Beach-to-Beach SUP and provide an opportunity to provide their feedback through the 'Have Your Say' survey and to meet with us in an online meeting to discuss the designs and answer questions. The following stakeholders were contacted.

- Beach to Beach Committee.
- Camden Haven Chamber of Commerce.
- Bunyah Local Aboriginal Land Council (LALC).
- Friends of Kattang.
- Dunbogan Bushcare/Camden Haven Landcare.
- Camden Head Environment Network.
- National Parks and Wildlife Services.
- Office of Environment and Heritage.
- Crown Lands.
- Local Oyster Growers.
- Camden Head Pilot Station.
- Camden Haven Community College.
- Hastings Birdwatchers.
- Camden Haven Historical Society.
- Directly affected businesses and residents.
- Broader community.

5.3 COMMUNITY AND AGENCY FEEDBACK

A series of key themes have been used to collate and categorise the feedback received during engagement and the community feedback. The following provides an overview of the themes of the feedback about the project received to date:

Table 5.1 Summary of Topic Discussed During the Three Video Community Consultation Meetings

Site	Meeting and feedback outcomes	Response
D3	Can the path go where dead mangroves are (and avoid pathway curves)?	This section of land was gifted to Council by the property owner and the proposed alignment is unable to be altered. All efforts will be made to avoid significant vegetation within the land gifted to Council.
	People tend to avoid the curved areas of pathways and walk on the road	It is unlikely this will happen on this section as the road is not wide enough, the pathway is the safer option.
	Can the drainage issues in this section be investigated to allow for better saltwater flow?	Does not form part of this project but is being investigated by relevant Council departments to look at options.
	Is the line of sight for cyclists ok?	Yes, compliance with relevant safety standards will be managed through detailed design.
	Can the exiting *Ochna serrulate* and other weeds be removed as part of a restoration plan? Are weeds within the road reserve (where they can be maintained)?	Weed management can be done within the 5 m boardwalk, however the adjacent land is still privately owned and this needs to be further discussed with the landowner. The entire project will maintain appropriate weed management practices. Opportunities for further weed management are subject to the landowner's acceptance.
	We recommend that a littoral rainforest recovery plan be developed which addresses each section of the pathway.	Community and volunteering groups that support project outcomes in relation to proposal are always appreciated as part of the project. The project will establish construction and to ensure management of the surrounding area, particularly Littoral Rainforest area are suitably protected and maintained.
	Who is the impact recovery plan being developed by?	PMH Council will develop management plans for the impacted areas as part of detailed design. Any community input/assistance will be considered.
	No current maintenance around the area supports the overall aesthetics of this plan Boardwalk is being put in the worst flood areas along that stretch. Is the path being raised or left at the same level?	Flooding for the area has been assessed and the path will meet minimum immunity heights and the SUP adjusted based on flood assessments. It is noted some areas are prone to flooding and will be signed appropriately.
	What is the cost of a boardwalk compared to a concrete pathway?	This depends on the pathway. It is significantly cheaper to build a standard pathway. However, when needing to create retaining structures or similar due to topography as is the case for large parts of the proposed pathway, the cost becomes higher than for a boardwalk.
D5	Is the reason for the boardwalk design that goes out to the water and back into the mangroves so that the Camden Haven Dingy Club can access the river better?	The intention is to bring the path around so the club can still access the river. Layout has been amended so both path and dinghy access can be maintained.

Site	Meeting and feedback outcomes	Response
	Can their access be moved to a different area to avoid mangrove loss?	The intent is to ensure the least impact possible to both terrestrial and aquatic vegetation based on the best alignment that takes into consideration all stakeholder views. The alignment has been amended to avoid and limit disturbance and removal/trimming of vegetation particularly with larger trees.
D8	There are trees along much of this section - what are you envisioning happening to them?	The intention is to allow flexibility in movement of the path during construction to deal with root management. Areas around mature trees along the alignment will incorporate arboriculture advice included within construction environmental management plans.
	Redgums need to be retained is there anything that can be done to save the Redgums that have been noted as to be looking sick? This depends on what is causing the issue, there are some in the other sections that have already been done. It is strong concern to protect the Redgums in future sections.	As above.
	Is there also a way to identify specific species of trees and plants that will be replanted through B2B that will positively impact the environment? (should be part of management plan) It is suggested to avoid any more disturbance to vegetation and maybe not include parking	Revegetation planning will contain species from the area.
D10	Position the path on the other side of the road.	The considerations for the concept design included safety concerns, which force people to cross the road; other consideration include relocating power lines, NSW Aboriginal Land claims and the road alignment from chainage 240 deviates off the road corridor itself and runs through crown land.
	Will the Kattang Nature Reserve boundaries be surveyed as part of this investigation?	The boundaries of the road have been surveyed. The Kattang Nature Reserve boundaries will be surveyed as part of the detailed design.
	Concerns over the safety of Camden Head residents getting onto the pathway with it being on the other side of the road.	The project is looking at the opportunities for a potential crossing to guide residents to a safe crossing point to join the path.
	Will there be a safe crossing point and signage to access the South Beach track?	This needs to be discussed with the Aboriginal Land Council in relation to maintaining that access during the land claim. There is no intention for a crossing point as part of the current proposal.
	The boardwalk – our preference is a continuous boardwalk (chainage 340 to 460).	The rationale for a concrete pathway from chainage 340 to 460 is purely based on the limited battering (impact area) that would occur in order to construct it.
	Any impact on the littoral rainforest will result in losing birds and trees from wind damage such as opening the vine area up.	The boardwalk is proposed to limit the impact during construction and reduce the potential damage. An ecology assessment has been undertaken and provides mitigation measure for the project.

Site	Meeting and feedback outcomes	Response
	The section near Unique Close; it changes from boardwalk to concrete pathway when it traverses the same littoral rainforest environment. Can this be all boardwalk? The eastern end of the track is very steep, and a boardwalk will help grading issues No benefit to a rest area near sewer pump station.	Boardwalk has been moved in line with the adjacent T-intersection and the proposed rest area has been removed.
	Would the pathway reduce traffic and parking along Camden Head Road?	That is hard to quantify at this stage. It should reduce some local traffic to Pilot Beach.
D11	Castellated curbs may not be enough as there have been a few crashes. Is there a better option for users? Move some of the concrete path to being a boardwalk	Castellated curbs are an appropriate means of deflection. If they aren't cost effective PMH Council transport team propose to make the path consistent with other sections in Camden Haven.
	There are very large colonies of flying foxes (grey and red headed) that use this forest area from November to March. This area must be recognised as being home to threatened species and have no construction during their resting time.	The ecologist assessment includes the flying fox colony and appropriate mitigation around construction will be put in place. It is likely their roosting is due to bushfires and looking for additional food sources. Recommendations are likely to include no construction during roosting times if flying foxes are present.
	Pilot Beach reserve pathway goes too close to the playground and dissects the playground. The path Cuts off the picnic shelter to the BBQ causing people to cross the pathway.	The pathway alignment has been amended to avoid segregation of areas within the park.
	The pathway is not connecting to the Breakwall as its heavily used by fishermen and pedestrians. - can we get it bitumen to make it safer.	Sealing the road to the breakwall does not form part of the project. The question has been asked of other Council departments.

Table 5.2 Summary of Topics from the 'Have Your Say' Community Consultation

Topic	Site	Meeting and feedback outcomes	Response
Vegetation			
Management Plan		Vegetation management plan is needed	Recommendation from the ecological assessment will be included in vegetation management and weed management plans for the project.
		How will the loss of vegetation be offset at all sites?	
Tree roots	D3	Tree roots need to be protected and methods put in place to ensure protection.	Measures will be put in place to protect tree roots during construction.

Topic	Site	Meeting and feedback outcomes	Response
Tree removal	D3 D5 D8	Concerns surrounding possible removal of mature trees such as Forest Red Gums. Mature trees should be maintained and protected. How will this happen?	No intention of removing trees of significance. Mitigation measures to be adopted during construction to minimise any impacts to trees.
Mangrove removal	D3	The proposal would be using an already degraded area instead of removing healthy mangrove species.	Impacts on aquatic biodiversity will be assessed and where necessary avoided or offset.
	D5	Alternate route proposed to avoid mangrove removal - GHD Option B (D5 Alignment Overview Figure 2.7, page 13). Option was only rejected due to recreational purposes.	
Vegetation loss	D8	Concrete pathways need to be avoided due to impact on vegetation	The overall intention of the project is to avoid and minimise impacts. An ecological assessment has been undertaken to fully assess impacts and appropriate measures implemented to ensure long-term health of adjacent vegetation.
		Loss of vegetation would alter visual characteristics of the land. Planting low growing species to reduce visual impact is suggested	
		Vegetation must be retained for important screening of busy road.	
Littoral Rainforest			
Climate change		Concerns over the neglect of climate change on Littoral Rainforest	An ecological assessment has been undertaken to fully assess impacts and appropriate measures implemented to ensure the long-term health of adjacent vegetation including consideration of climate change effects.
Salt incursion	D10	Removal of trees will impact on the Salt incursion for Littoral Rainforest	Consideration of edge-effects has been conducted by the ecologist and the project will be guided by their recommendation.
Footprint	D10 D11	The footprint of the track should be kept to a minimum	The inclusion of boardwalk sections is to limit the extent of vegetation impacts.
Design recommendations	D10 D11	Minimise disturbances to remaining vegetation, root systems and remaining trees and shrubs. Widen the road on the eastern edge along to the boundary of Kattang Nature Reserve so the path can be on the road edge of the lagoon side.	The inclusion of boardwalk sections is to limit the extent of impacts. These options did not meet the design requirements, were expensive to construct and included land ownership concerns.

Topic	Site	Meeting and feedback outcomes	Response
		Instead of clearing Littoral Rainforest vegetation along the access road to Pilot Beach, the current boardwalk route adjacent to the Pilot Station should be incorporated.	
Threatened species		Consideration of threatened species is needed in concept plan	An ecological assessment has been undertaken to fully assess impacts and appropriate measures will be implemented to ensure the long-term health of species within the project area.
Restoration			
Visual		Restoration of foreshore areas would enhance visual amenity	The proposed path will integrate with the foreshore areas and have minimal visual impacts.
Restoration Plan		A restoration plan is needed which should include community.	Community participation will be included throughout the delivery of the project.
	D3	Management of *Ochna Serrulata* and other weed species is needed. Restoration plan could address the issues of weeds on private/public lands.	Weed management can be done within the 5m boardwalk, however the adjacent land is still privately owned and this needs to be further discussed with the landowner. The entire project will maintain appropriate weed management practices. Opportunities for further weed management are subject to the landowner's acceptance.
	D8	Restoration plan could address the issues of weeds on private/public lands	
Native planting		Replanting vegetation to provide for native fauna (Koala)	Funds are being arranged for replanting work. Revegetation work of native species will be done in each area. Like-for-like species replacement will be conducted in consideration of the littoral rainforest species and surrounding bushland.
Erosion			
Erosion	D8	Will coastal erosion in this section be addressed?	Main areas where erosion is identified will be investigated. Long term works will be considered separately.
	D10 D11	Erosion concern for stilts being built on steep slope	Erosion mitigation measure will be implemented throughout the delivery of the project, including rehabilitation and stabilisation of disturbed areas.
Boardwalk		Boardwalk should be used over all EEC sites	Boardwalks will be utilised where appropriate to mitigate impacts to these communities.

Topic	Site	Meeting and feedback outcomes	Response
		Not using hand railing as much as possible to leave views of the river unobstructed. CH0- CH845, RU DUN 50-20, RU DUN 50-21	Handrails will used where required to meet relevant safety and design criteria.
	D10	Boardwalk over entirety of western side Section near Unique Close - Preferred to be all boardwalk. Significant damage in there for drainage.	Will be flagged with Environmental Planner.
	D11	Boardwalk at CH320-450 should be considered due to the regenerating plant species in the area.	
Construction			
Methods	D3	A 5m clearance area on drawing RU DUL - 3021 is excessive. Construction methods must minimise negative impacts.	The lot gifted to Council is 5 m wide. It is not the intent to clear 5m.
	D10	Impactful and expensive construction can be avoided at CH 240-330 by re-aligning Camden Head Road to the east.	Re-aligning Camden Head Road is an unnecessary cost to the development.
Traffic/Road			
Traffic control		Traffic needs to be slowed. Can be achieved through engineered devices (speedbumps)	Traffic calming is not part of the project, however discussion are occurring with PMH Council Road Infrastructure engineers to consider if there are any appropriate solutions.
Parking		Provisions for more parking from the boat launch area heading south	Parking is being reviewed. It is noted there is plenty of on-street parking.
	D8	Increased traffic has caused limited parking spaces for tourists and residents CH620- CH680	Parking is being reviewed. It is noted there is plenty of on-street parking.
	D8	Parking spaces at 'Rope tree'. Not providing parking will lead to cars parking on the footpath	Parking is not practical in the location of the rope swing. There are limited space and safety concerns in the area.
	D10	Informal parking ruining tree roots	Agreed. Opportunities to limit impacts on vegetation will occur.
	D3	Road needs to be widened at D2 and D3	Road widening is not part of the project scope.

Topic	Site	Meeting and feedback outcomes	Response
Road specifications	D11	Castellated kerb may not be enough due to past crashes into the rainforest.	Concern recognised, however guard rails take up a lot of space and require a deflection zone
	D8	Concerns over kerb height (300mm) still allowing 4WDs to mount the kerb and park along the road.	The potential addition of handrails may resolve this.
Accessibility			
		Path should be inclusive of skateboard, rollerblade and roller skate users	The path is designed such that skateboard, rollerblade and roller skate users can utilise the asset.
Disability Access		Disability access needs to be addressed along the entirety of the path	The path design will consider disability access over the proposed sections.
	D5	Remove the handrail on the southern edge of the boardwalk replace with 'wheel stop' edging. Allow prams, wheelchairs and bicycles to use boardwalk	Boardwalk will be available for all user types.
Safety			
Phone reception		Safety considerations for communicating assistance due to the limited phone reception on certain parts of the pathway.	Noted. Expected high patronage will allow for passive safety.
Signage		Signage to indicate pedestrian right of way over cyclists	Safety signage will be incorporated in the detailed design.
Bergalia walking tracks.		Linkages to Kattang NR need to be considered in relation to safely exiting the pathway at Camden Head and Pilot Beach roads to access the Bergalia walking tracks.	Connections and linkages are not part of the current scope of the project.
Crossings	D10 D11	Pedestrian crossing for Camden Haven Rd	Opportunities for potential safe crossing points are being considered.
	D10	Pedestrian safety is not considered a valid reason to not construct the pathway on the eastern side as residents from Camden Head will have to cross the road to access the pathway anyway.	It is considered by Council that where the crossing would be at the start of D10 is unsafe due to poor visibility, power poles and speed limits along this section.

Topic	Site	Meeting and feedback outcomes	Response
	D11	Concerns for pedestrian safety crossing oyster shed access road and the road to Trevor's corner. Pathway is too close to the playground, which is a safety issue for both cyclists and children using the playground	The crossings at Trevor's corner will comply with relevant safety standards. Pathway alignment has been adjusted to move the alignment adjacent to the breakwall road.
Recreational Land Use			
Picnic Area/Rest Area	D8	Picnic tables at CH200 One of the two proposed tables is in tree root zones. Tables are too close to the road. Suggested consideration of replacing one table for two seats sited closer to the river edge.	No additional tables are proposed as part of this proposal. Existing tables will be moved and maintained.
	D8	Roofed picnic area away from trees	No picnic areas are proposed within the scope of the current proposal.
	D8	Excessive car parking. Removal of 4 carparks would accommodate seating and offer less constrained recreational use. A disabled carpark and set down area should be incorporated. Avoid parking in CH 220-240 which are sited in a tree canopy.	Existing parking is being maintained.
	D10	Locate rest area at CH960 with a shade tree as the rest area proposed at the pump station is not ideal.	Rest area is being considered for an alternate location.
	D10	Locate rest area at CH960 with a shade tree as the rest area proposed at the pump station is not ideal.	Rest area is being considered for an alternate location.
	D11	The rest area is exposed to noise, limited viewing appeal, it's likely users won't use the rest area located at bottom of the hill. Effective/necessary	Rest area is being considered for an alternate location.
Swimming Spot CH620	D8	Swimming spot access CH620. Proposed parking already eroded and needing protection. Tree likely to collapse at some point.	Existing parking is being maintained.
	D8	Inclusion of jetty out over tree roots to mitigate tree damage from rope swing.	Currently this area is under review.

Topic	Site	Meeting and feedback outcomes	Response
Yacht storage	D5	RU DUN 40-20 from CH 120- 160. Concerns over the Yacht Club storage and launch area being a priority over vegetation loss. Suggestion of reverting to similar GHD Design B alignment for this section.	Vegetation loss is a priority Design has been amended to minimise vegetation loss for the entire project.
Beach access	D11	The current alignment only provides access to the northern end of Pilot Beach which is infrequently used. Concern over pedestrians who want to access the southern end will abandon the pathway and gain access through the busy carpark. Access also needs to be provided to the amenities block at Pilot Beach	Alignment along Pilot Beach Park has been amended to run adjacent to Breakwall access road.
General			
Waste Management		Waste management needs to be considered. Bins along pathway and dog waste bags available	Bin will be considered for inclusion with other street furniture.
Seating/Rest Areas		Inclusion of seating/rest areas, shaded areas, and water bubblers for aged cohort of Laurieton	Seating and rest areas are being considered for inclusion. Water bubblers do not form part of the scope.
Transport		A taxi ferry service across the river to Dunbogan and/or shuttle buses to reduce traffic in peak season	Taxi and public transport options are not included with the scope.
Distance Markers		Inclusion of distance markers on the pathway	Distance markers will be considered for inclusion with other signage.
Pilot Beach break wall		Pilot beach breakwall between Pilot beach and washhouse needs to be concreted	The breakwall does not form part of the project scope.
Diamond Waters Caravan Park		The pathway should be extended into the Diamond Waters Caravan Park. No pathway makes it hard for tourists/locals to walk/cycle into town.	Pathway to Diamond Waters Caravan Park is currently not part of the scope of works.
Cost		The concept design raises cost concerns.	Costs will be reviewed throughout all aspects of the design, along with funding opportunities.
Community Submissions		Concerns over the submissions holding up the project	All stakeholders are encouraged to provide their feedback with consideration and response made of all suggestions.

Topic	Site	Meeting and feedback outcomes	Response
Bike Rack		Bike rack facilities is needed at entrance and exit points to the beach	Bike parking will be reviewed and considered for inclusion in detailed design. Bike racks have been identified at Pilot Beach.
Bridge	D7	Inclusion of a bridge to follow rivers edge?	A bridge is not included as part of the project and would involve significant cost, environmental and property issues.
Community Group Inclusion	D8, D10 D11	Community Groups that need to be consulted with as part of the Council Resolution	All associated parties have been contacted and will continue to be consulted throughout the process.

5.4 PUBLIC EXHIBITION OF THE EIS

Public exhibition of the EIS will be for a minimum of 21 days as stated in the EP&A Act. During the exhibition period, government agencies, stakeholders and the community will be able to review the EIS and will have an opportunity to make a written submission for consideration in its assessment of the project. Consultation activities during the EIS public exhibition period will include:

- Information on the project website.
- Hard copies available on request.
- Government stakeholder engagement.
- Ongoing contact for community and stakeholders.

At the completion of the public exhibition period for the EIS, the DPE will collate and provide PMH Council with a copy of all submissions received. After reviewing the submissions, PMH Council will prepare a submissions report that responds to the relevant issues raised. The submissions report will be made publicly available on DPE's website. Anyone making a public submission will receive a letter notifying them of the publication of the submissions report on the DPE's website.

If changes are required to the project because of the issues raised in submissions or to minimise the environmental impacts or should the project be approved, engagement would continue with the community and key stakeholders during the re-design and/or construction periods. In general, this engagement would involve:

- Ongoing engagement with key stakeholders and other government agencies.
- Ongoing meetings and regular briefings.
- Provision of regular updates to the nearby communities.
- Development and implementation of a community complaints and response management system.

Engagement with stakeholders and the community would be guided by the framework for communication and engagement during construction of the project, which will include details concerning:

- Approach, objectives, principals, and tools to be used.
- Project structure, roles and responsibilities.
- Communication protocols and procedures to be followed.
- Key stakeholders.
- Approach to reporting and evaluation.
- A construction complaints management system, which would outline the framework for managing complaints, enquiries and escalation processes throughout the project lifecycle, as well as the process for reporting complaints received.

6 Environmental Assessment

This chapter provides an assessment of the key environmental issues for the project as identified in the SEARs and as per the relevant requirements of Section 190, 192 and 193 of the EP&A Regulation.

The key environmental issues for the project were identified and evaluated through the outcomes of specialist environmental investigations, and feedback received from the community and other stakeholders. Where the potential for a high or moderate impact is identified, an environmental assessment is undertaken to determine the level of potential impact and the measures required to mitigate or manage the impact.

The key environmental issues addressed in this chapter are as follows:

- Biodiversity.
- Aboriginal heritage.
- Non-aboriginal heritage.
- Hazards (Bushfire, Coastal and Flooding).
- Land, soils and water quality.
- Traffic and access.
- Visual.
- Waste management.
- Air quality, vibration and noise.
- Social and economic.
- Cumulative impacts.

6.1 BIODIVERSITY

This section provides an assessment of the potential impacts to terrestrial and aquatic biodiversity from the construction and operation of the project and recommends environmental management measures to reduce these impacts. Details of the biodiversity assessment undertaken are presented in the Biodiversity Development Assessment Report (BDAR) (refer to Appendix D), which includes the Biodiversity Offset Scheme (BOS) assessment for the project.

6.1.1 Assessment Methodology

The process taken in the assessment of the potential impacts from the project and the development of impact mitigation measures for the various aspects are outlined below.

The information sources used in carrying out the assessment comprised Government databases, certified local data and mapping layers. Details of the information sources used in the assessment are provided in the appended technical report (BDAR; Appendix D). The assessment methodologies described below identify where desktop sources of information were verified through ground-truthing and survey.

The biodiversity assessment was based on available data and field surveys and are therefore considered to be indicative of the environmental condition of the study area at the time of the survey. It should be recognised that conditions, including the presence of threatened or cryptic species, may change with time. To address this limitation, a precautionary approach has been used

that aimed to identify the presence and suitability of the habitat for threatened species. Where additional limitations to the survey have been identified, they are outlined in the methodology below.

Native Vegetation and Habitat

Desktop Review of Existing Information

A review of the following databases and literature relevant to the project site and surrounding area was undertaken:

- NSW Vegetation Information System (VIS) classification database (OEH, 2000)
- Port Macquarie Hastings LGA Vegetation and EEC Maps (2014) VIS IDs 4205 and 4206
- Greater Hunter Native Vegetation Mapping (Sivertsen et al, 2011)
- Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project, Vegetation Community Profiles (Somerville, 2009)
- Vegetation Map for the Mid North Coast of NSW (VIS ID 3886)
- Draft Camden Head Biodiversity Study (Darkheart Eco-Consultancy, 2010).

Floristic Survey

The following floristic surveys were undertaken by BAM accredited assessors:

- A number of sampling techniques were used to ensure the project site was adequately sampled. The site was scoped using the 'Random Meander Technique' described by Cropper (1993). This involved walking in a random meander throughout the project site, visiting the full range of habitats and recording every single plant species observed.
- Vegetation plots were established according to BAM. The bearing of each plot was dependent on the size and topography of the vegetation zone but was typically selected to best represent the vegetation zone and avoid zone edges and ecotones, wherever possible. Avoiding vegetation edges and ecotones was often unavoidable given the linear nature of the project area. Location of vegetation plots and targeted survey tracks are shown in Appendix V of the BDAR (Appendix D).
- Plant community types (PCTs) were determined by comparing the floristic structure and composition of the vegetation on site with vegetation profiles described within the VIS database (OEH, 2020) and community descriptions of endangered ecological communities known to occur in the local area. A list of all plant species recorded during fieldwork is listed in Appendix I of the BDAR (Appendix D).

Vegetation Plots

Seven vegetation plots were completed to assess the integrity of native vegetation within the project area. Data collected within the plot/transect includes:

- Flora diversity and composition.
- Groundcover composition and abundance.
- Vegetation structure (including canopy, sub-canopy, shrub and groundcovers).
- Fauna habitats (including hollow trees, fallen timber).
- Regeneration of canopy species.
- Landscape features (including: slope, gully, and aspect).

- Soil features (including soil type, rocks, organic matter).
- Geographical coordinates and a photographic record.

Vegetation plots are typically based on a 20 m x 20 m quadrant (400 m^2) to assess composition and structure components and a 50 m x 20 m plot (1,000 m^2) to assess function. Where a standard plot does not fit into a vegetation zone, an equivalent longer and narrower plot (e.g. 10 m x 100 m = 0.1 ha) was used. Due to the narrow, linear nature of the project area, the plots were best placed to be representative of each vegetation zone, either partly within or outside of the project area in equivalent vegetation.

Aquatic Habitat

Desktop Review of Existing Information

The following databases and literature relevant to aquatic habitat in the local area were reviewed:

- Mapping the habitats of NSW estuaries, Camden Haven River (Creese et al. 2009).
- Key Fish Habitat Map, PMH LGA.
- PMH LGA Vegetation and EEC Maps (2014) VIS IDs 4205 and 4206.
- Policy and guidelines for fish habitat conservation and management (DPI, 2013).
- EPBC Protected Matters Search (local records within 10 km of proposal area, last accessed 1 September 2020).

Existing Aquatic Habitat Mapping

The project is located within the riparian corridor of the Camden Haven River and comprises waterfront land for the purposes of the WM Act. The project also includes work within wetlands, salt marsh or intertidal zones that are below the level defined by High Water Solstice Spring tides (Highest Astronomical Tide) and are included in the definition of 'key fish habitat' under the FM Act. These locations are typically characterised by wetlands, salt marsh or intertidal zones.

The DPI Fisheries mapping of estuarine macrophytes in the Camden Haven River estuary (Creese *et al*, 2009) shows the occurrence of seagrass beds, mangroves, and saltmarsh within the vicinity of the project area. The proposed works within Sections D3, D5 and D8 have the potential to impact these areas (see Figure 6.1).

Field Survey Methods

A survey of the aquatic habitat within the proposed Sections D3, D5 and D8 areas was undertaken on 22 October 2020 and 4 November 2020. The survey area includes an approximate 20m buffer around any part of the project that was considered to have the potential to impact aquatic habitat or marine vegetation.

Due to the relatively good visibility and shallow water depths, the potential presence of seagrass or other marine vegetation within aquatic habitat was easily and accurately determined via wading and surface inspections by watercraft. Surface inspections were supported by underwater photography throughout the sub-tidal zone of Section D5, which was subsequently analysed for the purposes of determining species composition and condition of any marine vegetation. The extent of habitat types in Section D5 were also mapped using georeferenced aerial (drone) photography of the project area to ensure all habitats and their extent were adequately identified.

Threatened Flora and Fauna Species

A list of threatened species with potential to occur at the project site was generated following input of the landscape analysis and plot data into the BAM Calculator (BAM-C). This identified

41 predicted species (ecosystem credit species) and 45 candidate species (species credit species) requiring consideration for assessment.

Database searches (Licensed Bionet and EPBC protected matters search) were also undertaken to identify any additional potential candidate species (other than those generated by BAM-C) that are known or predicted to occur in the locality. A habitat assessment determining the likelihood of these species to be impacted by the proposed works is provided in Appendix III of the BDAR (Appendix D). Species rated as a moderate or high chance of occurring on site, additional to those generated by the BAM-C list, were included for assessment whether they were ecosystem or candidate species.

Ecosystem Credit Species

The ecosystem credit species (refer to Table 6.7) were returned by BAM-C as being associated with the PCTs present on the project areas. Targeted surveys were not required for ecosystem credit species and each of these species were assumed to have habitat and contribute towards ecosystem credit calculations. No ecosystem credit species were excluded from the assessment.

Species Credit Species

Candidate Species to be Assessed:

Species credit species cannot be confidently predicted by vegetation surrogates and landscape features, however, can be reliably detected by survey (BAM, 2020). 'Candidate' species requiring consideration are those 'assumed to be present' or are 'present or likely to use suitable habitat' in the project area.

Potential candidate species are those that could occur in the study area based on the habitat resources observed during field surveys and are categorised as confirmed candidate threatened species. These candidate species are either assumed to be present or require targeted surveys in accordance with Section 5.3 of the BAM (DPE, 2020) to confirm or exclude presence. The list of confirmed candidate species is provided in Table 6.8. Candidate species excluded from further assessment are listed in Table 5.3 of the BDAR (Appendix D).

Targeted Surveys:

Where a candidate species is considered to have potential to occur, and it is not assumed to occur for the purposes of the BAM-C, a targeted survey is required to verify its presence or absence. The field surveys and methods used to target threatened flora and fauna are detailed in Table 5.4 of the BDAR.

Threatened Species Polygons:

Candidate species subject to offsetting are presented in Table 6.9. Species polygons were prepared for each species in accordance with Section 5.2.5 of the Biodiversity Assessment Method (BAM) (DPE, 2020) and these were used to calculate the required species credits, as summarised in Table 6.11. Refer to Appendix VIII of the BDAR (Appendix D) for details of the species polygons.

6.1.2 Existing Environment – Landscape

This section outlines the local landscape relevant to terrestrial and aquatic ecology. This is considered to provide a baseline of existing conditions from which potential impacts from the project have been assessed.

Local Landscape Context

A landscape assessment in accordance with Section 3 of the BAM (DPE, 2020) was undertaken for input into the BAM-C. The site context was assessed using a 500m buffered assessment area, which applies to linear projects. A number of landscape features, such as the Interim

Biogeographically Regionalisation of Australia (IBRA) bioregion, IBRA sub-region, Mitchell landscape, rivers, streams and estuaries, and extent of native vegetation in the area were assessed for the project. Description of the local landscape biodiversity features and values within the biodiversity study area are summarised in Table 6.1 below and shown in Figure 2.1 to Figure 2.8 of the BDAR (in Appendix D).

Table 6.1 Biodiversity Landscape Features within the Project Area

Attribute	Description
IBRA Bioregion and Subregion	The study area is located within the Macleay Hastings subregion of the NSW North Coast bioregion.
NSW Landscape Regions (Mitchell Landscapes)	Except the southern half of Section D10 that is located on Port Macquarie Coastal Ramp (Pmr), the study area is located on Manning-Macleay Coastal Alluvial Plains (Mml), as mapped by the NSW DPE and described by the NSW Department of Environment and Climate Change (DECC) (2008).
Rivers, Streams and Estuaries	The project is broadly located along the Camden Haven Inlet. The proposed shared path extends into the inlet in Section D5 and crosses several waterways which drain into the inlet. The waterways within the project area are largely estuarine environments subject to tidal influences. The estuarine waterways occurring in the study area are summarised as follows: • Section D5 extends into the Camden Head Inlet. • The entire length of Section D8 extends along Gogleys Lagoon, and Gogleys Creek crosses into the lagoon via a culvert at CH330. An un-named first order creek also crosses into the lagoon via a culvert at CH610. • The lower reaches of an un-named creek form an estuarine wetland composed of mangrove forest between CH100 to CH200 and at CH260 to CH300 in Section D3. The creek drains into Camden Haven Inlet approximately 100 to 200m to the west of the proposed shared path area.
Wetlands	The buffered assessment area encompasses broad areas of coastal lowlands largely comprised of estuarine and freshwater wetlands. Coastal wetlands and littoral rainforest identified under SEPP Resilience and Hazards occur within the project area, as depicted on Figure 2.6 of the BDAR (Appendix D). It is noted that an area mapped as Coastal Wetland, north of Pilot Beach Road in Section D11, is inconsistent with the vegetation observed on site. The vegetation survey completed for the BDAR identified parts of this area as Littoral Rainforest (PCT 1536), which transitions into vegetation more consistent with Coastal Wetlands.
Native Vegetation Cover	A 500m linear buffer was applied to the project area resulting in an overall buffer area of 545 ha. The vegetation extent of native woody and non-woody vegetation was estimated based on observations from site visits and aerial photo interpretation. Native woody vegetation occupied 193.6 ha of the buffer area and native non-woody vegetation occupied 7.4 ha. The current percentage of native woody and non-woody vegetation cover in the buffer area is estimated at 37%, which falls into the >30 to 70% category within the BAM-C.
Connectivity Features	Sclerophyll forest, wetlands, and littoral rainforest habitat occurring in the project area forms part of larger patches of habitat throughout the assessment area. These patches provide connectivity to the broader locality despite fragmentation associated with local roads and residential areas. The vegetation occurring throughout the Camden Head area is also mapped by NPWS (2001) as a Regional Wildlife Corridor – Major Coastal Link (see Figure 2.4 of BDAR in Appendix D).
Patch Size	A patch is defined (as per Section 4.3.2 of the BAM) as an area of native vegetation that occurs on the subject land and includes native vegetation that

Attribute	Description
	has a gap of less than 100m from the next area of native vegetation (or ≤ 30m for non-woody ecosystems). The patch may extend onto adjoining land. The woody vegetation in the project area is < 100m from extensive areas of vegetation throughout Camden Head. These areas exceed 100ha and are therefore allocated to the >100 ha patch size class.
Areas of Geological Significance and Soil Hazard Features	There are no areas of geological significance within the study area. The project area contains potential soil hazard features in the form of acid sulfate soils. These are largely limited to low-lying areas within Sections D3, D5, D8 and D11, as depicted on Figure 2.7 of the BDAR (Appendix D).
Areas of Outstanding Biodiversity Value	No areas of outstanding biodiversity value occur within the vicinity of the project site.
Mapped Biodiversity Values	Mapped biodiversity values occur throughout the project area. These are associated with areas mapped under the SEPP Resilience and Hazards (Coastal Wetlands and Littoral Rainforest) or important habitat areas for species at risk of serious and irreversible impacts (SAIIs), as depicted on Figure 2.6 of BDAR (Appendix D).
Important Habitat Mapping	Important habitat areas have been mapped by DPE for two threatened species within the vicinity of the project site. These are *Lathamus discolor* (Swift Parrot) and *Numenius madagascariensis* (Eastern Curlew), as mapped on Figure 2.8 of the BDAR (in Appendix D).

Native Vegetation and Habitat

Plant Community Types

Seven plant community types (PCT) were identified within the study area and six of these occurred within the project area, as presented in Table 6.2.

Table 6.2 Plant Community Types within the Study Area

PCT Code	PCT	BC Act	FM Act	EPBC Act
1536	*Tuckeroo – Lily Pilly – Coast Banksia littoral rainforest*	EEC	N/A	CEEC
1727	*Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast*	EEC	N/A	EEC
1747	*Grey Mangrove low closed forest*	Not listed	Protected marine vegetation	Not listed
1746	*Saltmarsh Estuarine Complex*	EEC	Protected marine vegetation	VEC
771	*Coastal sand Tea-tree – Banksia scrub*	Not listed	N/A	Not listed
1724	*Broad-leaved Paperbark – Swamp Oak – Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*	EEC	N/A	Not listed
1808	*Estuarine reedland*	EEC	N/A	Not listed

CEEC – Critically Endangered Ecological Community

EEC - Endangered Ecological Community

VEC – Vulnerable Ecological Community

Non-Native Vegetation

Managed areas, including roadside verges and parklands, comprised of exotic herbs and grasses and were assessed as non-native vegetation. Some remnant trees occur within parkland areas and these areas have been mapped separately as *Remnant trees with non-native understorey.* Where trees cannot be avoided, trees have been assigned to the most likely PCT occurring in the project area (i.e. Gallery stands of Swamp Oaks have been assigned to PCT 1727).

Vegetation Integrity Assessment

The six vegetation types identified inside the project footprint (PCTs 1536, 1727, 1747, 1746, 771 and 1724) were stratified into various condition states to differentiate structural and floristic variations in the project area. These PCTs were then classified into seven vegetation zones. A summary of the vegetation zones conducted in accordance with BAM requirements and vegetation integrity scores are provided in

Table 6.3. Description of the vegetation integrity assessment for the project footprint is detailed in Section 3.4 of the BDAR (Appendix D).

PCT	Condition Class (BAM-C Zone)	Area of Impact (ha)	Composition Score/100	Structure Score/100	Function Score/100	Vegetation Integrity Score (VIS)[(a)]
PCT 1727	VZ1_Moderate (2)	0.0975	36.4	19.4	100	47.8
PCT 1727	VZ2_Good (4)	0.0147	75.2	30.8	100	61.4
PCT 1536	VZ1_Good (3)	0.1902	88.3	81.5	74.7	81.3
PCT 1536	VZ2_Regenerating (7)	0.0129	95.9	60.3	63.8	71.7
PCT 1747	Good (1)	0.0665	36.4	93.7	N/A	58.4
PCT 771	Good (5)	0.0815	89.4	100	N/A	94.6
PCT 1724	Good (6)	0.0196	87.1	90	88.7	88.6
TOTAL		**0.4829**				

Table 6.3 Summary of BAM Vegetation and Vegetation Integrity Score

(a) The VIS is calculated as the geometric mean (cubed root) of the Composition, Structure and Function Scores (or the square root of the composition and structure scores in non-woody vegetation).

Threatened Ecological Communities

Several PCTs identified within the project area are consistent with the endangered ecological communities (EEC), and/or threatened ecological communities (TECs) listed under the BC Act or the EPBC Act, respectively. The EECs and TECs occurring in the project area are summarised in Table 6.4.

Table 6.4 Status of Threatened Ecological Communities within the Project Area

PCT	BC Act	EPBC Act	Project Impact
PCT 1536 Tuckeroo – Lily Pilly – Coast Banksia littoral rainforest	Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions Status: EEC	Littoral rainforests and coastal vine thickets of eastern Australia Status: CEEC	0.2 ha

PCT	BC Act	EPBC Act	Project Impact
PCT 1727 Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions Status: EEC	Coastal Swamp Oak (Casuarina glauca) Forest of NSW and South East Queensland Status: EEC	0.11 ha
PCT 1724 Broad-leaved Paperbark – Swamp Oak – Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions Status: EEC	Not listed	0.02 ha
PCT 1746 Saltmarsh Estuarine Complex	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions Status: EEC	Subtropical and Temperate Coastal Saltmarsh Status: VEC	0.002 ha

CEEC – Critically Endangered Ecological Community

EEC – Endangered Ecological Community

VEC – Vulnerable Ecological Community

Weeds

A total of 27 exotic species were recorded within the project area, including 15 BAM listed high-threat weeds. Weeds were most prevalent within previously disturbed areas, managed parkland, road verges and the Swamp Oak Forest in Section D3, which had a relatively high proportion of high-threat weed growth.

Habitat Features

Key habitats recorded within the relevant sections of the project are summarised in Table 6.5.

Table 6.5 Habitat Types Occurring within the Project Area

Habitat Type	Key Features	Relevant Sections
Forest/Rainforest	The forested habitats within the project site provide habitat for a broad range of native fauna, including: • Mature trees providing seasonal roosting, nesting, foraging and/or breeding habitat for a range of birds, mammals, reptiles and frogs. • Koala feed trees throughout the local area may provide potential foraging habitat and cover for local Koalas, although preferred food trees are mostly absent within the project area. • Hollow-bearing trees that occur throughout the surrounding area may provide nesting habitat to a range of birds and mammals. No hollow-bearing trees occur within the project area. • Seasonal foraging habitat for insectivorous, frugivorous and nectarivorous birds and mammals. • Understorey flora provides cover and foraging resources for a range of birds, reptiles and mammal species. • Leaf litter and coarse woody debris provide shelter and foraging habitat for small mammals, frogs, birds and reptiles.	All (D3, D5, D8, D10 and D11)
Coastal Saltmarsh, Estuarine	The vegetation provides suitable habitat for a variety of wetland bird species. Habitat features include:	D3, D5 and D8

Habitat Type	Key Features	Relevant Sections
Mangrove Forest and Seagrass	• Zostera Seagrass – Providing habitat to marine fish species, migratory seabirds and waders. • Estuarine Mangrove Forest and Coastal Saltmarsh – provide foraging and roosting habitat for wetland birds and waders.	
Coastal Heathland	The habitat is associated with the PCT – Coastal Sand Tea-tree – Banksia Scrub. Coastal Heathland includes habitat features, such as: • Seasonal foraging habitat for insectivorous, frugivorous and nectarivorous birds and mammals. • Understorey habitat features of leaf litter, grasses and other understorey flora provide habitat for small burrowing mammals including Bandicoots and other small mammals.	D10
Non-native managed grasslands	Non-native managed grasslands are restricted to the road margins and existing parkland areas throughout the proposal area. Due to the heavily disturbed nature of this vegetation, it is likely to provide only marginal habitat for native fauna.	D3 and D10

Aquatic Habitat

The project is located within the riparian corridor of the Camden Haven River and comprises waterfront land for the purposes of the WM Act. The project also includes work within wetlands, salt marsh or intertidal zones that are below the level defined by High Water Solstice Spring tides (Highest Astronomical Tide) and are included in the definition of 'key fish habitat' under the FM Act.

The DPI Fisheries mapping of estuarine macrophytes in the Camden Haven River estuary (Creese *et al,* 2009) shows the occurrence of seagrass beds, mangroves and saltmarsh within the vicinity of the project area. Sections D3, D5 and D8 have the potential to impact these areas, as follows:

- **Section D3** traverses aquatic habitats (from approximately CH100 to CH200) characterised by Estuarine Mangrove Forests (PCT 1747) over a tidal wetland that is mapped as a Coastal Wetland under SEPP Resilience and Hazards. At the time of inspection, the community was dry between CH100 and CH180 and traversable on foot, indicating that the wetland is submerged during higher parts of the tidal cycle. Mangroves were noted to exist throughout the footprint of the proposed boardwalk from CH100 to CH180 and were identified as Grey Mangrove (*Avicennia marina*). Dense pneumatophores existed throughout the impact area and were occasionally interspersed with mangrove propagules. A lower lying portion of mangrove forest exists between CH180 and CH200 and contains an intertidal zone that is devoid of marine vegetation and appears to be submerged throughout the lower tidal ranges.

  The SUP will be constructed as a boardwalk within the mangrove forest/coastal wetland area. Some removal or pruning of mangroves may occur in the footprint of the boardwalk. Mangrove pneumatophores are likely to persist below the boardwalk.

- **Section D5** comprises mostly elevated boardwalk that circulates the northern/estuarine side of mangrove forest entering the estuarine environment for approximately 180m. Part of Section D5 is mapped as Coastal Wetlands under SEPP Resilience and Hazards and the estuarine habitats within the proposed SUP are also mapped as containing Zostera seagrass beds. The proposed boardwalk will traverse Grey Mangrove (*Avicennia marina*) forest for a short distance (approximately 5–10m) before continuing across intertidal and sub-tidal estuarine habitats on the northern (seaward) side of the mangroves and reconnecting with the terrestrial environment at around CH190.

  The D5 site was inspected during the middle-to-top of the flood tide cycle. At the time of the survey, the proposed boardwalk footprint was submerged with water depths ranging from

approximately 0.5 to 1.5m. The bottom substrate was readily observed from the surface and via underwater photography and comprised a fine sandy and silty substrate with infauna burrows of variable densities. Oyster encrusted mangrove pneumatophores occur below the mangrove forest in the upper extent of the intertidal zone.

The survey confirmed the presence of *Zostera Capricornia* seagrass occurring within discrete patches both within the boardwalk footprint and continuing north of the boardwalk as water depths increased further into the sub-tidal zone. The southern-most portion of the survey area, closest to the mangrove edge, was found to have a lower density and occurrence of seagrass with absence of seagrass delineating the edge of the intertidal zone. Seagrass patches were noted to occur at variable densities, generally increasing in density with increased water depth and exhibiting apparently less sediment and epiphyte coverage (Note: No quantitative analysis of seagrass health was undertaken as part of this survey). Macro algae were noted to be absent throughout the footprint of the proposed D5 shared path.

- **Section D8** traverses close to the edge on the southern bank of Gogleys Creek for a distance of approximately 840m south east of the Dunbogan Jubilee Hall access road. It is assumed the SUP will not involve any further reclamation of the waterway or saltmarsh and will be constructed as a cantilevered boardwalk where insufficient space exists between the existing road verge and the waterway. Seagrass surveys were not undertaken in the vicinity of section D8 given the limited potential for any direct impacts below MHW (except at the entrance to the culvert at CH320 to 340). Surveys in section D8 focussed on the terrestrial and near-shore intertidal environment with the objective of identifying marine vegetation or key fish habitat that may be potentially impacted by the works. The western-most section of section D8 (to CH320) is contained wholly within the terrestrial environment. No marine vegetation was recorded in the potential impact area up to CH320.

  The SUP contains an existing culvert at CH320 to CH340. Inspection of the existing culvert and surrounds indicates that:

  - The intertidal zone extends to the headwall of the culvert and through to wetlands and saltmarsh on the eastern side of The Boulevarde.
  - Marine vegetation (mangroves) occurs in the surrounds of the culvert. These mangroves may require either removal or pruning to provide sufficient clearance for construction of the culvert and shared path.
  - No other marine vegetation (seagrass or macroalgae) was noted to occur within the immediate vicinity of the culvert extension; however, it may be possible that some seagrass or macroalgae could occur within Gogleys Creek and associated rock training wall.
  - Coastal saltmarsh communities and isolated mangroves exist east of the culvert (CH340-CH440). Mangroves in this zone are located >3 m from the existing bank and appear capable of being retained. Some pruning may be required to provide sufficient clearance to pedestrians
  - Coastal saltmarsh encroaches to <2 m from the existing edge of the road pavement.

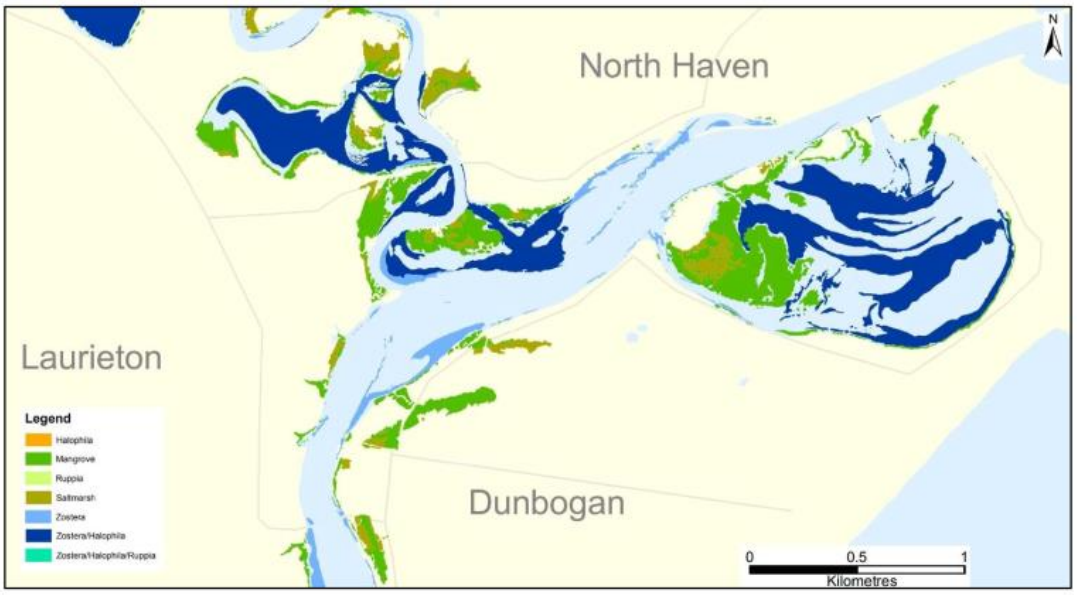


Figure 6.1 - Seagrass and Marine Vegetation Mapping in the Camden Haven River Estuary (Creese *et al*, 2009) – Showing Zostera and Mangrove occurrence in the vicinity of the project area.

Key Fish Habitat

The FM Act clarifies key fish habitat as 'aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. A review of estuarine habitat mapping (as depicted in Figures 4.1 to 4.5 of the BDAR (Appendix D)) indicates the project area has the potential to contain habitat in each of the three categories, as described in Table 6.6.

Table 6.6 Key Fish Habitat Occurrence within the Project Area

Habitat Sensitivity Ranking	Potential Habitat Types in the Project Area	SUP Section
Type 1 – highly sensitive key fish habitat	Coastal saltmarsh >5 m^2 in area	D8
	Zostera seagrass beds >5 m^2 in area	D5
	Coastal Wetlands	D3, D5, D8
Type 2 – moderately sensitive key fish habitat	Zostera seagrass beds <5 m^2 in area	D5
	Mangroves	D3, D5, D8
	Stable intertidal sand/mud flats with large populations of in-fauna	D5
Type 3 – minimally sensitive key fish habitat	Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation	D3, D5, D8

Aquaculture

The NSW Oyster Industry Sustainable Aquaculture Strategy 2016 (OISAS) maps priority oyster aquaculture areas (POAA) and oyster aquaculture development within the Camden Haven River.

Part 2.5 of SEPP (Primary Production) 2021 applies to development proposals and requires the consent authority to 'consider whether, because of its nature and location, the development may have an adverse effect on oyster aquaculture development or a priority oyster aquaculture area' (Section 2.27). The notes to the SEPP states that development may be incompatible with or impede oyster aquaculture if, for example, the development will limit access to oyster leases or

have an impact on water quality and, consequently, on the health of oysters and of consumers of those oysters.

The Camden Haven River sustains an industry of oyster aquaculture with existing POAA areas located within both the Camden Haven River and Gogleys Creek and Lagoon. Land-based oyster facilities (Crown Lease) also exist at the foreshore of Gogleys Lagoon and have land-based access via Pilot Beach Road.

Except for Sections D3, D5 and D8, the alignment of the proposed shared path traverses predominantly terrestrial environments and does not have the potential to directly impact on access to any POAAs or interfere with access to existing land-based oyster facilities. There are no existing POAAs within the vicinity of Section D5 which is the only section that traverses the waterway.

FM Act Offset and Monitoring Strategy

Direct impacts to marine vegetation including saltmarsh, mangroves and seagrass generate offsets under the FM Act. Offset requirements for mangroves and saltmarsh also overlap with offsets generated for terrestrial ecosystems under the BC Act.

Due to the overlapping offset requirements and in order that the impact is not offset twice, it is proposed that all entities covered by the BC Act (mangroves and saltmarsh) would be offset via the BOS as detailed in Section 6.1.5.

Chapter 3 of the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull, 2013) outlines the requirements for environmental compensation to ensure there is a 'no net loss' of key fish habitat. Given offsets for mangroves and saltmarsh will be secured in accordance with the requirements of the BOS (refer to Section 8.3 of BDAR (Appendix D)), it is proposed to only offset in accordance with the FM Act for potential direct and indirect impacts to 140m^2 of seagrass. The policy and guidelines require a minimum 2:1 offset for impacts to Type 1–3 key fish habitats and this is currently calculated at a rate of $113.50 per m^2 to meet the 2:1 offsetting requirement (refer to memos dated 16 May and 17 May 2022 in Appendix K).

The nature and extent of impacts to seagrasses is to some extent unknown as direct impacts via piling could largely be avoided during construction and any seagrass decline from overshadowing would need to be determined by monitoring. It is proposed that payment of a monetary bond equating to the total potential impact area of seagrass (140m^2) apply to the proposal. The site would be monitored annually for a period of three years to quantify the actual extent of direct and indirect impacts to seagrass, noting that the bond would be returned, partly returned or retained depending on the results of the monitoring program.

Threatened Species

A list of threatened species with potential to occur at the project site was generated following database searches and desktop review (refer to Section 5 of BDAR (Appendix D)) and summarised below.

Ecosystem Credit Species

Table 6.7 presents the identified 41 predicted species (ecosystem credit species) returned by the BAM-C as being associated with the PCTs that are present on the project study area.

Table 6.7 Ecosystem Credit Species Subject to Assessment

Common Name (Scientific Name)	Associated PCTs	BC Act 2016	EPBC Act 1999	FM Act 1994	Likelihood of Occurrence[(a)]
Australasian Bittern	1727	E	E	--	Low

Common Name (Scientific Name)	Associated PCTs	BC Act 2016	EPBC Act 1999	FM Act 1994	Likelihood of Occurrence[a]
(Botaurus poiciloptilus)					
Barking Owl *(Nixon connivens)*	1727, 1536, 1724	V	--	--	Moderate
Beach Stone-curlew *(Esacus magnirostris)*	1747	CE	--	--	Moderate
Black Bittern *(Ixobrychus flavicollis)*	1747, 1727, 1724	(b)	(b)	(b)	(b)
Black-necked Stork *(Ephippiorhynchus asiaticus)*	1747, 1724	E	--	--	Moderate
Black-tailed Godwit *(Limosa limosa)*	1747	V	--	--	Unlikely
Broad-billed Sandpiper *(Limicola falcinellus)*	1747	(b)	(b)	(b)	(b)
Common Blossom-bat *(Syconycteris australis)*	1536, 1724	V	--	--	Moderate
Dusky Woodswallow *(Artamus cyanopterus cyanopterus)*	771	V	--	--	Moderate
Eastern Chestnut Mouse *(Pseudomys gracilicaudatus)*	1724	V	--	--	Moderate
Eastern Coastal Free-tailed Bat *(Micronomus norfolkensis)*	1747, 771, 1724	V	--	--	High
Eastern False Pipistrelle *(Falsistrellus tasmaniensis)*	1724	V	--	--	Moderate
Eastern Osprey *(Pandion cristatus)*	1747, 1727, 1536, 1724	V	--	--	High
Glossy Black-Cockatoo *(Calyptorhynchus lathami)*	771, 1724	V	--	--	Moderate
Golden-tipped Bat *(Phoniscus papuensis)*	1724	V	--	--	Moderate
Great Knot *(Calidris tenuirostris)*	1747	V	CE	--	Moderate
Greater Broad-nosed Bat *(Scoteanax rueppellii)*	1747, 771, 1724	V	--	--	Moderate
Greater Sand-plover *(Charadrius leschenaultii)*	1747	(b)	(b)	(b)	(b)
Grey-headed Flying-fox *(Pteropus poliocephalus)*	1747	V	V	--	Assumed Present
Koala *(Phascolarctos cinereus)*	1724	V	V	--	High

Common Name (Scientific Name)	Associated PCTs	BC Act 2016	EPBC Act 1999	FM Act 1994	Likelihood of Occurrence[a]
Large Bent-winged Bat *(Miniopterus orianae oceanensis)*	771, 1724	V	--	--	High
Lesser Sand-plover *(Charadrius mongolus)*	1747, 771	(b)	(b)	(b)	(b)
Little Bent-winged Bat *(Miniopterus australis)*	1724	V	--	--	High
Little Eagle *(Hieraaetus morphnoides)*	1747, 1727, 771, 1724	V	--	--	Moderate
Little Lorikeet *(Glossopsitta pusilla)*	771, 1724	V	--	--	High
Masked Owl *(Tyto novaehollandiae)*	771	V	--	--	Moderate
Powerful Owl *(Ninox strenua)*	771	V	--	--	Moderate
Regent Honeyeater *(Anthchaera phrygia)*	771, 1724	CE	CE		Low
Rose-crowned Fruit-Dove *(Ptilinopus regina)*	1536	V	--	--	Moderate
Scooty Owl *(Tyto tenebricosa)*	771, 1724	V	--	--	Moderate
Spotted Harrier *(Circus assimilis)*	1727	V	--	--	Moderate
Spotted-tailed Quoll *(Dasyurus maculatus)*	1727, 1536, 771, 1724	V	E	--	Moderate
Superb Fruit-Dove *(Ptilinopus superbus)*	1536	(b)	(b)	(b)	(b)
Swift Parrot *(Lathamus discolor)*	771, 1724	E	CE	--	Assumed Present – Mapped Important Habitat
Terek Sandpiper *(Xenus cinereus)*	1747	(b)	(b)	(b)	(b)
Varied Sittella *(Daphoenositta chrysoptera)*	1727, 771, 1724, 1747	V	--	--	Moderate
White-bellied Sea-Eagle *(Haliaeetus leucogaster)*	1727, 1536, 771, 1724	V	--	--	High
White-fronted Chat *(Epthianura albifrons)*	1747	(b)	(b)	(b)	(b)
Wompoo Fruit-Dove *(Ptilinopus magnificus)*	1536	V	--	--	High

Common Name (Scientific Name)	Associated PCTs	BC Act 2016	EPBC Act 1999	FM Act 1994	Likelihood of Occurrence[a]
Yellow-bellied Glider *(Petaurus australis)*	1724	V	--	--	Low
Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)*	771, 1724	V	--	--	High

(a) Based on the 'likelihood of occurrence' indicated in Appendix III of the BDAR (Appendix D)

(b) No data was provided (in Appendix III of the BDAR) in relation to the likelihood of these species to be impacted by the proposed works.

CE – Critically Endangered

E - Endangered

V – Vulnerable

Species-Credit Species

Species-credit species cannot be confidently predicted by vegetation surrogates and landscape features, however, can be reliably detected by survey (BAM, 2020). 'Candidate' species requiring consideration are those 'assumed to be present' or are 'present or likely to use suitable habitat' in the project area.

Potential candidate species are those that could occur in the study area based on the habitat resources observed during field surveys and are categorised as confirmed candidate threatened species. These candidate species are either assumed to be present or require targeted surveys in accordance with Section 5.3 of the BAM (DPE, 2020) to confirm or exclude presence. The list of confirmed candidate species is provided in Table 6.8. (Note: Refer to Table 5.3 of BDAR (Appendix D) for a list of candidate species excluded from further assessment).

Table 6.8 Candidate Species Requiring Confirmation of Presence or Absence

Species	Recommended Survey Period	Surveyed	Species Presence	Comments[a]
FAUNA				
Bush-Stone-curlew *(Burhinus grallarius)*	All year	Diurnal Sept-Nov Nocturnal August	No (surveyed)	No offsets required. This species was not recorded during targeted surveys (diurnal searches, spotlighting and call-playback). Species is unlikely to occur within the project area given the paucity of local records.
Eastern Pygmy-possum *(Cercartetus nanus)*	Oct-Mar	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence.
White-bellied Sea-Eagle (Breeding) *(Haliaeetus leucogaster)*	Aug-Oct	June-Nov	No (surveyed)	No offsets required. This species was recorded flying over the study area during site surveys.
Swift Parrot *(Lathamus discolor)*	May-Aug	No	Yes (assumed present)	Requires offsetting. Important habitat mapped within project area. 'Important Mapping' will define species polygon for offsetting.

Species	Recommended Survey Period	Surveyed	Species Presence	Comments[a]
				Largely limited to native vegetation in Sections D10 and D11.
Green-thighed frog *(Litoria brevipalmata)*	Spring-Autumn after flooding rains	No	Yes (assumed present)	Requires offsetting. Potential habitat is limited to low-lying areas subject to flooding in Section D11 (between CH180 to CH 340).
Southern Myotis *(Myotis macropus)*	Oct-Mar	No	Yes (assumed present)	Requires offsetting. Habitat (PCTs on the subject land to which the species is associated) occurring within 200m of suitable waterbodies provide potential habitat for this species.
Eastern Curlew *(Numenius madagascariensis)*	--	No	Yes (assumed present)	Requires offsetting. Important habitat mapped within project area. 'Important Mapping' will define species polygon for offsetting. Limited to intertidal habitat in Sections D5 and D8.
Eastern Osprey (Breeding) *(Pandion cristatus)*	Apr-Nov	Sept-Nov	No (surveyed)	No offsets required. This species was recorded within Camden Haven Inlet and flying over the study area during site surveys.
Koala (Breeding) *(Phascolarctos cinereus)*	All year	Sept-Nov	No (surveyed)	No offsets required. No signs of Koala, including scats or scratches on tree trunks, were recorded within the project area. The project area is unlikely to support core habitat due to the paucity of preferred food trees. Retained as an ecosystem credit species given the presence of marginal foraging habitat.
Common Planigale *(Planigale maculata)*	All year	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence.
Long-nosed Potoroo *(Potorous tridactylus)*	All year	Yes Aug-Sept	No (targeted survey)	No offsets required. This species was not recorded during targeted surveys (Wildlife cameras). This species has not been recorded locally.
Grey-headed Flying-fox (Breeding) *(Pteropus poliocephalus)*	Oct-Dec	Yes	Yes (assumed present)	Requires offsetting. Despite being absent during the required survey period, it is reasonable to assume potential breeding habitat is available along Pilots Beach Road and species credits have been generated for impacts proposed in this area.
FLORA				

Species	Recommended Survey Period	Surveyed	Species Presence	Comments[a]
Trailing Woodruff *Asperula asthenes*	Oct-Dec	Yes Oct-Nov	No (surveyed)	Targeted Survey. No specimens recorded.
White-flowered Wax Plant *(Cynanchum elegans)*	All year	Yes Sept-Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Tangled Bedstraw *(Galium australe)*	Oct-Feb	Yes Sept-Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Noah's False Chickweed *(Lindernia alsinoides)*	Nov-Feb	Yes Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Maundia triglochinoides	Nov-Mar	Yes Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Biconvex Paperbark *(Melaleuca biconvexa)*	All year	Yes Sept-Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Scrub Tupertine *(Thodamnia rubescens)*	All year	Yes Sept-Nov	No (surveyed)	Targeted Survey. No specimens recorded.
Native Guava *(Rhodomyrtus psidioides)*	All year	Yes Sept-Nov, Feb	Yes (surveyed)	Requires offsetting. Several small plants were recorded at Section D10, occurring near the edge of the existing informal walking track between CH690 and CH820.
Magenta Lilly Pilly *(Syzygium paniculatum)*	Apr-Jun (requires fruit to confirm species)	Yes (outside of recommended survey period) Sept-Nov	No (surveyed)	Targeted Survey – outside of required survey period. No potential specimens recorded within the project area. A potential specimen was observed approximately 20m away from the proposed Section D11 and would not be impacted by the project.

(a) Refer to Table 5.2 of BDAR (in Appendix D) for detailed comments of potential candidate species that could occur in the study area based on the habitat resources observed during field surveys that categorised as confirmed candidate threatened species.

Targeted surveys were undertaken on 30 June, 30 July, 3 September, 22 October and 4 November of 2020 and 16 February 2022 to verify the presence of potential candidate species. A full list of species recorded during the field surveys are provided in Appendix II of BDAR (Appendix D).

A list of candidate species subject to offsetting are summarised in Table 6.9. The species polygons (provided in Appendix VIII of BDAR (Appendix D)) were prepared for each species in accordance with Section 5.2.5 of the BAM (DPE, 2020).

Table 6.9 Summary of Species Polygon

Species	Justification Why Species Credits Apply	Species Polygon
Swift Parrot *(Lathamus discolor)*	Important habitat mapped within project area.	'Important Mapping' defines species polygon for offsetting.

Species	Justification Why Species Credits Apply	Species Polygon
		Largely limited to native vegetation in Sections D10 and D11.
Eastern Curlew (Numenius *madagascariensis)*	Important habitat mapped within project area.	'Important Mapping' defines species polygon for offsetting. Limited to intertidal habitat in Sections D5 and D8.
Eastern Pygmy-possum *(Cercartetus nanus)*	Assumed present – Target survey required to exclude presence.	The species polygon captures PCTs 1536, 771 and 1724 which contain referred foraging habitat.
Green-thighed Frog *(Litoria brevipalmata)*	Assumed present – Target survey required to exclude presence.	The species polygon captures potential habitat which is limited to low-lying areas subject to flooding in Section D11 (between CH180 to CH340).
Common Planigale *(Planigale maculata)*	Assumed present – Target survey required to exclude presence.	The species polygon captures suitable habitat within PCTs 1727, 1536, 771 and 1724. PCT 1727 was excluded within Sections D5 and D8 as this was isolated from suitable habitat.
Grey-headed Flying-fox (Breeding) *(Pteropus poliocephalus)*	Assumed present – No breeding camps were recorded during site surveys although this species is known to seasonally roost in small numbers in rainforest vegetation off Pilot Beach Road (*pers com* J. Cohen, 2020).	The species polygon captures potential breeding habitat present along Pilot Beach Road.
Rhodomyrtus psidioides Native Guava	Recorded on site. Several small plants were recorded at Section D10, occurring along the edge of the existing informal walking track between CH690 and CH820. All recorded plants were small and appeared to be heavily affected by myrtle rust.	Individual plants were recorded by GPS. The species polygon captures habitat (PCT1536) occurring within a 50m buffer around any recorded plants. The species polygon only captures 33m^2 of habitat due to the extent of the existing disturbance associated with the informal walking track. For the purposes of credit calculations within BAM-C, the impacted area was increased to 0.01 ha as this is minimum allowable area.

Source: Table 5.6 of BDAR (Appendix D).

6.1.3 Avoidance and Minimisation

The alignment of the project considered several options at each section of the proposed SUP throughout the concept design phase, as detailed in Table 6.1 of BDAR (Appendix D). The project's final alignment and design have implemented the following measures to avoid and minimise impacts to biodiversity:

- The alignment utilises existing disturbed areas including managed road verges, existing gravel walkways and managed parkland, wherever possible.
- A boardwalk design would be used in sensitive areas (i.e. coastal wetlands and littoral rainforest) which would otherwise require 'fill' construction methods to minimise impacts to vegetation.
- The boardwalk alignment in Section D5 largely extends along the intertidal zone over Camden Haven Inlet minimising impacts to existing mangrove and seagrass vegetation.

- Vegetation impacts would be minimalised as far as practical during detailed design.
- Site compounds and stockpile sites would avoid impacts to existing vegetation would utilise existing Council facilities or cleared areas.
- Mitigation measures to minimise impacts to biodiversity (as provided in Section 7.2) would be implemented through a CEMP (see Section 7.1) to be developed for the works.

6.1.4 Assessment of Potential Impacts

Residual Impacts

Loss of Native Vegetation and Habitat

As detailed in the BDAR (Appendix D), the project requires the removal of small areas of native vegetation, as summarised in Table 6.10. The total area of vegetation potentially impacted by the project is 0.48 ha. The impact of the proposed works to species credit entities relevant to the project is summarised in Table 6.11.

Table 6.10 Summary of the Project Impacts to Vegetation

PCTs	BC Act (status)	FM Act (status)	EPBC Act (status)	Project Impact (ha)
1727 Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	EEC	0.11
1536 Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest	EEC	N/A	CEEC	0.20
1747 Grey Mangrove low closed forest	Not listed	Protected marine vegetation	Not listed	0.07
1746 Saltmarsh Estuarine Complex(1)	EEC	Protected marine vegetation	VEC	0.002
771 Coastal sand Tea-tree – Banksia scrub	Not listed	N/A	Not listed	0.08
1724 Broad-leaved Paperbark – Swamp Oak – Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	Not listed	0.02

(1) The proposal area impacts a small area (approx. 21m^2) of PCT 1746 – Good. Due to the small size of this zone impacts have been combined with the adjoining PCT 1747 for the calculation of offsets.

CEEC – Critically Endangered Ecological Community

EEC - Endangered Ecological Community

VEC – Vulnerable Ecological Community

Table 6.11 Summary of the Project Impact to Species-Credit Species

Species-Credit Species	Status	Species Presence Type	Project Impact (ha)
Swift Parrot *Lathamus discolor*	BC Act – E EPBC Act - CE	Important Areas Mapping	0.23
Eastern Curlew *Numenius madagascariensis*	BC Act – P EPBC Act - CE	Important Areas Mapping	0.01

Species-Credit Species	Status	Species Presence Type	Project Impact (ha)
Eastern Pygmy-possum *Cercartetus nanus*	BC Act - V	Assumed Present	0.31
Green-thighed Frog *LItoria brevipalmata*	BC Act – V	Assumed Present	0.02
Southern Myotis *Myotis macropus*	BC Act – V	Assumed Present	0.47
Common Planigale *Planigale maculate*	BC Act – V	Assumed Present	0.34
Grey-headed Flying-fox *Pteropus poliocephalus*	BC Act – V EPBC Act - V	Assumed Present	0.04
Native Guava *Rhodomyrtus psidioides*	BC Act – CE EPBC – CE	Present	0.01 (See Note 1)

Note 1: Minimum area allowable within BAM-C. Total impact area is approx. 33m^2

CE – Critically Endangered Species

E – Endangered Species

P – Protected Species

V – Vulnerable Species

Indirect Impacts

Indirect impacts occur when the project or activities relating to the construction or operation of the project affect native vegetation, TEC and threatened species habitat beyond the subject land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, TEC and threatened species habitat. The likely impacts of the project on native vegetation and habitat beyond the project area in reference to Section 9.1.4.2 of the BAM (OEH, 2016), include:

- Inadvertent impacts on adjacent habitat or vegetation (EECs – Littoral Rainforest, SOFF, SSFF, and the *Rhodomyrtus psidioides* (Native Guava)).
- Reduced viability of adjacent habitat due to edge effects.
- Reduced viability of adjacent habitat due to noise, dust or light spill.
- Transport of weeds and pathogens from the site to adjacent vegetation.
- Trampling of threatened flora species (such as the *Rhodomyrtus psidioides* (Native Guava)).
- Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds. (Note: No vegetation or habitat identified however the proposed Section D11 occurs near the forest that has been previously used as a seasonal flying-fox camp).

Detailed assessment of all indirect impacts listed in BAM (OEH, 2020) by the project construction works on adjacent habitat is detailed in Section 6.3 of BDAR (Appendix D).

Serious and Irreversible Impacts

Native Guava *(Rhodomyrtus psidioides)* is a critically endangered species (BC Act and EPBC Act) that was recorded within the proposal area. This species is considered at risk of serious and irreversible impacts (SAII) as it meets the criteria for Principle 1, in that an 80% reduction in the population of across Australia over the three generations is reasonably expected given documented levels of mortality due to Myrtle Rust *(Austropuccinia psidii)* infection, and high

susceptibility to Myrtle Rust in both mature individuals and seedlings (NSW Threatened Species Scientific Committee, 2018).

The other two species at risk of SAII which have important habitat mapped within the project area are:

- Swift Parrot *(Lathamus discolor)*
- Eastern Curlew *(Numenius madagascariensis)*.

Additional impact assessment provisions for these SAII entities considered in accordance with Section 9.1.2 of the BAM (2020) are detailed in Tables 6.6, 6.7 and 6.8 of BDAR (Appendix D).

Prescribed Biodiversity Impacts

Prescribed biodiversity impacts in accordance with Division 6.1 of the *Biodiversity Conservation Regulation 2017* that are relevant to the project are limited to impacts to habitat connectivity and the movement of animals. The project will add to the incremental fragmentation of vegetation within the local area. The relatively narrow nature of the proposed clearing is considered minor and is unlikely to isolate any local habitat areas or limit the movements of any threatened fauna species in the locality.

Aquatic Impacts

The potential impact of works proposed within Sections D3, D5 and D8 (of the project) to marine vegetation are summarised in Table 6.12. These sections of the shared path present impacts to mangroves, which have been considered as loss of native vegetation.

Table 6.12 Summary of Potential Impacts to Marine Vegetation

Site	Habitat Description	Identified Marine Vegetation	Impact Summary
D3	• Mangrove Forest	• Mangroves	• Potential removal of mangroves and/or lopping of mangrove branches within the alignment of the boardwalk. Direct and indirect impacts to pneumatophores through piling.
D5	• Mangrove Forest • Intertidal flats • Sub-tidal estuary channel	• Mangroves • Oyster encrusted mangrove pneumatophores • Seagrass	• Potential removal of mangroves and/or lopping of mangrove branches within the alignment of the boardwalk. Direct and indirect impacts to pneumatophores through piling. • Direct impacts to seagrass through piling. • Indirect impacts to seagrass through shading.
D8	• Mangrove Forest • Rocky channel edge • Saltmarsh	• Mangroves • Macroalgae and oyster reef	• Removal of or lopping mangroves in boardwalk alignment. • Potential impact to oyster reef and macroalgae existing on rock edges (only if reclamation occurs). • Direct impact to saltmarsh community within boardwalk footprint.

Potential impacts to seagrasses are limited to the raised boardwalk in Section D5, where impacts are likely to result from piling (where occurring in seagrass patches) or as a result of overshadowing. Potential overshadowing impacts are likely to be minimal given the location of the boardwalk alignment over the intertidal zone and to the south of existing seagrass patches. Any decline in the health or persistence of seagrasses would be minimal (if any) with an estimated 140

m^2 (0.014 ha) of seagrasses occurring within the footprint of the boardwalk and potentially subject to some shading effects.

No macro algae were detected within the footprint of the proposed development, therefore no impacts to macroalgae are likely to occur.

Construction Impacts

In relation to construction impacts for Section D5, it is anticipated that disturbance of bottom sediments for piling will result in a short-term increase in the turbidity of water in the vicinity of the construction activities. It is also possible that construction of the structures could result in indirect impacts to seagrass through accidental contact by construction machinery and boats.

Seagrasses and macroalgae are photosynthetic plants that rely on the availability of light for their survival and the impacts of increased turbidity are a known threat to the long-term survival of macroalgae and seagrasses generally. Long term increases in turbidity have the potential to decrease the availability of light and decrease the growth and survival of the marine vegetation.

It is assumed that construction (piling) activities at Section D5 would be limited to duration of several days. The persistence of sediment within the water column would likely be very short, however, a short-term increase in leaf sediment coverage is likely to occur for several days following construction, after which, turbidity and sediment levels are likely to return to normal levels.

The potential impact of turbidity and sediment on the survival of the nearby seagrass or macro algae is likely to be very low. The short duration of the impacts is not dissimilar to the natural conditions experienced after heavy rain, wind, or storms. Given the relatively shallow water (i.e. high availability of light) and tidal currents within the vicinity of the project, the impacts of short-term sedimentation are also likely to be significantly less than deeper water environments where light availability is the limiting factor for the growth of seagrass and tidal flushing is less active.

Therefore, the short-term impacts resulting from construction activities are likely to be to minor. The duration and extent of shading (due to turbidity) is not considered to be detrimental to the survival of seagrass in the immediate locality.

Fish Habitat Protection Plans

Fish Habitat Protection Plans (FHPPs) describe potential threats to fish habitat and recommend actions to mitigate the effects of potentially damaging activities (DPI, 2021). The following two FHPPs apply to the project:

- Fish Habitat Protection Plan No. 1 – General
- Fish Habitat Protection Plan No. 2 (Seagrasses).

FHPP No. 1 applies to activities that involve reclamation or the damaging of marine vegetation (mangroves). FHPP No. 2 applies specifically to activities involving impacts to seagrasses.

The objectives of FHHP No. 1 are generally reflected in the permit requirements under the FM Act for damage to marine vegetation and permits for dredging and reclamation. These permits would apply in relation to impacts to mangroves, sea grasses and reclamation activities in areas of saltmarsh (such as Section D8).

The objective of FHHP No. 2 is to ensure no net loss of seagrasses within the coastal and estuarine waters of NSW. The FHHP provides guidelines for the management of specific activities including the construction of jetties, wharves, bridges, ramps and pontoons. These guidelines would be applicable to the project.

FHHP No. 1 advises that construction of new structures over Zostera seagrass would be considered on a case-by-case basis and based in part on the regional importance of the seagrass bed. The subject seagrass beds are part of a broader estuarine environment that is characterised by small discrete patches of seagrass (Zostera sp.) separated by non-vegetated sand flats.

Through review of historical aerial imagery (SIX Maps), it appears that seagrass in the subject locality would undergo a high degree of seasonal change depending on movement of sands and other hydrological characteristics of the channel.

Figure 6.1 depicts the relative area of seagrasses in the locality and shows the occurrence of large and important seagrass beds within the areas of Queens Lake and Gogleys Lagoon. The subject seagrass beds are shown as narrow and isolated patches and are unlikely to be either temporally stable or of regional importance in comparison to other larger seagrass beds in the estuary.

Relevant to the guidelines, the project attempts to minimise impacts to existing seagrass through positioning of the boardwalk over the intertidal zone and minimising shading effects. Subject to the adoption of mitigation measures and having regard to the temporal variability in local distribution, there is unlikely to be a long-term net reduction in the area of seagrass in the locality.

Aquaculture

The shared path would be unlikely to have any adverse effects on oyster aquaculture development subject to the incorporation of appropriate safeguards during construction. It is assumed that operational access to the land-based oyster facilities at Pilot Beach Road will be maintained during construction and use of the shared path.

Other Relevant Legislation or Planning Policies Requiring Address

Fisheries Management Act 1994

For the purpose of the FM Act, macro algae and mangroves are defined as 'marine vegetation'. A permit is required under Section 205 of the FM Act in relation to any activity that is likely to impact on marine vegetation. As described in Table 6.12, the project is likely to impact 'marine vegetation' in Sections D3, D5 and D8. Furthermore, permits are required under Sections 200 and 201 of the FM Act in relation to any reclamation work.

The FM Act provides matters that are to be taken into account for the purposes of determining whether a proposed development is likely to significantly affect threatened species, populations or ecological communities listed under the FM Act. Appendix III of BDAR (Appendix D) provides an assessment of potential habitat for threatened species likely to inhabit the project area and indicates that there is not more than a 'low' chance of occurrence for any listed threatened marine species. No endangered populations or communities exist in the proposal area.

Having regard to the matters under Section 221ZV of the FM Act, the project is unlikely to have a significant impact on any threatened species, populations or ecological communities.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The SEPP Biodiversity and Conservation applies to PMH Council LGA as listed on Schedule 1, and the identification of koala management area as determined by the presence of koala use tree species listed within Schedule 2 (of the Policy).

No signs of koala including scats or scratches on tree trunks were recorded within the project area. Local records indicate a resident local population occurs throughout the Camden Head area and suitable habitat with a high incidence of preferred food trees may provide suitable breeding habitat. Schedule 2 listed koala use trees are largely absent from the project area except a small number of *Melaleuca quinquenervia* (Broad-leaved Paperbark) associated with PCT 1724 at the

eastern end of section D8, which are not expected to be removed to accommodate the proposed SUP.

Notably, the proposed SUP footprint is narrow and is unlikely to restrict koala movement throughout the local area or increase the risk of vehicle strike. It is considered that the potential impact of the project to local koalas is low and no further assessment under the provisions of this Policy is warranted. The CEMP during detailed design would look to ensure that no significant trees along section D8 are removed, including utilising suitable boardwalk options for the SUP construction to avoid impact on trees.

Matters of National Environmental Significance

The Matters of National Environmental Significance (MNES) relevant to the project study area are nationally listed threatened species and ecological communities and migratory species. A summary of the assessment on potential impacts relating to MNES (as provided in Appendix VI of BDAR (Appendix D)) are summarised below.

- **Three threatened ecological communities** listed under the EPBC were recorded within the project area. It was concluded that the project was unlikely to have a significant impact on the *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia* (CEEC) and *Coastal Swamp Oak* (*Casuarina glauca)* (EEC).

  A small patch of *Subtropical and Temperate Coastal Saltmarsh* (VEC) recorded within the project area in Section D8 failed to meet the minimum condition threshold for listing under the EPBC Act as the patch is <0.4 hectares and is isolated from other habitat areas by Camden Head. As such, no further assessment was required for this TEC.

- Potential habitat for **eight threatened species** (Swift Parrot, Eastern Curlew, Curlew Sandpiper, Great Knot, Native Guava, Red Knot, Bar-tailed Godwit, and Grey-headed Flying-fox) listed under the EPBC Act were identified. A significant impact criterion for these species was undertaken (Appendix VI of BDAR (Appendix D)) and concluded that the project was unlikely to have a significant impact on any of these threatened species. The project is considered unlikely to have a significant impact on any MNES and a Commonwealth referral under the provisions of the EPBC Act is not warranted.

6.1.5 Biodiversity Offsets

Despite avoidance and mitigation measures to minimise impacts to biodiversity, residual impacts from the removal/clearing of TEC and threatened species as a result of the construction and operation of the project would require offsetting. A summary of the impact to PCTs and the number and type of credits required to offset the proposed works are presented in Table 6.13 and Table 6.14, and further detailed in Section 8 of the BDAR (in Appendix D).

Table 6.13 Biodiversity Offset Credits Required – Vegetation

Plant Community Type	BAM-C Zone ID #	Change in VIS (loss/ gain)	Area Impacted (ha)	Biodiversity Risk Weighting (BRW)	Ecosystem Credits Required
1727 Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	2	-47.8	0.1	2	2
	4	-61.4	0.01	2	1
1536 Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest	3	-81.3	0.19	2	8
	7	-71.7	0.01	2	1

Plant Community Type	BAM-C Zone ID #	Change in VIS (loss/ gain)	Area Impacted (ha)	Biodiversity Risk Weighting (BRW)	Ecosystem Credits Required
771 Coastal sand Tea-tree – Banksia scrub	5	-94.6	0.08	1.75	3
1747 Grey Mangrove low closed forest	1	-58.4	0.07	1.75	2
1724 Broad-leaved Paperbark – Swamp Oak – Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	6	-88.6	0.02	2	1
		Total Area:	**0.48 ha**	**Total Credits:**	**18**

Table 6.14 Biodiversity Offset Credits Required – Candidate Threatened Species

Threatened Species	Potential SAII	BRW	Area Impacted (ha)(1)	Ecosystem Credits Required
Swift Parrot (*Lathamus discolor)*	Yes	3	0.24	16
Eastern Curlew (*Numenius madagascariensis)*	Yes	3	0.01	1
Eastern Pygmy-possum (*Cercartetus nanus)*	No	2	0.32	15
Green-thighed Frog (*LItoria brevipalmata)*	No	1.5	0.02	1
Southern Myotis (*Myotis Macropus)*	No	2	0.47	18
Common Planigale (*Planigale maculate)*	No	2	0.35	16
Grey-headed Flying-fox (*Pteropus poliocephalus)*	No	2	0.04	2
Native Guava (*Rhodomyrtus psidioides)*	Yes	3	0.01	1
			Total Credits:	**70**

(1) Where possible (Eastern Curlew, Green-thighed Frog, Southern Myotis and Grey-headed Flying-fox), the species credit impact area was attributed to the predominant PCT in BAM-C to avoid duplication of credits across small areas and different vegetation zones.

6.1.6 Biodiversity Assessment Conclusion

The BDAR (in Appendix D) addresses the key biodiversity issues identified in the SEARs, as well as the Stage 1 (biodiversity assessment) and Stage 2 (impact assessment) of the BAM (BC Act), MNES (EPBC Act), and marine vegetation and key fish habitats (FM Act). The assessment concluded that the project would impact coastal habitats present along the length of the shared paths including areas of Coastal Wetlands and Littoral Rainforest.

In accordance with the objectives of the BAM, the design and alignment of the proposed SUP aims to avoid and minimise impacts on biodiversity values. This includes using a boardwalk design in sensitive areas (i.e., coastal wetlands and littoral rainforest) to minimise the disturbance footprint and using existing disturbed areas including managed road verges, existing gravel walkways and managed parkland, wherever possible.

Mitigation measures (in Section 7.2) are to be implemented to minimise the potential impacts of the proposed works. These are to be incorporated into the CEMP for the construction phase of the project.

Residual Impacts

The proposed construction will require the removal of small areas of native vegetation largely on the margins of existing roads or tracks. The proposal would impact 0.48 ha of native vegetation and potentially impact an additional 0.014 ha of seagrass (at path section D5), which is protected marine vegetation under the FM Act.

Offsetting under the BC Act

The biodiversity assessment identified the offsetting requirements to address residual impacts of the project, as follows:

- 18 ecosystem credits to address loss of 0.48 ha of native vegetation and threatened species habitat
- 70 species credits to address impacts on eight (8) candidate threatened species: Swift Parrot, Eastern Curlew, Eastern Pygmy-possum, Green-thighed Frog, Common Planigale, Southern Myotis, Grey-headed Flying-fox and Native Guava.

These credit requirements will be satisfied through retiring of credits under the BOS, based on like-for-like rules, wherever possible. Payments into the Biodiversity Conservation Fund may be made where suitable credits are not currently available.

Assessment of Serious and Irreversible Impacts (SAII)

The SAII assessment identified that the proposal impacts are minor and unlikely to have a serious and irreversible impact on three threatened species: Native Guava, Swift Parrot and Eastern Curlew. Several small Native Guava specimens were recorded within Section D10 and important habitat mapping for Swift Parrots and Eastern Curlews occur within the proposal area. The native vegetation throughout Camden Head and North Haven is mapped by OEH as important migratory foraging habitat for Swift Parrots, and Camden Haven Inlet is mapped as important seasonal foraging habitat for Eastern Curlews.

Matters of National Environmental Significance (MNES)

The MNES assessment concluded that the proposed impacts to vegetation and habitat is unlikely to have a significant impact on any TEC or threatened species under the EPBC Act. As such, it is considered that a referral under the EPBC Act is not likely to be required for the project.

Aquatic Habitat and Marine Vegetation (FM Act)

The proposal is unlikely to have a significant impact on any key fish habitats, threatened species, populations or ecological communities listed under the FM Act. The proposal may require the removal of relatively small areas of protected marine vegetation (mangroves, saltmarsh and seagrass) in Sections D3, D5 and D8. A permit will be required under Section 205 of the FM Act for any activity that is likely to impact on marine vegetation. Furthermore, permits under Sections 200 and 201 of the FM Act would also be required for any reclamation works.

6.2 ABORIGINAL HERITAGE

The intent of the Aboriginal Cultural Heritage Assessment Report (ACHAR; Appendix E) undertaken for the project was to consult the Aboriginal community to understand the cultural heritage values that exist in the project development area, as well as to provide an assessment to the key aboriginal heritage issues identified in the SEARs (Appendix B).

The Approach

In accordance with the relevant administrative and legislative standards for NSW, the methods employed in the assessment included:

- Consultation with the Aboriginal Community.
- A search of relevant Aboriginal heritage registers.
- An environmental and archaeological investigation of the project area.
- A brief review of the archaeological and cultural heritage assessments pertinent to the potential heritage values associated with the project area.
- A review of historic aerial photographs of the project area.
- Assessment of the potential for the project area to contain significant Aboriginal heritage and the impact the project may have on said heritage, consistent with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW, Guide to Investigation, Assessing and Reporting on Aboriginal Cultural Heritage in NSW and Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW.

Landscape History and Environmental Context

Settlement of the Camden Haven generally occurred through the 1820s and 1830s associated with the main penal settlement of Port Macquarie. The first permanent European settler in the area occupied land at Laurieton in 1872, and by 1890 the Camden Haven was regarded as one of the main centres of the northern timber industry (DEC 2005 as cited in Darkheart 2010, p.15).

As detailed by DEC (2005 as cited in Darkheart 2020, page 15):

> *"Settlement of the Camden Haven occurred in a piecemeal fashion through the 1820's and 1830's as an outpost of the more structured penal settlement of Port Macquarie. Between 1820 and 1860, the Camden Haven area was important in order to intercept convicts who escaped from Port Macquarie. The towering headland of Perpendicular Point sheltered the area from strong winds and provided a haven for vessels during storms. The area was also visited by limeburners, cedar getters and graziers.*
>
> *The first permanent European settler occupied land at Laurieton (Peach Grove) in 1872. By 1890 the Camden Haven had come to be regarded as one of the strongholds of the northern timber trade, giving employment to "a small army of puntsmen, snaggers, rivermen, lumberers, coasting seamen, sawmill hands, wharf labourers, engineers, teamsters, splitters and shinglers" (Sharp, 1890 in Patterson Britton and Partners, 1999)."*

The region in general was known for logging and pastoral activities in the early settlement period (Heritage Office (HO) and Department of Urban Affairs and Planning (DUAP) 1996, pp.50-69). It was later in the 20th century that activities such as tourism and sand mining became important activities for the area.

Prior to construction of the breakwall, the north western area of Pilots Beach was subject to tidal inundation.

The environmental context of the project study area indicates that the most likely use would have been opportunistic hunting and gathering with potential for short term habitation near suitable potable water. Nearby water sources may have been able to provide access to flora and fauna, as well as potential for drinking water if the salinity was not too high. The topography provides opportunity for ridge lines and crests, although this is outside of the study area and around Camden Head. However, contours indicate that most of the project area is located between 0–22m in elevation. The landscape also represents modern infrastructure demands such as dams, roads, underground and above ground services, landfill and residential development. The combination of tidal waters, flooding events and a lack of permanent potable water, would have made the project study area unsuitable for any long-term habitation.

Cultural Context

It is generally accepted that traditional Aboriginal people of Lake Cathie-Bonny Hills belonged to the Birpai 'tribe' and spoke a closely related variant of the Kattang language (Holmer 1966). Dialect groups composed of interlinked extended families traditionally inhabited distinct territories within the wider Kattang language association. Land belonged to individual clans whose estate boundaries were known and well defined. At the time of the first European settlement, the Birpai maintained alliances with other 'tribes' via a system of regulated movement for ceremonial, ritual and social/secular purposes (Breton 1833; Howitt 1904; Fitzpatrick 1941:61.124).

Other significant landscape features associated with the area includes the Three Brothers Mountains. The closest and most northern mountain is located in Dooragan National Park. The Park is a declared Aboriginal Place because of its traditional significance relating to ceremonial and mythological sites to local Aboriginal people (Navin Officer 2004, p. 14; DEC 2004).

Regional Archaeological Context

The regional archaeological context for the project was provided by previous assessments that have tended to focus on near prominent infrastructure (such as the M1 Pacific Highway) and areas around Port Macquarie with a higher population. The coast or prominent bodies of water (such as the Pacific Ocean, Hasting River and Camden Head estuary) are likely to have greater archaeological sensitivity, reflecting these links and the history of Aboriginal occupation near the waterway (refer to Section 4.1.1 of the ACHAR (Appendix E)).

The most common finds reported were shell middens, while artefacts, open camp sites and a modified tree have also been documented. Due to the coastal influence, middens have been documented at a number of sites, as close as 200m from the project study area. The regional pattern also presents stone artefacts and open camp sites as examples of evidence of human occupation. It can be predicted from the previous assessments that early regional occupation was strongly connected to waterways and coastal areas. Details of the regional based archaeological assessments are further described in Section 5.1 of the ACHAR (Appendix E).

Assessment

Dunbogan and Camden Head are the traditional home of the Birpai and Bunyah people, who have a cultural and spiritual link to the area. The inlet and its banks are likely to have greater archaeological sensitivity, reflecting these links and the history of Aboriginal occupation near the waterway. An extensive search of the Aboriginal Heritage Information Management System (AHIMS) for the project site and surrounds (with a 50m buffer) returned nine registered Aboriginal heritage sites in the area, and these are typically middens comprising both shell and stone artefacts. None of the sites are located within the project area.

A desktop review of aboriginal heritage data sources (refer to Appendix E) identified an overall low potential for archaeological materials to be within the project area. Large sections of the study area have been altered due to the nature of disturbance at the project site through roads, residential development, and ancillary services as well as the reshaping of the land due to the breakwalls, floods and tidal surges.

The assessment included a field survey and pedestrian transect over the project area and the surrounding landscapes, which may have the potential to contain archaeological sites. The field assessment methods were aimed to inspect exposed ground surfaces as conditions would allow, to record any archaeological material found and assess its significance, and to assess the potential for concealed Aboriginal archaeological sites. Limitations when surveying the project area included dense vegetation along certain sections of the project, and where the distance between the road and water converge to a narrow point. The discussion of each SUP section of the survey area is, as follows:

- **Section D3:** The path commences at a swamp, where the area was deemed inaccessible due to the current water height and mangroves. A brief discussion occurred on-site, and the general consensus was that the proposed construction, although impacting vegetation and being invasive to the area, was highly unlikely to disturb archaeological deposits. The lower chainage of Section D3 was accessible and appeared to have been disturbed in the past with tree clearing and agricultural (timber post wire) fencing. The area adjacent to The Boulevarde (side road) had a number of subsurface services, such as water and telecom, thus providing a lower likelihood of finding archaeological deposits. Surface disturbance was prolific. CH200 to the existing Section D4 was all disturbed with nature strips, culverts, rock embankments, with some tidal landscaping. Consensus was reached that the proposed works of the SUP at this section would have a low probability of impacting Aboriginal heritage or cultural values.
- **Section D5:** The marshy nature of this area made the investigation difficult. At the time of the investigation, mud and recent flooding impacted the study area. Disturbance included boat storage, roads and associated drainage as well as embankment/coastal protection through rock barriers. Consensus was reached that the proposed works would have a low probability of impacting Aboriginal heritage or cultural values.
- **Section D8:** The path recorded no heritage issues. It was cited by the Regional Aboriginal Parties (RAPS) that midden/s had previously been recorded along this section and through the general development of the area (road, coastal protection, occupation, oyster farming) the middens had been destroyed. These midden/s are not recorded on AHIMS. Some evidence of shell material was noticed in the area, though with oyster farming, the tidal nature and recent flooding (March 2021) the shell is unsurprising. Erosion from the recent floods was evident in one section (approximately 10m) with rock and geofabric used to repair/stabilise the bank (see Photos 6 and 7 in Appendix V of ACHAR (Appendix E)). Potential heritage landscapes may have disappeared through mass movement of water. Consensus was reached that the proposed works would have a low probability of impacting Aboriginal heritage or cultural values.
- **Sections D10 and D11:** Along these sections, partially existing tracks are already present (grass tracks, etc.). When discussed on-site, the proposed works at these two sections would have a low probability of impacting Aboriginal heritage or cultural values. It was cited by the RAPS that midden/s had previously been recorded along these sections and through the general development of the area (road, coastal protection, occupation, oyster farming) the middens had been destroyed. These midden/s are not recorded on AHIMS. Further along Section D11, the breakwall landscape has been altered. When built, the landscape was different and given the time that has elapsed, none of the original landscape is likely to have survived. This drastically alters the likelihood of any evidence of Aboriginal occupation being retained in the area.

Based on the field survey, background research and the environmental context, the project area when undisturbed would have provided possible transitory and resource location for Aboriginal people. The lack of nearby fresh water would have limited occupation. Given the low exposure and visibility, the survey conducted was limited predominantly due to vegetation cover. An oral history of the presence of Aboriginal middens given by the Bunya Local Aboriginal Land Council (LALC) Officers indicated at least transitory and hunting activities in the area. Given the European disturbance of the area through roads, residential development, and ancillary services, as well as the reshaping of the land due to the breakwalls, floods and tidal surges, large sections of the project study area have been altered.

Shell is a common natural feature due to oyster farming and the project study area's tidal location adjoining the Pacific Ocean. The recent (March 2021) floods would also have had an impact on some of the low-lying areas that were investigated. The marsh/swamp areas of the project area, though likely to have a naturally higher level of shell would be impacted though a boardwalk construction, though the impact would be minimised through pier construction. The remaining

areas proposed for construction of pavement, retaining walls or boardwalks are within areas that are disturbed or unlikely to contain intact Aboriginal shell middens.

The mitigation measures and recommendations for the management of Aboriginal cultural heritage within the project area are outlined in Section 7.2. Specific strategies including conservation/protection, further investigation, and Aboriginal Heritage Impact Permit (AHIP), where required for the management of the project study area are detailed in Section 10 of the ACHAR (Appendix E).

6.3 NON-ABORIGINAL HERITAGE

This section provides a summary of the existing environment, identifies potential impacts, presents the risk assessment and proposed mitigation measure relating to non-Aboriginal heritage. Aboriginal heritage has been addressed separately in this EIS, as per Section 6.2. In addition to the landscape history described in Section 6.2, two items of European heritage value were identified as part of the desktop assessment although were none noted during the survey activity.

The SEARs did not identify anthropological, archaeological, cultural, historical, or scientific values required to be assessed and the project is not expected to change or impact upon a heritage site. The project is located in previously disturbed and modified land, as represented by the general development of the area through roads, residential development and ancillary services as well as reshaping of the land.

Items that are listed under the State Heritage Register (SHR) or Local Heritage Registers are afforded automatic protection under the Heritage Act and impact to historic values associated with these listings must be considered negligible, or assessment under a Statement of Heritage Impact must be undertaken. The EP&A Act provides the assessment framework for the consideration of cultural heritage values within the planning and development consent process. The EP&A Act classifies cultural heritage under environmental impacts, as well as archaeological sites and deposits.

A search of the National Heritage List, the State Heritage Register (SHR) and the Port Macquarie-Hastings Local Environmental Plan 2011 (LEP) for cultural archaeological historic heritage items was undertaken in December 2020 and again June 2021. Searches found two heritage items listed in the PMH LEP listings; I115 Graves and A113 Training Wall.

The heritage assessment focused on potential impacts to the LEP listings, as both of the listings are local items. Furthermore, there were no controls listed in the Port Macquarie Hastings DCP in relation to items. Areas of archaeological potential are generally located around the main activity areas.

It is considered very unlikely that proposal would impact any significant historical archaeological sites or listed heritage items within the proposal area. Based on the results of the assessment it is recommended that any future excavation or ground disturbance works can go ahead without further approvals. Due to the minimal archaeological potential of the area and the late date of the site's establishment it is concluded that the proposal is unlikely to encounter 'relics' as defined by the Heritage Act.

Whilst no historical archaeological or heritage impacts have been identified, due to the nature of archaeology, it is possible that some unrecorded and unidentified features may be present in previously occupied areas, however they will remain in-situ. General mitigation procedures that apply to all work would include:

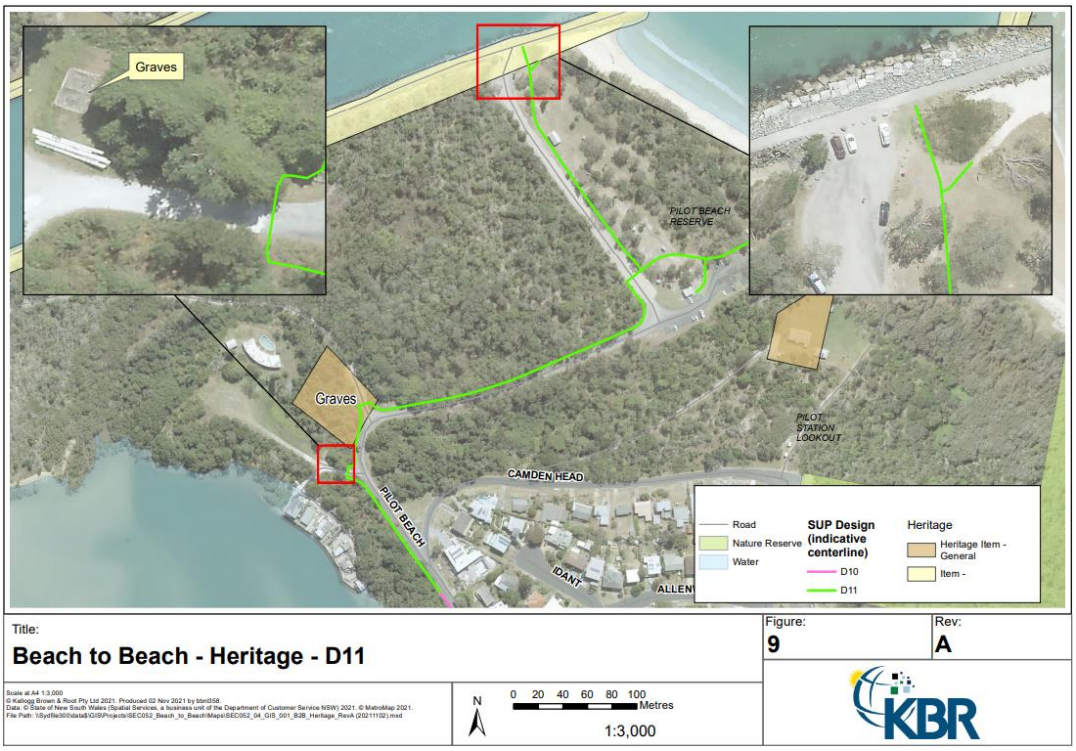
- Heritage induction should be presented to all construction staff.
- Some unrecorded and unidentified features may be present within the works area and provisions for unexpected finds should be followed during the construction.

Figure 6.2 - The '*Graves*' (I115) site contains two damaged graves with headstones



Figure 6.3 - A113 Training Wall (from opposite side of Camden Haven Inlet).





Based on the historical research conducted concerning historic land occupation, use, and modification (disturbance), the archaeological potential of the area is assessed as very low with any surviving archaeological resource found to be comprised:

- Subsurface features, such as rubbish or cesspits, wells, or cisterns.
- Demolished building footings.

The landscape alterations, such as road construction, quarrying activities and terracing and levelling of bedrock for dam construction, fencing and plantings, pastoral, and agricultural activities such as clearing is considered negligible at the project location.

Any potential archaeological remains will be limited to minor occupation-related deposits and landscape modification dating back to the 20th century

For this reason, only general mitigation measures are recommended for this environmental aspect. Any potential impacts associated with non-Aboriginal heritage will be managed through the standard procedures of the CEMP, including the development of an Unexpected Finds protocol.

6.4 HAZARDS (BUSHFIRE, COASTAL AND FLOODING)

The project involves the construction of boardwalk/pavement along the banks of the local Camden Haven River system through Dunbogan and Camden Head. The following describes the assessment of the potential bushfire, coastal and flooding hazards in the vicinity of the project site.

6.4.1 Bushfire

A bushfire review has been undertaken as the project is located within an area identified as containing bushfire prone land, as mapped on the NSW Rural Fire Service and PMH LEP bushfire land maps, for the purpose of Section 10.3 of the EP&A Act. The proposed development comprises sections of SUP on bushfire prone land which requires assessment in accordance with the Planning for Bushfire Protection 2019 (PBP19), and relevant legislative and regulatory requirements for building on bushfire prone land.

The Bushfire Attack Level (BAL) BAL-Low to BAL-FZ occurs across the length of the path. The bushfire review considered that the path is capable of complying with the acceptable solutions of PBP19.

The assessment methodology conducted in accordance with Appendix 1 of PBP19 is summarised according to the following steps:

1. Determine the vegetation formation to a distance of 140m.
2. Determine the effective slope for a distance of 100m.
3. Identify the relevant Forest Fire Danger Index (FFDI).
4. Determine separation distance.

- ***Vegetation:*** The vegetation within 140m of the path varies given its length and location relative to the foreshore.
- ***Slope:*** The slope of the land under the sections of the path within the foreshore areas is relatively flat with areas of section D10 and D11 trending towards upslope to the north-east and downslope to the south-west.
- ***Relevant FFDI:*** The Council area in which the development is undertaken is the PMH Council area. The PMH Council area is within the North Coast Fire Weather area and the applicable FFDI is 80.
- ***Separation:*** The nearest vegetation varies over the different sections of the path.

Assessment

The project is not for residential occupation, and as such the assessment considered the aims and objectives of the PBP19. For the protection of human life and to minimise impacts on property from the threat of bush fire, the assessment considered the following aspects: type of development, the impact of radiant heat and direct flame contact, separation from other development, radiation and embers, access and egress for firefighters, the provision of adequate water supplies and property maintenance requirements. Table 6.15 presents the project's response to address the objectives set out in the PBP19.

Table 6.15 Response to Planning for Bushfire Protection Objectives

Objectives	Response
• Afford buildings and their occupants protection from exposure to a bush fire	The path does not contain occupants, and materials will be appropriate for the purpose and potential exposure to bushfire (being made of either hardwood or non-combustible material).
• Provide for a defendable space to be located around buildings	Given the location of the paths are adjacent to a sealed public road, it is considered to be 'defendable'. While a person's behaviour in times of bush fire may be unpredictable, it is unlikely the limited sections of path within closer proximity to fuel loads will result in injury, death or loss of private property.
• Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings	Given the nature and construction of the path, it is unlikely to create fire spread to buildings.
• Ensure that appropriate operational access and egress for emergency service personnel and occupants is available	Given the paths location adjacent to a sealed public road, it is considered to have appropriate operational access and egress for emergency service personnel.

• Provide for ongoing management and maintenance of bush fire protection measures (BPMs)	Given the public nature of the path, the management and maintenance of adjacent fuel loads will be ongoing.
• Ensure that utility services are adequate to meet the needs of firefighters.	Given the paths location adjacent to a sealed public road and services (reticulated water), it is considered to have appropriate utility services to meet the needs of firefighters.

Overall, the assessment concludes that the project is unlikely to create or expose property or persons to high bushfire risk. The assessment has been based on the bushfire protection guidelines of PBP19, including a caution that bushfires burn under a range of conditions and there always remains an element of risk.

6.4.2 Coastal Processes and Flooding

The SUP project involves the construction of sealed concrete paths and raised boardwalks along the banks of the local Camden Haven River system through Dunbogan and Camden Head.

The NSW Coastal Planning Guideline – Adapting to Sea Level Rise (2010) outlines 'coastal risks' include coastal erosion, tidal inundation and coastal flooding, as well as the impacts of sea level rise. Sea level rise planning benchmarks under the NSW Sea Level Rise Policy Statement (2009), describe an increase above 1990 mean sea levels of 40cm by 2050 and 90cm by 2100. Climate modelling also suggests that rainfall intensity on the Mid North Coast of NSW may increase by up to 10% from present day levels over the next 60 years (PMH Council, 2015).

The project site falls within what is defined as the NSW coastal zone, where the project footprint and work site occur on low-lying land within the Camden Haven floodplain, which is subject to flooding. The PMH LEP mapping does not identify any coastal hazards such as coastal erosion risks at or in the vicinity of the project site. The main potential exposure of the project site to coastal processes or flooding would include periodic flooding associated with rainfall events, coastal inundation, potential tidal condition influences and long-term sea level rise attributed to climate change.

Flooding in low-lying areas, such as in the vicinity of the project site, will also be influenced as a consequence of climate change and sea level rise, including an increased likelihood in the frequency, duration and height of flooding and consequential emergency evacuations as well as possible damage to property and infrastructure. Areas that are subject to tidal waters, particularly in times of king tides, will also likely be subjected to more frequent tidal inundations (NSW Department of Planning, 2010). Given the low-lying nature of the project area and its location adjacent to a major tidal watercourse, the development would be susceptible to such circumstances and any flood event greater than the 1 in 20 years Average Rainfall Interval (ARI) (5% Annual Exceedance Probability (AEP)).

Another factor potentially influenced by the project is the flood regime itself, including the displacement of flood waters, and the resultant potential impact to surrounding land/property. The filling, excavation and building associated with the project may impact upon the flood behaviour of Camden Haven Inlet because the project works are located within the floodplain.

Assessment Methodology

The following coastal and flooding assessment was undertaken:

- Review of available data including existing flood studies and associated hydrologic and hydraulic models within the project area.
- Assessment of the potential flood risks during construction and the operational features of the project.

- Assessment of the potential impact the project would have on flood behaviour during construction and operation.
- Assessment of the impact future climate change scenarios would have on flood behaviour under operational conditions.
- Assessment of potential blockages of the local stormwater drainage systems during construction and under operation.
- Assessment of potential measures which are aimed at mitigating the risk of flooding to the project and its impact on existing flood behaviour.

The PMF occurs because of the Probable Maximum Precipitation (PMP) on the area catchments. The PMF is the result of the optimum combination of the available moisture in the atmosphere and the efficiency of the storm mechanism regarding rainfall production. Meaning, the PMF is defined as the upper limiting value of floods that could reasonably be expected to occur and defines the extent of flood prone land (i.e. the floodplain).

The flood planning area for the project site is based on mainstream flooding along the Camden Haven Inlet and major creeks. It should be noted that no flood modelling was carried out for the assessment and existing data was used to assess the flood risks and impacts associated with the project (see Flood Risk Assessment in Appendix H).

Potential Impacts of Construction Activities on Flood Behaviour

Construction activities have the potential to increase flood conditions when compared to both present day and operational conditions. This is because construction activities typically impose a larger footprint on the floodplain due to the need to provide temporary structures outside the operational project footprint, which will be removed following the completion of construction activities.

The assessment of potential impacts of construction activities on flood behaviour considered their temporary nature. Prior to construction, a Flood Management Plan (FMP) shall be implemented to mitigate the impacts of construction activities on flood behaviour.

While the majority of the construction would involve works within the floodplain that would need to be managed, the assessment found that the greatest potential for impacts is to local catchment runoff. This would be managed through appropriate local stormwater management controls to be implemented during the construction phase of the project.

The inundation of surface earthworks by floodwater has the potential to cause disruption to disturbed surfaces and transport sediment and construction materials into the receiving waterways. It would therefore be necessary to plan, implement and maintain measures that are aimed at managing disturbance and transport through or around the construction areas.

Soil stockpiles will be in areas that are less subject to frequent inundation by floodwater, ideally outside the mapped flood extent and upon higher elevated areas. The determined level of flood risk that will be accepted at stockpile sites will depend on the duration of stockpiling operations, the type of material stored, the nature of the receiving drainage lines, and the extent to which that would impact flooding conditions in adjacent development.

According to the Flood Risk Assessment (Appendix H) undertaken for the project, flooding along the shared path is driven by the Camden Haven Inlet and the construction of the path is not expected to significantly affect the flooding condition in the area.

Operational

The project has aimed to limit its impact during flood conditions, both in terms of impacts on the project and the surrounding areas. Project elements have been designed with consideration of the

surrounding areas and management measures are proposed to further reduce potential impacts from flooding.

Impacts on flood behaviour associated with rainfall intensities predicted to occur during future climate change scenarios are principally limited to the scenarios where the intensity of storm events are increased from 10% to 30%. During a flood event, peak flood levels would overtop the proposed path in several locations. The Flood Risk Assessment (Appendix H) was undertaken using the available 20%, 1% and 0.5% AEP RMA hydraulic model results, which showed that the shared path is flood affected, as presented in Table 6.16 and Table 6.17.

Table 6.16 Summary of Flood Depths

Section	20% AEP		1% AEP		0.5% AEP	
	Max Flood Depth (m)	Flood Impact	Max Flood Depth (m)	Flood Impact	Max Flood Depth (m)	Flood Impact
D3	1.2	-	2.10	Entire Alignment	2.40	Entire Alignment
D5	0.45	-	2.20	Entire Alignment	2.50	Entire Alignment
D8	–	–	1.90	CH 0 to CH 760	2.20	CH 0 to CH 774
D10	–	–	–	–	–	–
D11	–	--	0.60	CH 210 to CH 390	0.90	CH 172 to CH 422

CH = Chainage values are based on the detailed design.

Table 6.17 Summary of Flood Hazard

Section	20% AEP	1% AEP	0.5% AEP
D3	-	Very High	Very High
D5	-	Very High	Very High
D8	--	Very High	Very High
D10	--	--	--
D11	--	Low	Low

Summary

A FMP will be implemented to manage the impact of the project on flood behaviour during construction phase and operational phase. The design of the project will incorporate measures that are aimed at mitigating the impact of the project on flood behaviour i.e. proposing boardwalks above 5% AEP or ground slabs for SUP sections. Where feasible and reasonable, the hydraulic capacity of the existing drainage will be designed to comply with relevant guidelines and standards. In addition, flood emergency management measures for construction (typically, addressed in the FMP) and operation of the project shall be incorporated in relevant environmental and/or safety management documentation.

6.5 LAND SOILS AND WATER QUALITY

This section describes the existing soils and water quality within the project area and the potential impacts as a result of the construction and operation of the project. The environmental management measures to reduce the impacts of the project are outlined in Section 7.2.

6.5.1 Acid Sulfate Soils

Acid sulfate soils (ASS) are naturally occurring sediments containing iron sulphides, which produce sulfuric acid when exposed to air. ASS generally occur in estuarine floodplains and coastal lowlands. Prior to oxidation, these soils are referred to as Potential ASS (PASS). ASS that has produced acid as a result of oxidation are referred to as Actual ASS (ASS).

The project area is identified as having a high potential of ASS occurrence, with classes 1, 2, 3, 4 and 5 ASS identified on PMH LEP mapping (Sheets ASS_014A and ASS_014C). These are largely limited to low-lying areas within Sections D3, D5, D8 and D11. Such landscapes have a high risk of PASS.

The ASS could be disturbed during earthworks that occur below natural ground surface in Class 2 areas, as well as during vegetation removal, which results in the disturbance of soil below the natural ground surface. Any works below one metre, although this is expected to be limited for the project, may encounter ASS in Class 3 mapped areas. Any required dewatering may also have implications for ASS management as it can potentially result in the temporary drying of the soils and subsequent oxidation.

Disturbance or exposure of ASS has the potential to impact the surrounding environment through leaching or runoff of material containing potentially elevated concentrations of contaminants that could enter and affect nearby habitat and water bodies/courses. Oxidation of the sulfidic material can result in acidification of both surface water and groundwater and increased solubility of metals in the soil causing them to be released in toxic amounts. The impacts of ASS entering water bodies include changes to pH levels and the potential for habitat degradation, impacts to aquatic life, loss of food resources, impacts to the local oyster industry, lowered potential for fish migration and recruitment, disturbance to aquatic plant communities, and secondary effects on water quality.

Assessment

A geotechnical assessment of the proposed SUPs was undertaken by Regional Geotechnical Solutions (RGS, 2021) (refer to Appendix F). This included assessing the presence of PASS and the need for an ASS Management Plan. The following investigation was undertaken as part of the assessment:

- a total of 24 borehole locations (BH1 to BH24) were augered to depths within 0.55 and 3.0 m below ground surface (bgs) within the alignment for the purposes of geotechnical and PASS sampling and testing. However one borehole location (BH6 within section D8) was not investigated due to the narrow road shoulder and presence of underground services.
- A total of 41 samples obtained from 10 boreholes drilled in areas of high probability of ASS occurrence were submitted to a National Association of Testing Authorities (NATA) accredited Environmental Analysis Laboratory and seven soil samples (refer to Table 6.19) were field screened for ASS and analysed using the Chromium Reducible Sulfur (CrS) method. The seven grab samples to depth of 2.5 m were collected along areas of the proposed boardwalk and pavement alignment.

The assessment showed that during field work, shallow water tables were encountered at sections D3, D5 and D8, and dewatering controls may be required for trenching and service installation.

The results of the geotechnical units encountered during the investigation (refer to Appendix F) are summarised in Table 6.18.

Table 6.18 Summary of Geotechnical Units Encountered During Geotechnical Investigation

Unit	Material	Material Description
1A	Topsoil/FILL	Sandy SILT, low plasticity.

1B	FILL	Sandy GRAVEL, orange-brown, very dense, or Gravelly Silty CLAY, brown, very stiff.
2A	Estuarine (Loose)	Silty SAND to Clayey SAND, dark grey, sulfur odour, very loose to loose.
2B	Estuarine (medium dense/dense)	Clayey SAND, dark grey/orange/pale grey, with shell fragments, medium dense to dense.
3	Aeolian/Marine SAND	SAND, grey – white, medium dense, trace weakly cemented zones (indurated).

The ASS results from the investigation are as follows:

- Geological units 2A and 2B were encountered in the investigation boreholes located within Sections D3, D5 and D8. PASS material are associated with these estuarine soils.
- Aeolian/marine sands were encountered in Sections D10 and D11, in an area of no known occurrence of PASS.
- Based on the field (pH_F) screening results, 10 selected samples were submitted for detailed CrS and Potassium Chloride (KCl) extractable sulphur analysis. Of the samples analysed, four samples (from borehole locations within sections D3, D5 and D8) exceeded the adopted Action Criteria for 'coarse' texture soil, as presented in Table 6.19.

Table 6.19 Summary of Acid Sulfate Soil Analytical Results

Location	Borehole ID	Sample Depth (m)	Geological Unit	Titratable Actual Acidity (TAA) (mol H^+/t)	Chromium Reducible Sulfur (S_{Cr}) (mol H^+/t)	Net Acidity (mol H^+/t)	Lime kg $CaCO_3$/ tonne
D3 CH240	BH14	0.4-0.5	Unit 2A	41	<3	**52**	3.9
D5 CH0	BH1	1.5-1.6	Unit 2B	15	**260**	**280**	21
D5 CH210	BH4	2.4-2.5	Unit 2B	<2	**42**	**42**	<1
D8 CH0	BH5	1.5-1.6	Unit 2A	12	**300**	**310**	25
D8 CH260	BH7	0.6-0.7	Unit 2A	4.0	3.8	<10	<1
D8 CH900	BH9	0.4-0.5	Unit 3	2.0	<3	<10	<1
D10 CH0	BH10	0.4-0.5	Unit 3	2.0	<3	<10	<1

Where bolded, the analytical result is above Table 4.4 of the Acid Sulfate Soil Manual (ASSMAC, 1998) – adopted Net Acidity for 'coarse' textured soil of 18 mol H^+/t

- Based on the analytical results, proposed earthworks from Sections D3, D5 and D8 may encounter estuarine and tidal delta flat sediments (Units 2A and 2B). Whereby PASS are present within the estuarine soils (Units 2A and 2B).
- As recommended in the Geotechnical Report (Appendix F), further assessment may be required for where localised excavations are proposed below 1m AHD.

ASS Management

An ASS Management Plan has been prepared for the project (see Appendix G) and is required to be implemented to mitigate the environmental risks associated with the disturbance and exposure of PASS to air during sub-surface excavation works. The environmental risks associated with disturbance of PASS materials is considered to be 'low' based on the following observations:

- Only minor scraping of topsoil will be required where the proposed road pavement will extend beyond the existing unsealed tracks (top 100mm or so). This can be disposed of or reused

without further treatment due to small amounts of unsuitable soils expected to be created. In accordance with the Geotechnical Investigation (Appendix F) this soil is not expected to be ASS (as it is so close to the surface) so stockpiling on-site or off-site presents low risk.

- The boardwalks will be constructed and supported by beams, before laying the decking and fitting of a barrier fence (or safety rails), where needed. As such, small amounts of unsuitable/natural soils are expected to be created and/or stockpiled on-site or off-site, which presents low risk.
- The project construction technique avoids the need for bulk soil excavation/stockpiling and the generation of significant volumes of unsuitable soils, which otherwise would have required treatment, stockpiling/disposal.

Summary

The extent of excavations associated with the project are not considered to be significant in terms of area or depth. Past works in the immediate area have been undertaken successfully with no adverse impacts and it is expected that the proposed works will occur in a similar manner. The risks associated with the disturbance of PASS can be adequately managed and mitigated through the implementation of relevant measures and procedures set out in the Acid Sulfate Soil Manual (ASSMAC, 1998a) and Acid Sulfate Soils Assessment Guidelines (ASSMAC, 1998b). In addition, the ASS Management Plan (in Appendix G) is required to be implemented during construction to ensure no adverse impacts if PASS / ASS is encountered or disturbed during construction activities.

6.5.2 Earthworks, Erosion and Sedimentation Control

The project and works area affect sites that have experienced past disturbance and is substantially clear of significant vegetation, however edges of (and areas adjacent to) the work sites do exhibit various vegetation types, including an interface with an estuarine environment. There is the potential for works to impact soil and water resources during the construction phase of the project, notably earthworks and construction of the paved road (through the placement of fill) present risks through erosion and sedimentation.

Given the scope of work and topography of the land, the extent of excavation and trenching required is not considered to be significant, however fill material is required to be imported to the site to support construction. During the construction phase, the key risks relating to erosion and sedimentation arising from the works include ground disturbance and the placing of fill on land adjacent to the water-land interface. The local topography is relatively low-lying (particularly for Sections D3, D5, D8 and D11) and flat, which can reduce the risk and severity of potential erosion and sediment displacement; however, the risk is enhanced given the adjacent presence of a major water course and sensitive estuarine environment. The level of risk for erosion and sedimentation impacts is moderate to high and construction management measures for the control of erosion and sedimentation and stabilisation/ rehabilitation of soils would be implemented to avoid and/or mitigate any potential impacts.

Table 6.20 assesses the matters for consideration associated with earthworks pursuant to Clause 7.2 of PMH LEP.

Table 6.20 Clause 7.2 Earthworks of PMH Council LEP - Matters Considered by the Project

Sub-clause	Matters for Consideration	Comment
3 (a)	The likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality	The 2.9km development requires some earthworks (site preparation, excavation and fill); however, the footprint of the work sites is not significant and with implementation of the mitigation measures outlined in this EIS. There would be no significant impact on existing drainage patterns. No changes to soil stability are expected.

3 (b)	The effect of the development on the likely future use or redevelopment of the land	The land is and will fulfill a significant gap in the existing community infrastructure, as well as improve the operational efficiencies of recreational activities within the local area.
3 (c)	The quality of the fill or the soil to be excavated, or both	Any fill or excavated soil would satisfy relevant standards for reuse or off-site disposal.
3 (d)	The effect of the development on the existing and likely amenity of adjoining properties	The project will not have a negative impact on the amenity of adjoining properties. The shared path and is mostly along the banks of the local Camden Haven River system, therefore there are no immediately adjoining sensitive receivers such as dwellings.
3 (e)	The source of any fill material and the destination of any excavated material	Any imported fill (required) will meet relevant standards and the requirements of the appropriate NSW EPA Resource Recovery Order and Exemption, where relevant. Excavated materials from the project site would be reused (where appropriate) and subject to ASS management/treatment or disposed off-site to an approved facility.
3 (f)	The likelihood of disturbing relics	The development footprint has been altered due to the nature of disturbance through roads, residential development and ancillary services, as well as the reshaping of land due to the breakwalls, floods and tidal surges. As such, it is unlikely that the project would disturb items of significance. However, should relics be uncovered during the construction phase, the Unexpected Heritage Items Procedure prepared for the project should be implemented.
3 (g)	The proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area	The project sites are not identified as contributing to any primary drinking water catchment however, it is located adjacent to a major watercourse (Camden Haven Inlet) and environmentally sensitive areas (estuarine environment and SEPP Resilience and Hazards (coastal wetlands/littoral rainforest)). Construction management safeguards and mitigation measures, including implementation of erosion and sedimentation control measures in accordance with the Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004) would effectively avoid, minimise or mitigate any potential impacts. The ASS Management Plan shall be implemented.

An Erosion and Sediment Control Plan is to be prepared in accordance with Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004) (known as 'the Blue Book') and implemented as part of the CEMP. Whilst there is the potential risk of erosion and sedimentation impacts to the environment, practical and effective measures are available (refer to Section 7.2) and will be used to safeguard the environment from potential adverse impacts.

It should be noted that post-construction, the sites, and any soils would be stabilised/rehabilitated prior to the removal of erosion and sediment controls. Following this, the risk of erosion and sedimentation would be limited during the SUP operation.

6.5.3 Water Quality and Stormwater

The project site is broadly located along the Camden Head Inlet, alargely estuarine environment including coastal wetland that is subject to tidal influences. The key risks to water quality during construction would be associated with:

- Vegetation clearing and exposure/potential erosion of soils (through clearing and grubbing, surface and pavement stripping, excavation, stockpiling and transport). Sediment could be

transported into adjacent waterways, leading to increased turbidity, sedimentation, and increased nutrient load and any other pollutants from the exposed soil.

- Excavation and/or dewatering has the potential to alter the level and flow of groundwater and disturb or expose Potential or Actual ASS or contaminated materials, which could result in acidic or contaminated runoff.
- Construction works could result in an accidental spill or leak (e.g. fuel, oil, greases or other chemicals) from the use and/or storage of fuels/chemicals, vehicles, plant and/or machinery on-site. Such incidences could pollute receiving water environments.

The abovementioned activities present potential water quality impacts which could have implications for aquatic ecosystem health and human water users, including effects on sensitive receiving environments such as adjacent SEPP Resilience and Hazards coastal wetland/littoral rainforest and nearby oyster aquaculture areas. While the proposal represents a risk to water quality during construction if such risks go unabated, the project works footprint is restrained in area and construction activities and any associated risks can be managed by employing appropriate construction management procedures and environmental safeguards for soil and water at and around the sites.

Post-construction, the SUP operation would generate stormwater runoff from the pavements and sealed surfaces, which has the potential to influence water quality within receiving environments, including Camden Haven Inlet and the associated estuarine habitats and resources. Typical pollutants associated with stormwater runoff from the paths located adjacent to the roads can include heavy metals, hydrocarbons, nutrients and suspended solids. However, this would be no different compared to the existing operational conditions of the shared paths and associated runoff.

In addition, where the shared path is located adjacent to roads, potential road accidents during operation have the potential to result in contaminants entering waterways. Spills may occur from vehicles carrying hazardous or dangerous goods, or from general motor vehicle accidents. Whilst the likelihood of such occurrences is low, there is a potential risk that pollutants may enter receiving waters if an incident occurred. Nevertheless, such risks associated with operation of the SUP (and roads) would be at the same level presently associated with the existing (unconnected) shared path. On this basis, the operation of the continuous path network (including proposed Sections D3, D5, D8, D10 and D11) would present no more risk to the receiving environment than the existing operational conditions. In fact, construction of the five sections of the SUP would likely see improvements to the operation and functionality of the shared path network as a result of recreational facilities being built to current standards.

In order to fit the paths along the side of the road, the ground will be built up and existing culverts extended (within Sections D3 and D8). Although the culverts would allow water to be conveyed between the SEPP Resilience and Hazards coastal wetland and adjoining land, runoff water and drainage lines already intersect the surrounding area, including SEPP Resilience and Hazards coastal wetland and estuary. The project is not expected to significantly alter this regime, and no particular pollution or adverse water quality impacts are likely. The shared paths would be built to current best practice design and construction standards. Overall, no adverse deterioration of water quality conditions are expected during operation of the SUP compared to existing conditions, and there is likely to be some improvement.

Whilst there is the potential risk to water quality during construction and post-construction, practical and effective measures to safeguard the environment from potential adverse impacts are outlined in Section 7.2.

6.6 TRAFFIC AND ACCESS

The project involves an extension of the existing shared paths, which presently terminates near the intersection of The Boulevarde and Scarborough Way, approximately 500 m north of the Dunbogan Bridge. The proposed shared path will continue north east from the end of the existing shared path (Section D2) generally following the southern bank of the Camden Haven River and connecting other isolated sections of existing shared path adjacent to The Boulevarde. The proposed five sections of the SUP located adjacent to the roads, will complete an 11km scenic route of uninterrupted shared path from North Haven, through Laurieton and Dunbogan, and terminating at Pilot Beach in Camden Haven. Table 6.21 describes Sections D3, D5, D8, D10 and D11 of the project relative to traffic and the adjacent roads.

Table 6.21 Sections D3, D5, D8, D10 and D11 Routes Relative to Traffic and Adjacent Roads

Section	Route	Length
D3	The path commences (at the end of existing section D2) on the southern side of the intersection between **The Boulevarde** and Scarborough Way. The path crosses Scarborough Way and traverse's coastal wetland (low-lying area) before crossing Bay Street. The path continues north along The Boulevarde and ties in with the existing D4 section of the Beach to Beach SUP.	410m
D5	The path commences (at the end of existing section D4) along **The Boulevarde**, close to the south of the intersection between The Boulevarde and Longworth Road. The path veers west, continues as a raised boardwalk over the estuary of Camden Head Inlet, and emerges south of the Dinghy storage and launching site. The path extends along The Boulevarde before tying-in with the existing D6 section.	230m
D8	The path commences (at the end of existing section D7) southeast of the Dunbogan Jubilee Hall access road and **Camden Head Road** intersection. The path continues north between Gogleys Creek and Camden Head Road before tying-in to the existing D9 section (approximately 50 m north of Scarborough Way intersection).	840m
D10	The path commences (at the end of existing section D9) north of Seaview and Camden Head Road intersection. It generally follows the existing unsealed path heading northwest, along **Camden Head Road** and turns left away from Camden Head Road to the west of the existing sewer pump station (at about CH1000). After the pump station, the path re-joins with Camden Head Road and continues along the western side of the road to adjoin with the proposed D11 SUP section.	1230m
D11	The path commences at the end of the proposed D10 section, south of the **Pilot Beach Road** and **Camden Head Road** intersection. The path continues along the western side of Camden Head Road onto the western side of Pilot Beach Road before crossing the Camden Haven Oyster Supply access road and a second unsealed access road. The path continues along the northern side of Pilot Beach Road heading east before crossing the breakwall access road and meandering north through the adjacent park. It terminates at the northern end of Pilot Beach joining into the existing breakwall path.	700m

The Road (in bold font) refers to the main road likely to be most impacted by traffic at the various shared path during construction.

The roads (indicated in Table 6.21) are two-way main roads, often with no (or minimal) available shoulders. Traffic volumes are considered to be typical of most regional, small coastal townships along the Mid North Coast of NSW.

Potential Impacts

The main potential traffic and access impacts associated with the project include construction work traffic generation, increased traffic movements and decreased street parking availability, localised traffic disruptions in the vicinity of the sites, including reduced speed limits in proximity of the works, reduction of traffic to one lane with alternate traffic flow and potential minor

closures of lanes. This may result in minor delays for road users, including the local community, businesses, emergency services, tourist, and freight/transport companies.

Traffic would be generated by the project during construction through:

- Construction employees entering and leaving the site.
- Truck deliveries to the site for construction purposes and delivery of fill material.
- Equipment and plant being delivered to and used at the site for construction purposes.
- Periodic deliveries to the site for construction materials.

Traffic and Access Control

Traffic and access safeguards would be managed through the development and implementation of a Traffic and Access Control Plan to ensure existing road conditions are maintained as far as practicable to minimise traffic disruptions, and to provide safe and convenient access during construction.

The Traffic and Access Control Plan would be communicated during on-site safety inductions and toolboxes to ensure the safety of the traveling public and works personnel is maintained. It is anticipated that one lane of traffic would remain open at all times, and no diversion will be necessary. If necessary, any potential for minor intermittent road closures would be minimised and managed in accordance with PMH Council policy and the Traffic and Access Control Plan. All traffic disruptions would be communicated to road users in accordance with PMH Council policy, using an appropriate method of communication for the works.

All plant and equipment will be stored within an appropriate site compound, within the designated works areas (see Figure 1.2).

Whilst changed traffic conditions and construction related traffic generation would be notable during the works, this would be temporary and can be effectively managed. It is unlikely that such activity would strain the capacity or functionality of the local road network given the regional context.

Post construction, traffic volumes would be consistent with existing levels and there would be no significant operational impacts. No ongoing traffic, access or parking impacts are expected during operation of the proposed shared path infrastructure.

Given the location of the project works (at the five sections of SUP), current accessibility and the temporary nature of the construction period, no significant traffic impacts would result. Practical and effective measures required in the Traffic and Access Control Plan for the project are outlined in Section 7.2.

6.7 NOISE AND VIBRATION

This section provides an assessment of the potential impacts of construction noise and vibration on nearby sensitive receivers. Details of the assessment undertaken are presented in the Construction Noise and Vibration Assessment (CNVA) (Appendix I).

Existing Environment

The project sites are located within a rural area, on the outskirts of Dunbogan and Camden Haven. The surrounding area is characterised predominantly by rural land and vegetation, with nearby rural residential dwellings and other dwellings located in the urban footprints/outskirts of Dunbogan to the north and Camden Haven to the northeast.

During the site visit, undertaken as part of the CNVA (Appendix I), it was noted that existing road traffic, distant road traffic, and natural wildlife primarily described the ambient noise environment

and is indicative of a sub-urban noise environment. Sensitive receivers in close proximity (20–30m) to the proposed shared paths include:

- Rural residential dwellings to the north of section D3.
- A residential dwelling on a large plot of land across The Boulevarde to the southeast, and rural residential areas northeast and southeast of section D5.
- Rural residential areas along Camden Head Road, southwest of section D8.
- Rural residential dwellings along Camden Head Road, adjacent to the southwest of section D10.
- Commercial properties (along the coastline) to the west of section D11 and rural residential area along the east of Camden Head Road (in the southeast portion of Camden Head and Pilot Beach intersection).

Table 6.22 presents the measured background noise level at selected locations considered indicative of the local ambient noise environment. Details of the attended monitoring locations are described in Section 2 of the CNVA (Appendix I).

Table 6.22 Noise Monitoring Results

Location	Noise Period	Noise Level		Noise Sources
		L_{Aeq}[(a)]	L_{A90}[(b)]	
D3	10/2/2021 2:10pm – 2:25pm	62	40	Steady road traffic, wildlife noise
D5	10/2/2021 1:45pm – 2:00pm	54	38	Road traffic, wildlife noise
D8	10/2/2021 12:10pm – 2:25pm	68	44	Stead road traffic, wildlife noise
D10/D11[(c)]	10/2/2021 12:40pm – 12:25pm	55	36	Road traffic, wildlife noise

(a) L_{A90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90% of the time over a relevant period of measurement. The L_{A90} descriptor is used to establish the Rating Background Noise Level (RBL).

(b) L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

(c) During the site inspection, the D10 monitoring location was considered representative of the D11 area. Additionally, D11 consists of commercial receptors and no residential receptors.

Noise and Vibration Objectives

The approach for managing potential noise and vibration impacts arising from construction activities is concerned with impacts associated with the use of machinery and equipment, vehicle movements, vegetation removal, earthworks and paved road construction activities, and is intended to minimise noise and vibration emissions where practical. It is noted that there are limited sensitive receivers currently in proximity to the shared path with residential uses along The Boulevarde and Camden Head Road the main sensitive receivers.

Construction Noise

The project works will be temporary and are not considered to be of a significant scale or to constitute major construction work. Rather the works are limited to construction of five sections of the SUP path and associated recreational infrastructure. The Interim Construction Noise Guideline (DECC, 2009) prescribes the noise management levels (NML) to be applied during standard working hours and are depicted in Table 6.23. These management levels apply at the boundary of the most affected residences, or within 30m from the residence where the property boundary is more than 30m from the residence.

Table 6.23 Noise Management Levels for Residential Receivers

Time of Day	Management Level $L_{Aeq\ (15\ min)}$*	Application
Recommended standard hours: Normal Construction Monday to Friday: 7am to 6pm Saturday: 8am to 1 pm No work on Sundays or public holidays	Noise affected Background level + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected level of 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected Background level + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

** Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.*

Decibel (dB) – a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.

dB(A) – a measure of A-weighted sound levels.

$L_{Aeq\ (15\ min)}$ - the A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and

the community. Other descriptors may be used providing they can be justified as representing the characteristics of the construction noise.

It is understood that construction activities are planned for standard hours as per the Interim Construction Noise Guideline (DECC, 2009). Based on the RBL's determined from attended monitoring (Table 6.22) and the noise guidelines in Table 6.23, construction NMLs have been derived, as depicted in Table 6.24.

Table 6.24 Noise Trigger Levels Leq (15min) dB(A)

Receiver	NMLs within Recommended Standard Hours (dB(A))
D3 Residential	50
D5 Residential	48
D8 Residential	54
D10/D11 Residential	46

Road Noise

The NSW Road Noise Policy (RNP) recommends various criteria for different road developments and uses including residential land uses. Based on the definitions in the RNP, Camden Head Road is considered a local road. Table 6.25 presents the project-relevant noise goals based on the RNP.

Table 6.25 Road Noise Goals

Situation	Day 7am to 10pm	Night 10pm to 7am
Land use development with potential to create additional traffic on Local Roads (external)	55 LAeq (1 hour)	50 LAeq (1 hour)

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by construction activities and or land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.
Site construction traffic will blend in with local traffic by the time it travels past the nearest sensitive receivers. To increase noise levels by 2 dB(A) one would have to increase the cumulative traffic volume by 60%. The amount of additional construction traffic on the road network is negligible and will not increase overall traffic noise levels on the surrounding road network.

Vibration Guidelines

Human Exposure:

Vibration goals were sourced from Assessing Vibration: A Technical Guideline (DECC, 2006) that is based on guidelines contained in British Standard (BS) 6472–1992 Evaluation of Human Exposure to Vibration in Buildings (1–80 Hz).

Vibration, at high enough levels, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- Continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities.
- Impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities.

- Intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The preferred and maximum values for continuous and impulsive vibration, and the acceptable vibration dose values (VDV) for intermittent vibration sourced from the Assessing Vibration Guideline (DECC, 2006) are reproduced in Table 6.26 and Table 6.27, respectively for the applicable receivers.

Table 6.26 Preferred and Maximum Levels for Human Comfort

Location	Assessment Period[(a)]	Preferred Values		Maximum Values	
		z-axis	x- and y- axis	z-axis	x- and y- axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

(a) Daytime is 7am to 10pm and Night-time is 10pm to 7am

Table 6.27 Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime[(b)]		Night-time[(b)]	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Critical areas[(c)]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

(b) Daytime is 7am to 10pm and Night-time is 10pm to 7am

(c) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be needed to assess intermittent values against the continuous or impulsive criteria for critical areas.

Building Damage:

There is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. However, guidance of limiting vibration values can be attained from International Standards and Guidelines (refer to Section 3.3.2 of CNVA (Appendix I)).

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from vibration on the broader community is not typically expected. Vibration during works is considered to be an intermittent source associated with two main types of impact: disturbance at receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

Assessment of Potential Impacts

Construction Noise

It is understood that any construction activities would be undertaken during standard hours. The likely equipment including typical sound levels for the project are summarised in Table 6.28. Other equipment may be used, however it is anticipated that they would produce similar noise emissions.

Table 6.28 Typical Construction Item Sound Power Levels

Plant and Equipment	Estimated % of use in 15 minutes[(a)]	Typical Sound Power Level dB(A)
Excavator	50	110
Front End Loader	50	112
Light Vehicles	50	108
Smooth Drum Roller	50	107
Backhoe	50	111
Compactor	50	106
Dump Truck	50	110
Asphalt Truck	50	103

(a) The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the estimated usage has been adjusted to reflect this. This adjustment is consistent with the CNVA authors experience on similar projects.

Construction Operations

Acoustic modelling was undertaken to predict the effects of construction noise (refer to Section 4.1 of the CNVA (Appendix I)) based on the potential construction noise levels (in Table 6.28). Four scenarios were assessed (sections D3, D5, D8 and D10/D11), and demonstrated how the received noise levels can change due to location of the construction activity, as presented in Figures 4-2 to 4-13 of the CNVA (Appendix I).

The results indicated that NML's can be met in most situations however, there is the potential for exceedances, particularly when construction activities are taking place near residences.
In addition, NML's for offices and retail outlets and other industries are expected to be complied with. While NML's can be achieved in most cases for residential, office and retail outlets, and industrial receivers, there is a risk for NML's to be exceeded depending on work activities and locations. It is recommended a Noise and Vibration Management Plan (NVMP) be implemented during construction as part of the project CEMP to minimise the risk of adverse noise impacts on the community.

Post-Construction

Post construction there are no expected noise impacts as the works are limited to the extension of an existing shared path. There is no major alteration to the existing shared path alignment, other than a continuous path network that would provide 11 km of un-interrupted footpath and cycleway between North Haven Beach and Pilot Beach, and no major change to noise generated by the road traffic adjacent to the proposed constructed shared path is expected.

Summary

Overall, no significant short-term or long-term adverse noise and vibration impacts are expected to result from the project. Nonetheless, reasonable safeguard and management measures can be implemented to ensure no adverse impacts.

The mitigation measures to be implemented to address potential adverse impacts relating to noise and vibration are presented in Section 7.2. Notwithstanding the current context, careful management will be required to minimise acoustic, and vibration impacts on the adjacent residential uses.

Other Impacts – Dust, Odour and Air Pollution

The program of works may generate minor quantities of dust, odour and air pollution due to activities such as, but not limited to:

- Dust from excavation, stockpile locations and movement of vehicles around the project sites.
- Vegetation clearing (where approved and required) and stockpiling.
- Exhaust fumes and emissions from plant and equipment.
- Minor contribution to greenhouse gases through use of machinery and equipment.

The air quality impacts could potentially impact surrounding sensitive receivers. Potential sensitive receivers include (but are not limited to) parks, pedestrian areas, and private residences. Impacts would be largely dependent on daily weather conditions including wind direction and strength. Impacts are likely to be localised, short-term and would not persist after construction work is complete. These short-term impacts are expected to be minor and will be managed by implementing project specific safeguards as described in Section 7.2.

6.8 VISUAL

This section provides an assessment of the potential visual impacts of the project on the surrounding landscape. Details of the assessment undertaken are presented in the Visual Impact Assessment (VIA) (Table J).

Consideration of the visual impact of the project takes into account the visual modification to the existing environment caused by the project and the visual sensitivity of the surrounding environment or nearby visually sensitive receivers. Visual modification refers to the effects the project has on the existing environment. It considers aspects such as the appearance of the development, the existing environmental attributes and conditions, and the ability of the environment to absorb or screen the development's appearance.

Visual sensitivity relates to the level of perception of change and is influenced by the distance at which visual modifications are made and the mode by which they are viewed (e.g. vehicles driving past the site versus residents located in proximity to the site). It also can be influenced by the existing or emerging character of an area and the relationship of the proposal to that character, and the relative likelihood for the acceptance, or expectation of, change/development.

Visual Objectives

The proposed SUP aims to achieve a well-planned and integrated alignment providing a high-quality urban design response. The design vision for the project is to 'provide a distinctive recreational experience' through a series of undulating journeys and to provide an asset that connects North Haven to Camden Head. The project will provide enhanced connections and help achieve the vision, objectives and the desired outcome for recreation and social interaction.

The urban design requirements of the project have been informed by the project objectives and encompass the requirements for a functional design within the urban and public domain, and the

built elements of the project. The treatments, surface connections and operational infrastructure would be guided by the design requirements of the project.

Existing Visual Landscape

An overview of the dominant characteristics of the existing landscape relative to the various sections of the shared paths are presented in Table 6.29.

Table 6.29 Existing Landscape Characteristics

Section	Landscape Categories			
	Built Form	Natural Topography	Vegetation	Waterway
D3	A row of residential properties in the northern portion of the site (along The Boulevarde).	Relatively flat and low-lying.	The path traverse's coastal wetland surrounded by remnant trees before crossing Bay Street.	Path is located to the east of Camden Haven Inlet.
D5	To the east of the path and across The Boulevarde is a large residential property. This is followed by a residential area (along The Boulevarde and Longworth Road) comprising of single and double storey houses. The town of Laurieton (open space recreational facility and residential properties) can be seen from across the water body of Camden Haven Inlet.	The land is relatively flat. There are small increases and decreases in the ground elevation along The Boulevard. The ground elevation increases from the shoreline towards the residential area to the south of the path. Residents on higher grounds have greater views of the water but are still compromised by the vegetation on the shoreline.	The path is on the estuarine side of the mangrove forest, which sprawls along the coastline. The dense vegetation screens the water views along the western side of The Boulevard. Larger areas of dense vegetation is observed further south of the site.	The path is proposed on the estuary of Camden Haven Inlet water body. The waters of Queens Lake, Watson Taylors Lake, Stingray Creek, creeks and upstream tributaries connect to the waters of Camden Haven Inlet. Gogleys Creek and Gogleys Lagoon are located further east of the site.
D8	In the first half of the path, Dunbogan Jubilee Hall building, and residential properties are located to the west, and along Camden Head Road to the south of the site, respectively. Residential properties are observed towards the end of the (close to the intersection of Camden Head Road and Scarborough Way).	Relatively flat and low-lying	The path (between Camden Haven Inlet and Camden Head Road) traverse's remnant native vegetation and trees, followed by a section of coastal saltmarsh and estuarine mangrove forest. Towards the section D8-D9 tie-in, the path traverses along the edge of a forest (dense vegetation and tall trees).	Path is generally along the shoreline of Gogleys Creek.
D10	Residential properties (houses) to the east and along Camden Head Road in the	The land is relatively flat in the first half and gradually increases in elevation (along	Around the path are segments of dense vegetation described as coastal sand tea-tree, littoral rainforest	Path is generally along the shoreline of Gogleys Lagoon.

	second half of the path.	Camden Head Road) in the second half of the path. The elevation increases as it moves from the shore heading east (towards the residential areas). Residents from this increased elevation have greater views of the water but are still compromised by the vegetation on the shoreline.	and estuarine mangrove forest.	
D11	No buildings observed except for a few sheds and public toilets adjacent to the east of Camden Head Breakwall Access Road. Several commercial buildings along the shoreline of Gogleys Lagoon in the southwest portion of the path.	The land is relatively flat.	From the section D10-D11 tie-in, the path is surrounded by littoral rainforest and swamp oak forest to the corner of Camden Head and Breakwall Access Roads. Remnant trees are observed on the eastern portion of the access road.	The section D10-D11 tie-in path is located along the shoreline of Gogleys Lagoon, traverses inland (wetland) along Camden Head Road, and ends in Pilot Beach (nearby the start of Camden Haven Inlet).

Construction Impacts

Landscape character and visual impacts during construction would result from the introduction of construction work areas and activities into the existing landscape. Receivers who are likely to be impacted include:

- Residents that adjoin and/or have views of the construction compound and laydown sites.
- Road and water users, cyclists and pedestrians.
- Users of recreation areas/reserves with views of the project.

Moreover, the visible construction activities and equipment would include: (where required):

- Vegetation removal.
- Barriers/hoarding/fencing.
- Heavy and/or light vehicle access.
- Stockpile and laydown areas.
- The operation of plant and equipment, including cranes.
- The construction of infrastructure for the operation of the project.

In general, the potential construction impacts would be temporary in nature and localised to the section of the path that is subject to construction activities.

The project has aimed to limit its visual impact by ensuring that the project elements have been designed with consideration of the surrounding areas, and landscape treatments have been proposed to reduce the visual impacts of the new 11 km (continuous) shared path.

Visual impacts of a negative and temporary nature are expected for the majority of viewpoints (as shown in Figure 6.4) during the construction phase of the project. This is largely a result of the construction footprint of the project in areas adjacent to the road corridor. While construction activities are likely to be visible, adverse visual impacts will be temporary and limited in nature. Impacts are expected to be moderate or below, and localised in nature.

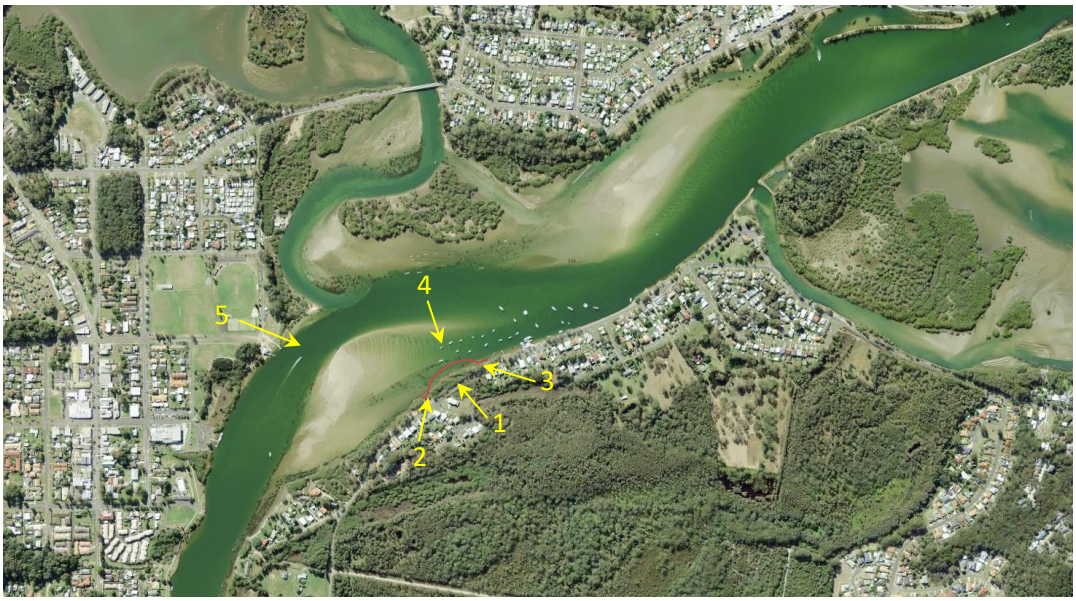


Figure 6.4 - Selected Viewpoints (view sites) 1 to 5

Visual Consideration and Impact Assessment

The potential for visual impact according to the different elements of the project were identified i.e. boardwalks and viewing platforms. As part of the visual impact assessment, topography, built form and the natural landscape features all play a relevant part. Landscape character and visual impacts were measured by completing a sensitivity analysis of existing landscape character areas and views and assessing the magnitude of change on those zones and views. Landscape character and visual impact ratings represent the potential impact of the project and if the application of environmental management measures are required. Selected viewpoints (shown in Figure 6.4) have been assessed for both the construction and operational stages of the project.
The viewpoints are in high and low traffic areas and aimed to account for all possible views, including views from the public domain, pedestrian, close and direct, and distant and filtered. The overall impact of each viewpoint is summarised in Table 6.30.

Table 6.30 Viewpoint Impact Assessment

Viewpoint	Sensitivity	Magnitude	Visual impact
1	Low	Negligible	Negligible
2	Low	Low	Low
3	Low	Low	Low
4	High	High	High
5	Low	Negligible	Negligible
6	Low	Low	Low

The above rating is based on EIA-N04 Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment (TfNSW, 2020), as discussed in Section 3 of the VIA (Appendix J)

Overall, it is considered that the new SUP would reasonably integrate into the existing visual environment without any significant or out of character impact. Although there would be some visual modifications to the various shared path sites, these would not be significant and there is a relatively low level of visual sensitivity to such changes given the context of the project sites and surrounding area. The level of visual impact would be minor and there would be no unreasonable detriment to the visual amenity of the immediate area or surrounding locality.

6.9 WASTE MANAGEMENT

The state's primary environmental protection legislation, the *Protection of the Environment Operations Act 1997* (POEO Act), together with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) and the *POEO (Waste) Regulation 2005* contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste.

Management and disposal of potentially hazardous wastes, in particular asbestos, must address the NSW WorkCover codes of practice and the POEO Act, *Work Health and Safety Regulation 2011* and the National Occupational Health and Safety Commission (NOSHC) Code of Practice for Safe Removal of Asbestos (NOSHC, 2005).

The criteria for assessing the impact of the project would be set as minimising waste to landfill and resource use and ensuring reuse and recycling opportunities are maximised in accordance with the NSW legislation.

Existing Environment

The project sites and location do not present any obvious existing waste materials or sources; however, some litter can generally be observed in such roadside areas.

Potential Impacts

The works would generate various waste materials. The nature and volume of waste generated from the project would be predominantly non-hazardous, relatively minor, and likely classified as 'general solid waste (non-putrescible)'. Waste sources, likely to be generated during the construction of the program of works may include, but is not necessarily limited to:

- General building/construction waste, surplus materials from the construction of the new shared paths. Materials would likely comprise spoil, concrete, timber planks, gravels, sands, fencing, off-cut materials, metals and barricades.
- Waste from concrete washout, vehicle washdown and surplus concrete material.
- Untreated ASS waste from minor excavations.
- Green waste generated by vegetation clearing and trimming – including weed species.
- Wastes generated at the construction site compound including used containers, bags and packaging.
- General site rubbish and domestic waste generated by onsite personnel and construction workers.
- Waste (such as, oil and grease) generated from site plant, leaks and spills and vehicle maintenance.

The inappropriate handling and management of waste could accumulate on-site and has the potential to result in a range of impacts, including:

- Reduced visual amenity and aesthetic quality of the project sites and work areas.
- A potential fire hazard.

- Attraction of pests and vermin.
- Toxicity to flora and fauna, and a hazard to the health and safety of local residents, workers and visitors.
- Leaching into the soil and groundwater.
- Land contamination.
- Adverse odours.
- Degradation of water resources.

Whilst waste would be generated, the project is not expected to generate significant amounts of wastes and any waste outputs can be effectively managed, reused, recycled and disposed of in accordance with the principles of resource management embodied in the WARR Act. Surplus spoil generated from the development works, if clear of weeds and confirmed to be ASS free, will be intended to be reused on-site for landscaping and restoration works and may be subject to testing by the Contractor. In addition, excess spoil will be disposed at a facility licenced to accept the material and would need to be classified in accordance with the NSW EPA Waste Classification Guidelines (2014). Similarly, liquid waste requiring disposal off-site would be removed by a tanker and disposed to a licensed facility. No liquid waste would be generated from the taking of water/dewatering. It is unlikely that contaminated or hazardous material would be encountered during construction works.

Concrete washout or chemical (hydrocarbon, oil, grease etc.) waste will be managed through collection at a designated impervious area for disposal by a licensed waste transporter to a licensed facility.

Whilst stockpiles would be established and utilised during the works, no bulk stockpiling is proposed. Waste can be stored in stockpiles or bins; however, it would not be stockpiled on-site for extended durations and is to be disposed of progressively and on a regular basis. Such stockpiles would be appropriately labelled, managed and monitored. Erosion and sedimentation controls would apply to any stockpiles. No stockpiling of potential contaminated or harmful waste would occur, and this is to be handled and managed appropriately and immediately.

Whilst not considered likely, there could be the potential that asbestos containing material (ACM) such as old pipes/pits or services could be encountered during the works. This would be classified as ‘Special waste (Asbestos waste)’. The potential impacts of such waste would be managed to minimise the risk of harm to the environment and human health.

Soil spoils could include ASS. The appropriate waste classification and disposal methods for soil spoils would be determined. An ASS Waste Management Plan would guide such processes.

When the SUP works are complete, waste is not anticipated to be generated in large volumes. Some minor volumes of litter along the paths and road from path and road-users may be expected, in addition to the generation of some general waste from future maintenance activities. This is consistent with current conditions and outside of the management scope of the project.

The measures to be implemented to prevent potential adverse impacts relating to generated waste are outlined in Section 7.2.

6.10 SOCIAL AND ECONOMIC

The project would facilitate the use of otherwise unutilised river-front land, allowing for recreational and employment generating opportunities. Having regard to the characteristics of the site and its location, the proposed development is considered suitable in that:

- It has been designed in a manner that minimises impacts on surrounding area and spaces.

- Will use areas of underutilised road reserve and other land.
- It will deliver considerable benefits, including a high-quality public domain and a wide variety of amenities for residents and visitors.
- It will result in result in only minor environmental impacts that can be appropriately managed and mitigated.

This would allow the area to meet its strategic potential as identified in the relevant strategic planning framework as outlined in this EIS.

Local Economy

The proposed SUP will promote further employment and broader economic benefits occurring within the local and wider economy, relating to flow-on multipliers from visitor opportunities. These multipliers include increased hotel room uptake, and higher occupancy of restaurants, cafes and campgrounds from the tourism dollar. The new SUP will:

- Improve the amenity and quality of the public domain.
- Generate increased pedestrian activity and interaction in the public domain.
- Provide opportunities for the integration of public art and landscaping.

Conclusions drawn from this EIS, indicate that the proposed development would result in economic growth due to the provision of employment generating opportunities during the construction and operational phases and provide for the health and wellbeing of residents in the locality.

Public Interest

The proposed development is in the public interest for the following reasons:

- It will provide numerous public benefits, including new neighbourhood links.
- It will deliver a high quality recreational pathway, servicing residents and tourist alike and provide for the areas growing population.
- It will substantially improve the public domain.
- It will enhance the permeability of the area through new pedestrian/cycle connections.
- It will deliver high quality tourist experiences contributing to the region's tourist status.
- It will deliver a recreational asset and destination, that contribute to the economic growth of the area.

The proposed development is therefore considered to be in the public interest and will play an important role in the continued revitalisation and reinvigoration of the southern PMH region.

6.11 CUMULATIVE IMPACTS

Cumulative impacts may arise from the interaction of the construction and operation of the project and other proposed activities (including projects) locally and regionally. When considered in isolation, a particular impact from one project may be considered minor, but when the impact of multiple projects on the same receivers is considered, the impact may be much more substantial.

The project is considered to be an appropriate recreational development for the purposes of improving the recreational infrastructure of the Dunbogan and Camden Haven areas, as well as provide a continuous (un-interrupted) path network connecting the shoreline of North Haven, Laurieton, Dunbogan and Camden Haven. The project remains mostly within the existing road

reserve and follows the alignment of the existing shared path, thus minimising the footprint of disturbance and environmental impacts.

Potential Impacts

The project is part of a multi-stage shared path upgrade and development in the local community. The other stages of the shared path have been completed. Therefore, the nature of potential impacts of the proposed development have been identified and assessed, similar to the previous environmental and assessment approval processes. In terms of considering the project and any potential cumulative impacts associated with other/future projects given the locality, there is no expectation of major projects development in the area. Whilst some form of other local development, utility upgrades or recreational amenity (including path) maintenance or upgrades may occur in the vicinity of the proposed development works and could lead to cumulative impacts, this risk is not considered to be significant.

There are no expected significant cumulative implications in regard to traffic, infrastructure services and environmental impacts. It is expected that the project would contribute to a number of cumulative impacts including the clearing of vegetation and habitat disturbance, resource consumption (e.g. construction material) and generation of greenhouse gas emissions (e.g. through operation of vehicles and equipment), as well as temporary construction noise and dust emissions. However, the safeguards and environmental management measures identified throughout this EIS (including vegetative compensation/offsets) and the method in which the project would be undertaken, are aimed to minimise the extent to which the proposed development contributes to cumulative adverse environmental impacts in the locality and community.

Overall, the proposed development would result in long-term positive outcomes for the local community and provide safe pedestrian and bicycle access to community centres schools and shopping centres. Moreover, the continuous 11 km shared path scenic route would attract cycle-related tourism into the area, creating jobs and boosting the vitality of the town centres, thus adding value to neighbourhoods and communities. There are no expected cumulative impacts that cannot be effectively managed or those that would cause significant social, economic or environmental pressures.

6.12 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Ecologically sustainable development (ESD) has been given statutory recognition in the EP&A Act as defined in the EP&A Regulation. Simply defined, ESD is development which aims to meet the needs of people today, while conserving our ecosystems so that future generations can meet their needs.

The design of the project and various environmental investigations undertaken in respect thereof, highlights a significant effort toward meeting the needs of the current generation without compromising the ability of future generations to meet their own needs. The design integrates sustainable principles and best practice measures. The design has focused on reducing the demand on resources via the use of simple strategies, which also offer excellent amenity to future users of the path. These strategies are supplemented with building systems to further reduce ongoing resource use, including:

- Material selection is intentionally robust, reducing ongoing maintenance requirements.
- Retention or detention of stormwater runoff from constructed impervious surfaces incorporating treatment and end-of-line filter and control of pollutants.
- Establish revegetation so the project has as little disturbance to the environment as possible.
- The maintenance of water quality; and remediation of contaminated soils are also consistent with this principle.

The EP&A Regulation and the EPBC Act emphasise the need for effective integration of economic and environmental considerations in decision-making processes and set out the following ESD principles to be considered when assessing a project. An analysis of these principles has been recognised and applied during the development of the project and is discussed below.

Precautionary Principle

The precautionary principle is utilised when uncertainty exists about potential environmental impacts. It provides that 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.

The precautionary principle requires careful evaluation of potential environmental impacts in order to avoid, wherever practicable, serious or irreversible damage to the environment. This EIS has not identified any direct serious threats of irreversible damage to the environment and therefore the precautionary principle is not required to be given further consideration in this instance. Notwithstanding this, avoidance of indirect damage to the environment can be achieved through implementing the mitigation measures identified in this EIS, which will inform the construction and operation of the proposed development.

Intergenerational Equity

Section 192 and 193 of the EP&A Regulation 2021 provides for the principle of intergenerational equity, namely that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. The project has been designed to achieve relevant sustainability targets, as well as benefit both the existing and future generations through the provision of a permeable and activated public domain with the new SUP.

The project has also integrated short and long-term social, financial and environmental considerations so that any foreseeable impacts are not left to be addressed by future generations. Issues with potential long-term implications such as the appropriate disposal of waste can be avoided and/or minimised through construction planning and the application of safeguards and management measures described in this EIS and the appended technical reports.

The new SUP would provide improved access and connectivity, reduced travel time, safer and improved travel time reliability, and savings in transportation and vehicle operating costs and vehicle emissions. Future generations would not be affected by the small amount of property acquisition and transfer of land required as part of the project. They would however benefit from the operational phase of the project including the economic benefits and improved access for residents, businesses, visitors and the community.

Conservation of Biological Diversity and Ecological Integrity

The principal of the conservation of biological diversity and ecological integrity upholds that it should be a fundamental consideration in development. The proposed development will not result in any direct impacts on the biophysical environment, with the site not having any significant ecological features, and the project has been designed to achieve the relevant sustainability targets and mitigate or minimise all projected environmental impacts.

Biodiversity is considered a key environmental aspect for the project, as it would not have a significant impact on ecological communities and their habitats. Up to 2.76 ha of native vegetation including vegetation constituting TEC as listed under the BC Act and EPBC Act would be impacted. Preliminary path route options assessments were undertaken to minimise this area, where possible. Calculations provided in this EIS for vegetation clearing are to be used as the basis of offsetting the impacts identified to TEC and threatened species. The BOS addresses residual impacts that cannot be mitigated.

Improved Valuation, Pricing, and Incentive Mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by a project, including air, water, land and living things. While it is often difficult to place a reliable monetary value on the residual, environmental and social effects of a project, the value placed on environmental resources within and around the SUP is evident in the extent of environmental investigations, planning, and design impacts including environmental management measures to prevent adverse environmental impact as identified in this EIS.

Costs associated with the planning and design of measures to avoid/minimise adverse environmental impacts and the costs to implement them have been included in the overall project costs and a cost benefit analysis carried out as part of the assessment process.

7 Environmental Management Measures

7.1 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

All works/activities would be delivered in accordance with a CEMP, which provides a structured approach to the management of environmental issues identified in the EIS. Implementing the CEMP would effectively ensure that the project meets regulatory and policy requirements in a systematic manner and continually improves its performance. The strategies defined in the CEMP would be developed in consideration of the project approval requirements, and the safeguards and mitigation measures presented in this EIS. Generally, the CEMP establishes the system for implementation, monitoring, and continuous improvement to minimise the impacts of the project on the environment.

The CEMP would be developed, reviewed, and approved prior to any works/activities commencing, and would include all relevant sub plans: (including the following as a minimum)

- Biodiversity Management (including Vegetation Clearing Limit).
- Unexpected Finds Heritage Items (Aboriginal and non-Aboriginal) procedure.
- Erosion and Sedimentation Control Plan.
- Flood Management Plan.
- Acid Sulfate Soils Management Plan .
- Unexpected Find Protocol for contamination (asbestos etc.)
- Demolition/Construction Waste Management Plan.
- Traffic and Access Control Plan.
- Noise and Vibration Management Plan.

The CEMP would incorporate all relevant safeguards detailed in this EIS and the requirements of the development consent. These would be implemented and complied with throughout all stages of the proposal.

All construction staff and site personnel would be made aware of their environmental responsibilities and safeguard measures within the CEMP to minimise environmental impacts.

An onsite meeting should be held with the relevant contractor(s), construction staff, site personnel and PMH Council project staff before the commencement of works/activities, including site establishment. The purpose of the meeting would be to discuss the environmental safeguards required to be implemented for the relevant phase of works. The meeting would also include relevant environmental awareness and toolbox talks on:

- Limit of works and no-go zones.
- Environmentally sensitive areas (native vegetation, threatened species, nearby watercourse and estuarine environments).
- Pollution prevention including designated storage and disposal areas.
- Vegetation trimming and removal procedures (noxious weed management, protection of native flora/fauna).
- Construction methodology (excavation and management of PASS).

- Hazards (e.g. mass movement, traffic, bushfire and flooding risks).

The design, construction and operation of the project would be carried out in accordance with the management measures identified in this EIS, as well as any additional measures identified in conditions of approval for the project.

7.2 ENVIRONMENTAL MANAGEMENT MEASURES

The collective measures required to safeguard the environment and avoid, minimise or mitigate the impacts associated with the project are predominantly associated with the construction phase and are detailed in Table 7.1. These measures have been derived from the previous assessments in Chapter 6 and those detailed in the appended specialist/technical reports.

Note: A unique Reference Identification has been assigned for the respective environmental issues and associated environmental management measures. BD = Biodiversity, AH = Aboriginal Heritage, NA = Non-Aboriginal Heritage, FL = Flood, AS = Acid Sulfate Soil, ES = Erosion and Sediment, WQ = Water Quality, TA = Traffic and Access, NV = Noise and Vibration, WM = Waste Management, VA = Visual Amenity.

Table 7.1 Compilation of Safeguards and Mitigation Measures

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
Biodiversity - General	BD-1	The Council approved CEMP and monitoring/ compliance reports for the works shall include: • Plans showing areas to be cleared and areas to be protected including exclusion zones, protected habitat features and revegetation areas • Sediment and erosion control measures • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens • Monitoring and compliance reporting requirements. This may include monitoring, auditing and reporting of preparation works, pre-clearance surveys, vegetation clearing and establishment of exclusion fencing.	Proponent/ Contractor	Detailed design/ Pre-construction
Biodiversity - Exclusion Zones	BD-2	Measures to further avoid and minimise the construction footprint and Vegetation Clearing Limits will be investigated during detailed design and implemented where practicable and feasible. The clearing of native vegetation must be minimised with the objective of reducing impacts to any threatened species, populations and ecological communities to the greatest extent practicable.	Contractor	Detailed design/ Pre-construction
	BD-3	Vegetation clearing would be restricted to the identified impact area and trees located outside of the proposed impact area are to be retained. Establishment of exclusion zones and the selection of suitable work methods which	Proponent/ Contractor	Detailed design/ Pre-construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		aim to minimise impacts to retained vegetation would be documented in the CEMP including: • Exclusion zones on a suitable plan • Selection of a suitable exclusion fence type • Allow enough lead time to establish exclusion zone before clearing • Mark out exclusion zones with temporary markings such as pegs or paint and where possible use a qualified surveyor • Place exclusion zone fencing around tree protection zones where possible • Erect signs to inform personnel of the purpose of exclusion zone fencing • Ensure all exclusion zones are regularly inspected and repairs to fencing are made where required • Communicate the importance of exclusion zones, and any changes to the zones, to all site staff and contractors (e.g. in toolbox talks and inductions).		
Vegetation Clearing	BD-4	The following vegetation removal measures would apply to the works: • Develop a clearing and grubbing plan with reference to the Vegetation Clearing Limit and other habitat protection measures and communicate the requirements of the plan to site staff regularly • The selection of suitable work methods which aim to minimise impacts to retained vegetation would be documented in the CEMP. Any trimming of overhanging branches is to be carried out by, or under the supervision, of an appropriately qualified arborist (AQF Level 3 or above) to avoid adverse impacts to trees located outside of the proposed impact area. • Large overhanging trees occurring in section 11 between CH40 and CH60 are located adjacent to the proposed boardwalk. These trees are to be retained and protected from harm during construction • Appropriate offsets will be obtained to compensate for the loss of vegetation arising from the project.	Proponent/ Contractor	Pre-construction/ Construction
Weed and Pathogen Management	BD-5	The following weed and pathogen management measures would apply to the works: • Weed debris and topsoil containing weed plant material should be stored separately to best prevent the spread of propagules and disposed of at a licensed refuse facility. No	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		weed contaminated material is to be reused on site • Weeds should be separated from native vegetation where native vegetation is to be used for mulch. Weeds are not to be used for mulch • Contractors should be required to ensure that all machinery, materials, and personnel are clean of any weed seed and tyres, boots, hats and clothing are disinfected/laundered prior to entering the site each day to prevent the introduction or spread of weeds and pathogens • Check the DPI website (www.industry.nsw.gov.au) for the most up-to-date hygiene protocols for each pathogen and for the most recent locations of contamination.		
Marine Vegetation	BD-6	Applications for Part 7 permits under the FM Act are to be lodged and activities are to comply with any conditions of approval for works impacting marine vegetation (Sections D3, D5 and D8) or works involving reclamation (i.e. placement of fill in Section D8).	Proponent/ Contractor	Pre-construction/ Construction
Seagrasses (FHPP No. 2)	BD-7	Potential impacts to seagrasses from the raised boardwalk in section D5 may be avoided or minimised through: • Constructing the boardwalk as close as practical to the shoreline/ mangrove edge and away from the intertidal zone as far as possible • Viewing platforms/ extension should be located to avoid shading of existing seagrass patches • Where the alignment of the boardwalk covers existing seagrass patches, consideration should be given to the use of mesh or similar material to allow increased light penetration through the walkway.	Proponent/ Contractor	Pre-construction/ Construction
Aboriginal Heritage - General	AH-1	The individual or persons responsible for the management of on-site works will ensure that all site personnel are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the *National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010*, under the *National Parks and Wildlife Act 1974*.	Contractor	Pre-construction/ Construction
	AH-2	In the case of unexpected Aboriginal heritage items being identified during any excavation works, an 'Unexpected Heritage Items Procedure' be created, adopted, and provided to all workers, contractors, sub-contractors	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		and employees at their time of their work induction to the site. It is recommended the Procedure is acceptable to Bunya LALC and that any shell material found as a direct result of construction activities (regardless of cultural origin) be left on-site and spread out on the landscape. If suspected of being of cultural origin, please follow the Unexpected Heritage Items Procedure.		
Non-Aboriginal Heritage - General	NA-1	The 'Unexpected Heritage Items Procedure' shall include provisions for unexpected non-Aboriginal heritage finds during the works. The Procedure shall be provided to all workers, contractors, sub-contractors, and employees at their time of their work induction to the site. If unexpected archaeological remains or relics are uncovered during the works, all works must cease in the vicinity of the material/find. PMH Council and any other relevant authority, such as the OEH, will be contacted. Work would not proceed in the vicinity of the find until appropriate clearance is given.	Proponent/ Contractor	Pre-construction/ Construction
Flood Management - General	FL-1	A 'Flood Management Plan' (FMP) shall be developed and formed part of the CEMP. The following should be considered in the Plan: • Provisions of measures mitigating the impacts of construction activities on flood behaviour • Appropriate local stormwater management controls during construction • Managing disturbance and transport through or around construction areas.	Proponent/ Contractor	Pre-construction/ Construction
Flood Management During Construction	FL-2	The FMP shall include: • Flood warning and evacuation requirements • Temporary works such as hardstand areas and access tracks are to be designed and constructed to withstand flooding • Minimising the extent of obstructions within the flood prone areas, as far as practicable at all times during construction • Locate plant and equipment on high ground • Locate spoil stockpiles in areas which are not subject to frequent inundation by floodwater • Removal of construction infrastructure and equipment from the flood prone areas in the event of a forecast flood to minimise both the risk of damage to infrastructure/ equipment and the risk of flood impacts to properties	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		• Securing objects that are likely to float and cause damage.		
Monitoring for Potential Flood	FL-3	The Bureau of Meteorology (BoM) is to be monitored for flood event warnings and forecast of heavy rainfall events in order to allow sufficient time to vacate and prepare the site prior to commencement of heavy rainfall and flood events	Proponent/ Contractor	Construction
Flood Safety	FL-4	Flood emergency management measures for operation of the shared path will be incorporated into relevant environmental and/or safety management documentation.	Proponent	Operation
ASS Management	AS-1	A 'ASS Management Plan' is to be prepared and implemented in accordance with the ASS Manual (ASSMAC, 1998a) to inform the identification, handling and management of ASS during the construction phase of the project, as well as to mitigate potential impacts arising from the disturbance/exposure and/or handling of ASS. The ASS Management Plan shall include: • Testing of excavated material for ASS • Handling and management procedures for excavated ASS • Liming and treatment procedure for ASS • Identification of Monosulfidic black oozes • Handling and management of excavated monosulfidic black oozes • Liming and treatment procedure for monosulfidic black oozes • Appropriate storage, transport and disposal of ASS material • In the event of large concentrations of ASS being uncovered or identified, this should be removed and treated/disposed of off-site, away from watercourses and sensitive estuarine environments.	Proponent/ Contractor	Pre-construction/ Construction
Erosion and Sediment Control - General	ES-1	Prepare and implement the 'Erosion and Sedimentation Control Plan' in accordance with the Blue Book (Landcom, 2004). The Plan shall be formed as part of the CEMP and include: • Diversion of any surface runoff and stormwater flow away from stockpiles of erodible materials • Establishment of erosion and sedimentation control and runoff diversion measures • Maintenance and regular inspections of erosion and sedimentation control measures to ensure effectiveness for the duration of the works	Proponent/ Contractor	Pre-construction/ Construction/ post-construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		• Site stabilisation and restoration (includes grass planting, turfing and planting of appropriate native species) of disturbed areas of soil and vegetation post completion of earthworks • Containment and storage of chemicals and fuels is to occur within bunded areas and away from any natural or stormwater drainage line • Establish site conditions where works are not to take place in heavy rainfall or high wind weather • Ensure erosion and sediment controls are not removed prior to adequate stabilisation of disturbed areas has occurred.		
Erosion and Sediment Control During Construction	ES-2	Workers, contractors, sub-contractors and employees shall implement the following safeguards and control measures in accordance with the Erosion and Sedimentation Control Plan during construction works: • Undertake earthworks to the minimum extent necessary to facilitate the development. • Establish erosion and sedimentation control and runoff diversion measures before any works commence and retain in place until all surfaces have been fully restored and stabilised. • Remove any material collected in the sediment traps as required to maintain effectiveness of the controls and at the completion of works and dispose of at a licensed waste facility. • Remove silt fencing and any other materials used for erosion and sedimentation control from the works site once sufficient stabilisation of disturbed areas has occurred and disposed of at a licensed facility. • Upon completion of roadworks, disturbed areas of soil and vegetation will be adequately stabilised and restored in a manner that does not encourage further ponding, runoff or soil erosion. • Work areas are to be stabilised progressively during the works, as far as practical. • Chemicals and fuels shall not be stored within or near any natural or stormwater drainage line.	Contractor	Construction/ post-construction
Water Quality Monitoring	WQ-1	Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) within and adjacent to the sites is to be undertaken on a daily basis to identify any potential spills or	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		deficient erosion and sediment controls during construction.		
Water Quality During Construction	WQ-2	Workers, contractors, sub-contractors and employees shall implement the following measures during construction works: • Refuelling of plant and equipment, or any other activity which may result in the spillage of a chemical, fuel or lubricant, is to be undertaken away from drainage lines or waterways to the maximum extent possible/practical and within areas that are suitably protected (e.g. a bunded area of adequate volume) • Work vehicles, plant and equipment are not to be washed on site, except for in appropriately designated and bunded areas as necessary • Concrete washout is to occur in designated impervious areas and disposed of at a licensed waste facility.	Contractor	Construction
Spill Control	WQ-3	An adequate number of spill kits (marine and terrestrial) would be kept on-site, and staff trained in its use. In the event of any spillages during construction phase, the project works would cease immediately and PMH Council would be contacted. Contaminants would be contained immediately, removed, treated (if necessary) and disposed of at a suitably licensed facility. Pollution incidents that cause or threaten material harm to the environment must be reported in accordance with the POEO Act. All incidents will be documented, investigated and suitable actions taken to prevent reoccurrence.	Contractor	Construction
Traffic and Access – General	TA-1	The following traffic and access measures shall be adopted for the project: • Current traffic movements and accessibility are to be maintained during the works, where possible. Any disruptions are to be minimised as far as practical to prevent unnecessary traffic delays • Regard to public safety would be maintained at all times • Workers, contractors, sub-contractors and employees shall implement the safeguards and mitigation measures in accordance with the Traffic and Access Control Plan during construction works.	Proponent/ Contractor	Pre-construction/ Construction
Traffic and Access Management	TA-2	Prepare and implement the 'Traffic and Access Control Plan' according to relevant policy and regulations and operating procedures to cover all parts of the works. The Plan shall form part of the CEMP and include:	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		• Detailed access and movement plan for vehicles and pedestrians • Appropriate signage to be utilised for site safety during the proposed works • In the event of a requirement to alter access to a site or close both lanes, adequate notification and/or advertising would be undertaken to notify traffic users and suitable diversions put in place • Emergency services would be informed of any changed traffic conditions and access would be maintained/provided, as required.		
Construction Noise and Vibration - General	NV-1	A Noise and Vibration Management Plan (NVMP) shall be developed and implemented to minimise the risk of adverse noise emanating upon the community, as part of the CEMP.	Proponent/ Contractor	Pre-construction/ Construction
Construction Hours and Notification	NV-2	Details of construction hours, public notification of construction activities, and complaint management shall be included in the NVMP. • Construction activities will be undertaken in accordance with DECC recommended standard construction hours: – Monday to Friday: 7 am to 6 pm – Saturday: 8 am to 1 pm – No work on Sundays or public holidays • Briefing of the work team will occur to create awareness of the location of sensitive receivers and the importance of minimising noise emissions • Adjoining properties would be notified with regard to the proposed works and contact details would be provided to potentially affected residences for complaints. • Any noise complaints will be recorded and include suitable identification/description of the noise source (e.g. continual/ impulsive) and general location of the complaint. Any noise complaints will be investigation and actioned as required within 24 hours.	Proponent/ Contractor	Pre-construction/ Construction
Use of Plants and Equipment	NV-3	Additional noise management measures to be adopted during works include: • Utilise work equipment and tools with lower noise emission levels • Higher noise activities to be carried out predominantly during less noise-sensitive periods, where possible. Nearby residents shall be consulted to help identify less noise time sensitive periods	Contractor	Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		• Utilising respite periods where noise intensive plant items are required • Locating noisy items of plant away from receivers, where possible • Turning off noisy plant when not in use • Ensuring plant is regularly maintained and equipment repaired/replaced to manufacturers specifications. • Utilising silenced or less noise-intensive equipment, where reasonable and feasible • Reversing of equipment shall be minimised or squashed duck sounders used so as to prevent nuisance caused by reversing alarms.		
Waste Management - General	WM-1	The following waste management measures shall be developed and included in the CEMP: • Ensure responsible environmental management of waste that cannot be avoided and promote opportunities for the re-use or recycling of waste products where appropriate • An unexpected finds protocol will be developed to address risks posed by fill or other potentially contaminated materials which may be encountered during construction works. Hazardous/potentially contaminated materials or waste would be stockpiled separately and not be stored or handled within proximity of watercourses where practical and without appropriate safeguards put in place • The handling and removal of any encountered contaminated or asbestos waste needs to be undertaken by suitably appropriate/licensed contractors/personnel • Green wastes should be reused on site where possible and appropriate (mulching), without the potential to compromise water quality. Noxious weeds should be disposed of appropriately in accordance with relevant guidelines • Waste fuels, lubricants and chemicals must be stored within containment areas designed to prevent the escape of spilt substances to the surrounding environment, as required by relevant legislation and standards (e.g. AS1940:2017 Storage and Handling of Flammable and Combustible Liquids) • Safety Data Sheets are to be maintained and made readily available at the project site for	Proponent/ Contractor	Pre-construction/ Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		all potential contaminants and chemicals on-site • Contractor to implement an Incident Management Plan detailing how any spillage of contaminated soil or waste would be safely managed to minimise environmental impacts prior to works commencing on site. The Plan shall include: – An emergency response spill kit (marine and terrestrial) to be kept on-site at all times – All construction personnel to be trained in spill containment and response procedures – If a spill occurs, the material is to be contained to the smallest area possible and promptly removed off-site for disposal at an appropriately license facility.		
Maintenance of Work Areas, Plant and Equipment	WM-2	• Working areas will be maintained, kept free of rubbish and cleaned up at the end of each construction day • Waste will be minimised as far as practical • Waste material will not be left on site once the works have been completed • The maintenance and servicing of equipment on site should be avoided as far as practical. If waste oils and other contaminated materials are generated, they are not to be stored on-site and should be removed immediately and disposed of appropriately.	Contractor	Construction
Waste/ Stockpile Management	WM-3	• All waste should be assessed, classified, managed and disposed of in accordance with relevant waste classification guidelines • Waste would not be stockpiled on-site for extended durations and is to be disposed of progressively and on a regular basis • Waste stockpiles would be appropriately labelled, managed and monitored • Waste will be disposed of at a licensed waste or recycling facility, as appropriate • Any spoils related to ASS would be managed and handled in accordance with an appropriate ASS Management Plan.	Contractor	Construction
Visual Amenity	VA-1	No specific measures are required given the limited visual amenity impacts, however, the measures outlined in other areas of this table (and report) would ensure that the visual environment is not detrimentally affected and that the project sites would be reinstated to	Contractor	Construction

Impact	Ref #	Environmental Management Measures	Responsibility	Timing
		an acceptable quality upon completion of the works.		

8 Project Justification and Conclusion

This environmental assessment has addressed the key issues identified in the Secretary's environmental assessment requirements (SEARs) issued and Sections 190, 192 and 193 of the EP&A Regulation. A checklist showing where the SEARs is addressed in this environmental assessment is provided in Appendix B.

The merits of the project were considered in the context of other alternatives and a route options development assessment process was carried out early in project planning to avoid or minimise potential environmental impacts from the project, where possible. The project (SUP alignment) outlined in this EIS was deemed to be in the public interest by providing the best outcome of enhancing visual connections around Camden Haven Inlet, provision of recreational amenity in Dunbogan and Camden Haven, and catering for the population and tourism growth in the area, as a result of the planned residential development in the PMH LGA.

Notwithstanding this, there are valuable and sensitive environments adjacent to and within the broader area surrounding the proposed sections of the shared path. The potential environmental impacts posed by the project have been thoroughly examined throughout this EIS and the accompanying technical/specialists reports. Some impacts would occur locally, however, it is unlikely that any significant or long-term adverse impacts would eventuate. Risks to sensitive environments during construction can be effectively avoided, managed, or mitigated, as appropriate. In order to ensure that the extent of impacts is limited and that unavoidable impacts likely to occur are managed and minimised, environmental management measures and safeguards have been developed to be implemented and monitored during construction of the project.

On the balance the project is considered justified when taking into account the need and reasons behind it. The potential negative environmental impacts of the project are mostly considered temporary (during the construction stage) and acceptable (when combined with the proactive and responsive management measures and safeguards) and are outweighed by the longer-term benefits of the project.

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Appendix A

Proposed Plans



LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- PAVED ROAD / SEALED
- GRAVEL ROAD / UNSEALED
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW SEWER
- XXXX EXISTING VEGETATION

PROPOSED FEATURES:

- CONTROL LINE
- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- ROAD - NEW PAVEMENT
- BARRIER FENCE / HAND RAILS
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- Ø600 HDPE PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- W PROPOSED WATERMAIN
- DECOMMISSION WATERMAIN

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-30-02.
2. THE BOARDWALK TO BE ALIGNED BETWEEN TREES WITHIN LOT DP 233364 WHICH IS LOCATED IN SWAMPY MANGROVE AND ESTUARIAN FORESTS.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. REFER TO DRAWING No. RU-DUN-30-50 FOR STORMWATER DRAINAGE LONGITUDINAL SECTIONS
3. CH DENOTES MAIN CHAINAGE ALIGNMENTS - CH0, CH20 ETC.
4. THE SMALLER NUMBERS REFER TO KERB ALIGNMENT CHAINAGE - 0, 20 ETC

PLAN - THE BOULEVARDE (NORTH)

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
0	ISSUED FOR CONSTRUCTION	18.10.2021	TECHNICAL APPROVAL	LESSON JULY	
E	ISSUED FOR DETAILED DESIGN	17.09.2021			
D	ISSUED FOR PRELIMINARY DESIGN REVIEW	03.08.2021	PROJECT APPROVAL	LESSON JULY	
C	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
B	RE-ISSUED FOR CONCEPT DESIGN	20.08.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	07.08.2020			

KBR DRAWING No.
SEC052-01-DW-0002-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D3 DETAILED DESIGN
THE BOULEVARDE (NORTH)
GENERAL ARRANGEMENT PLAN

DRAWING No.
RU-DUN-30-20

REVISION
0

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PLAN - D5 SUP - THE BOULEVARDE (NORTH)
SCALE: 1:1000

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW SEWER
- D150 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- REST AREA
- BARRIER FENCE / HAND RAILS
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- DECOMMISSIONED WATERMAIN

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-40-02.
2. THE DESIGN HAS REFERENCED DETAIL SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. THE BOARDWALK TO BE ALIGNED BETWEEN TREES AS MUCH AS PRACTICAL.

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
1	RE-ISSUED FOR CONSTRUCTION	20.04.2022	TECHNICAL APPROVAL	LESSON JULY	
0	ISSUED FOR CONSTRUCTION	18.10.2021	PROJECT APPROVAL	LESSON JULY	
D	ISSUED FOR DETAILED DESIGN	17.09.2021	CLIENT APPROVAL		
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	13.08.2021			
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	21.08.2020			

KBR DRAWING No.
SEC052-01-DW-0003-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D5 DETAILED DESIGN
THE BOULEVARDE (NORTH)
GENERAL ARRANGEMENT PLAN

DRAWING No.
RU-DUN-40-20

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LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW STORMWATER - SURVEYED
- REST AREA - PICNIC TABLES AND SEATS
- D15.0 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- ROAD - NEW PAVEMENT
- KERB LINE
- BARRIER FENCE / HAND RAILS
- PRAM RAMP
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- W PROPOSED WATERMAIN
- SRM PROPOSED SEWER RISING MAIN
- REST AREA - PICNIC TABLES AND SEATS
- SINGLE GALVANIZED MESH ACCESS GATE

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-50-02.
2. MODELED EARTHWORKS BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.

PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH)

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
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D	ISSUED FOR DETAILED DESIGN	21.09.2021	PROJECT APPROVAL	LESSON JULY	
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	16.08.2021	CLIENT APPROVAL		
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	16.09.2020			

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PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
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TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D8 DETAILED DESIGN
CAMDEN HEAD ROAD (SOUTH)
GENERAL ARRANGEMENT PLAN - SHEET 01

DRAWING SCALE: SCALE 1:1000
DRAFTER: DANIEL TAING
ORIG. SIZE: A1
DRAWING No.: RU-DUN-50-20
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PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH)

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW STORMWATER - SURVEYED
- REST AREA - PICNIC TABLES AND SEATS
- D150 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- ROAD - NEW PAVEMENT
- KERB LINE
- BARRIER FENCE / HAND RAILS
- PRAM RAMP
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- W PROPOSED WATERMAIN
- SRM PROPOSED SEWER RISING MAIN
- REST AREA - PICNIC TABLES AND SEATS
- SINGLE GALVANIZED MESH ACCESS GATE

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-50-02.
2. MODELED EARTHWORKS BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.

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REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
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			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
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D	ISSUED FOR DETAILED DESIGN	21.09.2021	PROJECT APPROVAL	LESSON JULY	
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	16.08.2021	CLIENT APPROVAL		
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	16.09.2020			

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BEACH TO BEACH D8 DETAILED DESIGN
CAMDEN HEAD ROAD (SOUTH)
GENERAL ARRANGEMENT PLAN - SHEET 02

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PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH)
SCALE: 1:1000

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW EXISTING STORMWATER
- REST AREA - PICNIC TABLES AND SEATS
- D150 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- SHARED USER PATH - LANDING
- REST AREA
- ROAD - NEW PAVEMENT
- BARRIER FENCE / HAND RAILS
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- W PROPOSED WATERMAIN
- SRM PROPOSED SEWER RISING MAIN
- NON-FRANGIBLE GUIDE POST

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-60-02.
2. MODELED EARTHWORKS ARE BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. DESIGN WORKS AREA SHOWN IN PINK DENOTES WORKS TO BE COMPLETED AS PART OF RU-DUN-70 PACKAGE (D11)

FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
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D	ISSUED FOR DETAILED DESIGN	27.09.2021	PROJECT APPROVAL	LESSON JULY	
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	18.08.2021	CLIENT APPROVAL		
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	21.09.2020			

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PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D10 DETAILED DESIGN
CAMDEN HEAD ROAD (NORTH)
GENERAL ARRANGEMENT PLAN - SHEET 01

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LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SRM SEWER RISING MAIN
- WM WATER MAIN
- SW EXISTING STORMWATER
- REST AREA - PICNIC TABLES AND SEATS
- D150 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- SHARED USER PATH - LANDING
- REST AREA
- ROAD - NEW PAVEMENT
- BARRIER FENCE / HAND RAILS
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- W PROPOSED WATERMAIN
- SRM PROPOSED SEWER RISING MAIN
- NON-FRANGIBLE GUIDE POST

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-60-02.
2. MODELED EARTHWORKS ARE BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. DESIGN WORKS AREA SHOWN IN PINK DENOTES WORKS TO BE COMPLETED AS PART OF RU-DUN-70 PACKAGE (D11)

PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH)
SCALE: 1:1000

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	ROBERT CAVALLARO	
			INDEPENDENT CHECK	NEIL CUMMINGS	
0	ISSUED FOR CONSTRUCTION	19.10.2021	TECHNICAL APPROVAL	LESSON JULY	
D	ISSUED FOR DETAILED DESIGN	27.09.2021	PROJECT APPROVAL	LESSON JULY	
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	18.08.2021	CLIENT APPROVAL		
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	21.09.2020			

KBR DRAWING No.
SEC052-01-DW-0005-CV-PLN-0021

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE: SCALE 1:1000
DRAFTER: DANIEL TAING
ORIG. SIZE: A1

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D10 DETAILED DESIGN
CAMDEN HEAD ROAD (NORTH)
GENERAL ARRANGEMENT PLAN - SHEET 02

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REVISION: 0

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PLAN - D11 SUP - PILOT BEACH ROAD

SCALE: 1:1000

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- CONTOUR - EXISTING MAJOR
- CONTOUR - EXISTING MINOR
- EDGE OF PAVEMENT
- KERB
- PAVED ROAD / SEALED
- GRAVEL ROAD / UNSEALED
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SEWER RISING MAIN
- WATER MAIN
- EXISTING STORMWATER
- REST AREA - PICNIC TABLES AND SEATS
- D150 EXISTING VEGETATION

PROPOSED FEATURES:

- CONTOUR - PROPOSED MAJOR
- CONTOUR - PROPOSED MINOR
- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- SHARED USER PATH - LANDING
- REST AREA
- D10 - PAVEMENT
- ROAD - NEW PAVEMENT
- BARRIER FENCE / HAND RAILS
- PRAM RAMP
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-70-02.
2. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
3. CH DENOTES MAIN CHAINAGE ALIGNMENTS - CH0, CH20 ETC.
4. THE SMALLER NUMBERS REFER TO KERB ALIGNMENT CHAINAGE - 440, 460 ETC

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	BRENDON ON	
			INDEPENDENT CHECK	NEIL CUMMINGS	
1	ISSUED FOR CONSTRUCTION	23.03.2022	TECHNICAL APPROVAL	LESSON JULY	
0	ISSUED FOR CONSTRUCTION	19.10.2021	PROJECT APPROVAL	LESSON JULY	
D	ISSUED FOR DETAILED DESIGN	28.09.2021	CLIENT APPROVAL		
C	ISSUED FOR PRELIMINARY DESIGN REVIEW	02.09.2021			
B	RE-ISSUED FOR CONCEPT DESIGN	03.11.2020			
A	ISSUED FOR CONCEPT DESIGN	23.09.2020			

KBR DRAWING No.
SEC052-01-DW-0006-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D11 DETAILED DESIGN
PILOT BEACH ROAD
GENERAL ARRANGEMENT PLAN

DRAWING No.
RU-DUN-70-20

REVISION
1

© Kellogg Brown & Root
DATE: Thursday, 24 March 2022 11:02:39 AM
FILE: O:\G&I\CAD\PROJECTS\3EC341\03.CAD\CONCEPT DESIGN D11\CIVIL\01 DRAWINGS\RU-DUN-70-20.DWG

Appendix B

Secretary's Environmental Assessment Requirements

Planning, Industry & Environment

Transport Assessments
Contact: Alexander Scott
Phone: (02) 8217 2096
Email: alexander.scott@planning.nsw.gov.au

Mr Craig Swift-McNair
General Manager
Port Macquarie-Hasting Council
Via email: council@pmhc.nsw.gov.au

Attention: Sam Mackie, Project Manager

Dear Mr Swift-McNair

Construction of a proposed public shared pathway between North Haven Beach and Pilot Beach in Dunbogan NSW - State Environmental Planning Policy (Coastal Management) 2018 – Secretary's Environmental Assessment Requirements (SEARs)

Thank you for your request for the Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Statement (EIS) for the above development proposal. I have attached a copy of these requirements.

In preparing the SEARs, the Department has consulted with the relevant government authorities. Please find attached a copy of their comments received for your information. It is recommended that you consider matters raised by agencies in preparing your EIS.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will require an additional approval under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Commonwealth Department of the Environment and Energy on (02) 6274 1111.

If a development application (DA) and EIS are subsequently lodged with Council, please forward one electronic copy to the Director, Northern Region DPIE, prior to the commencement of the public exhibition period. This will allow the Department to exhibit the document concurrently with Council's exhibition.

Following the exhibition period, Council must send the Department a copy of all the submissions it has received, in accordance with Clause 81 of the *Environmental Planning and Assessment Regulation 2000*. **If the Department does not respond within 21 days, Council may proceed to determine the application.**

In addition, it would be appreciated if Council would forward the Department a copy of the determination of the DA.

Should you have any further enquiries, please contact Alexander Scott, Team Leader Transport Assessments, at the Department on the details above.

Yours sincerely

6/11/19

Glenn Snow
Director
Transport Assessments
as delegate of the Secretary

Environmental Assessment Requirements

Section 4.12 (8) of the *Environmental Planning and Assessment Act 1979* *Schedule 2 of the Environmental Planning and Assessment Regulation 2000*

Designated Development

SEAR Number	1391
Proposal	Construction of a proposed public shared pathway between North Haven Beach and Pilot Beach in Dunbogan NSW – Port Macquarie-Hastings Council
Location	Coastal wetlands and littoral rainforest under the *State Environmental Planning Policy (Coastal Management)* at the Gogleys Lagoon and Gogleys Creek foreshore – primarily on land adjacent to Camden Head Road and The Boulevarde, Dunbogan
Applicant	Port Macquarie-Hastings Council
Date of Issue	6 November 2019
General Requirements	The Environmental Impact Statement (EIS) must meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* The Planning Secretary requires the matters detailed below to be addressed as part of the EIS. The Department of Planning, Industry and Environment (the Department) advocates the preparation of concise, accessible and justified EISs, focusing on the proposed development, its likely environmental impacts and the mitigation of those impacts. All EISs should be prepared to allow government agencies and the public to fully comprehend the environmental implications of the proposed development. The EIS must clearly outline the statutory planning provisions that apply to the proposal.

Key Issues	The Department has identified the following issues which are likely to be of key significance to the environmental planning and assessment of the proposed development. These issues do not relieve the Applicant from assessing any other key issues that may be identified during the EIS preparation.
	
	The EIS must include an assessment of all potential impacts of the proposed development on the existing environment, during construction and operation (including cumulative impacts if necessary), and develop and appraise appropriate measures to avoid, minimise, mitigate, offset, manage and/or monitor these potential impacts. As part of the EIS assessment, the following matters must also be addressed:
	
	• **Strategic and Statutory Context** – including:
	  ○ a detailed justification for the proposal and suitability of the sites for the development;
	  ○ demonstration that the proposal is permissible under and consistent with all relevant planning strategies, environmental planning instruments, development control plans (DCPs), or justification for any inconsistencies;
	  ○ consideration of impacts of 'no action' and consideration of alternative options as well as construction and operation technologies; and
	  ○ a list of any approvals that must be obtained under any other Act or law before the development may lawfully be carried out.
	• **Biodiversity** – including:
	  ○ a description of the ecological value of the identified coastal wetland and littoral rainforest;
	  ○ a detailed assessment of the potential impacts on biodiversity values to

determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act). If the proposed development is likely to significantly affect threatened species, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared in accordance with Part 6 of the BC Act; and
    - a detailed assessment of the potential impacts and offsetting (direct and indirect) to the coastal wetland and littoral rainforest, including impacts on marine vegetation (seagrass, mangroves and saltmarsh areas), aquatic species and key fish habitat listed under the *Fisheries Management Act 1994* and aquaculture activities (oyster leases) in the area.
- **Aboriginal Heritage** – including:
    - the assessment for impacts on Aboriginal heritage (including cultural and archaeological significance) undertaken consistent with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), as well as any other relevant guidelines and requirements; and
    - consultation with Aboriginal people regarding the proposal, including the significance of any Aboriginal cultural heritage values and likely impact of the proposal on their cultural heritage.
- **Hazards and Risk** – including:
    - the effects of coastal processes and coastal hazards including the effects of sea level rise and climate change;
    - consistency with coastal zone management plans, floodplain risk management plans and flood hazards associated with the land;
    - flooding, with consideration of the impacts of the proposal on the hydraulic and hydrology regime; and
    - an assessment of the risk of bushfire, including addressing the requirements of *Planning for Bush Fire Protection 2006* (RFS).
- **Soil and Water** – including:
    - detailing the disturbance of soils and potential impacts from erosion, sediment and leachate;
    - an assessment of potential impacts on receiving water courses, wetlands, estuaries, marine waters and floodplain areas;
    - an assessment of potential impacts on stormwater management; and
    - an assessment of potential impacts in accordance with the relevant guidelines in the *Acid Sulfate Soils Manual* (Stone et al. 1998) and the *Acid Sulfate Soils Laboratory Methods Guidelines* (Ahern et al. 2004) for the presence and extent of acid sulfate soils (ASS) and potential acid sulfate soils (PASS) on the site.
- **Traffic and Transport** – including:
    - an assessment of the traffic impacts on the surrounding land uses during construction (access to and from the site) and operation, including consideration of connectivity, public transport, and active transport modes such as walking and cycling.
- **Noise and Vibration** – including:
    - a description of all potential noise and vibration sources during construction, including hours of construction; and
    - assessment of the likely noise impacts on nearby sensitive receivers during construction in accordance with the *Interim Construction Noise Guideline* (DECC, 2009).
- **Waste Management** – including:
    - identifying, characterising and classifying all waste in accordance with the *Waste Classification Guidelines* (EPA, 2014) and providing details of waste quantities and handling including, transport, identification, receipt, stockpiling and quality control including off-site reuse and disposal; and
    - the measures that would be implemented to ensure that the proposed development is consistent with the aims, objectives and guidelines in the *NSW Waste Avoidance and Resource Recovery Strategy 2014-21.*

	• **Visual** – including:
	  ○ consideration of the proposal on the overall visual amenity of the foreshore.
	• **Land Use** – including:
	  ○ the assessment for impacts of construction and operation on and from surrounding land uses, including issues relating to managed adjoining areas and an analysis of site suitability with respect to potential land use conflicts. Particular attention should be made to potential impacts upon any adjoining and/or nearby Office of Environment and Heritage estate, Crown Land, NPWS lands, business and aquaculture operations (oyster leases), residential and educational land uses, as well as recreational and tourism activities that may be carried out in the locality; and
	  ○ details on any land acquisition required for the proposal.
	• **Environmental Management and Monitoring** – the EIS must describe and appraise in detail what measures would be implemented to manage, mitigate or offset the potential impacts (including cumulative impacts) of the proposal (as identified above) during construction and operation as relevant, and where required, describe how the environmental performance of the proposal would be monitored and managed over time. Where possible, reasonable and feasible mitigation measures should be developed in consultation with surrounding affected landowners and relevant public authorities.

Environmental Planning Instruments and other policies	The EIS must assess the proposal against the relevant environmental planning instruments, including but not limited to: • *State Environmental Planning Policy (Coastal Management) 2018;* • *State Environmental Planning Policy No 44–Koala Habitat Protection;* • *Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 Update);* • *Crown Land Management Act 2016;* • *Port Macquarie-Hastings Local Environmental Plan 2011;* • *North Coast Regional Plan 2036;* • *Port Macquarie-Hastings Council Urban Growth Management Strategy 2017-2036;* • *Port Macquarie-Hastings Council Draft Coastal Koala Plan of Management 2018;* • *Port Macquarie-Hastings Council Flood Policy (September 2015);* • *Camden Haven Floodplain Risk Management Plan (March 2004);* • *Camden Haven River Estuary Management Plan (June 2002);* • *Port Macquarie-Hastings Development Control Plan 2013; and* • *Relevant section 94 plans.*
Guidelines and Agency Issues	During the preparation of the EIS you should consult the Department's Register of Development Assessment Guidelines which is available on the Department's website at planning.nsw.gov.au. Whilst not exhaustive, this Register contains some of the guidelines, policies, and plans that must be taken into account in the environmental assessment of the proposed development. Matters to be considered and guidelines identified in consultation with agencies in the preparation of these requirements should also be addressed.
Plans and Documents	The EIS must include all relevant plans, diagrams and relevant documentation required under Schedule 1 of the Regulation. These items are to be provided as part of the EIS rather than as separate documents.
Consultation	During the preparation of the EIS, you must consult the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult with the:

	• Environment Protection Authority;
	• Department of Planning, Industry and Environment, specifically the:
	  ○ Environment, Energy and science Group (Biodiversity and Conservation);
	  ○ Water Group;
	  ○ Crown Lands;
	  ○ Regions, Industry, Agriculture and Resources Group (DPI Fisheries);
	• Transport for New South Wales (Former Roads and Maritime Services);
	• NSW Rural Fire Service;
	• NSW SES;
	• special interest groups, including Birpai Local Aboriginal Land Council and Registered Aboriginal Parties;
	• utilities and service providers; and
	• the surrounding landowners and occupiers that are likely to be impacted by the proposal.
	Details of the consultation carried out and issues raised must be included in the EIS.

Further Consultation After Two Years	If you do not lodge an application under Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* within 2 years of the issue date of these SEARs, you must consult with the Planning Secretary in relation to any further requirements for lodgement.

Appendix C

Community Engagement Report



PORT MACQUARIE-HASTINGS COUNCIL

Beach to Beach Shared Footpath

COMMUNITY ENGAGEMENT REPORT

14 January 2021



Project name	Beach to Beach Shared Footpath		
Project manager	Sam Mackie		
Consultant	Kellogg, Brown & Root (KBR)		
Engagement Officer	Liz Brennan, Olivia Lawler		
Operation Plan #	4.4.1.23CW	**CM Reference**	SF18/4357

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1. INTRODUCTION

1.1. Background

The Beach to Beach Shared Footpath is a community-based project to deliver 11km of shared walking and cycling path to connect all areas from North Haven Beach to Pilot Beach in Dunbogan. The footpath follows the river and creates a scenic route for both residents and tourists to enjoy whilst also minimising impacts to the natural environment.

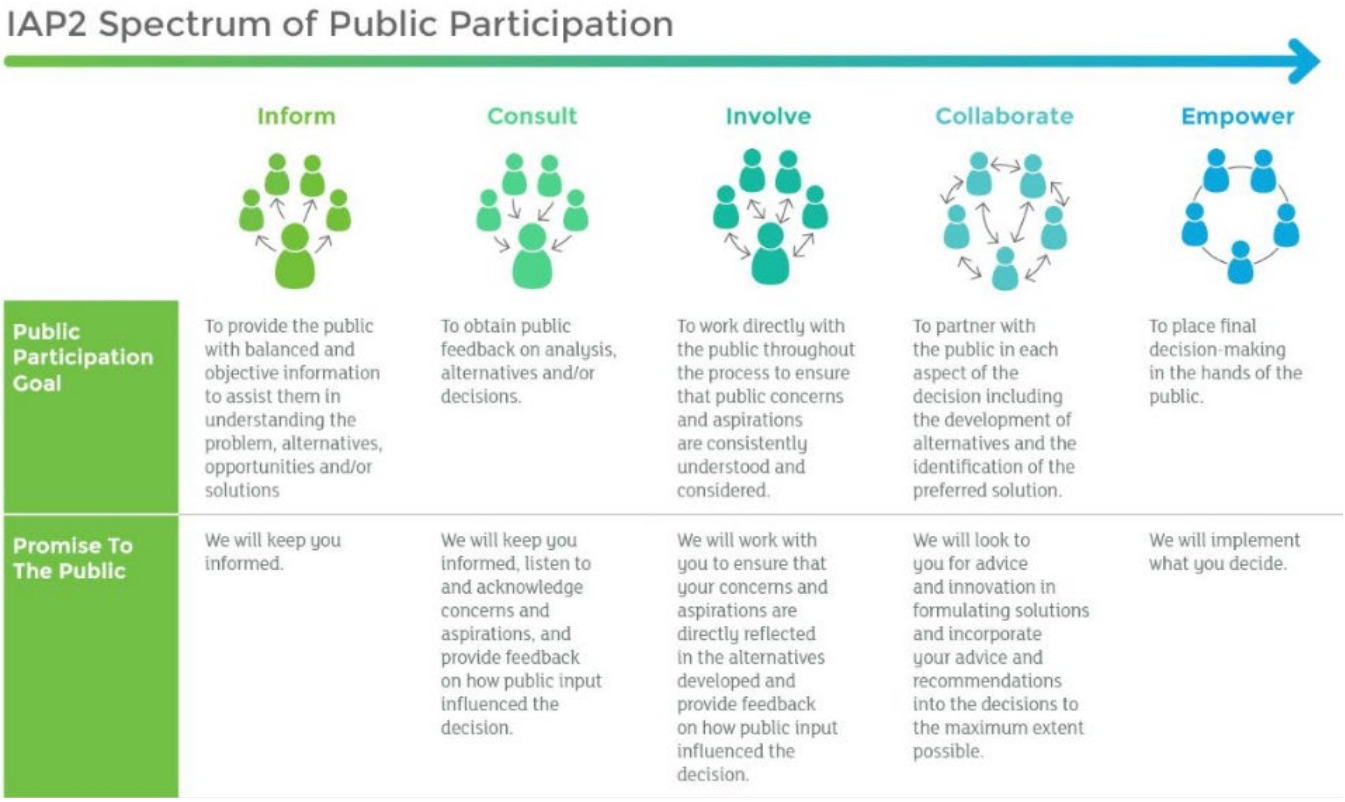
As a number of the remaining sections (D3, D5, D8, D10 and D11) of pathway intersect sensitive environmental areas, such as mapped coastal areas and Littoral Rainforest, an Environmental Impact Statement (EIS) is required and is being completed by Kellogg, Brown & Root (KBR). Community consultation is a requirement of the EIS and at the 12 August 2020 Ordinary Council Meeting, a resolution was determined that reinforced the need to conduct early and ongoing engagement with relevant community groups and agencies.

1.2. Engagement approach

Engagement activities were undertaken to **consult** with the community from Thursday 19 November to Tuesday 22 December 2020. The intent of this consultation was to inform stakeholders of the new concept designs for the remaining sections of path along the Beach to Beach footpath and provide an opportunity to provide their feedback through the Have Your Say survey and to meet with us in an online meeting to discuss the designs and answer questions.

Stakeholders

- Beach to Beach Committee
- Camden Haven Chamber of Commerce
- Bunyah Local Aboriginal Land Council (LALC)
- Friends of Kattang
- Dunbogan Bushcare/ Camden Haven Landcare
- Camden Head Environment Network
- National Parks and Wildlife Services
- Office of Environment and Heritage
- Crown Lands
- Local Oyster Growers
- Camden Head Pilot Station
- Camden Haven Community College
- Hastings Birdwatchers
- Camden Haven Historical Society
- Directly affected businesses and residents
- Broader community.



1.3. Consultation focus

Stakeholders were asked to comment on the concept designs developed for the remaining sections of path. Due to the broad nature of concerns and feedback expected, the Have Your Say survey consisted of one question, “Please provide any feedback or comments you may have in relation to the Beach to Beach Riverwalk Footpath Concept Designs”.

The main issues being explored relate to the potential impact on the natural environment the remaining sections of path could cause with the current alignment, particularly, as these sections intersect sensitive Littoral Rainforest. Another main issues raised is the consideration of pedestrian safety along the pathway and how to maximise this in these sections.

2. ENGAGEMENT ACTIVITIES, TIMELINES & RESULTS

2.1. Letters to Stakeholders

Letters were sent to the surrounding residents and businesses along the remaining sections of the Beach to Beach pathway, notifying them on the new concept designs and encouraging them to provide feedback and attend our community meeting. Letters were delivered on Wednesday 25 November 2020. (See Appendix 1).

2.2. Stakeholder Meetings

Three meetings were held through the consultation period with the Beach to Beach Committee, key stakeholders and the general community. (See appendix 2 for meeting minutes).

The **Beach to Beach Committee meeting** was held on Tuesday 1 December.

Topic	Issue	Comments
D8	Concerns over kerb height (300mm) still allowing 4WDs to mount the kerb and park along the road.	The potential addition of handrails may resolve this.
Engagement Process	Concerns over submissions holding up the project.	All stakeholders are encouraged to provide their feedback with consideration and response made of all suggestions.

The **Beach to Beach Community meeting** was held on Thursday 3 December.

Topic	Issue	Comments
D10	Concerns that celebration of the environment, education opportunities and safety is being lost if the pathway is to only follow the road.	Noted. This process will look at balancing between aesthetics, cost, safety and impact to the environment. Further in the future, educational material along the pathway will be looked into.
D10	The Littoral Rainforest is being opened up to the effects of salt spray and wind, which will cause 10m of impact to the rainforest.	The edge effect consideration will be done by the ecologist and the project will be guided by their recommendation.
	Pedestrian safety is not considered a valid reason to not construct the pathway on the eastern side as residents from the Camden Head will have to cross the road to access the pathway anyway.	Noted. It is considered by Council that where the crossing would be at the start of D10 is unsafe due to poor visibility and speed limit.
Car parking	Provisions for more car parking from the boat launch area heading south. Preventing car parking along the pathway as cars overhang the path	Large cost implications for providing parking near the boat launch area. Bollards have been established to prevent parking at the boatshed. Further methods will be considered to prevent parking along the road/kerb areas.
D8 Coastal Erosion	Will coastal erosion in this section be addressed?	Main areas where erosion is identified will be investigated. Long terms works will completed separately.

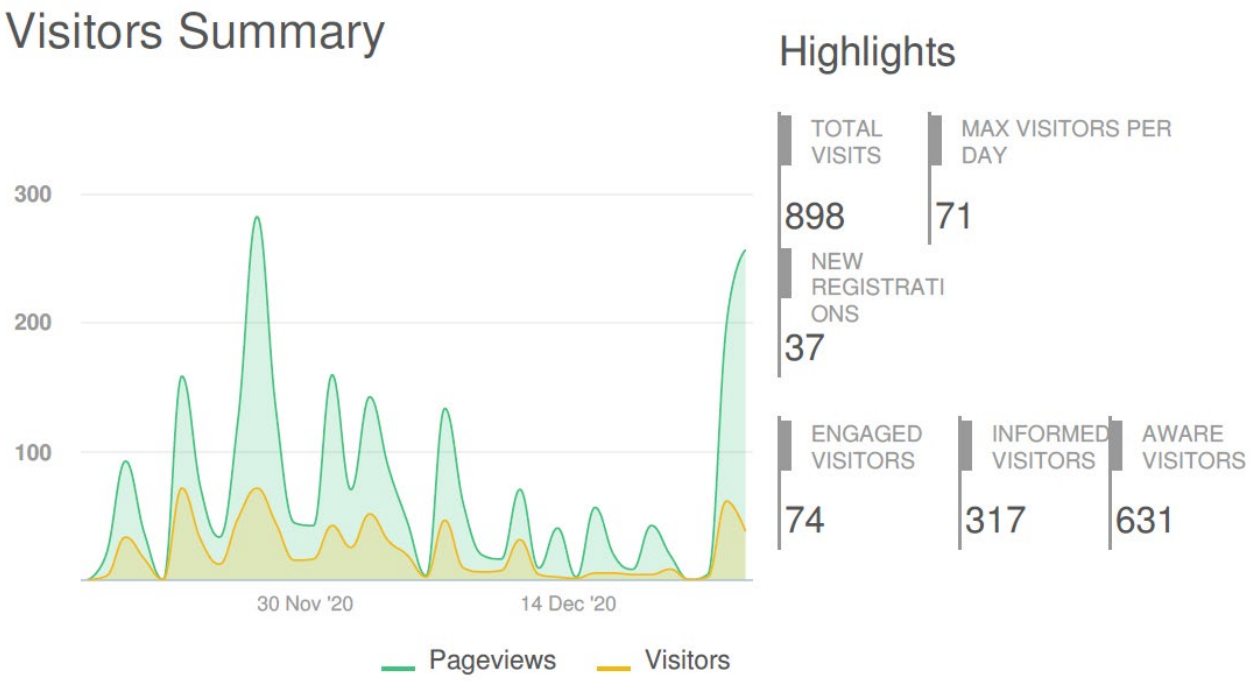
Gum Trees	Concerns over the removal of gum trees in the boatshed area.	No intention of removing trees and measure will be put in place to protect tree roots.
Replanting	Replanting works for koala habitat.	Funds are being sort for replanting work. Revegetation work of native species will be done in each area.
Chainage 300-340	This section goes under water in a king tide.	Flood assessments will be undertaken.

The **Beach to Beach Stakeholder meeting** was held on Thursday 15 December, 3pm-5pm.

Topic	Issue	Comments
Weed management (D8)	Along The Boulevard between the boardwalk and road there are many environmental weeds which need to be removed. Suggestion of Littoral Rainforest Recovery Plan to be developed addressing each section of the pathway. Will this be developed and who is responsible?	This can be achieved within the 5m of boardwalk, however adjacent land is privately owned and further discussions are needed with the owner. Intent of project is to establish management plans. Any involvement by community or volunteer groups is welcome. This will be developed by KBR with consideration of community submissions.
Pedestrian Safety (D10)	Concerns of safety of residents from Camden Head accessing the pathway.	Opportunities for potential safe crossing points are being considered.
D10	Gap in boardwalk - continuing the boardwalk is preferred. Section near Unique Close - Preferred to be all boardwalk. Significant damage in there for drainage.	Considered. Will be flagged with Environmental Planner.
D11	Castellated kerb may not be enough due to past crashes into the rainforest.	Concern recognised however guard rails take up a lot of space and require a deflection zone.

2.3. Have Your Say

A total of 55 submissions were received through the Have Your Say Survey with 194 participants downloading at least one document and a total 898 page visits. (See Appendix 3 for Have Your Say submissions).



Summarised Submission Issues - Online Submissions

Issue	Suggested Solution	Number of related submissions
Section D5		
Boardwalk handrail CH 20 - CH 160 RU DUN 40 -20	Instead of a handrail, install a 'wheel stop' edging which would restrict prams, wheelchairs etc. from rolling over the edge.	
Section D8		
Handrails CH 0 - CH 845 RU DUN 50 - 20 RU DUN 50 -21	Hand railing will spoil the views of the Camden Haven River from the pathway. Instead, install a castellated kerb with not bollard or handrails.	
Parking CH 620 - CH 680	This is a popular spot which needs at least three parallel	

	parking spots. If this is not provided, individuals will park on the pathway and pedestrian safety will be at risk.	
Section D10		
Natural environment	Taking advantage of the educational opportunities the natural environment provides by constructing the pathway through the forest.	
Alignment with D11	Alignment of these two sections would give visual access to Googley's Lagoon and the headland.	
Littoral Rainforest	High potential for significant impact on Littoral Rainforest. Alternative - Widen the road on the eastern edge along to the boundary of Kattang NR so the path can be on the road edge of the lagoon side. Another option is a shared car/bike/pedestrian path with reduced speed limit and speed bumps.	2
Section D11		
Littoral Rainforest	Instead of clearing Littoral Rainforest vegetation along the access road to Pilot Beach, the current boardwalk route adjacent to the Pilot Station should be incorporated.	
Overall Pathway/unspecified sections		
Extension	Is there possibility to extend this to the Diamond Waters Caravan Park?	
Width of pathway	Ensure it is wide enough for a pedestrians and cyclists to pass each other safely.	
Traffic	Traffic calming measures need to be implemented to slow vehicles in the area.	
Amenities	Provision of seating, rest areas, shaded areas and water	

	bubblers need to be considered.	
Parking	Formal car parking must be provided to prevent vehicles being parked on the pathway.	
Distance Markers	Can distance markers be included?	
Signage	Please ensure all necessary signage is provided along the pathway.	
Pilot Beach Breakwall	The Pilot Beach Breakwall between Pilot Beach and the washhouse needs to be concreted as it is unsafe.	
Bridge	Why can't a bridge be put across at Dunbogan (d7) and follow the river edge? There used to be a bridge there, and a path all the way along to the beach. The complaint back then was that the bridge wasn't replaced. It seems it would be a cheaper option not to mention the views along the river and the upside would be the oyster farms etc would have as much an impact?	

2.4. Formal/Written Submissions

A total of 15 written submissions have been made for the Beach to Beach Riverwalk Footpath via email. (See Appendix 4).

Issue	Suggested Solution	Number of related submissions
Section D3		
Removal of mature trees. (Forest Red Gums, Broad-leaf paperbark, Swamp Oak, Saw Sedge Swamp Forest)	Consideration of tree roots and methods put in place to ensure protection. Trees are critical to koalas and endangered bird species.	2
Removal of mangroves	Using an already degraded area instead of removing healthy mangrove species.	2

Weed management	Management of the Ochna Serrulata and other weed species in needed.	
Construction impact	A 5m clearance area on drawing RU DUL - 3021 is excessive. Construction methods must minimise negative impacts.	
Section D5		
Removal of mangroves	Alternate route proposed - GHD Option B (D5 Alignment Overview Figure 2.7, page 13). Option was only rejected due to recreational purposes.	2
Recreational Use	RU DUN 40-20 from CH 120-160. Concerns over the Yacht Club storage and launch area being a priority over vegetation loss. Suggestion of reverting to similar GHD Design B alignment for this section.	
Section D8		
Infringing vegetation Googley's Lagoon	Must be retained for important screening of busy road. Alternatively planting low growing species to maintain character.	
Aboriginal Midden Site	Concerns over its protection. Suggestion that the pathway cover it or densely rehabilitating it with soil capping and low growing vegetation.	
Car Parking	Excessive car parking. Removal of 4 carparks would accommodate seating and offer less constrained recreational use. A disabled carpark and set down area should be incorporated. Avoid parking in CH 220-240 which are sited in a tree canopy.	

	No parking at informal swimming spot CH 620. Current area is already eroded and needs protection - car parking would likely result in more damage. There is sufficient access already.	
Picnic Areas	Current unsafe in CH 200 and located in tree root zones and under canopy. Relocation needed away from trees (roofing added for shade) and away from the road.	
Boardwalk	CH 340-440 - Preferred boardwalk for this area as there is 90m of EEC impacted in this section which needs protection. CH 500 -520 - section notated as boardwalk. Needs rock armouring and planting to stabilise bank and protect it from wash and flood.	
Section D10		
Littoral Rainforest along Googley's Lagoon (also D11)	Minimise opening up the rainforest to the effects of salt spray and wind. • An appropriate boardwalk can achieve this. Vulnerable species inhabit this area. • Keep pathway footprint to a minimum • Develop vegetation management plan	2
Pedestrian safety	Provision of at least a single point at which residents can safely cross Camden Head Road. Concerns over pedestrian access to South Beach.	2

Construction Impacts	Impactful and expensive construction can be avoided at CH 240-330 by re-aligning Camden Head Road to the east.	
Boardwalk	Boardwalk preferred along eastern alignment to avoid edge effect impacts and to implement buffer zones regarding the Littoral Rainforest.	
Rest area	Locate rest area at CH960 with a shade tree as the rest area proposed at the pump station is not ideal.	
Section D11		
Boardwalk	CH320-450 should be considered to be boardwalk as it is shown as regenerating plant species.	
Rest area	Concerns over whether the rest area at CH120 is necessary or ideal due to the nearby industrial zone and busy road and intersection.	
Beach access	The current alignment only provides access to the northern end of Pilot Beach which is infrequently used. Concern over pedestrians who want to access the southern end will abandon the pathway and gain access through the busy carpark. Access also needs to be provided to the amenities block at Pilot Beach.	
Pedestrian safety	Concerns for pedestrian safety crossing oyster shed access road and the road to Trevor's corner. Pathway is too close to the playground which is a safety	

	issue for both cyclists and children using the playground	
Overall pathway		
Disability access	Disability access must be considered for all point of the pathway.	
Visual amenity	Restoration of foreshore in relation to native plantings, prevention of informal parking and bank stabilisation need to be considered to enhance visual amenity whilst protecting the environment.	
Community Stewardship	In assisting restoration plans, the opportunity for community and volunteer involvement would be welcomed. This can also address the weed management needed in D3 in relation to the Ochna Serrulata and other weed species.	
Kattang Nature Reserve	Linkages to Kattang NR need to be considered in relation to safely exiting the pathway at Camden Head and Pilot Beach roads to access the Bergalia walking tracks.	

2.5. Communications

Communication activities for this consultation included promoting the 'Have Your Say' survey and community meeting on social media. Social media platforms used included the Council corporate Facebook page, EngagePMH Facebook group and ConnectPMH Instagram. Comments from these posts were collared to provide the sentiment of the community regarding the Beach to Beach footpath project. The posts did not receive much commentary in relation to the project, however the reactions and engagement was positive and made the community aware of the consultation. (See appendix 5)

3. RESULTS SUMMARY/CONCLUSION

Overall, it is widely agreed that the Beach to Beach Riverwalk Footpath is a highly appealing and much needed piece of infrastructure for the Camden Haven area. The community believe it is beneficial for the tourism, economy and safety of their town and would like to see it constructed as soon as possible.

The main concerns held by some community members and groups involve the protection of the environment, particularly that of the endangered Littoral Rainforest, with alternative alignments for the pathway and measures to ensure protection of the environment being suggested.

Therefore, it remains important that the remaining sections of the Beach to Beach pathway balance the needs between environmental impacts, pedestrian safety, costs and visual amenity to ensure the project is delivered with consideration of all community feedback.

4. NEXT STEPS

- Draft Environmental Impact Statement - December 2020
- Final Environmental Impact Statement - February 2021
- Detailed Design - March 2021
- Public Exhibition of Environmental Impact Statement - March 2021
- Issued for Construction Drawings - May 2021

5. APPENDICES

Port Macquarie-Hastings Council
PO Box 84
Port Macquarie
NSW Australia 2444
DX 7415
e council@pmhc.nsw.gov.au

ABN 11 236 901 601

PORT MACQUARIE HASTINGS COUNCIL

25 November 2020

Refers to:

Dear Resident/Property Owner

Community Consultation - Beach to Beach Riverwalk Footpath

Concept designs have now been developed for the remaining sections of the Beach to Beach Riverwalk Footpath. The Beach to Beach Riverwalk Footpath is a community driven project that proposes an 11km continuous shared pathway between North Haven Breakwall and Pilot Beach in the Camden Haven. The first sections were constructed as a partnership between community, Council and state, over the last 5 years.

As a number of the remaining sections of pathway intersect sensitive environmental areas, an Environmental Impact Statement (EIS) is required which will be developed alongside the designs and will be available for comment in the coming months. Kellogg, Brown and Root (KBR) have been engaged to complete both the EIS and detailed designs and will be a part of the community consultation.

We are now seeking your feedback on the concept designs and would love to hear your thoughts. We also invite you to join our online community meeting on Thursday 3 December, 5pm-7pm for us to discuss the concept designs and answer any questions or concerns.

To share your thoughts online and register for our community meeting visit, haveyoursay.pmhc.nsw.gov.au/beach-to-beach-riverwalk-footpath
We encourage you to view the concept designs, frequently asked questions, Preliminary Impact Statement and submit questions prior to the meeting.

For more information visit, pmhc.nsw.gov.au/beach-to-beach or call Council on (02) 6581 8111.

Yours sincerely

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17 Burrawan Street, Port Macquarie NSW 2444
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9 Laurie Street, Laurieton NSW 2443
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Beach to Beach Committee Meeting Minutes
Tuesday 1 December, 2pm-3pm.

PRESENT

Members:

Community Engagement Manager (Liz Brennan)
Project Manager, Infrastructure Project Delivery (Sam Mackie)
KBR (Konrad Grinlaubs)
Beach to Beach Committee Member (Penny Small)
Beach to Beach Committee Member (Mary)
Beach to Beach Committee Member (Murray)

The meeting opened at 2:00PM.

013 CODE OF CONDUCT

04 GENERAL BUSINESS

4.01 Open Discussion: Engagement Plan and Understanding

- D8 Penny asked how high the kerb is.
  - Sam responded it should be 300mm high.
  - Penny expressed concern that most fisherman have 4WD and don't care about mounting the kerb and parking along the road.
  - Sam advised they may be able to engineer that out with a hand rail or something along those lines. This will be worked through with KBR.
- Penny expressed concern about the area at CH600-700, big 4WD parking along there and teenagers (P-Platers) going swimming here - historical habit.
- Penny asked that the fundamental agreement that there is definitely no road crossing in D10?
  - Sam confirmed it is all along the lagoon side of the road.
- Penny asked after the ecologist report about the D10 area, what definition they are using for this area? Are they sand dunes or littoral rainforest?
  - Konrad confirmed for the most part it meets the definition of littoral rainforest.
- Penny asked is there opportunity to seal the Breakwall access road?
  - Sam responded that he was unsure if that could be fitted into this project.

    - Liz advised she would follow up on this and see if it is a road sealing that is being considered in the future.
- Penny questioned Konrad about response to submissions; can submissions be put in by anyone?
    - Konrad confirmed yes anyone can make a submission
    - Penny expressed concern about submissions being made that will hold up the project.
    - Konrad advised that any submission requiring further investigation will be handled accordingly, but every submission is responded to that it was received and considered.
- Penny questioned if the Councillors are consulted with again once the designs are approved?
    - Konrad and Sam did not think so, but construction applications do need to be done when it comes to that
    - Liz advised she would find out for sure and get back to the Committee.
- Penny questioned the expertise of the JRP Panel to ensure there will be no hold ups in this aspect.
    - Konrad confirmed that the panel is chosen based on their expertise and not chosen lightly. There are usually no delays in the assessment process with that respect.
- Penny questioned how many times one small voice can put forward an opposition and hold up process?
    - Sam advised this is the bulk of the engagement and we will do our best to address concerns but it is not possible to have everyone and every group in complete agreeance.
- Murray questioned how many negative feedbacks that have been received?
    - Liz advised so far there may only be one or two.
    - Sam stated that he has not come across one yet that is in complete opposition.
- Penny raised a comment from Blair Maxwell about including Koala food trees in the replanting works.
    - Konrad advised the replanting works on a like for like species replacement so looking at the littoral rainforest species and surrounding bushland.
- Penny expressed concern that we are not getting an accurate representation of the community opinions and views from the small number of people who are attending these meetings.

The meeting closed at 3:20PM.

Beach to Beach Community Meeting
Thursday 3 December, 5pm-7pm.

PRESENT

Members:

Deputy Mayor (Lisa Intemann)
Community Engagement Manager (Liz Brennan)
Engagement Officer (Olivia Lawler)
Project Manager, Infrastructure Project Delivery (Sam Mackie)
KBR (Konrad Grinlaubs)
President, Hastings Birdwatchers Group (Sue Proust)
Friends of Katang (Peter West)

The meeting opened at 5:00PM.

013 CODE OF CONDUCT

04 GENERAL BUSINESS

4.01 Open Discussion: Engagement Plan and Understanding

- D11: (Phil) supply access road; sympathy for the grave sites there?
    - Sam: Yes, they will be identified as part of the heritage studies.
- Deputy Mayor to Conrad: Community Groups that need to be consulted with as part of the Council Resolution; confirm for me that they will be individually contacted and their issues discussed, particularly concerning D8, D10 and D11.
    - Konrad: Yes, we will contact all parties. There will be constant consultation throughout this process.
    - Liz: We have reached out to these groups and invited them to these meetings and directed them to HYS.
- Phil: Concerned that this should go to approval of the full Council and not approval from one person who is not from our area.
    - Konrad replied by explain the JRPP panel and why it is set up the way it is.
    - D/M: So this can't come to Council for the decision Phil is asking about?
    - Phil built on his initial comment by explaining past experiences with DA applications

    - Konrad: We want to address all concerns both positive and negative as best we can. Wants to present and application the community has engaged with and has had input in.
- D10 (Blair): Would it not reduce battering and ecology impact if it was pulled back from the road a bit? The gradient is pretty level here isn't it?
    - Sam: No. Putting the path in a different spot was eliminated due to a number of reasons.
    - Blair: Is there an alternative for the JRPP to look at that is not right near the roadway? Just this section up to chainage 788.
    - Konrad: We can take this on board and consider other options; nothing is off the cards at this point.
    - Blair: moving the footpath into the bushland will create more of a celebration of the environment and make it safer for pedestrians.
    - Sam: can you send through a marked up drawing of this section to better understand what you are referring to? We need a balance between aesthetics, cost, safety and the impact to the environment.
- Blair spoke to the majority of this pathway being along the road and feels that it is a wasted education opportunity and does not enlighten anyone to the bush and natural environment that surrounds it.
    - Sam: further down the process will be looking at education along the pathway for both the environment and Aboriginal / European heritage.
- Konrad reaffirmed that the amount of clearing required will be kept to a minimum to best reduce the impact to the forest, hence the sections of boardwalk that are post and frame allowing vegetation to grow underneath.
- Sue: why can't the path go along the Eastern route? You are opening up the littoral rainforest to the effects of salt spray and wind, possibly causing 10m of impact to the rainforest.
    - Konrad: The edge effect considerations will be done by the Ecologist. The pathway may have slight deviations to allow for trees to remain in place to protect the edge. We will be guided by the Ecologist's recommendations.
- Konrad spoke to the land claims currently being investigated and the boundaries of National Park and road verges and other property concerns.

- Peter feels that the reason of road crossing safety is not a valid reason to not put the pathway on the Eastern side as every single resident will have to cross the road to access the pathway. Feels that the residents on the headland are not being considered at all due to the Beach to Beach Committee going on about pedestrian safety all the time.
    - Sam responded by advising where the path would cross the road at the start of D10 is not as safe as if it was up near the housing area as the speed limit is 50kmp/h and visibility of cars.
    - Peter challenged by stating that the whole road is 50kmp/h and that the visibility is better both ways at the start of D10 than up where the houses are.
    - Sam responded with they must consider that in this stretch people do not obey the speed limit as it is a straight stretch of road.
    - Peter challenged again by stating there are ways to slow traffic, but there are elderly people on the headland and children and grandchildren living on the headland. Residents and visitors are

going to want to use this pathway and there is no consideration at all for the safety of the people on the headland.

- Blair asked if it is possible to widen the road from the dinghy launch area heading south to allow for better and more parking?
    - Sam stated that it is something we can consider but would have fairly significant cost implications.
    - Blair said we also need to look at the longer term in this project.
- Blair - in the new sections we need to put something in place that cars parked along the pathway to stop cars overhanging the pathway.
    - Sam responded and advised along the Boatshed area there have been bollards put in to prevent this, and options need to be looked at to prevent illegal parking along the road / kerb areas.
- Coastal erosion along D8 - will this be addressed in this project or another?
    - Konrad: The main areas where there is identifiable coastal erosion in this process will be investigated further as we don't want to build a path that will erode in a few years. Long term works will be done under a separate consideration and approval process.
- Sue expressed serious concern that any submissions done later on or consultation done during the process about the environment will be too late once the design is finalised.
    - Konrad advised that the alignment is not 100% fixed in these designs, amendments can be made throughout the process as more information, concerns and issues arise.
- Peter made a comment about the Boatshed area, the large Gum Trees, predicting that over the next few years that Council will take done some of these trees, but we do not want a systematic die off of these trees once the pathways is built.
    - Konrad responded by advising that there is no intention for any of these large trees to be removed as part of this project. There are alternate construction methods that can be used to protect the tree roots.
- Blair spoke to the replanting works with regards to Koala habitats, can this be done as part of this project?
    - Konrad: if money wasn't an issue than major replanting of vegetation would occur. There will be revegetation works done of native species in each area.
    - Sam: we will be trying to make funds available for these types of works as it has such a positive impact on the project. Requested Sue to send through information about the specific areas she was referring to about the noxious weeds.
    - Phil requested that new species not be introduced into this area as part of the replanting.
- Blair advised that between chainage 300-340 goes under water in a king tide.
    - Sam advised that KBR will undertake a flood assessment.
- Blair also advised that the new section just off the bridge where the Diamond Head Road turn is, the traffic island needs to be made smaller as the school busses are damaging the bollards and semi-trailer trucks also have to mount the kerb to get through without hitting the bollards.

The meeting closed at 7.03PM.

Beach to Beach Stakeholder Meeting
Thursday 15 December, 3pm-5pm.

PRESENT

Members:

Group Manager Community (Lucilla Marshall)
Community Engagement Manager (Liz Brennan)
Engagement Officer (Olivia Lawler)
Project Manager, Infrastructure Project Delivery (Sam Mackie)
Director Infrastructure (Dan Bylsma)
KBR (Konrad Grinlaubs)
Camden Head Environment Network (Janet Cohen)
Dunbogan Bushcare (Marg Riehl)
President, Hastings Birdwatchers (Sue Proust)
Friends of Kattang (Peter West)
President, Camden Haven Chamber of Commerce (Stuart Bate)

The meeting opened at 3:00PM.

01 APOLOGIES

Dunbogan Bushcare Group - Sue Baker

023 CODE OF CONDUCT

05 GENERAL BUSINESS

5.01 Open Discussion: Engagement Plan and Understanding

- Section D11 - small sections of road to be sealed to allow for safe pedestrian crossing.
- D3: (Janet) we want the pathway to be built but with as minimal environmental impact as possible.
    - Sue: Can part of the restoration plan include the removal of the weed Ochna serrulata (aka Mickey Mouse Plant) at the start of D3.
    - Could the path go through the areas that already have dead mangroves in them?
        - Sam: Section of land gifted to Council by property owner and this is the design that he wanted to see.
    - Janet: is the gifting of the land legally conditional on the curve of the pathway?
        - Sam: The alignment is conditional as there is a property boundary line on either side now.
        - It is just the 5m section that has been gifted not the whole block
    - People tend to avoid the curved areas of pathway and walk on the road
        - Sam: Do not think this will happen on this section as the road is not wide enough, the pathway is the safer option.
    - Janet: is it possible to look at the drainage issue inside that triangle section to allow for better saltwater flow?
        - Sam: may not be able to form part of this project but can be passed on to the relevant departments to look at options.
        - Janet: environmental improvement outcomes desirable. So there is no option to take the pathway through the dead mangrove section?
            - Sam: No
    - Sue: line of sight of cyclists going through that curve going to be ok?
        - Konrad: believe so yes.
    - Sue: along the boulevard between the boardwalk and the road there are a lot environmental weeds, can these be removed as part of the project?
        - Konrad: Can be done within the 5m boardwalk, weed management ongoing, however the adjacent land is still privately owned, needs to be further discussions with the landowner. Offset requirements as part of the entire project - weed management funding opportunity subject to the landowners acceptance can be considered.
        - Sue: a lot of the weeds are in the forest part not the mangroves so is this not road reserve?
            - Konrad: the Ecologist walked the alignment and he has noted there is quite a lot of weed internally, not just what can be seen from the road.
    - Janet: In regards to weed management and other environmental impacts such as erosion, would like to recommend that a littoral rainforest recovery plan be developed which addresses each section of the pathway. Including but not limited to actions in the national recovery plan for littoral rainforest, should include allocation for continual monitoring, ongoing maintenance and partnerships

between professional bush regenerators and locally based bush care groups.
    - Konrad: Any sort of community groups and volunteer works in terms of supporting the outcomes in relation to management plans are always appreciated as part of any project. The intent of project is to establish management plans.
    - Janet: so there would be an impact recovery plan developed as part of this project, who is that being developed by?
    - Konrad: that would be ourselves and any submissions from the community from people who want to be involved with that process.
    - Janet: opportunity for use of our expertise in applying for funding for grants for environmental restoration works.
  - Peter: off to the left of the map, where the road is being raised, we were lucky that the stone being thrown up by the landowner doing maintenance didn't go through the window but it made a pretty big hole in the side of the car. No current maintenance around the area supports the overall aesthetics of this plan
  - Peter: boardwalk is being put in the worst flood areas along that stretch so is the path being raised or left at the same level?
    - Sam: flood mapping for this area has only just been handed over. Unsure if current heights are correct but will be adjusted based on flood mapping results
  - Marg: What is the cost per linear metre for the boardwalk with handrails?
    - Sam: schools to schools, slightly different, about $2,500 per l/m.
  - Janet: How does that compare to a concrete pathway?
    - Sam: depends on the pathway. Significantly cheaper to build a stock standard pathway. When needing to create retaining structures or similar, the cost becomes higher than a boardwalk.
  - Konrad: the pathway height would be as flood immune as possible.
- D5:
  - Janet: The reason for the section that goes out to the water and back into the mangroves, was this done for the Camden Haven Dingy Club can better access the river?
    - Sam: yes correct the intention is to bring it around so the club can still easily access the ramp.
    - Janet: disappointed that change will result in a loss of mangrove community - can their access be moved to a different area?
    - Sam: No. We have had that discussion and looked at possible other areas but they are extremely limited. They are attached to that area.
  - Konrad: from chainage 120-160, that location is a bit indicative at this point, that may change slightly once the survey information comes in. Get the boardwalk in between the larger trees to limit disturbance and removal/trimming of vegetation.
- D8:

- Peter: praise to Sam and Konrad for listening to community members and making adjustments. There are trees along much of this section - what are you envisioning happening to them?
  - Konrad: in a practical world, we may not be able to retain them all. The intention is to allow flexibility in movement of the path during construction to deal with root management. We don't want to remove any, but some may need to be removed.
  - Sue: president of Hastings Birdwatchers - some species of trees are more important to wildlife than others, the Forest Redgums are important to the Swift Parrots. Due to the number of Redgums decreasing they are now endangered. Redgums need to be retained.
  - Janet: is there anything that can be done to save the Redgums that have been noted to be looking sick?
    - Sue: depends on what is causing the issue, they are in the other sections that have already been done. It is strong concern to protect the Redgums in future sections.
    - Sam: If we can construct them in a way that has an adverse impact to the existing trees it may help them to recover.
  - Stuart Bate: is there also a way to identify specific species of trees and plants that will be replanted through B2B that will positively impact the environment. Proactive about environmental sustainability.
    - Janet: this should be a part of the littoral forest management plan.
  - Stuart: be careful not to be too specific with language as it may hinder grants.
  - Peter: Plant new trees but protect older trees as the older they are the more they provide to the animals.
  - Konrad: we can tailor the revegetation plan to fit what is best for the area and what supports community input.
  - Janet: Park this issue for now but address the issue of the sick trees at some point soon and get an arborist in to survey the trees. (Trees near boatshed)
  - **Peter to send Sam more information about the trees for Sam to provide to internal arborist.**
- Janet: avoid any more disturbance to vegetation and maybe not include parking. Unsure on how I feel about this at this point.

- D10:
  - Marg: why has there been no mention of putting the path on the other side of the road? (Seaside not Lagoon side) Was discussed a year ago with who held Liz's job at that point.
    - Sam: Concept options with KBR - primary issue was safety concerns forcing people to cross a road, easement with relocating power lines, property issues with National Parks and Aboriginal Land Claim.

        - Janet: spoke to Amos, was not aware of the land claim. The land can be gifted to National Parks to be able to be used.
        - Sam: spoke to Amos a few months ago, he still wasn't 100% across what the claim is through there. NSW Aboriginal Land Council have been in discussions with Bunyah Land Council to resolve the outstanding claim.
        - Konrad: the road alignment from chainage 240 actually deviates off the road corridor itself and runs through crown land which is subject to the land claim.
    - Janet: will the katang nature reserve boundaries - will this be surveyed as part of this investigation?
        - Sam: it will but it is highly likely the path will be constructed within the nature reserve.
- Marg: Safety of Camden Head residents getting onto the pathway with it being on the other side of the road?
    - Konrad: we are looking at what opportunities are available - potential crossing points.
- Janet: safe crossing point to the access track to South Beach and signage.
    - Sam: we will need to discuss with the Aboriginal Land Council with maintaining that access during the land claim.
- Janet: gap in boardwalk section - preference is continuous boardwalk.
    - Sam: can be considered. Rational for concrete pathway from chainage 340 to 460 is purely on the limited battering that would occur to construct it.
- Sue: any impact on the littoral rainforest will result in loosing birds and trees to wind damage. Opening up the vines.
- Janet: section near unique close - changes from boardwalk to concrete pathway when it traverses the same littoral rainforest environment. Can this be all boardwalk? Significant damage in there during investigations for drainage, lots of vines have been cut. About 3 months ago for sewer lines.
    - Sam: will flag with environmental planner and see if they had permission to do that.
- Peter: eastern end of track, very steep in the last section. Boardwalk will help grading issue there.
    - Sam: Confident that can change to a boardwalk area. (chainage 780 to 920)
- Janet: No benefit to rest area near sewer pump station.
    - Sam: looking at alternate options raised. Is quite tight in some areas and putting it on the road side at a t-intersection is a safety concern.
- Stuart: would the pathway reduce traffic and parking along Camden Head Road?
    - Sam: hard to quantify at this stage. Will reduce local traffic yes.

- D11:
    - Sam: there are some grade issues here that are near impossible to solve. Considering flat landings as opposed to recovery bays.
    - Janet: going through the pilot station track?
        - Sam: not an option we are looking at as it is very difficult to build a shared pathway through there. Need to accommodate traffic and pedestrians along this track. Right of way issues.
    - Janet: castellated curve may not be enough as there have been a few crashes into the rainforest. Better option for users?
        - Sam: Guardrails take up a lot of space and require a deflection zone, takin gup 2.5m. Concern recognised.
        - Peter: move some of the concrete path to being a boardwalk.
        - Sam: boardwalk is bigger at 2.8m.
    - Janet: 240-300, presence of large colonies of flying foxes (grey and red headed) that use this forest area from November to March. Very large colonies, mark on plan to recognise this area as being home to threatened species and no construction during their resting time.
        - Konrad: boardwalk narrowing may occur as we are looking to not disturb the canopy. Ecologist is of the view their roosting there was due to bushfires and not a regular location. His recommendation was no construction during roosting times.
    - Janet: would like to see boardwalk all the way through.
    - Janet: corner near Breakwall access - will clearing be required for line of sight access?
        - Sam: at this stage unsure. Low speed environment.
    - Sue: boardwalk, drilling down - can they be more floating style boardwalk to disturb the environment less?
        - Sam: Geotech investigations need to be done to determine the footings that can be put in.
        - Sue: Wingham Brush boardwalk.
    - Janet: Pilot beach reserve - goes too close to the playground and dissects the playground. Cuts off picnic shelter to BBQ causing people to cross the pathway.
        - Sam: some comments we will come back to you on. Master Plan isn't under way yet. Sealing the road - crown land reserve issues with doing that.
        - Janet: pathway not connecting to the Breakwall as heavily used by fishermen and pedestrians.
    - Peter: next steps? Feedback in writing required by the 22nd after this meeting?
        - Konrad: we will take notes and provide responses to these.

Stuart: Disagrees with the break wall - can we get it bitumen to make it safer?

06 Actions

1. D3 Section: Sam to pass on information regarding the drainage issue in this triangle section to the relevant department in Council to allow for better saltwater flow.
2. D3 Section: Discussions with landowner regarding possibly providing funding for ongoing weed management in the forest section along The Boulevard.
3. D8 Section: Peter to send Sam more information and locations of sick Redgums to be able to provide to internal arborist to inspect.
4. D8 Section: Include Redgums and other species of tree/plant in the revegetation plan that will positively impact the animal's native to the area.
5. Konrad/Sam to check on status of Aboriginal Land Claim
6. D10 Section: Sam to discuss with the Aboriginal Land Council about maintaining access to the track leading down to South Beach.
7. D10: Sam to flag with Council Environmental Planner as to whether permission was granted for the damage to and removal of vegetation during sewerage investigation works 3 months ago.

The meeting closed at 5.15PM.

Beach to Beach Riverwalk Footpath

The Beach to Beach (B2B) Riverwalk Footpath is a community driven project that proposes a 11km continuous shared pathway between North Haven Breakwall and Pilot Beach in the Camden Haven. The first sections of the pathway were constructed earlier in 2003 as a partnership between community, Council and state, on the Laurieton side of the Camden Haven Inlet. The remaining sections of the pathway are titled D3, D5, D8, D10 and, D11 and will complete the B2B shared path. During this time, we have worked closely with the B2B committee who have driven the project since its inception.



Click to view larger image

A number of the remaining section of pathway intersect sensitive environmental areas, such as mapped coastal areas and Littoral Rainforest. The proposed pathway will look to traverse and/or run adjacent to these areas which have varying ownership which includes, but is not limited to, road reserve, private property, Crown Lands and National Park. Therefore, an Environmental Impacts Statement (EIS) is required in accordance with Part 4 of the Environmental Planning and Assessment Act. Kellogg, Brown and Root (KBR) have been engaged to complete the EIS and detailed design for the pathway. The detailed design will be developed in conjunction with the EIS outcomes, with the aim to minimise environmental impacts, improve safety, and generally prevent redesigns.

The main objectives of the Beach to Beach Riverwalk include:

- Improve safety and accessibility for pedestrians and cyclists
- Provide a shared pathway link between North Haven Beach and Pilot Beach
- Provide a safe pedestrian access between schools, shops, and community centres
- Promote healthy activities, exercise and non-motor vehicle travel within the community
- Maintain and promote environment diversity
- Provide an important recreational asset that attracts an increase in tourism
- Deliver community initiatives

The project will assist in appropriately responding to the increased need for recreational facilities, in line with State and Federal Government objectives surrounding "physical activity is important for good health and wellbeing".

Who's listening

Liz Brennan

Community Engagement Manager



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Sam Mackie

Project Manager



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Email Sam.Mackie@pmhc.nsw.gov.au

Document Library

- Beach to Beach Riverwalk Footpath FAQ (773 KB) (pdf)
- Beach to Beach Preliminary Impact Areas (20.9 MB) (pdf)
- Concept design
  - Beach to Beach Concept Designs Combined (10.7 MB) (pdf)
  - Beach to Beach Section D3 Detailed Concept Design (2.86 MB) (pdf)
  - Beach to Beach SEC052-D5 Detailed Concept Design (1.87 MB) (pdf)
  - Beach to Beach Section D8 Detailed Concept Design (3.44 MB) (pdf)
  - Beach to Beach Section D10 Detailed Concept Design (4.45 MB) (pdf)
  - Beach to Beach Section D11 Detailed Concept Design (3.71 MB) (pdf)

Lifecycle

Concept Design
This consultation is Open for contributions.

Community Consultation December 2020

Preliminary Design December 2020

Beach to Beach Riverwalk Footpath - Have Your Say Submissions.

The footpath is very much needed to increase safety when walking in Dunbogan and Camden head. We have a beautiful coastline and stunning views which we cannot enjoy safely as there is no footpath alongside the road. I live in Camden head and do not feel safe to walk to Dunbogan boat shed for example or Dunbogan park with my children due to the high level of traffics in combination with no safe footpath and so instead drive what should be an easy 20 minute walk. I have also been hesitant to ride a bike from Camden head to Laurieton again due to the volume of traffic. The completion of the path will allow for increased community participation for all residents. I hope it's not another 10years before we see its completion.
This is an excellent idea that will encourage outdoor activity for all age groups in a safe and enjoyable way.
Firstly I would like to congratulate all involved in this project, for their tireless efforts in achieving the completed sections to date. I feel, as well as many other residents and visitors, that this is an essential addition to our area for not only safety but for a tourist attraction and for health and wellbeing of the locals. Hopefully within the next year more sections will be finished and the Beach to Beach pathway will be nearing completion.
There are sections of this proposal that are more urgent than others. How someone hasn't been killed along The Boulevard & Camden Head Road is beyond belief. For safety reasons this project is urgent. Not to mention what it would do for tourism to this area. This proposal should be given urgent attention & action.
Congratulations Sam KBR and the PMHC team that are working solidly to provide the best pathway design possible for the B2b. I fully support the concept design options that have been presented in all 5 sections. They represent the safest pedestrian, heritage, cultural and environmental options.
Everyone loves the section at Bunny's Corner where the pathway meanders through the forest rather than make a bee line. It is important that the pathway (where possible) is not just a transport route but is there for enjoyment and access to visual sights. I truly believe that we need to take advantage of the natural environment and protect as much established large trees in the D10 and D11 areas while providing world class scenic access to the waterways. It would be a travesty to have the pathway "just" traverse the landscape and follow the edge of the road, (like much of the pathway), when it could truly be an educational, environmental, postcard walkway for the finish. So many people use this section as pedestrians daily that it would be an asset to environmentalism, tourism and the general public to create a magnificent/unique section of the B2B pathway here. NB the total length of pathway has many unique sections and that is what makes it such an attraction. Section 10 and 11 should also align and give visual access to the glorious "Googlies Lagoon" and the flora of the headland. I implore that all stakeholders in the pathway, not be simple in providing a truely inspirational section of pathway while still allowing it to be wide enough for the increasing number of cyclists, mobility scooters and walkers for whom this may be there only way to access to natural environment. The best time to see Googly's lagoon from D10 is late afternoon with the sun setting over the water and this asset should not

be squandered by having regrowth literal forest blocking the view completely. All Stakeholders need to be there at sunset to weigh up your options.
Congratulations Sam KBR and the PMHC team that are working solidly to provide the best pathway design possible for the B2b. I fully support the concept design options that have been presented in all 5 sections. They represent the safest pedestrian, heritage, cultural and environmental options. Penny Small President Creek to Creek Queens Lake Trail.
Having spent the weekend in Sydney near the Parramatta River and enjoying the 100’s of km of pathways... I am shocked that this project has taken the PMHC so long to fund
Can this be extended to the Diamond Waters Caravan Park? Lots of traffic on Diamond Head road. Is hard for locals or tourists in caravan park to walk /cycle into town and even harder when trying to walk dogs.
Please just get it finished so that everyone can enjoy our beautiful environment
I 100% support the design concepts and can't wait to see the fruits of the labours of the council and the Beach to Beach team. This infrastructure will be a great community and tourism asset.
I felt compelled to write again and add that the D10 and D11 sections need to meander within the forest landscapes so the pathway can be used as a educational walk for schools to explain the different types of forest in the coastal environment. When looking at the maps provided and visiting the site it is evident that there would be minimal impact on the environment and far more to gain than being a roadside pathway. For goodness sake, National parks, Nature reserves and other public lands have walking trails all through our local bush. Friends of Kattang are constantly maintaining and upgrading pathways in adjacent bush without any issues, except silt runoff and erosion from the dirt pathways. I wholeheartedly disagree with the roadside route on D10 as short sighted, unattractive, uninformative and unenvironmental. Naturally I guess the committee has discussed a planting regime like the other Landcare groups meddling in the natural environment to bring back the natural corridor that Koala used to use before the sandmining on the spur. There is so much that could benefit this forest area on this route and the "stay out attitude" of old school environmentalism just does not work for management and education. We need a fresh look and response to promoting our natural environment for ALL into the Future. Don't stuff this up because of a minority view to outdated environmentalism and protection. Let’s celebrate our forests, replant them, monitor them, manage them and be amongst them.

The B2B project is progressive and proactive. It is community based and community driven. The B2B project will provide lasting long term benefits for the community.
This is an amazing project, with benefits to the entire community, and I look forward to it being completed soon! Congratulations to all concerned!
Congratulations Sam KBR and the PMHC team that are working solidly to provide the best pathway design possible for the B2b. I fully support the concept design options that have been presented in all 5 sections. They represent the safest pedestrian, heritage, cultural and environmental options. Peter Nash President Creek to Creek Queens Lake Foreshore Trail
The walkway is an urgent necessity as the traffic is getting busier and it is quite dangerous walking on the road especially in the narrower areas. The proposed route seems sufficient. Holiday times Dunbogan is becoming very busy and the council has a duty of care to provide a safe passage.
It's awesome - please progress asap. Please just make sure that it is truly wide enough to allow a cyclist to pass a pedestrian safely, or two cyclists to pass each other safely.
With the completion of the walkway, we can then organise a Camden Haven Running festival, which could include a 1/2 marathon, and 10 klm and 5 klm runs. This could coincide with the Port Macquarie Running festival. The 21klm route would be one of the most attractive 1/2 marathons on the coast and would attract a large number of competitors.
This pathway linking North Haven to Pilot beach is essential for the safety of high volume pedestrian, cycle, mobility scooter etc that daily access the sections already available. The sections of path already available on the Dunbogan side encourage locals and visitors to engage their families in daily exercise and recreation but the stop start nature forces all ages into the dangerous activity of walking along narrow busy boulevard road sections as they move from on part of path to the next. I fully support the concept design as presented and encourage the council to complete this pathway as a priority.
This is a very worthwhile project which I fully support.
please adopt in full in alignment with the designs, they are awesome plans and we need this in place before a death occurs

The concept designs are great. This pathway will be an amazing amenity for all members of our community and visitors.
Design looks very good and boardwalks over vegetated areas & deviation through treed areas looks to be a great shared footpath
1. Aesthetics... I believe that any design will be fine as long as it is done sooner rather than later. 2. Safety- We need to keep residents safe by providing the minimum- a safe place to walk. 3. Traffic- Cars and trucks that use the roads in the area, for work and visitors, especially during holiday periods, - need to be slowed down. 4. Inclusion- Not providing walkways for those who cannot drive is like not providing access to the disabled. 5. Community events- Fundraising and other events will go onto the map in Australia, if this bike way is completed. This will bring tourism to the area and with it funds to inject into our economy. 6. Liability for not providing a safe place to walk is the council's responsibility. Comments- I am unable to walk into Laurieton from Dunbogan due to having to walk on the road. While walking in- specifically- 2 sections (D3 and D5), you have to jump into the swamp, move from one side of the road to the other side of the road, and try to run, all so you don't get hit by a car. Section D3 is a blind spot on a corner. Even driving the speed limit, I have come around that corner, only to have to stop quickly for elderly people on motor scooters or young families and children riding bikes. D3 is very dangerous section and needs to be a priority. 1 day a resident is going to be badly injured or killed on this section. I would be the first to blame the council for taking such a long time to not only get these dangerous spots fixed, but to provide adequate amenities for the whole community, to be able to walk or use disabled motor scooters, ensuring inclusion to all (specifically for residents who cannot drive). A possible solution, in the short term- to ensure safety for our community, is to turn these spaces (until they can be fixed) into shared zones; where one lane is closed and cars have to stop and can only go forward if there are no other cars coming the other way. (Like the 1 lane bridges in the country.) This way you have a lane for pedestrians, and 1 for traffic. This will slow the traffic down too as, even though there is a 50 zone in place, traffic easily speeds up to 70 kilometres an hour. I personally have been brushed by a car while I was riding my bike. I was off the road at the time, and this car brushed me with their side mirror. Needless to say, I now have to drive over to Laurieton so I can go for a walk, which is such a shame as Dunbogan is so beautiful.

The designs appear to provide safe pedestrian/cycle access through the most dangerous sections of Camden Head Road with minimal impact to the vegetation communities. I support the designs in full and look forward to seeing the detailing of the walkway components and environmental mitigation measures. In particular how pedestrian access to the waterways will be provided and how coastal erosion along Camden Head Road will be addressed.
so is there in fact a survey? when you say survey, one could expect a sequenced collection of questions to gather data on specific matters?
I am really happy with the current concepts and I know that the designs are a result of years of effort and widespread community and expert environmental consultation. I am upset that a very small number of individuals are now trying to disrupt this process, for their own political agendas. There is a great need for this pathway in our community, for the families of young children, those who are elderly and those with a disability. The current design is one of integrity and based on evidence and so needs to be moved forward on. Please, do not let any more political agendas railroad this pathway. The current pathway is dangerous and lives are at risk. Thank you.
Priority..... Sections D1 - D8 ASAP.
I think the concept designs are great, my concern is that they are too expensive to do
I am at a loss as to how no one has not been injured along Camden Head Rd , we deserve a safe pathway for all to navigate, walking, biking and especially those who are disabled and have walker’s and mobility scooters ,
As a Dunbogan resident, I have keenly watched the work amd dedication from the committee. I am one of many keen walkers in the area, both for a stroll amd a long hike. I truly believe this will become an iconic walk in time bringing people to the area. Walking from pilot beach to north haven, up to Bonny Hiils amd then into Port Macquarie will be a huge asset to the local area. As an aside, whilst I am fit and mobile, many people struggle and the current areas that are used for different transports are terribly dangerous for those people and the drivers of cars. Looking forward to the completion.
I am in full support of this project.

Great idea. I would support the concept design on proviso that habitats etc are not adversely impacted. Maintaining our natural environment should be our priority. As we have an Aged cohort in Laurieton plenty of seating / rest areas, shaded areas and water bubblers should be provided to prevent dehydration and exhaustion. Also a number of stations dispensing doggy poo bags, along with plenty of bins, will be needed to ensure area is kept clean.

Hello,

As the founder of the Beach to Beach Riverwalk, I have a sincere belief that this project will bring a huge array of long-lasting benefits to the local Camden Haven community. As a whole, I applaud the work of the B2B Committee for engaging Council over the recent year and a half. Finally, B2B is getting the support it deserves. My congratulations to the current Council staff who have adopted this project and are seeing it come to fruition.

As a whole, the concept plans are fantastic. It is exciting to see designs progressed to this stage. I have the following specific comments and suggestions relating to a few pathway sections.

1. CH 20 - CH 160 - D5 - RU DUN 40-20 - Boardwalk
Examine the option of having NO handrail on the southern edge of the boardwalk... rather...install a 'wheel stop' edging. This would restrict prams, wheelchairs, and bicycles etc. from rolling over this southern edge. The height to water would not be extreme here and there is significant benefit to be gained by allowing the user to interact with the mangrove habitat, rather than be barricaded off from it.

2. CH 620 - CH 680 D8 - RU DUN 50-21 - Parking area at 'Rope Tree'
This location where at the river bend is consistently used by locals and visitors. Children regularly congregate and swim here, as it has a natural deep hole that is a close distance to a shallow sandbank area. It is also the opening into Googleys lagoon and boats, kayaks, fishermen and other water users regularly congregate at this junction. There is shaded area under the trees here that is regularly used as a picnic spot for people on chairs or rugs. It is common for three or more vehicles to be parked at this location.

Currently, no allowance has been made to provide for vehicular parking.

Admittedly, it is a tight space to facilitate both a path and a parallel parking area. However, if no parking is provided, it is inevitable that vehicles will park on the pathway. It would be entirely likely that several cars will park upon the pathway and totally obstruct pedestrian users. Yes, it could be signed as a 'no parking' area and fines could be imposed for non-compliance. However, you will inevitably have users who will disregard this restriction.

Alternatively, could you investigate solutions that allow for all users? Could the committee and Council consider widening this area to allow for up to three parallel carparks? Alternatively, can 'fill' be provided on the opposite side of the road to create three carparks?

3. CH 0 - CH 845 - D8 - RU DUN 50 - 20 and RU DUN 50-21 - Barrier/fence along entire section

Hand railing is proposed for this entire 850m section.

I would really hope that we can avoid the use of hand railing as much as possible throughout the pathway. We need to try and create a pathway that does not obstruct the views into the Camden Haven river. We have such an amazing riverside view and we do not want to spoil it with too many bollards and handrails. This is a particularly beautiful section of the walkway and it would be such a shame to walk or drive along this pathway and not have a clear view that connects you to the river, especially when long lengths of this section do no propose any significant pedestrian 'fall risk'.

At the most... can a castellated kerb be installed here with no bollards or hand railing on either side of the pathway? It is a far cheaper solution that requires very little long-term maintenance.

As a comment, it is becoming more prevalent for Councils to become overtly 'risk averse'. Increasingly, bollards or barricade hand railing are put in locations where risk is minimal. The committee needs to ensure that the pathway does not impede the magnificent vista offered by the Camden Haven River. If whole sections of the Riverwalk become 'caged' by balustrading or bollards, the beauty of this stretch of the Camden Haven will be severely compromised. The recently completed section of D1 and D2 is a prime example of where the pathway has been 'over barricaded'. Both bollards and hand railing have been used here, and this stretch of pathway is now constricted and polluted by expensive, maintenance intensive, unnecessary 'safety features'. This is not a city cycleway... it's a small town, scenic Riverwalk.

Thankyou

Andrew McCoubrie

Firstly, I would like to thank all involved for this opportunity to submit feedback on the Beach-to-Beach Riverwalk Footpath. There on certain projects knowing that nothing will change anyway has been, and still is, a tendency with some Councils to seek public feedback - but PMHC appears to be quite genuine in its recent efforts to involve the community, and most importantly, implement change where necessary.
I reside on The Boulevard in Dunbogan, and have done so for a number of years, so the Beach-to-Beach Riverwalk Footpath holds more than a passing interest for me.
I have no doubt that the feedback you receive on this project will be wide and varied. There will be feedback from long-time local residents who will again shudder at the thought of further development and increased crowds. There will be feedback from recently retired couples who have chosen to relocate to the area because of its once quaint appeal. There may even be feedback from those, both young & old, who simply wish to partake of the new footpath regardless of the change it will bring to the area.
Everyone deserves to be listened to.
Where I personally sit on the issue is not important. What is important, however, is for PMHC to be totally aware of the impact the footpath will have on the additional numbers of cars, bicycles and foot traffic.
It would be naive to think that with recommended, or even designated Beach-to Beach starting points, motorists will park safely in them and then proceed to enjoy the full length of the facility on foot or bicycle.
This, combined with the surge in patronage the Dunbogan Boat Shed and Dunbogan General Store have seen in recent years will mean safe car parking will be at an absolute premium.
Even outside the busy Easter & Christmas holiday periods many residential driveways are now being used by visitors for U Turns in order to wait, or backtrack,

before finding an available car space outside these two shops. And it is not uncommon to see cars parked for long periods in 'No Parking' zones in some areas. Whilst the success of the Boatshed and General Store is to be applauded, it must be remembered that much of the traffic congestion along this section of The Boulevard is a direct result of these two modest sized businesses. Pilot Beach, Wash House Beach and Point Perpendicular attract many visitors but it is generally only through-traffic and there is adequate parking to accommodate these cars at Camden Head. And we must not forget the additional traffic that has resulted from the new housing estates that have gone in at the back of Wash House Beach recently. Clear signage offering Scarborough Way as an alternative to The Boulevard – in and out of Dunbogan and to and from the beach, would assist in some way. I am very reluctant to introduce any hint of scaremongering in this feedback to Council but in closing I would like to go on record as having, once again, alerted PMHC to the very likelihood that a life will be lost in a motor vehicle accident on The Boulevard in the foreseeable future. There have been a number of near misses. The total number of cars now using these streets, the number of cars competing for restricted car spaces, speed, driver impatience, blind reversing and all the young families with children now living here, and visiting, all add to the danger. Yes, it is a difficult situation for Council to manage – limited access in and out of a beautiful part of the world always poses challenges. The needs of both the locals and the visitors need to be weighed up but I'm very sure nothing is as important as a young life.
I am strongly opposed to the proposed alignments and construction methods for D10 and D11. The current Option for D10 has a high potential for significant environmental impact on littoral rainforest, most of which can be avoided by widening the road on the eastern edge along to the boundary of Kattang Nature Reserve so that the path can then be accommodated on the road edge on the lagoon side instead of on the steep slope. While this would involve relocation of four electricity poles and also building retaining walls in some places, this eastern side of the road does not involve steep drop off slopes nor as much littoral rainforest. In comparison to the cost of building boardwalks, retaining walls and slope stabilisation works this other option must mean significantly reduced costs. With regard to D11, I strongly recommend that the current boardwalk route adjacent to the Pilot Station be incorporated instead of clearing littoral rainforest vegetation for a path along the access Road to Pilot Beach
Post Zoom Community Meeting 3/12/2020. In Regards to salt incursion to the littoral forest in section D, due to an open edge with the footpath being forest /Road side. I went for a site inspection this morning. 1. Call me ignorant, however squeezed 100m from the salt beach and directly adjacent the salt lagoon, allowed wind swept salt to be disbursed all over this section of vegetation to then only allow rain to wash it into the forest. My house on the headland is continually covered in salt spray. As section D is protected by the dunes (another sensitive environment) I cannot possibly see how this would increase sea salt incursion to this habitat. By shear natural effect salt is sprayed onto the trees and is the washed into the soil at the next rain event. 2. I note that it is very clear in section CH700 to CH780 where the path goes through the forest there is edge protection to the elements adjacent the road and the pathway is in a tunnel of vegetation under the canopy protecting the localised environment. This protects to forest from edge salt incursion with was mentioned in the meeting as a major issue to the path being roadside. You can see this

vegetation tunnelling effect also in CH40 to CH140 where the forest has grown over and not obstructed the path for invasive maintenance such as would be needed on either side of Camden Head Road.

3. Apart from the necessary boardwalk where there is not enough space for the pathway it would appear VERY EVIDENT that a pathway off road and under the canopy would be far less intrusive, more enjoyable to use, easier to maintain, trim and manage weeds, rubbish etc. We have to look not only at construction impact but long term impacts and that the pathway becomes sympathetic with the changing forest (part of it). Let nature help maintain by being under the canopy.

I sent some route options to Sam last night that were fairly simple and I feel that a site visit should be necessary to walk and discuss the impacts of an alternate route from approximately CH300 to CH720 or further but restricted to CH980.

We sometimes have to have disturbance environmentally when constructing something that will have a long term Environmental benefit, Social Benefit and economic and safety benefit. We do this so we also stabilise an environment for the long term and minimise human interference down the track. Running the path for a couple of hundred meters off the road saves on drainage, removes roadside danger, Lowers costs in engineering roadside requirements and delivering them. Roadside will require land fill grading, boardwalk, Castalated curbing and possibly also road upgrades. A more natural free flowing pathway under the canopy requires none of these and in fact breaks up larger expanses of soil covering giving a wider area for water to access roots. Separating the path and the roadway along here as many benefits that I don't think have been properly addressed. Don't tell me it’s too hard for council to do this because National Parks would place a pathway in similar environments all over this country with minimal impact.

The use of boardwalks over sensitive vegetation is a great proposal. The potential for tourism in the area will be increased if the boardwalk is seen as ecologically friendly, quality walking / riding experience.

The slowing of traffic along Camden head road through engineered devices (speed humps) would be a good idea.

Good Morning Sam
My Wife and I are residents living in Dunbogan and are very interested in the Beach to Beach project
I’m taking this opportunity to Have my Say.
Just two points
1. Could we have distance makers, the total is 11 km maybe 1 per km, these could be painted or sign information. This has been done in Warners Bay (from Speers Point to Eleebana) and is a great initiative

2. It is a footpath and so bike riders need to sound their bells if approaching pedestrians from behind. Pedestrians should have right of way, signage may help make the walkway safer for children and older walkers.

Both of these initiative have been used elsewhere, and seem to work well

Thank you for the opportunity to share these suggestions

Kind regards
Steve and Dale Allen

This looks to be a great well thought out plan that's provides safe paths to enjoy our beautiful area especially the proposed Camden head section which currently is very dangerous for pedestrians. The increased traffic and sometimes speed of cars is a bit of a concern. Ideas: The Pilot beach break wall between Pilot beach and washhouse desperately needs to be concreted (which I assume is in the plans) as there are large stones which are very tricky to walk on and are a hazard. They also prevent a majority of people access to this area. To encourage people to use the walk (rather than cars) a taxi ferry service across the river to Dunbogan and/or shuttle buses especially during peak season would reduce traffic and be an exciting trip. Thank you
Really needed for the elderly
The designs are wonderful and will make walking with the grandchildren more enjoyable and easier, especially when pushing a pram.
I am very concerned at the plans for D10 where the path will be on stilts through Littoral Rainforest on a very steep slope that is at risk of erosion. I do not feel that a path is important enough to risk the dire environmental impact this plan could have. Especially when there are other options, including widening the bitumen on both sides and having the path on the lagoon side between the road and the rainforest with bollards between. Another option would be a shared car/bike/pedestrian path with reduced speed limit and speed humps. We have precious but at risk natural resources in the area. Let's not destroy them. The path is purportedly for increased enjoyment of the natural surroundings so I believe it would be hypocritical to endanger them.
The proposed concept designs are exactly what is required to complete the beach to beach river walk. The safety for walkers and bicycle riders is greatly enhanced by this addition to the pathway. Having visited the area frequently over the last 20 years and now a resident of Scarborough Way my family frequently now uses the existing walkways and carefully negotiates the rest of the path way not built when walking to Pilot Beach. The proposed extensions will allow all residents to access all parts of the river walk with the current lack of safe access east of Dunbogan park especially frustrating. I fully support the proposed design. Thanks.
I write as a permanent resident of Camden Head. It has come to my attention that amongst feedback responses is a proposal recommending a change to the location of the walkway from the north side of Camden Head Rd to the south side (through sand dunes) to avoid a small section of littoral rain forest. Such a change involves creating 2 road crossings. Further, the proponents may be represented as constituting a consensus or majority view. I make these observations: 1. The original B2B concept for the walk/cycle way included the commitment to

safety for pedestrians and cyclists. To relocate the pathway to include 2 road crossings negates the safety achievement developed in keeping to the north side of Camden Head Rd. Extant is the already safety concern for local pedestrians and cyclists given road width, visibility, vegetation and abuse of speed limits. There is a present impossibility for children (of independent age) to be safely either pedestrians or cyclists on Camden Head Rd.
2. It is environmentally arguable that shifting to the dunes side of the road is a better conservation outcome than running a pathway under the exisiting canopy, thereby preserving the dunes and the protection they offer to the north side vegetation.
3. Amongst locals, there is an active minority who have a particular set of beliefs and interests (as they are entitled) whose ideological views and claimed environmental facts are assertions not shared unanimously, nor substantively accurate. e.g. I have planted a mahogany gum which became the resident food source for a released and returned koala, to be told that koalas and their food trees are not endemic by some of our "local environmentalists".

Laurie Davies
5 Allenwood Street
Camden Head
18 December 2020

PS. The Survey proved inaccessible and would not download to my computer, when accessing the PMHC website on different days.

Regarding safety: the area has frequent black spots for mobile ph reception. Would there be any personal safety considerations for communicating assistance required?

A great initiative to get the populous moving. It would be great for it to be all inclusive - skateboard, roller blade, roller skate etc.

I think the design is wonderful and the sooner Council move forward with the project and meet the demands of this community for safe walkways and footpaths the better. Please Council, do everything in your power to obtain the funding required to move this project into a reality. Half-finished pathways only encourage people to get out on foot or bikes to exercise, only to encounter very dangerous sections of road on that journey. A serious accident or worse is surely a possibility if this is not completed.

I would like to see this project progress to completion as a matter of priority. I have noticed many local residents and holiday makers out walking, running cycling for necessary exercise on a regular basis. I am most concerned about the safety of these people from local vehicular traffic which is increasing all the time. I fear it is only a matter of time before a tragedy strikes?

At present, a lot of existing pathway exists but danger occurs when the pathway ends and pedestrians and cyclists are forced to use sections of road with no footpaths. This is extremely dangerous to the community and I myself have witnessed a few close calls where vehicles have just missed walkers and runners etc by inches!

The B to B pathway has become very popular and the Camden Haven area is well known for it and it is already a tourist attraction for the area. Unfortunately, the risk of serious injury increases significantly during holiday seasons as Pathway users and vehicular traffic in the area increases. The completion of the entire B to B Pathway as proposed needs to happen ASAP to eliminate this present danger to the public. Safe access to the pathway all the way around is a no brainer to prevent accidents from occurring. I believe Council has an urgent responsibility to prioritize this project for the safety and enjoyment of all concerned.
As advised by the PMHC switch board, my submission has been sent to council@pmhc.nsw.gov.au , attn Liz Brennan Peter West Friends of Kattang
Why can't a bridge be put across at Dunbogan (d7) and follow the river edge? There used to be a bridge there, and a path all the way along to the beach. The complaint back then was that the bridge wasn't replaced. It seems it would be a cheaper option not to mention the views along the river and the upside would be the oyster farms etc would have as much an impact?
As directed by the receptionist at PMHC, I have emailed my submission to council@pmhc.gov.au And marked it attention Liz Brennan.
As a resident of Camden Head with 3 school age children I approve of the design and wish the construction to go ahead asap. I have spoken to other residents on the headland and we are fed up with our children not having a safe footpath/cycleway to visit their friends in Laurieton/North Haven. There has been a number of near misses with vehicles and children on bikes. We are very happy the design continues on the Googly's side of the road with no unnecessary road crossings. - Ron Byrnes, 4 Bergalia Crescent, Camden Head
I have tried to send Camden Head Environment Network's submission to B2B Concept Designs however this page does not allow attachment of the submission. I have sent it to council@pmhc.nsw.gov.au and cc to Liz Brennan.

Beach to Beach Written Submission - Email

I wish to just say what an amazing job the Beach2Beach people have been doing trying to organise our footpath out to Pilot Beach despite what would be the most frustrating work anyone could imagine.
The Dunbogan side is such a dangerous piece of road, to walk and ride along and I myself have had times where I've have had to get into the bushes in certain patches along the way to avoid oncoming traffic. And let's face it, the traffic has increased dramatically in the last 10 years.
On the other hand, as a driver, while driving along the road it is so dangerous when meeting people walking their dogs, cycling alone or with children, pushing prams etc. and not everyone shows the care that should be taken as there is very little room, or even impossible to get off the road in some spots. My husband has had several close calls whilst cycling which has made him less keen to get on his bike for much needed exercise.
As a Dunbogan resident I look forward to the time when we can safely walk or ride to the beach. We certainly don't look forward to the coming summer with all the extra people about and trying to park a car at Pilot beach. Already on normal weekends its packed well beyond its capacity. You have to park along the road and the only place then to walk is on the road itself…not great!
Surely the people who are against the path, in particular the Camden Head area, should realise that people walking or cycling has less impact on the area that we all love and call home. (I personally feel they are being selfish). The paths out to Point Perpendicular and Flower Bowl are much better than trying to walk along the road.
Come on!! Let's get this path completed. It's becoming a joke. When we drive through other coastal villages there are footpaths everywhere, even less populated places seem to have footpaths. Dunbogan needs to be made safer for its residents and visitors alike.
Kind regards
PS: I do appreciate what has been done with the Dunbogan jetty upgrade, fish cleaning tables and Dunbogan park. It is so nice to see them in use with people out enjoying themselves in our beautiful part of the world.

G'Day Liz, Myself and my wife are 80 Yr old and residents of 13 Seaview Ave Dunbogan. We have been following the Paths construction and challenges with great interest.

We have contributed $500 to support its construction although it is a PMHC responsibility.

It will provide a safe egress for wheelchairs and people to visit Laurieton or simply to go and catch a fish.

The Camden Head Rd traffic is fast and ever increasing. It is used by Residents visiting builders, scenic drivers and Holiday Makers unaware of the roads dangers one being people and children on the road. There is no footpath.

Dunbogan is no longer the quiet village it once was in1946. It has become a place to reside, a Tourist and Holiday destination.

Construction of the B2B pathway is timely as it will provide safe passage for pedestrians.

This has been missing since the opening of the Bridge across the Camden Haven River gave vehicle access for all to Dunbogan and its environments and encouraged development. Its time.
Best thing for the Camden Haven this century
We are so pleased that there has been progress on this great community project and look forward to when it will be completed. We use the pathway every day to walk, bike ride, and take our dog for its walk. We greet so many locals and tourists who enjoy our beautiful area and many comment on the pathway. We can't wait to be able to ride or walk the pathway in it's entirety from north haven beach to pilot beach. This is such a great asset to our community....thanks to the council for helping with the project.
I fully support this wonderful B2B project. The sooner the better for our community
Hi Liz My wife and I have lived in the Camden Haven for more than 40 years. We have worked, raised a family and thrived in this area. We are active within the community. The B2B project has our full support. We class it as an important and necessary council project. The B2B shared pathway will bring long term benefits to our community(increased tourist, increased public safety, historical education, highlight natural beauty). B2B has huge public support(extremely well attended public meetings) and a long time dedicated committee. Some sections of the pathway have been created by public labor and through public donations. The B2B concept has been around for over a decade. We feel that this project should be completed as soon as possible. The council should be praised for their support BUT this project needs to be COMPLETED. Many localities around NSW and Australia have interconnecting pathways. The Camden Haven is truly BEAUTIFUL and should be showcased in the most effective manner. A completed B2B pathway will do this. It ticks ALL the boxes. Thank you for allowing us to have our say. Wishing you good health and prosperity.
I fully support B2B, its a great plan for everyone, the sooner its finished so many from will be able to walk to and from Laurieton.
Good afternoon Liz, I am a resident of DUNBOGAN and fully support the Beach to Beach pathway. I regularly walk from Hope Close DUNBOGAN to the headland and return, I'm afraid if a footpath is not approved someone is going to be injured and possibly killed on this particular section. I also support the concept plans for the other 4 remaining sections.
Dear Liz, I am just writing to you to let you know as a rate payer and a resident of Dunbogan I fully support the construction of the Beach to Beach pathway. I look

forward to be able to walk safely into Laurieton without having to walk on the road, as it's an accident waiting to happen especially during the holiday season.

Looking forward to councils full backing with this important (safety) project.

Good Morning Sam
My Wife and I are residents living in Dunbogan and are very interested in the Beach to Beach project
I m taking this opportunity to Have my Say.
Just two points

1. Could we have distance makers, the total is 11 km maybe 1 per km, these could be painted or sign information. This has been done in Warners Bay (from Speers Point to Eleebana) and is a great initiative

2. It is a footpath and so bike riders need to sound their bells if approaching pedestrians from behind. Pedestrians should have right of way, signage may help make the walkway safer for children and older walkers.

Both of these initiative have been used elsewhere, and seem to work well

Thank you for the opportunity to share these suggestions

Dear Liz

As a 35 year resident of Camden Head Road Dunbogan I would like to register my full support for B 2 B pathways. This project is long overdue for residents and visitors alike to provide safe access around our beautiful area. It is a great plan that needs to be completed as soon as

possible. I look forward to a positive and speedy outcome to this extremely worthwhile project

Submission on proposed route of the Beach to Beach Dunbogan Riverwalk Footpath

I am writing this submission on behalf of Hastings Birdwatchers (HBW), a community group interested in birds and their conservation.

Our local council area encompasses two of 45 Key Biodiversity Areas (KBAs) in NSW. One of these areas is the Hastings Macleay KBA. KBAs are sites that contribute to the global persistence of biodiversity, including vital habitat for threatened plant and animal species in terrestrial, freshwater and marine ecosystems. They are considered "Nature's Hotspots". The Hastings Macleay KBA was proclaimed by Birdlife International to help protect the critically endangered Regent Honeyeater, Swift Parrot and endangered Australasian Bittern and the B2B shared bicycle track goes through the southern section of this KBA. Firstly, we welcome the construction of the B2B pathway and as a local resident of Camden Head I know how necessary this path is. However, as birdwatchers we know that developments have had very adverse effects on the survival of birds and other biodiversity and we have real concerns that the pathway as proposed will have adverse effects on our resident birdlife. Birds are great indicators of the state of the

environment. They are mostly out in the daytime, are highly visible and much surveyed. There is good data on bird populations and BirdLife Australia's data shows that many birds, even the common ones like the Laughing Kookaburra and Willy Wagtail, have declining populations. Our specific concerns are listed below.

- The proposed D3, D5 and D8 sections of the pathway will involve removal of some mature trees. We are particularly concerned that no more Forest Red Gums in these sections are taken down. Dunbogan has already lost many of these important trees and some have died, or are dying, along the already completed sections of the B2B. Any new sections of the pathway must be built in such a way that tree roots are protected. Large Forest Red Gums are an important food tree, especially in drought years for the migratory Swift Parrot (and the koala). This parrot is listed under the EPBC Act as Critically Endangered and was seriously impacted by last summer's bushfires. Its population may now be as low as 350 birds. We have observed 30 of these birds in Dunbogan in the past. We are also concerned that mangrove trees will be removed in both D3 and D5. We understand that in D3, the landholder's gift of the pathway means that many more live mangroves will need removing than if the pathway was to go through a section which already has dead trees. This was before the EIS process was completed! This is very unsatisfactory. In D5, Camden Haven Environment Network has proposed an alternative arrangement for the boardwalk that will involve only one mangrove tree being removed. This should be given serious consideration. In D8, (CH600 to CH820) there is also an Endangered Ecological Community (EEC) - Broad-leaf Paperbark –Swamp Oak-Saw Sedge Swamp Forest and care will need to be taken not to damage this EEC.

- The proposed D10 and D11 sections of the pathway will impact on the littoral rainforest along Googley's Lagoon. Littoral Rainforest and Coastal Vine Thickets of Eastern Australia are also listed as Critically Endangered under the EPBC Act and many of them were burnt in last summer's bushfires. If the pathway does go along the western side of Camden Head Road, then every effort must be made to minimise opening up the rainforest to the effects of salt spray and wind. An appropriate boardwalk should be the option for these two sections. The rainforest here has a breeding pair of White-bellied Sea-Eagles, as well as Wompoo Fruit-Dove both listed as Vulnerable under the Biodiversity Conservation Act. Noisy Pittas visit in winter. The presence of these species (and possibly other fruit-doves) indicates that this rainforest is very important habitat and contains fruiting rainforest trees. At D11, there is also another EEC - Swamp Oak Floodplain Forest at CH 260 to CH320. Care should also be taken to minimise damage to this community.

Under NSW state legislation, is a requirement to "avoid, minimise, offset" in that order. Given that avoiding damage to the littoral rainforest should be

the first priority, why has the eastern alignment option never been seriously considered? Safe crossings could be put in place (as they are on the school to school pathway), native title issues could be resolved and the cost of removing power lines may be less than the costs of purchasing offsets for the damage to the rainforests.

Thank you for the opportunity to make a submission on this development.

B2B submission from Friends of Kattang 22.12.2020

I am writing to you on behalf of Friends of Kattang, a bush regeneration network that has worked for over 20 years to maintain the native vegetation at Camden Head and in particular that within Kattang Nature Reserve. Friends of Kattang are one of a number of like organisations working across the whole headland. I am also an interested resident of Camden Head.

Please be aware that we in principle support the construction of the B2B pathway, as a long overdue track infrastructure connecting Camden Head with the rest of the Camden Haven. It is a resource for use by residents of the headland and visitors to the area alike.

As a bush regeneration group we are particularly concerned about the maintenance of native vegetation and exclusion of weeds and it is this aspect of the B2B development that we wish to comment on.

We appreciate the opportunity given during the consultation meetings to hear and understand the Beach to Beach and PMHC positions on alignment, construction methods etc. Also the opportunity to discuss our concerns and possible options for minimising the damage that will certainly occur. The points below reflect those discussions

It is understood that while keeping the track on the western side of Camden Head Road appears to be the likely outcome in the final design of the track in segments D10 and D11, it must be stated that this is not the optimum alignment when considering the viability of the native vegetation and in particular the Littoral Rainforest (critically endangered under the EPBC ACT) along Camden Head Road. It also does not take into consideration safety considerations of the residents of the headland, as any resident wanting to use the track will have to cross Camden Head Road.

With these issues in mind we would ask that the following steps be taken in the construction of and the ongoing maintenance of the pathway in these segments of the B2B.

1. The littoral rainforest is not only critically endangered it is also very sensitive to disturbance and in particular removal of vegetation along exposed edges. The B2B pathway will certainly have an impact on the rainforest. We would ask that every effort be taken to minimise this impact by:

a. Keeping the footprint of track to a minimum. We do understand that the track needs to be of a minimum width to function as a shared pathway.

b. Minimising the impact of disturbance on the remaining vegetation. This in particular relates to the impact on the root systems of the remaining trees and shrubs

The various construction methods proposed can significantly affect both of these issue. While a board walk has been proposed in several locations along the track, we would ask that this be increased to just about the total track except in those few locations where there is a broad expanse of cleared land between the road and the forest. These are to be found between the intersections of Camden Head Road with Unique Close and Bergalia Crescent, also once the track reaches the open areas at Pilot Beach.

2. A vegetation management plan is required for all current and proposed sections of the walkway. This is most important in the areas of rainforest in sections D10 and D11. This will provide for plantings of locally where these may be needed. Also the disturbance along the track will likely introduce weeds in all sections of the pathway. This again will be most critical where there is rainforest in sections D10 and D11. The plan should cater for ongoing monitoring for weeds and their removal and funding to support this. There is the possibility for cooperation between the

B2B committee, PMHC and the several bush regeneration groups that work on the headland and at other points along the track which we would encourage you to follow up.

3. Finally provide at least a single point at which residents can safely cross Camden Head road. There are young children and residents in their 70s and 80s on the headland both of whom would benefit from a safe crossing point. I will not go into designs etc. as I have no expertise in this, suffice it to say consultation between residents and PMHC engineering should be able to come up with an appropriate position and safe design.

Whilst the above focusses on sections D10 and D11 there are some points we would like considered in the other sections of the track to be constructed D3, D5 and D8.

a) There are many mature trees along these sections, some are eucalyptus and others casuarinas. Maintaining these trees in good health should be considered in all areas. This maintains the natural features along the track that contribute to the beauty of the Camden Haven and why we live here and visitors come for their holidays.

b) Some of the trees are Forest Red Gums, *Eucalyptus tereticornis*, one of four eucalypt species in our area which are the feed trees for the Swift Parrot and Regent Honeyeater, both critically endangered under the EPBC Act. These mature trees are favoured by the birds as they produce abundant nectar. Both species have been recorded recently in trees in this area.

c) In previously constructed sections of the B2B several of these trees have already died and two of these have recently been removed. While there are several factors that could have caused the death of these trees disturbance of the roots during construction and the subsequent laying of concrete over the roots are likely to have contributed. I agreed during the consultations to identify the trees we were most concerned about and will complete this in early January.

We would ask that to prevent similar problems in the future that

1. Where possible the track avoid the root area of the trees

2. That where ever the pathway passes over the root system of these trees that the track construction be altered to minimise the impact on the trees. A board walk type construction would be optimal and is requested.

We thank you for the opportunity to comment on the current plans and look forward to seeing future plans including the requests that we have made above

I would like to say after the disability access disappointment with the walk extending past Town Beach it is critical that we ensure this walk and all the others are disability accessible. People with disability are starting to doubt the Council's commitment to disability access let alone the influence of the Disability Access Committee. I was cornered by a wheelchair user who was very upset about that most recent extension.

What we need to remember is that physical infrastructure is a once off cost. It usually does not require recurrent funding but is available to all for many years! And the next time it is rejuvenated it would benefit from the work done today.

We love Port Macquarie and want to enjoy the beautiful sites it offers as much as possible, like everyone else. Please, we much reignite our commitment to create an accessible community so all can partake and be included, not as an afterthought but in the forefront of our planning process.

Camden Head Environment Network Submission
Have Your Say-B2B SUP Concept Designs 22nd December 2020
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1. Introduction

☐ Camden Head Environment Network (CHEN) encompasses Dunbogan Bushcare, Friends of Kattang and a wider network of people connected to the area and interested in the protection of its biodiversity.

☐ CHEN supports the B2B Pathway and has worked cooperatively with PMHC to ensure
a balanced outcome between pathway users' experience and environmental protection and enhancement.

☐ The following comments and questions (highlighted) are provided to assist B2B to
achieve a balanced outcome.

☐ CHEN acknowledges the more than 20 year commitment of Dunbogan Bushcare and
Friends of Kattang to enhancing the area's natural environment and encourages the
B2B project to respect this commitment and to work with this intimate knowledge of
the local environment.

2. General Comments

Vegetation loss and environment restoration

☐ The development of the B2B SUP will result in removal of a significant amount of
native vegetation and will create ongoing impacts to native vegetation including plant
species protected under the NSW Coastal SEPP.

☐ The loss of native vegetation will alter the natural character of this environment,
detracting from residents' and visitors' experience.

☐ Could the project quantify the **total** amount of native vegetation (SEPP listed and
unlisted) to be removed under this Concept Design plan and an estimate of the **total**
area of impact to all native vegetation during construction?

☐ Has he project considered **restoration activities** such as stabilisation, weed treatment planting and ongoing maintenance along the length of the B2B?

☐ Is an Environment Restoration Plan being considered as an integral part of the B2B
from segment D3 to D11?

☐ Could offsets be used to fund such a plan?

Use of boardwalk / pathway narrowing to protect EECs.

☐ While we understand that further investigation (EIS and geo-tech. surveys) to determine final B2B designs are ongoing, it is difficult to comment on specific areas where it is unclear whether a concrete pathway or boardwalk is to be used.

☐ CHEN would prefer in all areas which impact on an EEC or create a gap in the EEC
continuity, minimum impact designs are used - boardwalk is our preferred option for all EEC areas.

☐ Boardwalk design and construction should protect root zones i.e. Landmark diamond piers or the use of bridging pads as Wingham Brush NR.

☐ Where possible alteration of SUP width may be necessary to protect sensitive areas and particular trees.

Improving visual amenity-restoration plan

☐ As a visitor attraction, the SUP will focus more attention on the existing degraded
environs which it traverses e.g. along the Boulevarde in Dunbogan.

☐ In this segment informal car-parking impacts mature trees, there is evidence of previous clearing for views & use of the public foreshore for informal structures such
as plantings of non-native species.

☐ In this segment there has also been tree loss – large stumps stand where mature trees
have been removed and an isolated fig has been ‘pruned’ over time.

☐ East of Dunbogan Reserve to approx. Scarborough Way, sections of riverbank and
environs are eroded, with dead standing native vegetation in some places and informal carparks contributing to erosion and compaction of tree root zones.

☐ Is there a plan to restore foreshore areas to enhance visual amenity? Previous PMHC
foreshore restoration works from DB Reserve to Scarborough Way have been undertaken for bank stabilisation and with plantings to protect edges, impede access
and act as a safety barrier.

☐ What visual amenity guides the concept design along the river foreshore, particularly
in areas east of DB Reserve? It would change the area's natural character to see it hard
rock-walled all the way with no screening plantings of low growing native vegetation.

☐ Appreciating that some of the foreshore area is tight, can a physical allowance be
made in the design for low plantings?

Community stewardship-restoration plan

As reported at the consultation 15th December, a key theme to come from Have Your Say
consultation is about the opportunity for community involvement.

☐ CHEN suggests that there is scope for the community to work with restoration professionals and experienced volunteers on a long term project to restore degraded
environments along the SUP.

☐ This would support the B2B 'hero story', which as well as one of community passion
for a connected community, could also be about stewardship and protection of the
natural environment.

☐ Such a project could involve a partnership between local community organisations
such as Chamber of Commerce and existing Bushcare groups and could involve joint
funding applications. While it is not possible to expand existing groups' area of bush
regeneration, it should be possible with expertise and information aligned with a restoration plan, to assist in establishing other groups with a Dunbogan focus.

☐ What role could B2B / PMHC play to foster such a partnership and restoration plan?

☐ Could offsets be used to fund the development and implementation of a plan?

Linkages to Kattang NR

☐ For infrastructure which aims to attract visitors, linkages to outstanding recreational
opportunities in Kattang NR need to be considered to maximise the visitor experience.

☐ How can SUP users wanting to access Kattang NR walking tracks at Bergalia carpark

exit the SUP in a safe manner at Camden Head and Pilot Beach roads junction?

☐ The SUP design does not adequately address these current users.

3. D3 Mangrove Segment Bell Street

Land donation agreement

☐ PMHC has confirmed (15th Dec. 20) that the agreement with a private individual re
donation of land to B2B in this segment, specifies the concept pathway alignment and that this alignment was agreed upon and was legally 'locked in', before the community consultation process and an EIS were undertaken.

☐ Why and can this be changed?

☐ This is not a good environmental outcome as this alignment will necessitate removal
of healthy mangrove species, when an alternative alignment following the line of least disturbance, could have voided this by using an already degraded area.

☐ How will any offset costs be allocated? Any offsets for loss of Estuarine Mangrove
Forest in this area should be used to restore this area.

Estuarine Mangrove Forest viability & restoration

☐ The ongoing health of this mangrove community should be investigated as part of a
B2B SUP Restoration Plan to determine its long term viability. Threats to this community need to be identified and ameliorated to avoid further degradation and
possible loss of amenity, which would alter the SUP user experience.

☐ It has been observed that the level of tidal inundation height is less in this segment
when compared to the eastern side of the Boulevarde.

☐ Is this due to the ongoing impact of the road and its one drain allowing limited water
exchange?

☐ What could B2B do to ensure the ongoing viability of this remnant forest?

Construction impact

☐ Drawing RU DUL-3021 shows the approx. surface area required for SUP is 400 square
metres and that a 5 metre clearance will be allowed for boardwalk construction.

☐ A 5 metre impact area is excessive. Construction should aim to minimise the impact
on pneumatophores, using sensitive construction methods which avoid any compaction by foot / machinery and mechanical damage. Examples such as Diamond
Piers and limiting the number of piers to minimise damage.
https://selector.com/media/files/pedestrian-bridges-brochure.pdf

☐ What construction methods will be used to reduce impact?

Weed management

☐ Friends of Kattang have provided PMHC with an indicative map of *Ochna serrulata* in
D3. Questions remain concerning the removal and ongoing management of other weed species from Council and private land in this segment e.g. mature Camphor Laurels, Bitou, Lantana, Winter Senna, Ground Asparagus etc.

☐ A SUP Restoration Plan including community involvement opportunities could address the issue of weeds on private as well as public lands.

4. D5 Mangrove Forest Vegetation Impacts

Estuarine Mangrove Forest -CH 20 to CH 160.

The Accuplan Preliminary Impact Analysis indicates that the design will result in loss of 318
square metres of Estuarine Mangrove Forest, protected under the Coastal SEPP. This is a
poor outcome for this vegetation community, which in this area only occurs in isolated
fragments along the CH river frontage.

☐ The current design does not sufficiently mitigate these impacts by considering alternative routes.

☐ A previous design by GHD-Option B (D5 Alignment Overview figure 2.7 page 13),
would result in less impact to Mangroves. This design was overturned due only to recreational user concerns.

☐ The KBR Concept Design indicates approx. 60 lineal metres of boardwalk will impact
on Mangrove Forest by an alignment that enters the forest at the CH20 and ends through 160, a closer alignment to the Mangrove edge than the GHD design.

☐ The Impact Analysis mentions minimising vegetation loss by “pruning or lopping
overhanging (Mangrove) branches”. This is not considered an acceptable method for
tree protection and will incur ongoing maintenance and cost to PMHC.

☐ The current documents show conflicting information. The Preliminary Impact Analysis drawing shows 2 ‘fishing’ bays at CH60 and near CH120 while the Concept Design drawing shows 1 widened bay area between CH60-120.

☐ Which drawing is correct?

☐ CH60 and CH 120 impact sea grass. The bays should be designed to avoid sea grass,
not achieve a balanced architectural drawing.

☐ The riverbed here is shallow and not conducive to fishing which occurs mainly where
the river is deeper.

Recreational use area-Camden Haven Yacht Club

See Attachment 1. D5 Design Options for consideration

☐ The current design shows a change of direction, impacting Mangrove trees to avoid
an area of private recreational use for dinghy storage and river access.

☐ Drawing RU DUN 40-20, from CH 120-160 shows the SUP as a tightly cranked, pathway which veers into Mangrove Forest to avoid the dinghy storage and launching area of the Camden Haven Yacht Club, comprising a group of ten dinghies

permanently stored on the foreshore and a concreted launching area all in a space between 2 Mangrove Forest patches.

☐ This is a poor outcome for protection of Mangrove Forest and could be avoided.

☐ It was reported at the consultation (15th Dec) that discussion with the CH Yacht Club
indicates that the group is 'wedded' to the current location.

☐ KBR said (15th Dec) that this 'bend back' is indicative only and that the alignment
may be adjusted to minimise vegetation loss and avoid the Coastal SEPP, by diverting
through a 'channel' between CH 20 and CH 100, which could result in less loss of habitat (to be confirmed).

☐ A visual assessment (Dec 20) indicates that the channel does not appear to be wide
enough to accommodate a boardwalk without further vegetation removal and notes
the presence of an old growth Mangrove at the channel head.

☐ Why are the needs of a single use activity given higher priority than vegetation loss?

☐ What investigations have been undertaken to determine the legal status of the user
group and any regulatory requirements of other bodies in relation to this use?

☐ Is this a policy issue for PMHC? Has this been flagged?

☐ Have other options been considered which would result in less Mangrove impact and
ongoing management?

Alternative Option for D5 and CH Yacht Club

☐ Request revert to a similar GHD design B alignment for this segment?

☐ Request consideration / detailed investigation and ongoing discussion between PMHC / KBR and CHEN re design alternatives listed as Attachment 1?

5. D8 Gogley's Lagoon Creek

Vegetation fringing the waterway

☐ An integral part of the visual amenity of Camden Head Road in the D8 segment is the native vegetation fringing the waterway, which from the road and a boat in Gogley's Lagoon affords important screening of the busy, noisy road.

☐ As the Accuplan impact analysis states, it may be unavoidable to avoid vegetation loss in parts due to minimal verges and steep embankments, however every effort should be made in further investigations to minimise this loss.

☐ If this is not possible could allowance be made for planting low growing species such as Lomandra, Dianella etc. to soften the visual impact and retain the character of this area?

☐ The Gallery Swamp Oak along a substantial part of D8 will be heavily impacted. Past PMHC river restoration works have opted in some locations, to cut them off in a way which encourages them to regrow from root stock.

☐ There is evidence that residents have cut this regrowth for views and river access.

☐ Could the B2B design discourage the continuation of this practice?

☐ Has the project considered ways of mitigating the initial estimate of 754 square metres loss?

CH 140-240 Remnant Trees with Managed Understorey, Aboriginal site, picnic tables, parking area and CH240-320 recreational parking, fishing, launching.

Midden

☐ On the surface there are 2 distinct areas of shell midden, perhaps a larger area subsurface.

☐ How will the Aboriginal midden site be investigated and protected?

☐ Is there a possibility that the SUP alignment could protect it by covering it or by densely rehabilitating it with soil capping and low growing native vegetation?

Remnant tree protection / car parking

It has been observed that mature trees in other parts of the B2B have been removed or are
being impacted by the pathway and current usage such as is occurring near Dunbogan
Boatshed (informal parking on tree root zones).

☐ How will the B2B avoid impacts to existing mature trees in D8?

☐ Will the current damage to trees near the Boatshed be addressed by investigation by
arborist and prevention of parking on root zones?

☐ Any area of pavement near remnant trees with managed understorey in this area
should avoid root damage (no digging into root zone) particularly during construction.

☐ Could permeable paving be used e.g. https://www.specnet.com.au/press/1219/wat_181219/Permeable-Concrete-Paving-Melbourne-from-WaterPave

☐ In this D8 picnic area 8 parking spaces have been allocated. This appears to be excessive to accommodate current use. It is arguable that this whole area has more
amenity for river users i.e. fishermen, boat users etc. without so many carparks, which will create more constraints for enjoyment and usage.

☐ Removal of up to 4 car parking spaces in this area could accommodate better placement of seating and a less constrained area for people fishing and / or enjoying
the riverbank.

☐ There is ample street parking in adjacent and Bell Street.

☐ Suggest that one or more parks should be a disabled carpark and set-down area.

☐ At CH 220, it appears that 2.5 parking spaces are sited within a tree canopy which
will increase negative impacts on root zones. Please avoid parking in CH 220-240.

Picnic tables CH 200

☐ The concept design shows 2 tables (currently 1) in tree root zones and under canopy.
The tables are too close to the road to have comfortable amenity or safety.

☐ Could 1 table be deleted in favour of 2 seats, sited closer to the river-edge as a more
amenable rest stop?

☐ Could the picnic tables be located away from trees but roofed for shade?

☐ Another possible siting for picnic tables is the Aboriginal shell midden site. Not suitable depending on protection treatment?

☐ How could the concept design or construction methods be altered to prevent damaging mature trees from table base material?

Coastal Saltmarsh CH340-440

☐ There is 90 square metres of EEC impacted in this area -it would be highly desirable
to boardwalk this section and protect it during construction with 'no go' barriers.

☐ There has already been loss of this EEC in Dunbogan reserve near the park exit, by
placement of boulders on top of a community that could have been avoided.

☐ Is boardwalk an option in this area?

CH 500-520 notated as boardwalk

☐ This area needs rock armouring and planting to stabilise bank and protect it from
wash and flood as it is currently threatening to undermine the road.

CH 520-550 current riverside parking

☐ As this area has been widened to accommodate parking could it provide an opportunity for a fishing spot / seating?

Swimming spot access CH 620

As advised at the consultation (15th December) some residents have requested that B2B
provide access to an informal swimming hole near CH620, at which ropes are fixed to two
trees, the main one a large paperbark overhanging the lagoon, to swing out into a swimming
hole. B2B project are considering providing car parking spaces here or opposite to accommodate this activity.

CHEN does not support parking here for the following reasons:

☐ In the past PMHC have committed funds to prevent bank erosion by hard-rocking,
native vegetation planting and installation of bollards and by providing parking in the
area to reverse bank erosion. Planting and bollard installation only resulted in an area further along the foreshore being impacted and this is now severely degraded.

☐ This area of riverbank is already eroded and needs protection. Carpark allocation is
likely to result in more damage. One former 'swing tree' next to the existing tree has
already collapsed, accelerating bank erosion.

☐ The SUP pathway provides adequate improved access to children who are the main

users of the swimming hole. The aim of the SUP is to provide better pedestrian / cycle access not to create areas of user conflict and maximise environmental damage.

☐ The area near the swimming hole is degraded. Erosion from foot traffic is evident
around the roots of the Paperbark, around the base of the White Mangrove adjacent
(less common in this area than Grey and continuing for a distance along the foreshore to the east.

☐ Paperbark limbs have been illegally removed and a structure made to aid climbing
out to the ropes. It is likely that this tree will collapse at some point.

☐ Why should PMHC facilitate vehicle access to an area which has been illegally cleared over the years and could lead to liability in terms of user safety?

☐ The provision of car parking on a busy, constrained roadway is not necessary at this
point as it is provided in other nearby locations such as on street parking in neighbouring streets.

☐ Is there an opportunity to formalise access, reversing the impact on vegetation and
protecting the area without adding carparks?

☐ Would a jetty out over tree roots be considered so that tree damage can be mitigated?

Swamp Forest Endangered Ecological Community.

Between CH 620 and CH 820 the SUP impacts an area of Broad Leafed Paperbark / Swamp
Oak / Saw Sedge, an EEC. Up to 760 the pathway intrudes into the EEC.

☐ The Concept Design shows a concrete pathway using significant amounts of fill and
360 square metres of impact.

☐ CHEN can only support the use of boardwalk in this sensitive environment. Use of
boardwalk would also mitigate the need to extend 2 drains.

☐ This good condition of this forest is largely the result of the prior work of Dunbogan
Bushcare group.

6. D10 Segment from end of D9 to CH 980 western alignment with Lagoon edge

Minimising Environmental Impacts on Littoral Rainforest

From the B2B project's first iteration it has been evident that a higher priority than

protecting an endangered species and native vegetation is SUP user safety (although in
other segments such as D9 which crosses 30 private driveways, and on Dunbogan Bridge
this not evident) and the priority of maintenance of a visitor experience of almost 11km of
continuous waterway views.
From the outset headland Bushcare groups have advocated for:

☐ An eastern alignment

☐ Realigning Camden Head Road or sections of it.

☐ Crossing the road to link to a highly used attraction- South Beach

The B2B project has advised the following constraints:

☐ Power supply poles re-location difficult.

☐ Land title issues with Kattang NR and a Native Title Land Claim make planning difficult. It is understood that one issue (Land Claim) is almost resolved.

☐ Given land title and boundary issues why was the boundary of Kattang NR not surveyed early on to establish a planning baseline from which an eastern alignment
could be assessed and ruled out or in?

☐ The B2B key design criteria of safety insists that SUP will not cross the road, despite
the fact that safety solutions can be engineered and have been in similar projects such as the School to School SUP

☐ While safety is a major concern for visitors, the SUP does not provide for safe access
to the pathway for the residents of Camden Head village at any point.

☐ Will options for Camden Head residents to access the SUP at safe crossing points be
provided?

Environmental Impact

☐ While understanding the difficulty that any alignment in D10 will impose on either
side of CH Road, with an EEC on both sides, CHEN's view is that the B2B project has
not adequately considered any alternative option for any part of the D10 segment to
avoid environmental damage.

☐ This is counter to the legislation and the Commonwealth's National Recovery Plan
for the Littoral Rainforest and Coastal Vine Thickets of Eastern Australia Ecological

Community (Feb 2019) which states:

2.1.2 Avoiding or mitigating likely significant impacts

The primary way to prevent the decline of Littoral Rainforest is to protect remnant patches.

This includes not undertaking activities within close proximity that could impact on the

extent, quality and functionality of Littoral Rainforest. The primary goal should be to avoid

all impacts to patches of Littoral Rainforest. Offsets should be considered a last resort after

all avoidance and mitigation measures have been exhausted and residual impacts remain.

We do not believe that all options have been exhausted to avoid and mitigate the effects of

the B2B on Littoral Rainforest.

Climate Change Impact on Vegetation Management / Public Safety on B2B

☐ Climate change is a significant threat to the project. Climate change has the capacity

to augment the detrimental effects of other threats, including edge effect, invasive weeds and increased human use.

☐ As a result of climate change, Littoral Rainforest will be further impacted by increased rainfall variability and frequency of severe weather events (DSE 2004b; Lavorel et al., 2016).

☐ Personal observations over a 14 year period (2006 to 2020, 11yrs of which I managed Sea Acres Rainforest Centre and its 1.5km boardwalk through coastal Rainforest) indicate an accelerated loss of mature trees on this walk due to more frequent and severe storm / rain events. The maintenance and public safety liability

this emerging scenario creates is considerable, necessitating frequent inspections and maintenance of trees by professional arborists.

☐ What design considerations have been applied in D10 acknowledging the impact of

climate change on the EEC vegetation in this segment and other LRf areas?

☐ Avoidance of disturbance is one solution as is extending existing patches of LRf throughout the B2B, through the development and implementation of a Restoration

/ Recovery Plan as outlined in Commonwealth guidelines for LRf and Coastal Vine Thickets.

☐ It is strongly recommended that where all options for avoiding disturbance to LRF

have been exhausted that a Recovery Plan for the SUP be developed, which would include but not be limited to actions outlined in the National Recovery Plan. This

plan should include allocations for initial treatment, monitoring and maintenance and should aim to.

☐ improve condition and complexity

☐ restore degraded patches and extend existing patches

☐ establish natural buffers / improve connectivity

☐ include partnerships between professional bush regenerators and locally based volunteer bush-care groups such as exist in the Camden Head area.

Design Comments

☐ There is insufficient detail in the designs confirming what the treatment will beboardwalk
or concrete pathway, retaining walls and fill? These methods have very different environmental impacts so it is difficult to make an informed comment.

☐ If an eastern alignment is not to be strenuously assessed then our strong preference
is for boardwalk along the entire length of this western alignment to avoid detrimental impacts of 'edge effect', resulting in further habitat fragmentation and contributing to the emerging impact of climate change.

☐ The Commonwealth Recovery Plan for LRf recommends buffer zones, areas adjacent
to a patch important for protecting the integrity of the ecological community. As the
risk of damage to an ecological community is usually greater for actions close to a patch, the purpose of the buffer zone is to minimise this risk by guiding planners and
land managers to be aware when the EEC is nearby and take extra care around the edge of patches. The buffer zone helps protect the root zone of trees at the edge of
the patch, and other components of the ecological community, from damage that may result from nearby activities.

☐ Buffer zones should be large enough to ensure that biodiversity, structural integrity
and ecosystem functioning are not adversely affected within the Littoral Rainforest patch to which the buffer is being applied.

☐ Has the project considered the recommended use of buffer zones in all LRf segments
and if not, or if this is not possible then has it considered how such zones could be created to mitigate impacts both from construction and into the future?

Where D10 adjoins D9.

☐ The proposed design alignment linking D9 to D10 through a patch of remnant bush,

creates a tight radius bend, creating blind spots and possible collision between cyclist and walkers.

☐ The proposed alignment will also encourage Dunbogan bound cyclists to use the
lagoon edge informal walkway as it will be in their continuous line of sight heading towards Dunbogan.

☐ For consistency and safety reasons could the pathway be aligned with the road as in
other segments? It would also provide a clearer line of sight for motorists.

☐ Does the SUP interfere with an APZ? If there is none marked as it appears, why not?

Facilitating access to South Beach

☐ The concept design map does not indicate the PMHC signed access track to South
Beach at CH160, nor does it make any allowance for this track's current usage e.g. example a standing zone incorporated into the path for safe crossing.

☐ At other regularly used South Beach access points at Tuckeroo carpark / board riders' access track, no provision is made for safe access to these attractions. This is
inconsistent with the B2B aim of public safety and makes even less sense from a tourism promotion point of view.

☐ Will access infrastructure (pedestrian refuge / stand -off area) be considered to facilitate safe pedestrian and all SUP user access to these key destinations?

☐ Bicycle racks should also be considered as an adjunct to better access

Re-align Camden Head road from CH 240-330

☐ There is an opportunity in this section of the SUP from CH 240 to 330 which is an
extremely steep, highly erodible, sandy slope, to re-align the road to the east mitigating the cost of expensive and impactful construction methods.

☐ Removal and realignment of 1 only power pole could achieve this.

☐ It is noted that road widening was undertaken at the junction of Seaview Avenue
and Camden Head Rd to facilitate a safer intersection.

☐ Could a cost benefit analysis be done for this option that also reflects the need for
ongoing maintenance of a boardwalk in this section?

Boardwalk breaks

☐ The section from CH 310 to 450 is shown as concrete pathway. On the preliminary
mapping LRf is from 410 onwards.

☐ Why is this segment not shown as boardwalk?

☐ Concrete pathway here will impact the viability of LRf removing an important connectivity link between remnant LRF patches and creating a gap into which increasingly severe storms can impact.

☐ LRf in this segment should be a red flag for protection and rehabilitation to extend
and connect remnant patches, not for construction of a concrete pathway.

☐ The pathway segment CH 560 to 780 is shown as boardwalk up till CH 780 then changes to show concrete pathway to CH 860 even though the pathway traverses a
LRF environment.

☐ Why is boardwalk not shown in the entire segment?

7. D10-Pump Station Segment

Attachments 2 and 2a. Sketches and photos for alternative rest area.

The concept design for a "rest area" which is a viewing platform, from CH980 to CH 1020;
10m x 2.5 wide. The design has deficiencies:

☐ The area is at a low point in SUP alignment. Natural loss of elevation is 5 metres;
constructed elevation loss is 4 metres. It is counterintuitive and impractical to locate
a rest area which users have to descend into and 'climb' out of.

☐ The subject area is part of the Coastal SEPP site no 122. The exit pathway from the
platform C1020 to 1040 will result in loss of Vine Thicket and recovering LRf (fire) which could be totally avoided by using an alternative route.

☐ The proposed area is on the site of an historic land slip caused by inadequate stormwater infrastructure. The lagoon's fringing vegetation community is in ongoing
recovery from this and associated storm impacts.

☐ Current views of the lagoon from this vantage point will be lost over time as vegetation closes a gap. It is illegal to manage vegetation in a SEPP for views.

☐ The area has a lack of amenity as a longer stay area- a highly degraded natural environment requiring restoration, near PMHC sewerage infrastructure signed *Pump
Station Access Only.* This infrastructure is not amenable to visitation – when pumping (pers. obs.) it is pervaded by an offensive odour and is subject to PMHC 24/7 access for maintenance / breakdown.

☐ No public vehicle access to this whole precinct would be a preferred option.

☐ It will provide no shade, highly desirable for a rest area in this climate

☐ A viewing area will be a possible blot on the visual amenity of the LRf from across the
lagoon by placing infrastructure in a canopy gap on the lagoon edge.
At the consultation there was interest in an alternative location which will avoid LRf and
Brad Leafed Paperbark community degradation and prevent constraints to pump station
infrastructure:

☐ Locate rest area at CH960 –20 x 10 metres of grass, mown by PMHC with the amenity of a shade tree.

☐ This site could also provide a safe crossing site for Camden Head residents to access the SUP which is not provided elsewhere? (Is this area is used by Busways as a non –marked bus drop off for school children).

☐ The SUP could then continue along the road edge without descent with a bridging boardwalk avoiding the root zone of a significant Cheese Tree *Glochidion ferdinandi*. There is 3 metres from the base at ground level to the edge of the road seal. SUP could narrow at this point and integrated barrier fencing may be required to protect users.

☐ Recommend for pump station site is to delineate edges of service area; close the
area to vehicles and to implement "mow-back" practice and revegetate.

☐ Will these recommendations and design options in attachment 2 a, and 2b, be considered? CHEN would appreciate ongoing input into this evaluation.

8. D11 Pilot Beach Road Segment CH 0 – CH 460

Rest Area

A rest area 3m L x 2.5 W is indicated at CH120. This has the following disadvantages:

☐ Removes more Littoral Rainforest which is in recovery– legislative aim is to avoid
removal where possible and minimise disturbance where not.

☐ The proposed rest area overlooks a light industrial zone and has limited appeal - it is
noisy, malodorous (rotting oyster shells), close to truck and semi-trailer movements
and to a busy, hazardous road and intersection. The lack of amenity and proximity to
the long stay area of Pilot Beach, means it is unlikely to be used.

☐ It is likely that SUP users won't use a rest area located at the bottom of a hill.

☐ How can this rest area be justified as effective and is it necessary?

Safety for users crossing oyster shed access road and the road to Trevor's corner

☐ As in D3 Bay Street consideration should be given to 60mm U-rails both sides to help
users stop and look and to stop cyclist cutting the corner.

☐ Castellated pavement CH 120-CH 180 is insufficient protection for users (past history
of accidents).

☐ Is there a better alternative? Attachment 3.Photo integrated kerb handrail

Boardwalk

☐ In only one section of the D11 SUP from CH 220 – 320 is boardwalk being considered
in LRf and Swamp Oak Forest. The Concept Design states that boardwalk "will be considered" but does not commit to its use as the least environmentally damaging option. Minimal disturbance and maintenance of canopy must be a prime design driver for this Littoral Rainforest and Swamp Oak Forest EEC.

☐ The segment CH 320 – CH450 is shown as regenerating Tuckeroo, Lilly Pilly, Coast
Banksia, LRf EEC. Why is this section not boardwalk? Could boardwalk be considered
along the entire length of this segment?

☐ Consideration needs to be given to leaf litter mounding on pathway in terms of maintenance in this segment. Elongated holes in fibreglass Treadwell group boardwalk decking instead of small squares could assist with this. This decking has the advantage that each cell has a convex edge rather than flat which increases user
safety from falls (skin grazing pers. obs. Sea Acres RFC)

☐ Closer identification of plants to be lost is required and a plan implemented to recover and replant (e.g. plant rescue of fern / epiphyte species) disturbed vegetation.

Threatened Species

☐ The design does not indicate the presence of a Threatened Species. Grey Headed
and Little Red Flying Fox use the forest as a feeding area and seasonal roost for large
camps (pers obs. November 2019 to March 2020).

☐ One large camp was located on the road edge in the vicinity of CH 240-300 mainly on
northern side of PB Rd.

☐ Although their presence is assumed to be seasonal associated with recent fires, the
species has been impacted by vegetation loss from the same fires and could have been pushed out of areas formerly used.

☐ Could the presence of a Threatened Species be noted on the plan?

☐ It is imperative to retain as much canopy as possible so as not to compromise their
viability and to ensure that pathway construction is as environmentally sensitive as possible including not undertaking works when camps are present. How will the project respond to this presence?

Lines of sight and safety at Breakwall rd.

☐ The design does not indicate if vegetation removal at CH 420 and 460 will be required to facilitate lines of sight. Could you provide more details please?

☐ Why isn't a 20 metre section of the road to the breakwall being sealed consistent
with the sealed strip of gravel road to Trevor's Cr. near light industrial area?

9. D11 – Pilot Beach Reserve Segment. *Attachment 4. Concepts for alternative alignment*
PB Reserve.

The Concept Design appears to be driven by achieving an even elevation but does not
exemplify good design considering a wider range of factors including:

Integration with other plans for park use and road upgrades

☐ The proposed alignment dissects the reserve, cutting it in half.

☐ This single-use design driver, pre-empts an LGA wide park master-planning process
and could stunt development of concepts for wider community use of the Reserve. E.g. bicycle safety course or other B2B complementary facilities.

☐ The suggested alignment has little aesthetic appeal-i.e. straight line, unshaded and
limited engagement with the reserve's natural environment.

☐ Currently the unsealed road to the training wall creates discomfort for park users
from dust, has parking and drainage issues at park interface and needs to be sealed.
A SUP road edge route which could be integrated with road sealing would be a better outcome but this may not align with project time frames.

☐ Our understanding from the 15th December consultation is that the unsealed road is
a Crown Lands asset, for which PMHC is not responsible.

☐ Have discussions occurred with Lands re any upgrade program on its planning horizon?

Connections between primary land use and users

☐ The proposed design does not consider the reserve's current primarily passive recreational use as a picnic area, dedicated children's playground and informal pedestrian thoroughfare which meanders behind Pilot Beach.

☐ The proposed SUP will not lead bicycle users to where they currently and will want to go. The design does not consider the current beach access patterns of cyclists and pedestrians and has no direct linkage link with access points to Pilot and Wash House beaches.

☐ The SUP, promoted as Beach to Beach does not deliver on a key brand 'promise'. It delivers users to the northern end of PB-an infrequently used, relatively unsafe area for small children, a family unfriendly part of the beach remote from facilities such as showers and toilets.

☐ It also fails to capitalise on the visitor experience of Wash House Beach, one of the area's key attractions, accessed from the same area as Pilot Beach.

☐ It is highly likely that cyclists will abandon the SUP and will take their own route through a congested, unsafe carpark to access Pilot and Wash House beaches.

☐ If safety is a key concern could the project provide better access to Pilot Beach as part of the design for this segment and could provision of bicycle rack facilities close to Pilot Beach be added? If picnic tables and parking spaces are indicated in other areas why not bicycle racks as an integral part of cycleway design?

User safety / environment in addition to above

The proposed SUP design brings cyclists into conflict with current users:

☐ The proposed SUP design creates potential user conflicts with a children's playground. The SUP is too close, abutting large landscaping rocks along the edge of playground, a safety issue for cyclists and does not address the issue of small children running around the playground edge.

☐ 3 large young Swamp Mahogany trees close to the children's playground are not marked on the concept design map. These trees are being impacted by drought and mowing practices and would be further impacted by any root zone disturbance.

☐ Could all trees and vegetation islands in this park be mapped in the Concept Design
map and avoid impacts where possible.

☐ There needs to be clear lines of sight and buffer zones between this area and SUP.

☐ The SUP also dissects the open space between the large picnic shed and a BBQ restricting BBQ usage and creating pedestrian / cyclist conflict.

☐ The SUP ends close to the river breakwall, leading cyclists to a pathway which does
not meet SUP standards and is very heavily used for fishing creating user conflicts.

☐ Currently there is no formal pedestrian access from anywhere including Pilot and
Wash House beaches to the toilet block. Main access is drive to toilets.

☐ Provide direct access to Pilot and Wash House Beaches via a SUP extension aligned
along the northern side of PB carpark behind existing bollards.

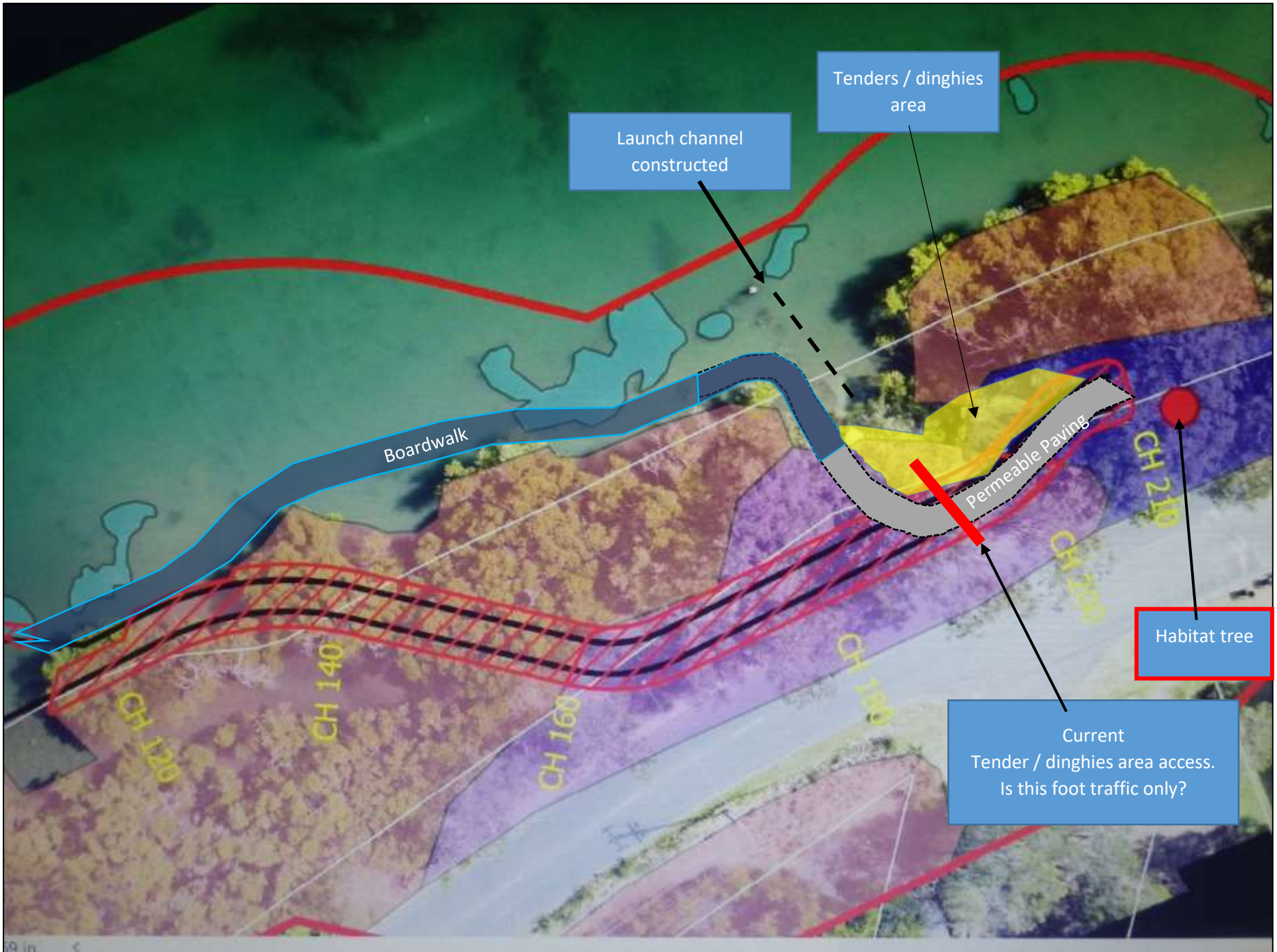
☐ Provide a more fluid pathway access to the toilet block via the eastern side.

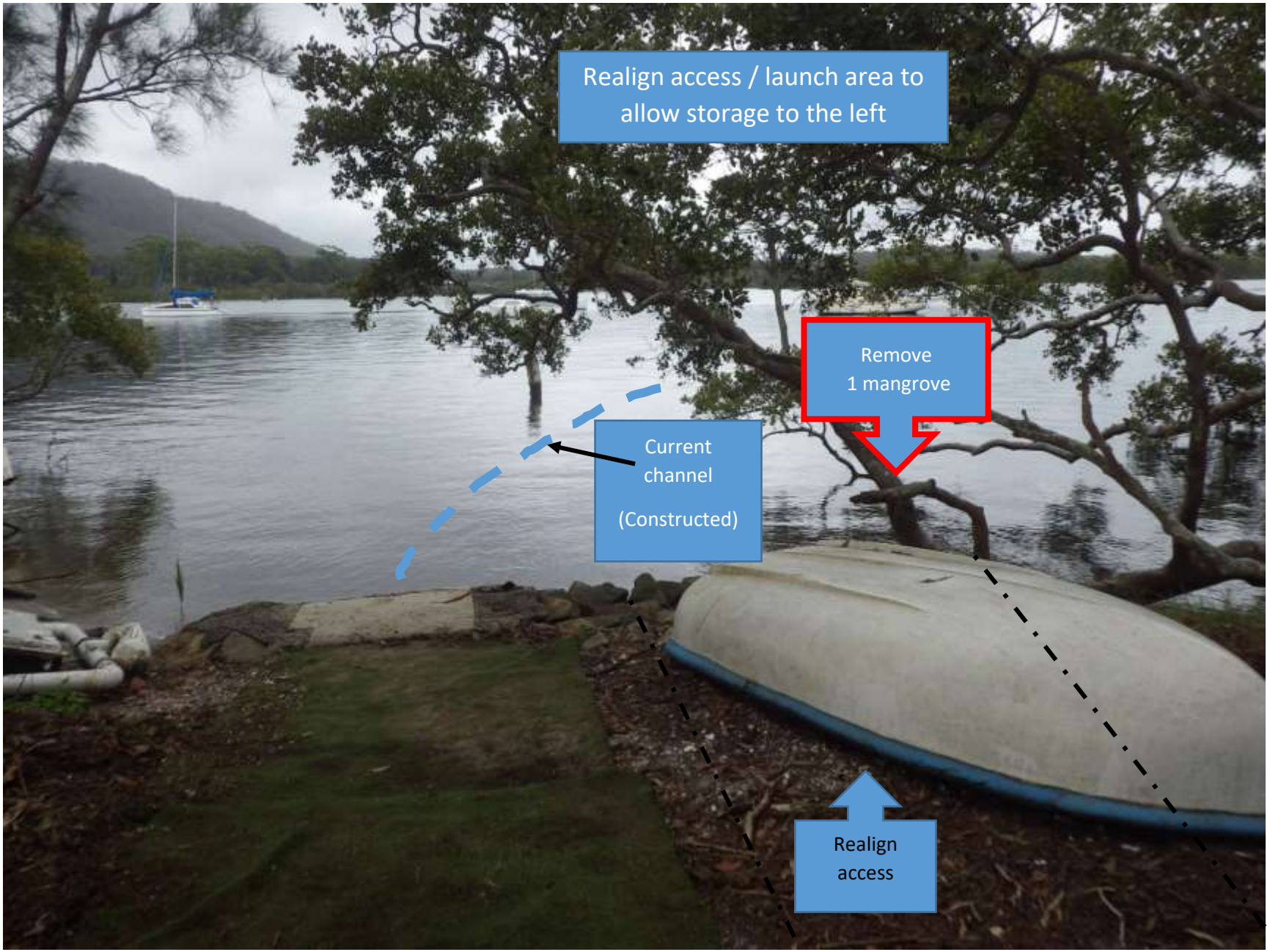
☐ Integrate PMHC park master planning process for PB Reserve to achieve a better
outcome and consider an amended Concept Design.

Attachments

1. D5. Dinghy storage design options
2. 2a and 2b. D10 pump station design options
3. Example of Integrated barrier and handrail
4. D11 Pilot Beach Reserve design options

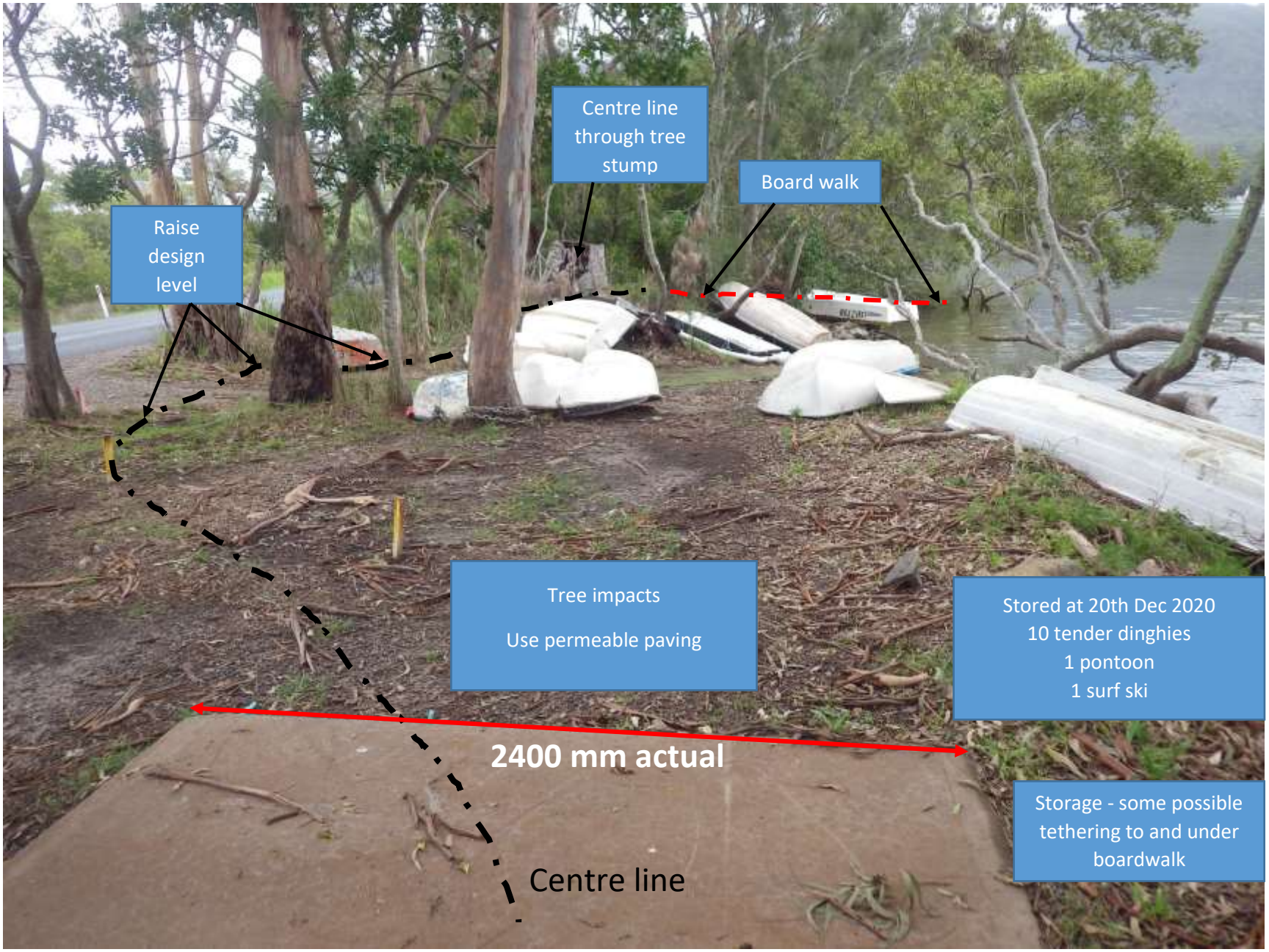
B2B D5 Design Option-Camden Head Environment Network. 22/12/2020

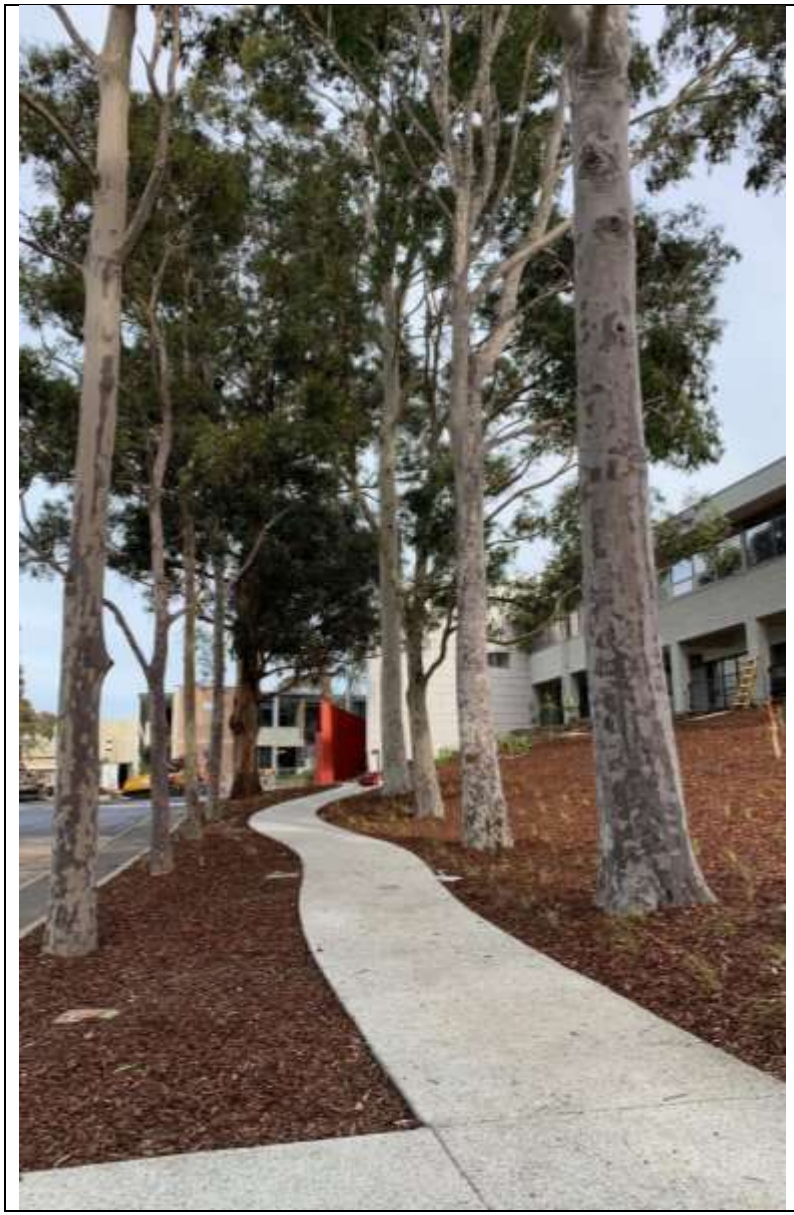



Realign access / launch area to allow storage to the left
Remove 1 mangrove
Current channel
(Constructed)
Realign access



B2B D5 Design Option-Camden Head Environment Network. 22/12/2020





Tree impacts compaction and root damage use permeable paving ref.

- Permeable Concrete Paving Melbourne from WaterPave (foot path and tree pic)

https://www.spec-net.com.au/press/1219/wat_181219/Permeable-Concrete-Paving-Melbourne-from-WaterPave

WaterPave permeable systems are now recognised by many local councils throughout Australia as the preferred solution for permeability in tree protection zones and where an increased level of permeability is required.

Example Photo left
app.goo.gl/MoBg55i3mEsnDuJr8

- Permeable Concrete – DriveCon – The Gunlake Group | Advanced Concrete & Quarries | Sydney

https://www.gunlake.com.au/products/permeable-concrete-drivecon/

Boardwalk and tender / dinghies launch area ref.

- Fibreglass Moultruded Grating | MoultrEX(R) | Treadwell Group

https://www.treadwellgroup.com.au/access-systems/frp-grating-range/moultrex/



Page intentionally blank



Bridging Boardwalk FRP decking width, max. 2.5 m

Avoid piles on roots by construction with carrier/ hanging beam

Fibreglass Reinforced Polymer


Width from seal edge to cheese tree at ground level 3 metres




Rest area 20 x 10m wide with shade from tree.
Offers a safe crossing zone to residential area

Attachment 2. Additional Information-B2B D10 Pump Stn. Concept Mock Up Camden Head Environment Network. Dec 2020



Attachment 2. Additional Information-B2B D10 Pump Stn. Concept Mock Up Camden Head Environment Network. Dec 2020



Attachment 2. Additional Information-B2B D10 Pump Stn. Concept Mock Up Camden Head Environment Network. Dec 2020



Road / path integrated barrier curb and hand rail at T intersection.

Port Macquarie Pacific Drive

Attachment 3. Example of road / path integrated barrier curb and hand rail at T intersection.



Road / path integrated barrier curb and hand rail at T intersection.

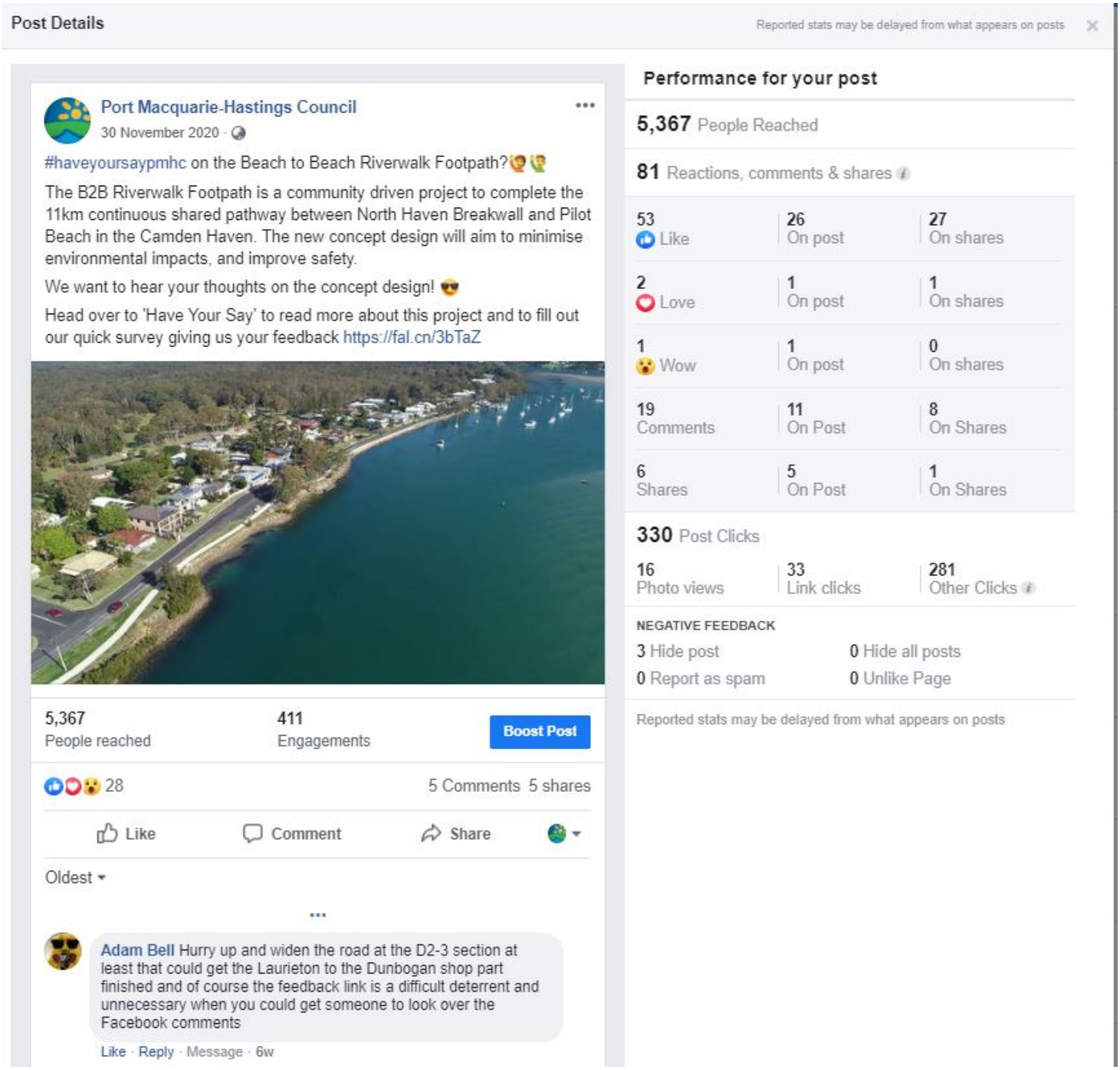
Port Macquarie Pacific Drive

Attachment 3. D11 B2B Pilot Beach Reserve Design Options
Camden Head Environment Network Submission



Beach to Beach Riverwalk Footpath - Social media results

PMHC Facebook Page



Author

Port Macquarie-Hastings Council Thanks Adam Bell for the feedback! Sorry you found the survey link a deterrent. We use a survey tool in order to ask a number of quite specific questions. We value your input, so we hope you are able to take a few mins to answer the questions.

Like · Reply · Commented on by Comms Admn [?] · 6w

Reply as Port Macquarie-Hastings Council

Justin Brooks How about just footpaths along Pacific Drive even? Really suicidal to have to walk on the road almost the whole way. Fun watching confused tourists though. 🤦‍♂️🤦‍♂️😜

Like · Reply · Message · 6w

Author

Port Macquarie-Hastings Council Justin Brooks Thanks for taking the time to give us your thoughts on a Pacific Drive pathway. We like to hear and gather ideas from our community.

Like · Reply · Commented on by Comms Admn [?] · 6w

Justin Brooks Port Macquarie-Hastings Council Well then!

I live in Shelly Beach. To walk into town (not along the beaches - as many many tourists choose not to as well) I have to walk on the road into on coming traffic almost all the way to Flynn's Beach. A few hundred metres of footpath, then uphill around a bend into on coming traffic.

You should see the looks on people's faces when and where repeatedly the footpaths simply end! It's pathetic.

You ripped up and replaced perfectly fine footpaths in town, yet fail to realise hundreds of tourists every day walk along the beaches out to Shelly Beach, but then want a quicker route back along the road... But have to play chicken with cars - just like me - everyday.

You can't possibly be oblivious to the exact spots I'm talking about as they are everywhere.

PMCLGA also has an incredibly old average of age resident, how on earth do you think the elderly are able to manage the silly patchwork of ending footpaths into on coming traffic - if it pisses off and concerns a fully able bodied and brave person as myself?

Rant over.

2

Like · Reply · Message · 6w · Edited

Justin Brooks Port Macquarie-Hastings Council PS I have sent emails of photo documentation oh SO many times already.

You have millions to butcher Lake Cathie, but nothing to have footpaths in high traffic routes... When everywhere else considers it normal to just have them them everywhere anyway.

Like · Reply · Message · 6w

Port Macquarie-Hastings Council
21 December 2020 ·

Don't forget to #haveyoursaypmhc on the Beach to Beach Riverwalk Footpath concept design We want to hear your thoughts! Survey closes tomorrow 22nd Dec

Click here to fill out our quick survey and read more about this project
https://haveyoursay.pmhc.nsw.gov.au/beach-to-beach-riverwal…



Port Macquarie-Hastings Council
Government organisation

Send Message

2,549	103	
People reached	Engagements	Boost Post

Marie Jensen, Kathryn Butler and 4 others — 1 Comment

Like · Comment · Share

Oldest

Shirleyann Loaney How lovely it would be for the active oldies in the Sherwood area to have a path to the Lake Innes Shopping Centre. Please consider.

Like · Reply · Message · 3w

1

Comment as Port Macquarie-Hastings Council

Performance for your post

2,549 People Reached

7 Likes, Comments & Shares

6 Likes	6 On Post	0 On Shares
1 Comments	1 On Post	0 On Shares
0 Shares	0 On Post	0 On Shares

96 Post Clicks

3 Photo views	50 Link clicks	43 Other Clicks

NEGATIVE FEEDBACK

1 Hide post	0 Hide all posts
0 Report as spam	0 Unlike Page

Reported stats may be delayed from what appears on posts

EngagePMH Facebook Group

Elizabeth Brennan
Admin · November 30, 2020 ·

Concept designs for the remaining sections of the Beach to Beach Riverwalk Footpath are here and we want to know your thoughts!

We're holding an online community meeting on **Thursday 3 December from 5pm-7pm** to discuss the concept designs and answer any questions.

As a number of these sections intersect sensitive environmental areas, an Environmental Impact Statement is required which will be available for comment in the coming months.

For more info and to 'have your say' visit,
https://haveyoursay.pmhc.nsw.gov.au/beach-to-beach...



Jane Gwalter Brennan and 4 others

Like Comment Share

Write a public comment...

Elizabeth Brennan
Admin · December 18, 2020 at 7:55 PM ·

Have you seen the new concept designs for the remaining sections of the Beach to Beach Riverwalk Footpath? 🌊

Don't miss your chance to share your thoughts and provide your feedback at, haveyoursay.pmhc.nsw.gov.au/beach-to-beach

Survey closes Tuesday 22 December.



Jane Gwalter Brennan and 9 others 2 Shares

Like Comment Share

Write a public comment...

ConnectPMH Instagram

Story Post Details

Posted
on 12/20/2020 6:24 PM



Post Performance

Interactions

5

Actions taken from this story

Profile Visits	4
Website Clicks	1

Discovery

131

Accounts reached with this story

Impressions	131
Follows	0
Navigation	126
Back	3
Forward	84
Next Story	30
Exited	9

Video Post Details

Published
on 11/28/2020 6:31 PM

connectpmh



connectpmh Concept designs for the remaining sections of the Beach to Beach Riverwalk Footpath are here!

As some of these sections intersect sensitive environmental areas, an Environmental Impact Statement is required, which will be available for comment in the coming months.

We encourage you to view the designs, frequently asked questions and Preliminary Impact Areas document, take our short survey and register for our community meeting.

Visit, haveyoursay.pmhc.nsw.gov.au/beach-to-beach

Nov 28, 2020

Post Performance

10 0 0

Views	108

Interactions

4

Actions taken from this post

Profile Visits	3
Website Clicks	1

Discovery

251

Accounts reached

4% weren't following you

Follows	--
Reach	251
Impressions	280
From Home	250
From Profile	30

Appendix D

Biodiversity Assessment Report



Biodiversity Development Assessment Report

Beach to Beach Shared User Path

Dunbogan - Camden Head

May 2022
Final (Rev 1)

Prepared For
Port Macquarie - Hastings Council

Project: 20108

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Prepared for: Port Macquarie - Hastings Council

Report Certification

I, Luke Pickett, certify that this Biodiversity Development Assessment Report (Rev 1, dated 19 May 2022) has been prepared on the basis of the requirements of and information provided under the biodiversity assessment method.

Luke Pickett

Bachelor of Environmental Science
Master of Wildlife (Habitat) Management
Accredited Biodiversity Assessor (BAAS17100)

Report History

Date	Revision	Comment
21 April 2021	Rev A	Draft for KBR review
19 August 2021	Rev B	Draft for Council review
22 September 2021	Rev C	Final Issue (Pre-certification)
26 October 2021	Rev 0	Final Issue (Certified)
19 May 2022	Rev 1	Final Issue (Certified) Revised following Council and DPIE comment

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Definitions

Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Where an event or circumstance is a direct consequence of the action (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (OEH 2014).
Indirect impact	Where a primary action is a substantial cause of a secondary event or circumstance which has an impact on a protected matter (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf).
Matters of NES	A matter of national environmental significance (NES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH 2014).
Mitigation	Action to reduce the severity of an impact. (OEH 2014).
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
Population	All the individuals that interbreed within a given area.
Proposal area/ Proposal site	The area of land that is directly impacted on by a proposal that is considered under the EP&A Act.
Study area	The area directly affected by the development and any additional areas likely to be affected by the development, either directly or indirectly (OEH 2014).
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.

Abbreviations

AOO	Area of occupancy
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Credit Calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EOO	Extent of occupancy
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Federal).
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
PFC	Projected Foliage Cover
REF	Review of Environmental Factors
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SUP	Shared User Path
TECs	Threatened Ecological Communities
TSPD	Threatened Species Profile Database
VEC	Vulnerable Ecological Community
VIS	Vegetation Information System

1. INTRODUCTION

Accuplan has been engaged to prepare a Biodiversity Development Assessment Report (BDAR) in relation to the construction of a Shared User Path (SUP) from Dunbogan to Camden Head, NSW. The project forms part of a larger project known as the Beach-to-Beach (B2B) pathway and is proposed by Port Macquarie - Hastings Council to improve pedestrian and cyclist access throughout the Camden Haven area. The B2B SUP is a community driven project that aims to deliver approximately 11 km of uninterrupted shared user pathway between North Haven Beach and Pilot Beach in Dunbogan. To date, sections of the shared pathway from North Haven Beach to Dunbogan have been completed and 2.9 km of the pathway remains to be completed, which is the subject of this BDAR.

The proposed SUP alignment traverses land mapped under *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP) as coastal wetland and littoral rainforest. The proposal is therefore "designated development" subject to assessment and approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This BDAR has been prepared to address biodiversity issues identified by the Secretary's Environmental Assessment Requirements (SEARs) (SEAR No. 1391) and inform the Environmental Impact Statement (EIS) for the project.

1.1 Site and Proposal Description

The proposal would connect the existing unconnected SUP sections in Laurieton, Dunbogan and Camden Head; therefore providing a continuous 11 km scenic route that follows the banks of the local Camden Haven River system from North Haven, Laurieton and Dunbogan, and past the shoreline of Gogleys Lagoon to Camden Head.

The proposal involves an extension of the existing SUP which presently terminates near the intersection of The Boulevarde and Scarborough Way, approximately 500 metres north of the Dunbogan Bridge. The proposed SUP will continue north-east from the end of the existing SUP, generally following the southern bank of the Camden Haven River and connecting other isolated sections of existing SUP adjacent to The Boulevarde.

This report examines the proposed construction of sections D3, D5, D8, D10 and D11 of the overall B2B project, as described in **Table 1.1**. A map showing the location of each section is provided in **Figure 1.1.**

Table 1.1: Proposal description

Section	Route	Length
D3	D3 commences at the end of the existing Section D2 at the southern side of the intersection between The Boulevarde and Scarborough Way. The SUP crosses Scarborough Way and traverses coastal wetlands within Lot 5 DP 233364 before crossing Bay Street. The SUP continues north along the Boulevarde and ties in with the existing Section D4 of the SUP.	409 m
D5	D5 commences at the end of the existing Section D4 of the SUP along The Boulevarde, south of the intersection between The Boulevarde and Longworth Road. The SUP immediately veers west and continues as a boardwalk elevated over the high tide level within Camden Haven Inlet. The SUP emerges south of the dinghy storage area and launching site and extends along The Boulevarde before tying-in with the existing Section D6 of the SUP.	231 m
D8	D8 commences at the end of the existing D7 path, south-east of the Dunbogan Jubilee Hall access road and Camden Head Road intersection. The SUP continues north between Gogleys Creek and Camden Head Road and connects to the existing Section D9 of the SUP approximately 50m north of the Scarborough Way intersection.	843 m
D10	D10 commences at the end of the existing Section D9 of the SUP, north of Seaview and Camden Head Road intersection, and continues along the western side of the Camden Haven Road before connecting with existing unsealed paths at chainage 700 to 980. The path re-joins with Camden Haven Road and continues along the western side of the road to adjoin with proposed Section D11.	1230 m
D11	D11 commences at the end of the proposed Section D10, south of the Pilot Beach Road and Camden Head Road intersection. The SUP continues along the western side of Camden Head Road onto the western side of Pilot Beach Road before crossing the Camden Haven Oyster Supply access road and a second unsealed access road. The SUP continues along the northern side of Pilot Beach Road, heading east before crossing the breakwall access road and meandering north through the adjacent park. The SUP terminates at the northern end of Pilot Beach, joining onto the existing breakwall pathway.	836 m

1.1.1 Typical construction methods

The SUP will have a width of 2.5 metres and be constructed using a combination of sealed concrete pathways and raised boardwalks. Raised boardwalk construction would be used in areas with steep gradients and to minimise impacts to sensitive environments including coastal wetlands and littoral rainforests. Typical sections used along the length of the SUP are shown below.

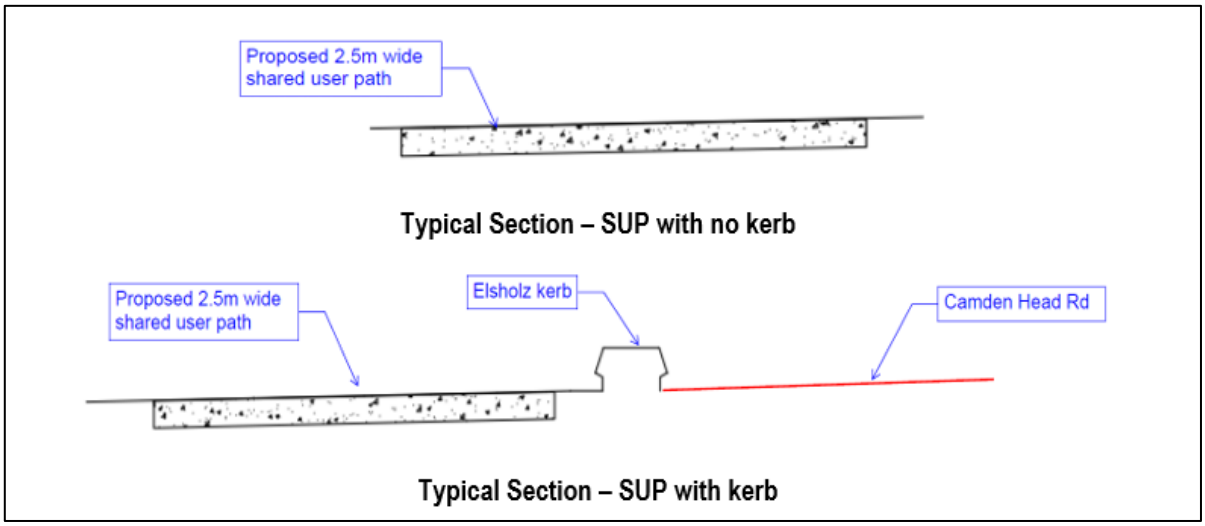


Figure 1.1: Typical sections of concrete pathway construction

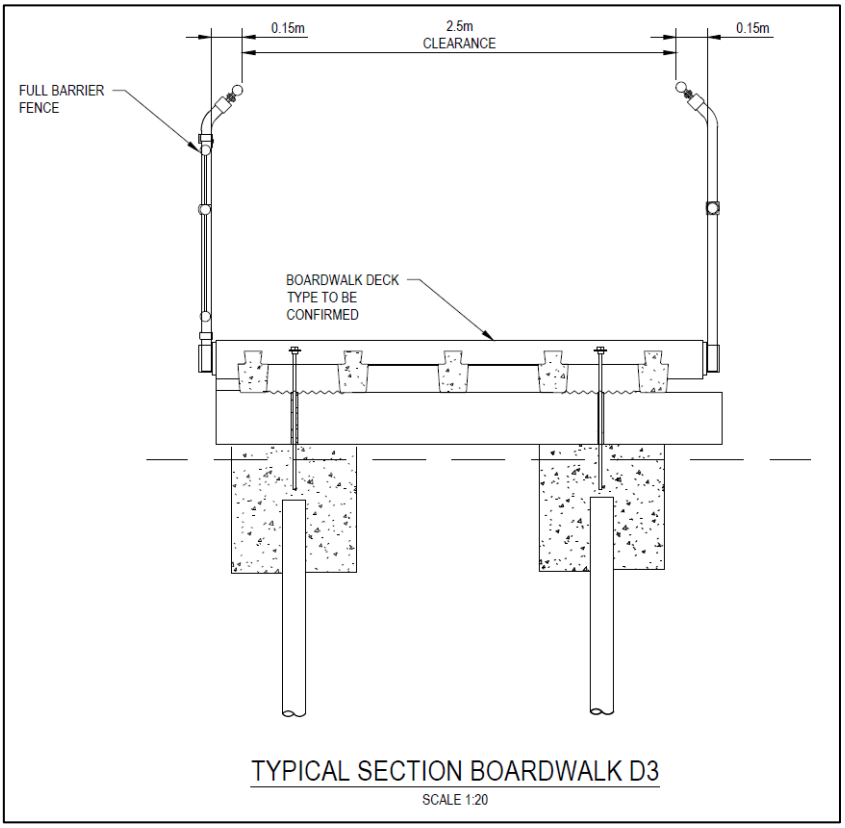


Figure 1.2: Typical section of boardwalk construction

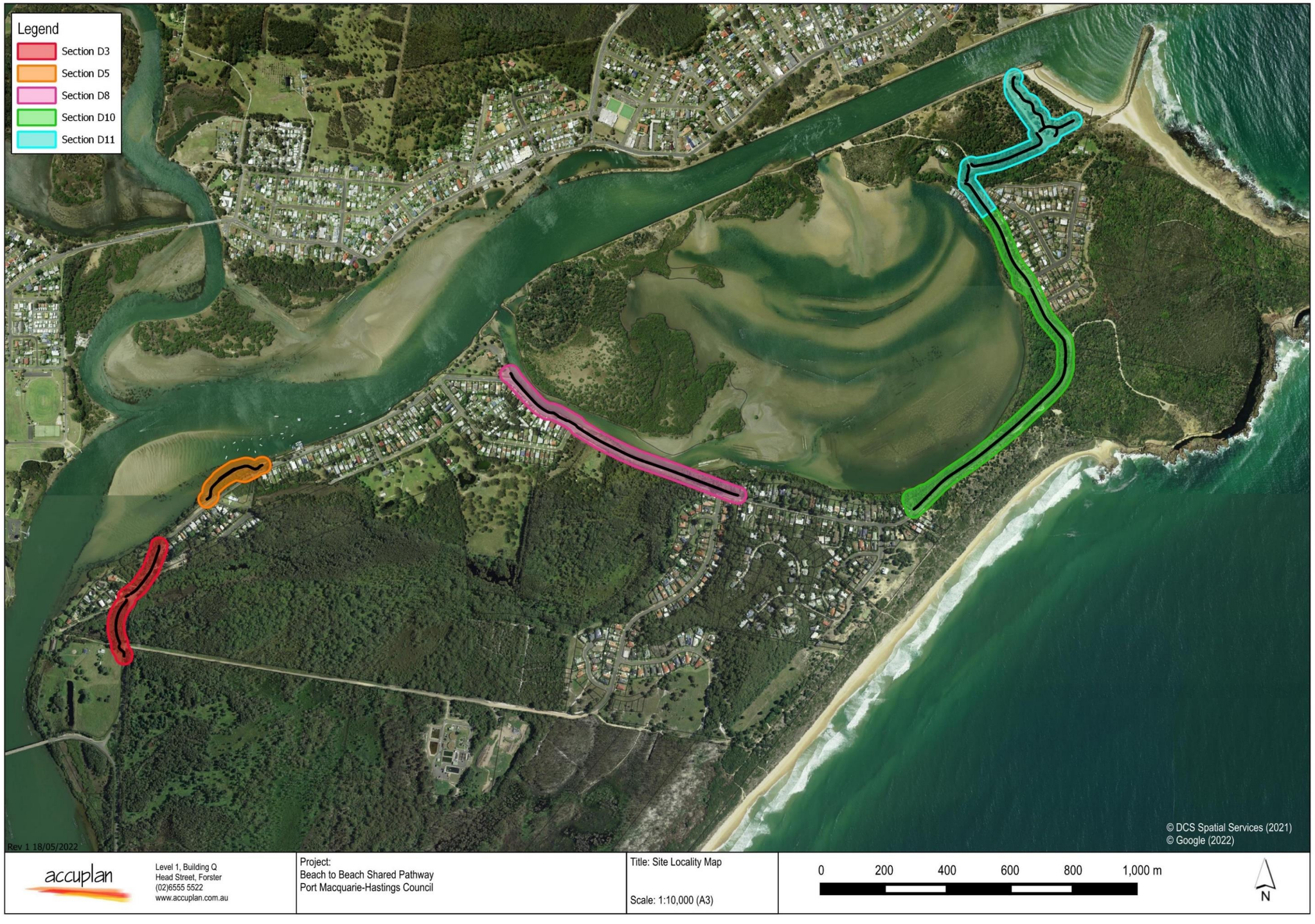


Figure 1.3: Proposal locality map

1.2 Study Aims

This BDAR has been prepared to address key issues relating to biodiversity as identified by the Secretary's Environmental Assessment Requirements (SEARs) (SEAR No. 1391) and informs the EIS accompanying the development application. **Table 1.2** summarises the key issues relating to biodiversity identified in the SEARs along with additional requirements provided by the Biodiversity and Conservation Division (BCD of the Department of Planning, Industry and Environment (DPIE)).

Table 1.2: SEARs relating to biodiversity

Key issues - Biodiversity	**BDAR reference**
A description of the ecological value of the identified coastal wetland and littoral rainforest	Sections 4 and 5
A detailed assessment of the potential impacts on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act). If the proposed development is likely to significantly affect threatened species, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report (BDAR) prepared in accordance with Part 6 of the BC Act	BDAR required (see Section 1.3). BDAR prepared in accordance with Part 6 of the BC Act.
A detailed assessment of the potential impacts and offsetting (direct and indirect) to the coastal wetland and littoral rainforest, including impacts on marine vegetation (seagrass, mangroves and saltmarsh areas), aquatic species and key fish habitats listed under the *Fisheries Management Act 1994.*	Sections 4, 5, 6 & 7

1.3 Legislative Context

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

The EP&A Act provides the framework for environmental planning and assessment, including approvals and environmental impact assessment requirements for proposed developments.

The proposal is designated development and subject to assessment and approval under Part 4 of the EP&A Act. The proposal is also "integrated development" requiring approval from other approval bodies under Section 4.46 of the EP&A Act. This BDAR is a supporting document for the EIS that accompanies a development application to Port Macquarie-Hastings Council and has been prepared to address the key issues relating to biodiversity as identified by the SEARs.

1.3.2 Biodiversity Conservation Act 2016 (BC Act)

The BC Act, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Thresholds for entry into the scheme are:

1. whether the impacts occur on an area mapped on the Biodiversity Values map published by the Minister for the Environment; or
2. whether the amount of native vegetation being cleared exceeds a threshold area; or
3. whether the proposal would have a significant impact on threatened communities or species – determined by the "5-part test".

Review of the Biodiversity Values map indicates that several parts of the proposed route have mapped biodiversity values including Coastal Wetlands and Littoral Rainforest with impacts to these areas triggering entry into the BOS (refer to Figure 2.6 below). Subsequently, biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2020) and documented in a Biodiversity Development Assessment Report (BDAR). This BDAR has been prepared by an accredited assessor (BC Act, S.6.10) and includes information in the form detailed in the BC Act (S.6.12), BC Regulation (S.6.8) and the BAM.

1.3.3 Fisheries Management Act 1994

The FM Act provides for the conservation of threatened species of fish and marine vegetation and their habitat, and for the protection of fish habitat in general.

The FM Act sets out provisions to protect marine vegetation (mangroves, seagrass and seaweeds whether alive or dead) from 'harm'. 'Harm', under the FM Act, means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it. A permit is required under Section 205 of the FM Act in relation to any activity that is likely to impact on marine vegetation.

The estuarine habitats present within the proposal area are mapped as Key Fish Habitat (KFH) (Figure 4.2 - Figure 4.4) and the proposed works have the potential to impact protected marine vegetation including mangroves, saltmarsh and seagrass.

The proposal triggers the 'integrated development' provisions of the EP&A Act and the following permits from the NSW Department of Primary Industries (DPI) may apply:

- **Section 201** - permit to carry out works of dredging or reclamation, i.e., any excavation within or filling of water land; and
- **Section 205** - permit to harm (cut, remove, damage, destroy, shade, etc.,) marine vegetation (mangroves, seagrass and seaweeds).

The FM Act has been considered in this assessment through:

- Desktop review to determine potential for threatened species and marine vegetation to occur within the proposal area;
- Aquatic habitat assessment;
- Assessment of potential impacts on threatened biota and key fish habitat; and
- Identification of mitigation measures for aquatic habitats in the proposal area.

Impacts to KFH and marine vegetation are considered in the aquatic impact assessment contained within Section 4 of this report.

1.3.4 Coastal Management Act 2016 (CM Act)

The objectives of the CM Act 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. Part 2 of the CM Act identifies objectives related to four coastal management areas of the 'coastal zone', being:

- Coastal wetlands and littoral rainforests area;
- Coastal vulnerability area;
- Coastal environment area; and
- Coastal use area.

The site will encroach within areas mapped as 'Coastal Wetlands' and 'Littoral Rainforest' mapped under *State Environmental Planning Policy (Coastal Management) 2018* (CM SEPP) (Figure 2.6). A consent authority cannot approve works in these areas unless satisfied that sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland or littoral rainforest.

1.3.5 Commonwealth Legislation

Under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance or the Environment of Commonwealth land. This includes impacts to threatened species, communities and migratory species listed under the EPBC Act. These are considered in Section 6.7.3.

The assessment of the proposal's impact found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment under the EPBC Act.

1.4 Personnel

This BDAR was prepared by accredited assessor Luke Pickett (BAAS17100) with assistance from Matt Clancy and Shannon Baker. A review of the report was undertaken by Simon Carroll. All content and fieldwork has been conducted in accordance with the Biodiversity Assessment Method 2020 (BAM). A description of the roles and qualifications of staff is provided in Table 1.3.

Table 1.3: Staff qualification and roles

Name	Position / Role	Qualifications	Experience
Luke Pickett	Senior Ecologist Field surveys, BAM calculations, GIS mapping, BDAR reporting and certification	Bachelor of Environmental Science Master of Wildlife Habitat Management BAM Accredited Assessor (17100)	16+ years
Matt Clancy	Senior Environmental Planner / Scientist Field and aquatic surveys, Aquatic impact assessment, Document review	Registered Planner Bachelor of Environmental Science (Honours) Graduate Certificate in Environmental Management	16+ years
Shannon Baker	Ecological consultant Field surveys, GIS mapping	Bachelor of Environmental Science	2+ years

1.5 Information Sources

The following information sources were used for this assessment:

- Office of Environment and Heritage (OEH) licensed Bionet Atlas of NSW Wildlife database (local records within 10km of proposal area - last accessed 1 September 2020)
- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (local records within 10 km of proposal area -last accessed 1 September 2020)
- Biodiversity Assessment Method calculator (BAM-C)
- Biodiversity Assessment Method (OEH, 2020)
- NSW Biodiversity Values Map – last accessed August 2021 https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap
- NSW Vegetation Information System (VIS) classification database (OEH, 2020)
- Port Macquarie Hastings LGA Vegetation and EEC Maps (2014) VIS IDs 4205 and 4206
- Greater Hunter Native Vegetation Mapping (Sivertsen et al., 2011)
- Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project - Vegetation Community Profiles (Somerville, 2009)
- Draft Camden Head Biodiversity Study (Darkheart Eco-Consultancy, 2010)
- NSW Oyster Industry Sustainable Aquaculture Strategy, 2014
- Department of Primary Industries Policy Guidelines for fish habitat conservation and management

2. LANDSCAPE ASSESSMENT

A landscape assessment in accordance with Section 3 of the BAM (DPIE, 2020) was undertaken for input into the BAM Calculator. The site context was assessed using a 500-metre buffered assessment area which applies to linear projects. The landscape value considers several factors including:

- IBRA bioregions and subregions
- Rivers, streams and estuaries
- Native vegetation cover and patch size
- Wetlands
- Habitat connectivity
- Areas of geological significance and soil hazard features
- Areas of outstanding biodiversity value

A summary of the local landscape context is provided in **Table 2.1** and shown in **Figure 2.1** to **Figure 2.8.**

Table 2.1: Local landscape context summary

Attribute	Description
LGA	Port Macquarie – Hastings Council
Zoning	The site covers several land zones as shown in Figure 2.1. These include: *W1 – Natural Waterways, C2 – Environmental Conservation, C3 – Environmental Management, R1 – General Residential, RU1 – Primary Production and RE1 – Public Recreation.*
Catchment	Camden Haven River
IBRA Bioregion	NSW North Coast
IBRA Subregion	Macleay Hastings
Mitchell Landscape	Two Mitchell Landscapes have been mapped within the proposal area (Figure 2.2) as described below. **Manning-Macleay Coastal Alluvial Plains (Mml)** Wide valleys, channels, floodplains, swamps and terraces of the Manning and Macleay rivers and other coastal streams on Quaternary alluvium, general elevation 0 to 50m, local relief 15m. Dark organic loams and silty clay on the floodplain, gradational brown loams and yellow-brown texture-contrast soil on terraces, organic silty mud in swamps. **Port Macquarie Coastal Ramp (Pmr)** Ranges and steep hills on the coastal fall on upper Permian pebbly mudstone, siltstone, conglomerate and sandstone, Carboniferous lithic sandstone, greywacke, tuff, mudstone and some limestone. General elevation 50 to 640m, local relief 350m. Higher slopes with gradational structured loams merging to red-brown to yellow texture-contrast soils on lower slopes and in valleys. Blackbutt (*Eucalyptus pilularis*), Grey Gum (*Eucalyptus punctata*), White Mahogany (*Eucalyptus acmenoides*), and Brush Cypress Pine (*Callitris macleayana*) on ridges. Tallowwood (*Eucalyptus microcorys*), Sydney Blue Gum (*Eucalyptus saligna*), brush box (*Lophostemon confertus*), in valleys. Flooded Gum (*Eucalyptus grandis*), Turpentine (*Syncarpia glomulifera*), with closed forest elements such as; Crabapple (*Schizomeria ovata*), Sassafras (*Doryphora sassafras*), hard corkwood (*Endiandra sieberi*) and Silver Sycamore (*Cryptocarya* spp.) on the flats.
Native Vegetation Cover	A 500 m linear buffer was applied to the proposal area resulting in an overall buffer area of 545 ha. The vegetation extent of native woody and non-woody vegetation was estimated based on observations from site visits and aerial photo interpretation. Native woody vegetation occupied 193.6 ha of the buffer area and native non-woody vegetation occupied 7.4 ha. Combining the estimated woody and non-woody vegetation cover resulted in 37% of the buffer area supporting native vegetation. This falls into the >30 – 70% category within the BAM Calculator. The extent of native vegetation cover is shown in Figure 2.3.

<table>
<tr><th>Attribute</th><th>Description</th></tr>
<tr><td>Patch Size</td><td>A patch is defined in Section 4.3.2 of the BAM as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). The patch may extend onto adjoining land.

The woody vegetation in the proposal area is <100 m from extensive areas of vegetation throughout Camden Head. These areas exceed 100 hectares and are allocated to the >100 hectares patch size class.</td></tr>
<tr><td>Connectivity Features</td><td>Sclerophyll forest, wetlands and littoral rainforest habitat present in the proposal area forms part of larger patches of habitat throughout the assessment area. These patches provide connectivity to the broader locality despite fragmentation associated with local roads and residential areas. The vegetation occurring throughout the Camden Head area is also mapped by NPWS (2001) as a Regional Wildlife Corridor – Major Coastal Link (see Figure 2.4).</td></tr>
<tr><td>Rivers, Streams, and Estuaries</td><td>The proposal area is broadly located along the Camden Haven Inlet. The proposed SUP extends into the inlet in Section D5 and crosses several waterways which drain into the inlet. The waterways within the proposal area are largely estuarine environments subject to tidal influences. The waterways occurring in the study area are summarised below and shown in Figure 2.5.
<table>
<tr><th>Waterway</th><th>Strahler Order[1] / Waterway Type</th><th>Riparian Buffer Distances[2]</th><th>Location and description</th></tr>
<tr><td>Camden Head Inlet</td><td>Estuarine</td><td>50</td><td>Section D5 extends into the inlet to avoid and minimise impacts to existing mangrove vegetation. The inlet is a tidal waterway.</td></tr>
<tr><td>Gogleys Creek and Lagoon</td><td>Estuarine</td><td>50</td><td>The entire length of Section D8 extends along Gogleys Lagoon, and Gogleys Creek crosses into the lagoon via a culvert at CH330. The lower reaches of Gogleys Creek and the lagoon are estuarine waterbodies subject to tidal influences.</td></tr>
<tr><td>Unnamed Creek (D8)</td><td></td><td></td><td>An unnamed first order creek also crosses into the lagoon via a culvert at CH610. Given the proximity to the lagoon, riparian buffers for estuarine waterways would apply to the lower reaches of the creek.</td></tr>
<tr><td>Unnamed Creek (D3)</td><td>Estuarine</td><td>50</td><td>The lower reaches of the creek form an estuarine wetland composed of mangrove forest at CH100 to CH200 and at CH260 to CH300 in Section D3. The creek drains into Camden Haven Inlet approximately 100 to 200 m to the west of the proposal area.</td></tr>
</table>
[1] Strahler stream ordering system (Strahler 1952)
[2] Riparian buffer distances – apply to each side of the waterway (Table 14 – Appendix E BAM 2020)</td></tr>
</table>

Attribute	Description
Wetlands	The buffered assessment area encompasses broad areas of coastal lowlands largely comprised of estuarine and freshwater wetlands. Coastal wetlands and littoral rainforest identified under *State Environmental Planning Policy (Coastal Management) 2018* occur within the proposal area (Figure 2.6). It is noted that an area mapped as Coastal Wetland, north of Pilot Beach Road in Section D11, is inconsistent with the vegetation observed on site. The vegetation survey completed for this BDAR identified parts of this area as Littoral Rainforest (PCT 1536) which transitions into vegetation more consistent with Coastal Wetlands. Wetlands associated with the nearby Crowdy Bay National Park are also listed as Nationally Important Wetlands. These wetlands broadly align with the coastal wetlands identified under the Coastal Management SEPP and are described as non-tidal freshwater forested wetlands, rocky marine shores, freshwater lagoons and marshes in the coastal zone, intertidal forested wetlands, and sand, shingle or pebble beaches including sand bars, spits and sandy islets.
Areas of Geological Significance and Soil Hazard Features	There are no areas of geological significance (karst, caves, crevices, cliffs or other features) within the Study Area. The proposal area contains potential soil hazard features in the form of acid sulphate soils. These are largely limited to low-lying areas within Sections D3, D5, D8 and D11. Local acid sulphate soil risk mapping is shown in Figure 2.7.
Areas of Outstanding Biodiversity Value	No areas of outstanding biodiversity value occur within the vicinity of the proposal site.
Mapped Biodiversity Values	Mapped biodiversity values occur throughout the proposal area. These are associated with areas mapped under the Coastal Management SEPP (Coastal Wetlands and Littoral Rainforest) or important habitat areas for species at risk of serious and irreversible impacts (SAIIs) (see Figure 2.6 below).
Important Habitat Mapping	Important habitat areas have been mapped by DPIE for two threatened species within the vicinity of the site. These are *Lathamus discolor* (Swift Parrot) and *Numenius madagascariensis* (Eastern Curlew). These maps are provided in Figure 2.8.

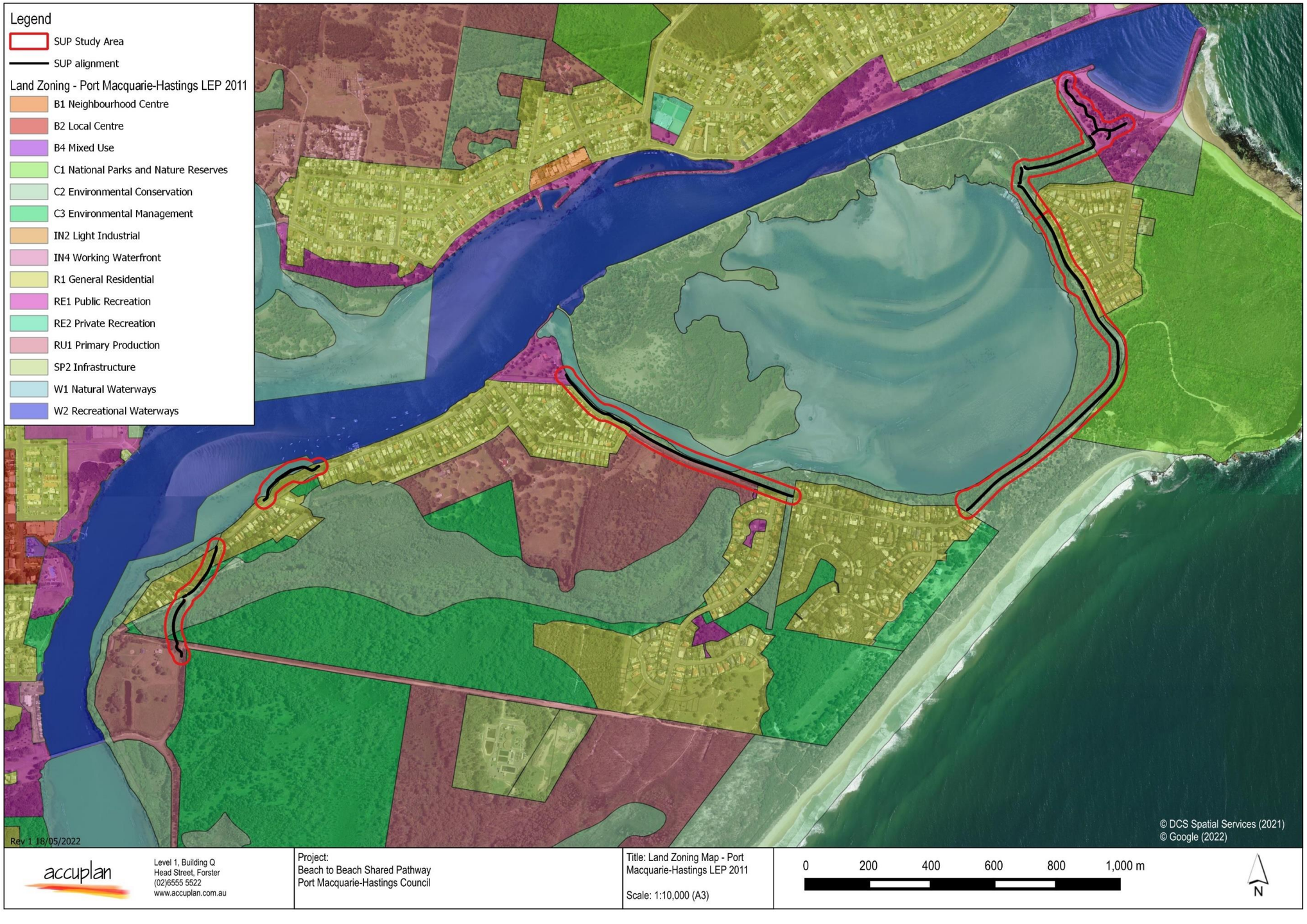


Figure 2.1: Land Zoning - *Port Macquarie-Hastings Local Environmental Plan 2011*

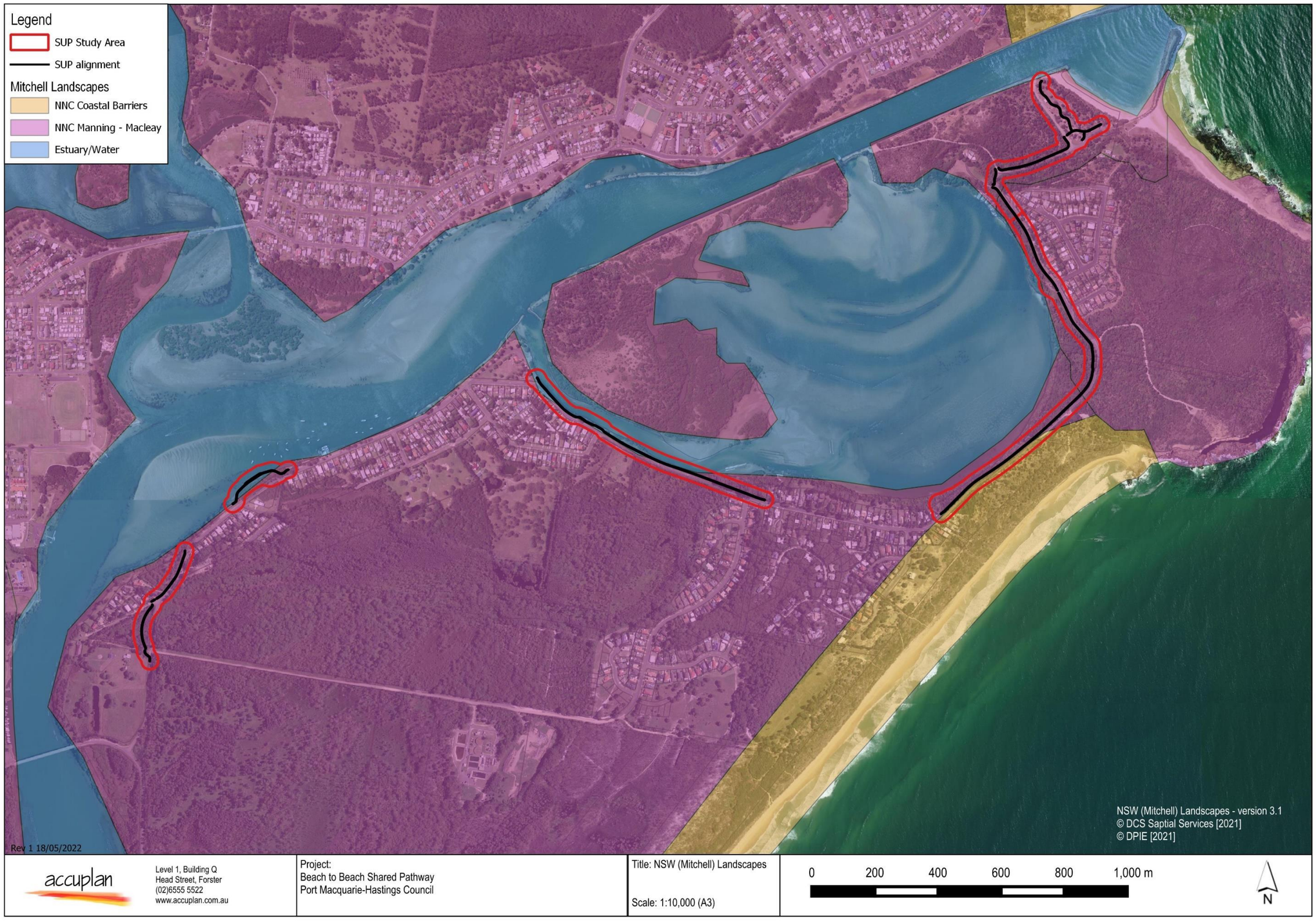


Figure 2.2: NSW (Mitchell) Landscapes (Version 3.1) occurring over the study area

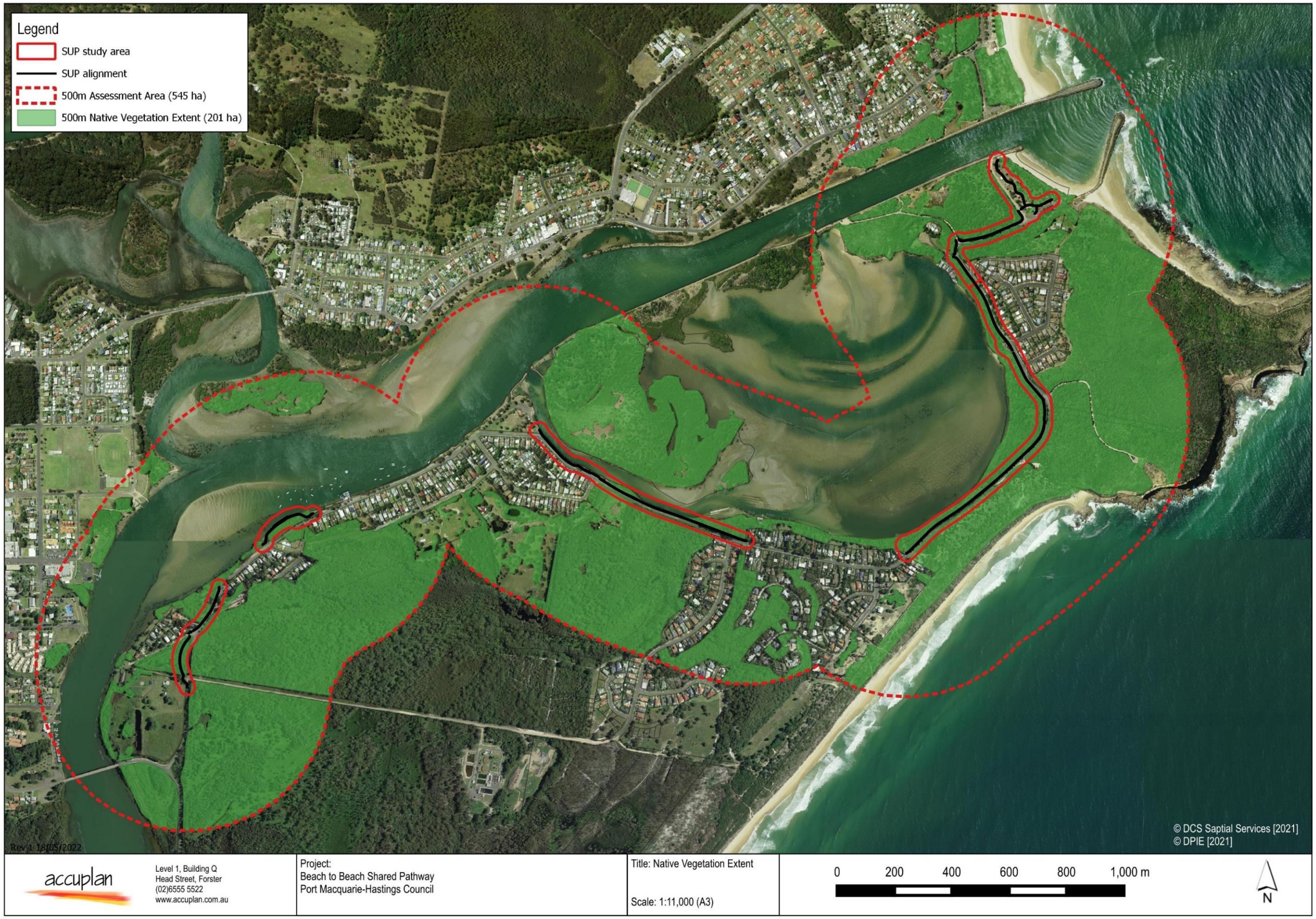


Figure 2.3: Native vegetation extent

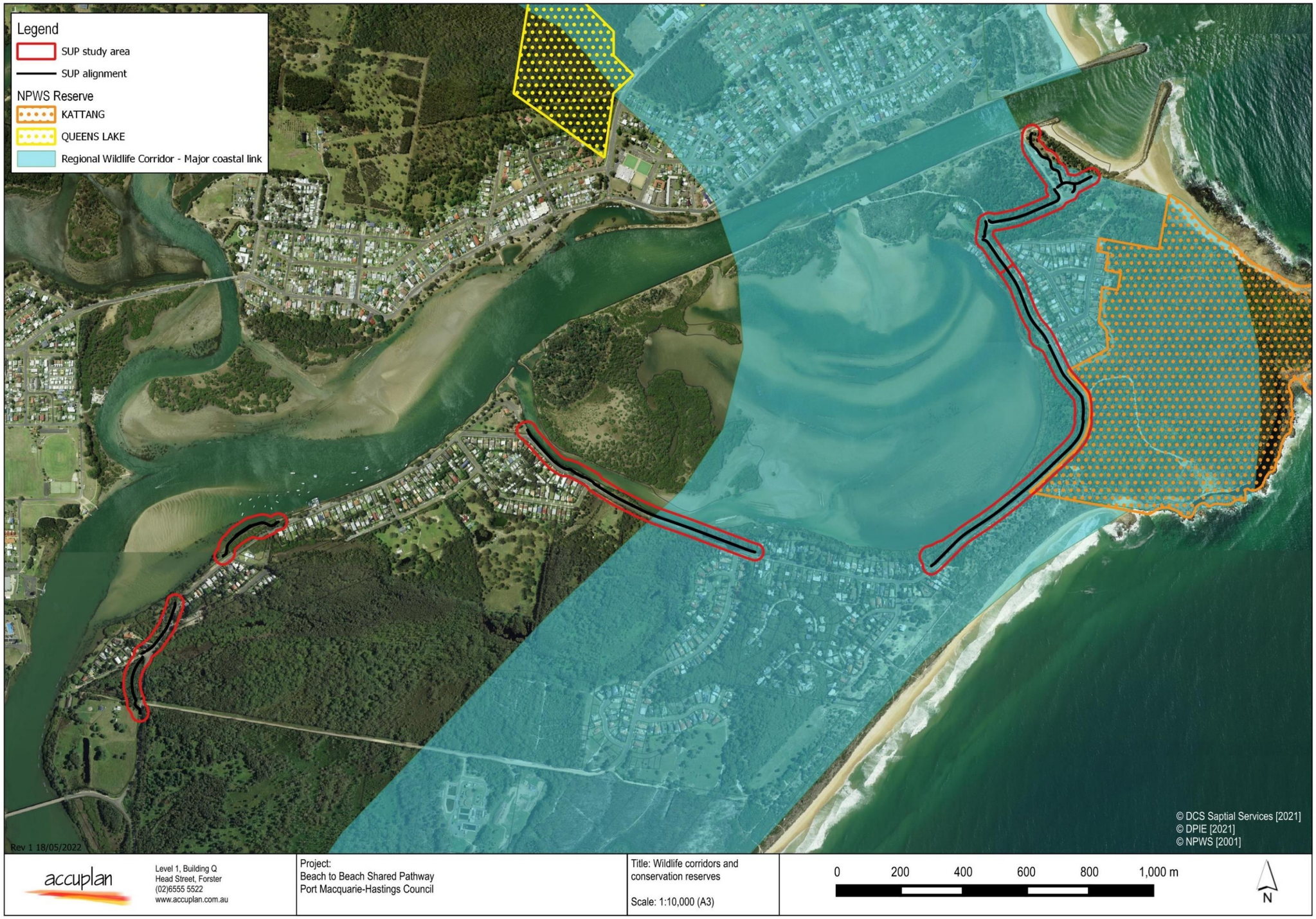


Figure 2.4: Mapped wildlife corridors and conservation reserves



Figure 2.5: Rivers, streams, and estuaries

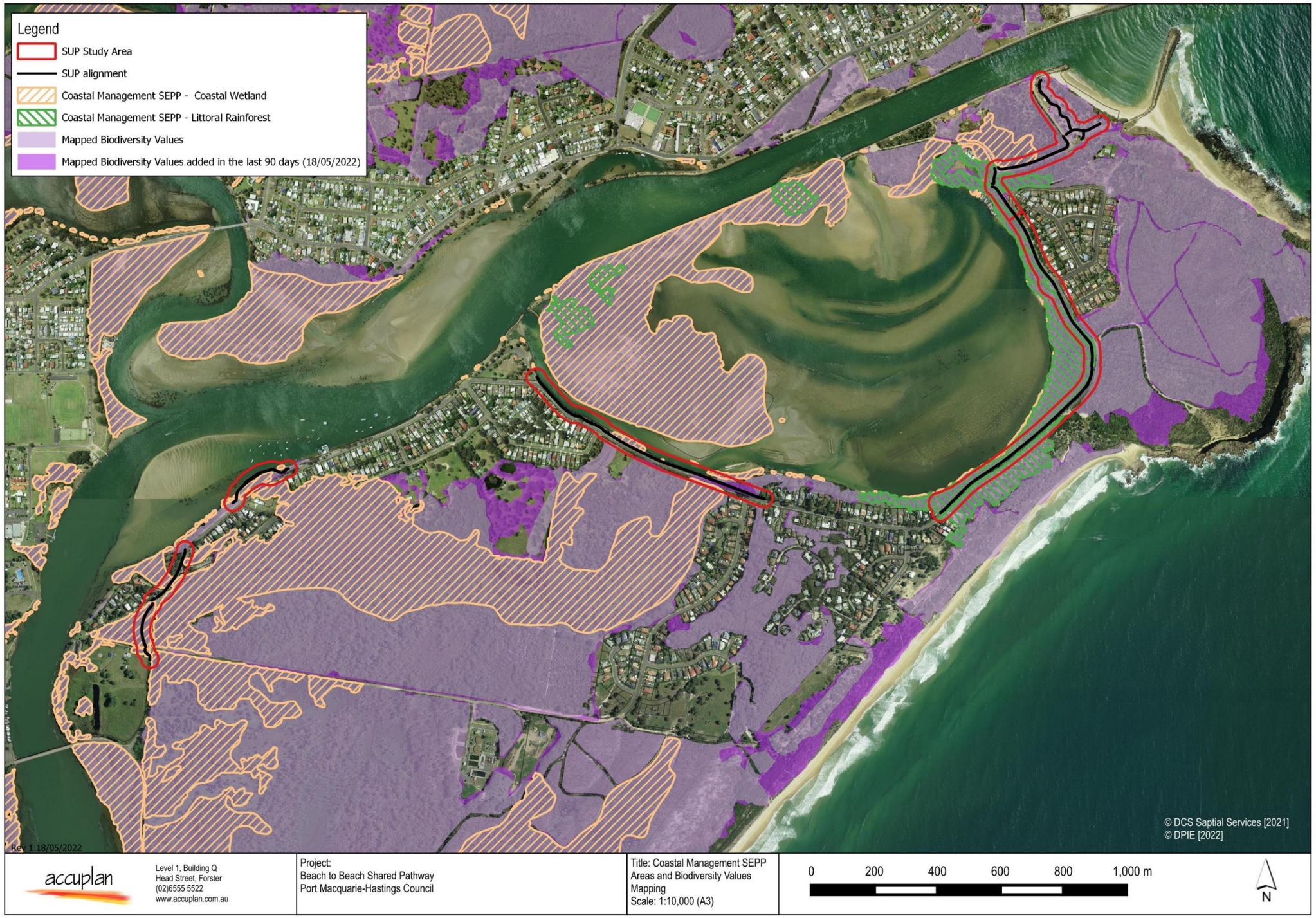


Figure 2.6: Mapped biodiversity values and Coastal Management SEPP Areas

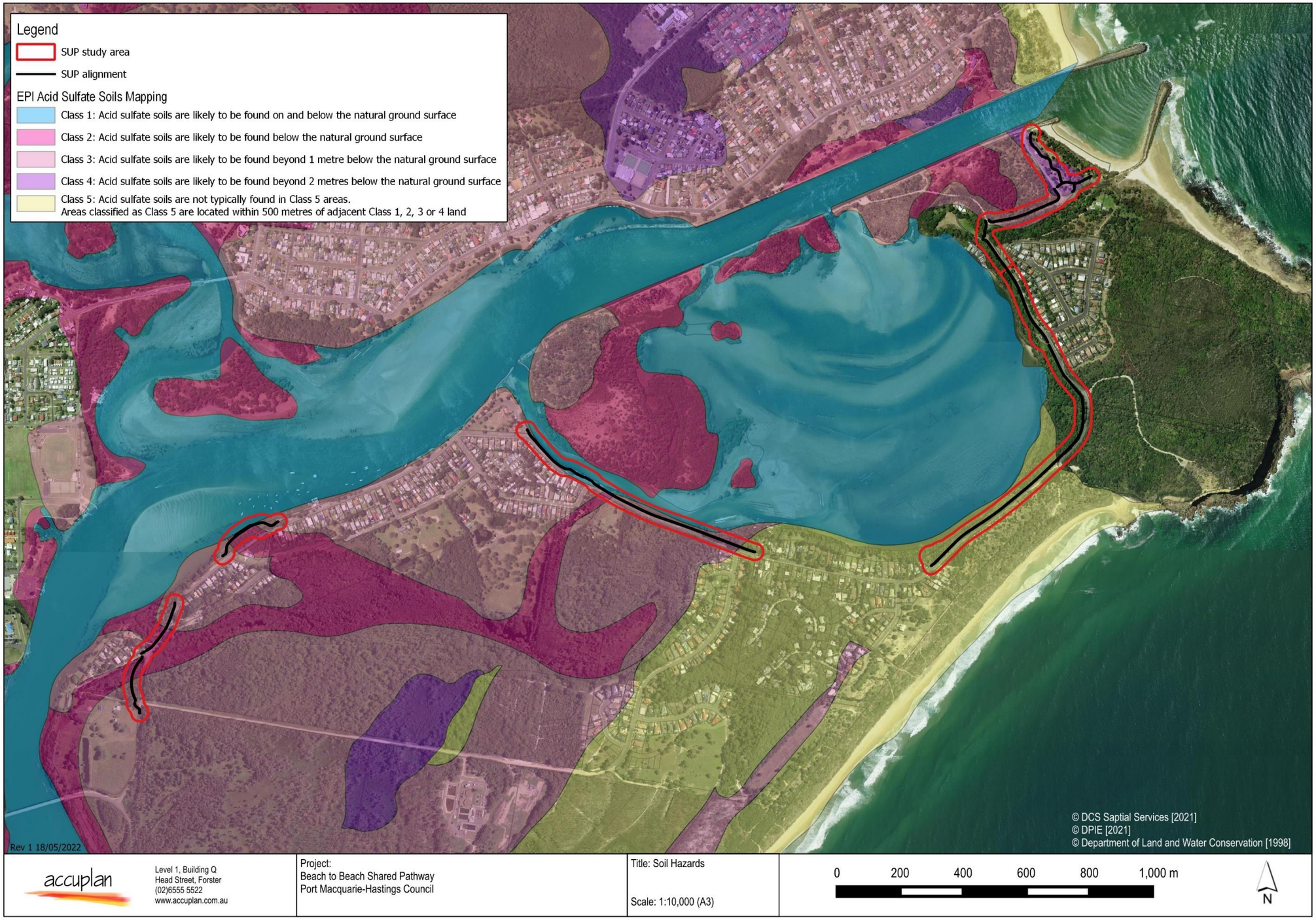


Figure 2.7: Acid Sulfate Soil probability

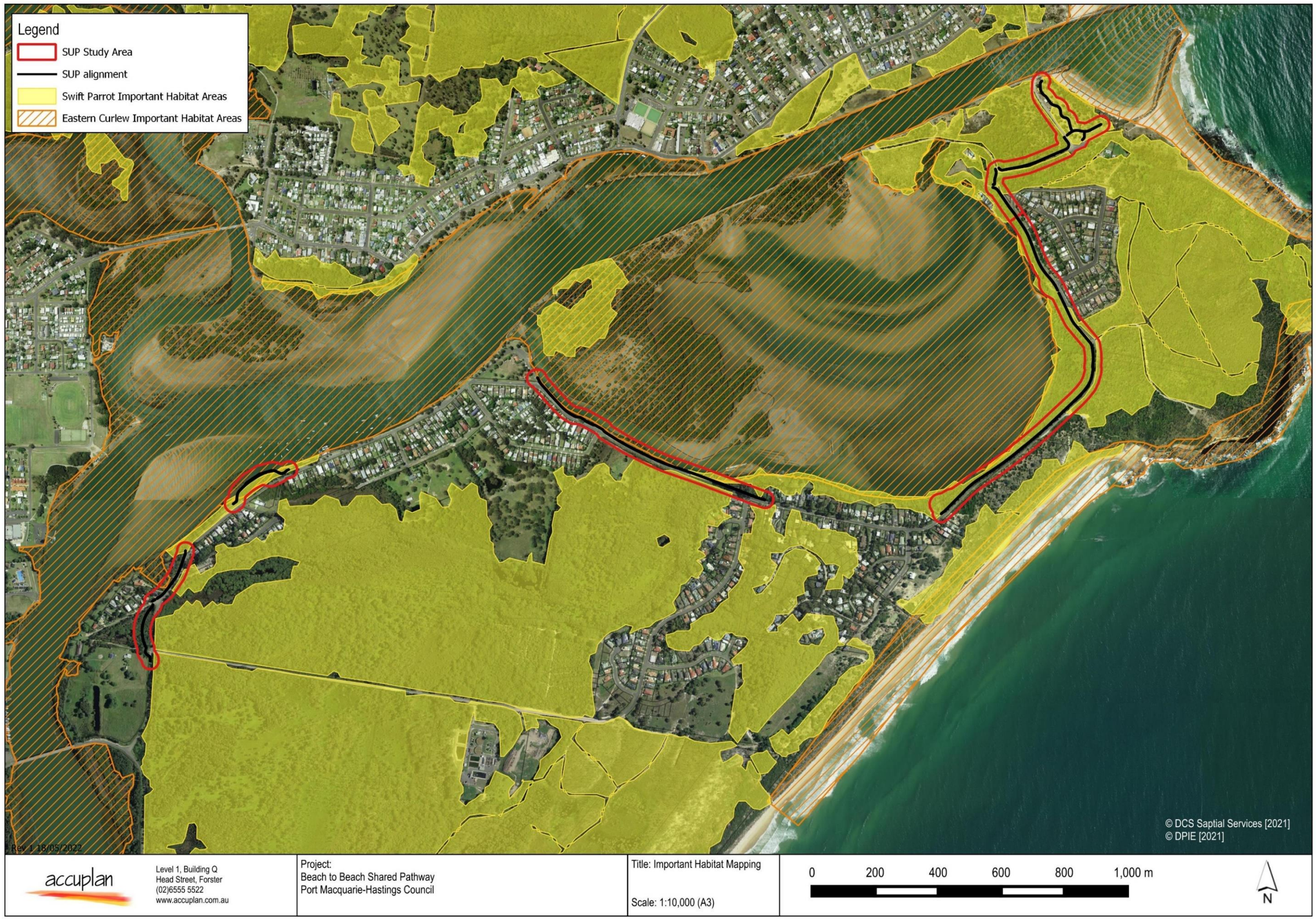


Figure 2.8: Important habitat mapping (DPIE, 2021)

3. NATIVE VEGETATION AND HABITAT

3.1 Native Vegetation Extent

Vegetation within the Camden Head area is largely characterised by coastal influences and includes estuarine communities, coastal wetlands and swamp forests, littoral rainforest, dry sclerophyll forest, heath, and vegetated dunes.

The extent of native vegetation in the study area (i.e., a 25 m buffer surrounding the proposed alignment) was mapped in accordance with the BAM (**Section 4.1**). This was undertaken via aerial interpretation, at a scale no greater than 1:1500, and was assisted by site collected data.

3.2 Methods to assess PCTs

3.2.1 Review of existing information

A review of existing information was undertaken for the site. This included review of the following databases and literature relevant to the site and local area:

- *NSW Vegetation Information System* (VIS) classification database (OEH, 2020)
- Port Macquarie Hastings LGA Vegetation and EEC Maps (2014) VIS IDs 4205 and 4206
- *Greater Hunter Native Vegetation Mapping* (Sivertsen *et al.*, 2011)
- *Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project - Vegetation Community Profiles* (Somerville, 2009)
- Vegetation Map for the Mid North Coast of NSW (VIS ID 3886)
- *Draft Camden Head Biodiversity Study* (Darkheart Eco-Consultancy, 2010)

3.2.2 Floristic survey

Floristic surveys were undertaken by Luke Pickett (Accreditor Assessor No: BAAS17100) with assistance from Shannon Baker and Matt Clancy.

A number of sampling techniques were used to ensure the site was adequately sampled. The site was scoped using the 'Random Meander Technique' described by Cropper (1993). This involved walking in a random meander throughout the proposal site, visiting the full range of habitats and recording every plant species observed.

Vegetation plots are established in accordance with the BAM as detailed in **Section 3.2.3**. The bearing of each plot was dependent on the size and topography of the vegetation zone but was typically selected to best represent the vegetation zone and avoid zone edges and ecotones wherever possible. Avoiding vegetation edges and ecotones was often unavoidable given the linear nature of the proposal area. The locations of vegetation plots and targeted survey tracks are shown in Appendix V.

Plant community types (PCTs) were determined by comparing the floristic structure and composition of the vegetation on site with vegetation profiles described within the VIS database (OEH, 2020) and community descriptions of endangered ecological communities known to occur in the local area.

A list of all plant species recorded during fieldwork is listed in **Appendix I**.

3.2.3 Vegetation Plots

Seven vegetation plots were completed to assess the vegetation integrity of native vegetation within the proposal area. Data collected within the plot/transect includes:

- Flora diversity and composition;
- Groundcover composition and abundance;
- Vegetation structure (including canopy, sub-canopy, shrub and groundcovers);
- Fauna habitats (including hollow trees, fallen timber);
- Regeneration of canopy species;
- Landscape features (including slope, gully, aspect);
- Soil features (including soil type, rocks, organic matter); and
- Geographical coordinates and a photographic record.

Vegetation plots are typically based on a 20m × 20m plot (400m^2) to assess composition and structure components and a 50m × 20m plot (1000m^2) to assess function. Where a standard plot does not fit into a vegetation zone, an equivalent longer and narrower (e.g., 10 m x 100 m = 0.1 ha) has been used. Due to the narrow nature of the proposal area, the plots were best placed to be representative of each vegetation zone, either partly within or outside of the proposal area in equivalent vegetation.

3.3 Plant community types (PCTs)

Seven PCTs have been identified within the study area and six of these occur within the proposal area. A summary of the vegetation types recorded in the study area is provided in **Table 3.1**. The distribution of vegetation occurring in the study area is shown in **Figure 3.1** to **Figure 3.6** and a description of each PCT recorded in the proposal area is provided in **Table 3.2** to **Table 3.7.**

A full list of species recorded during the field survey is provided in **Appendix I**.

Table 3.1: PCTs occurring within the study area

PCT	BC Act	FM Act	EPBC Act
PCT 1536 Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest	EEC	N/A	CEEC
PCT 1727 Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	EEC
PCT 1747 Grey Mangrove low closed forest	Not listed	Protected marine vegetation	Not listed
PCT 1746 Saltmarsh Estuarine Complex	EEC	Protected marine vegetation	VEC
PCT 771 Coastal sand Tea-tree - Banksia scrub	Not listed	N/A	Not listed
PCT 1724 Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	Not listed
PCT 1808 Estuarine reedland	EEC	N/A	Not listed

3.3.1 Non-native vegetation

Managed areas including roadside verges and parklands were primarily comprised of exotic herbs and grasses and were assessed as non-native vegetation. Some remnant trees occur within parkland areas (i.e., no native understorey) and these areas have been mapped separately as *Remnant trees with non-native understorey*. The proposed SUP avoids impacts to remnant trees in these areas; thus, these areas have also been assessed as non-native vegetation.

Where trees cannot be avoided, trees have been assigned to the most likely PCT occurring in the proposal area (i.e., gallery stands of Swamp Oaks have been assigned to PCT 1727).

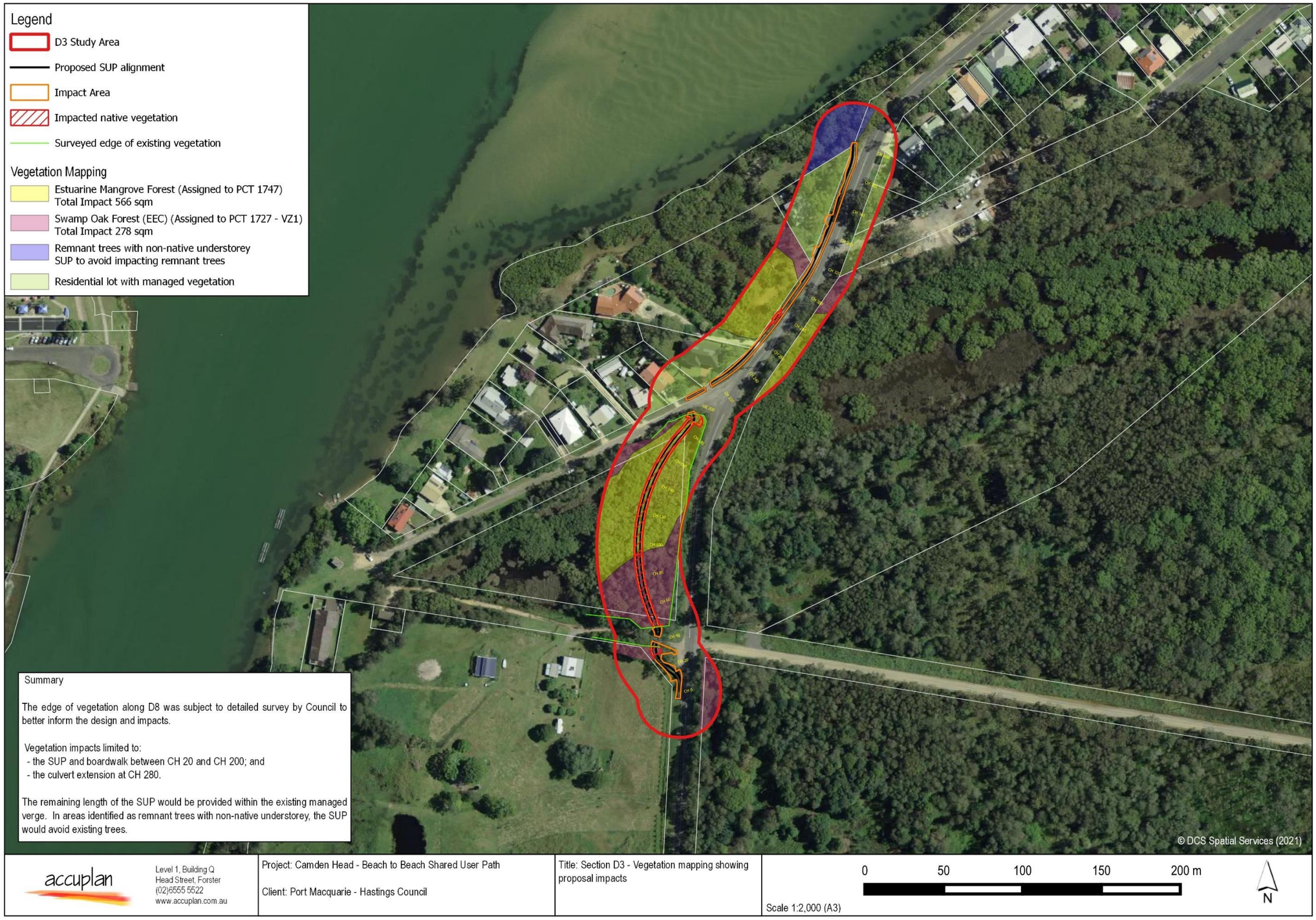


Figure 3.1: Section D3 – Vegetation map showing proposal impact area

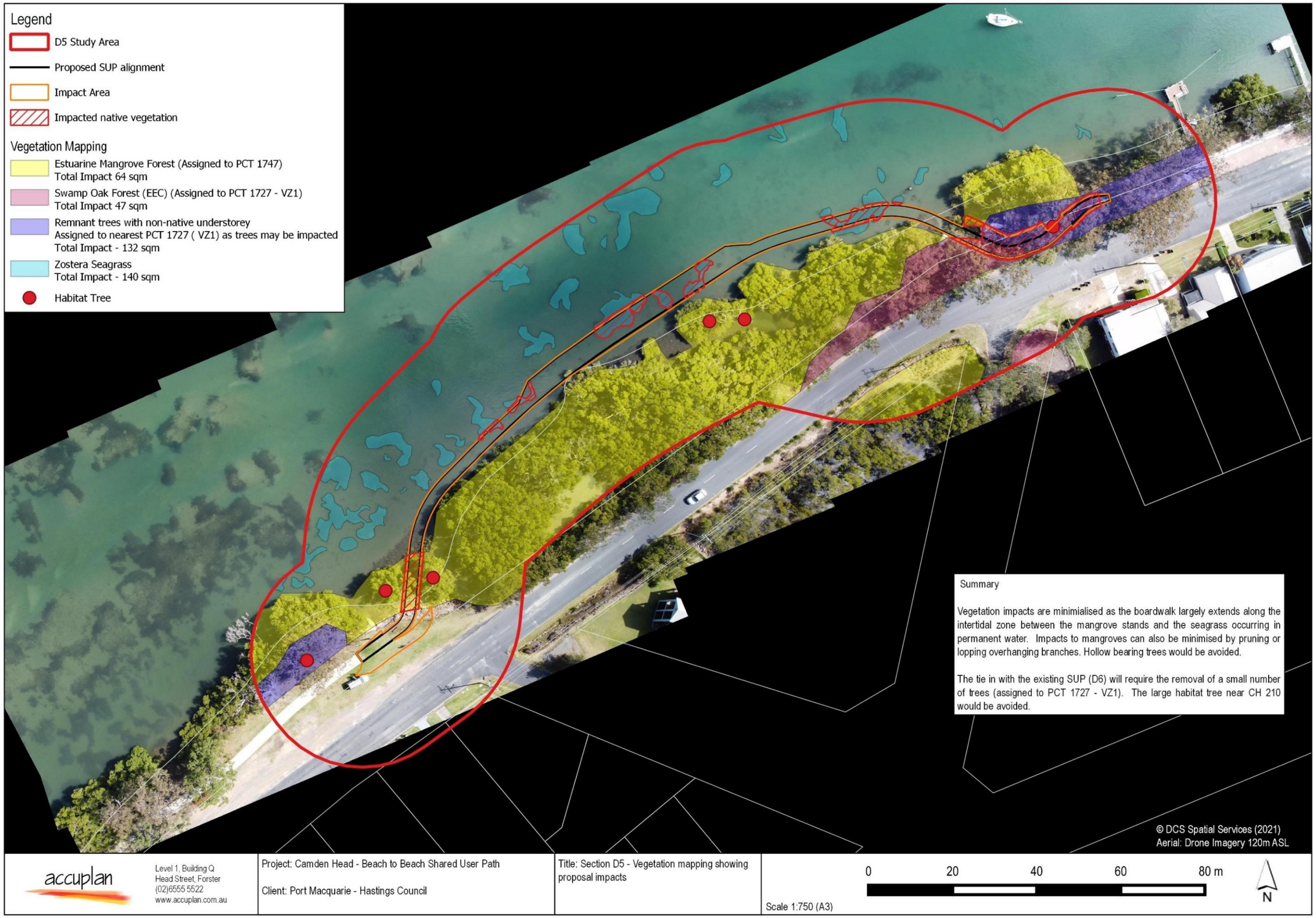


Figure 3.2: Section D5 – Vegetation map showing proposal impact area

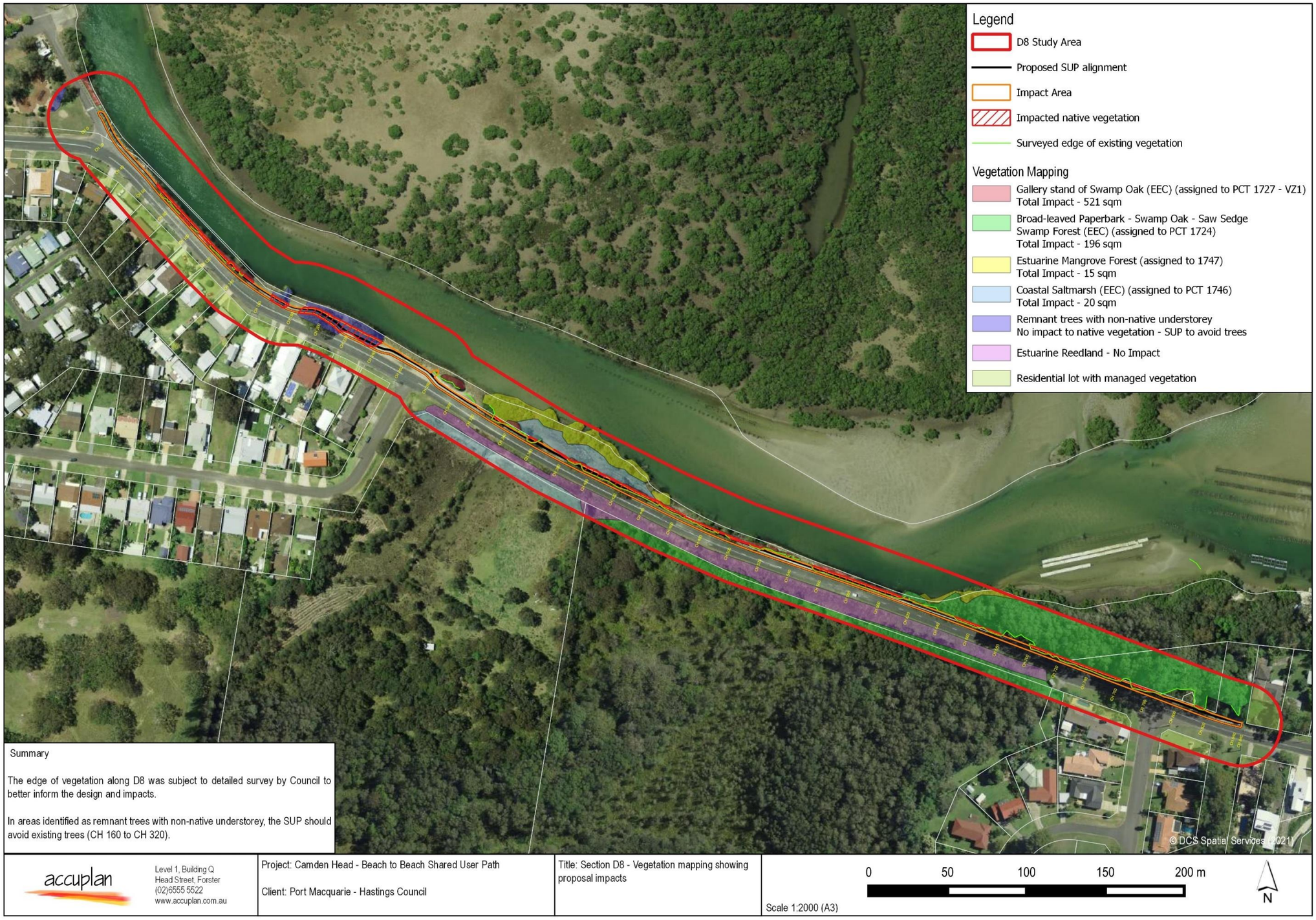


Figure 3.3: Section D8 – Vegetation map showing proposal impact area

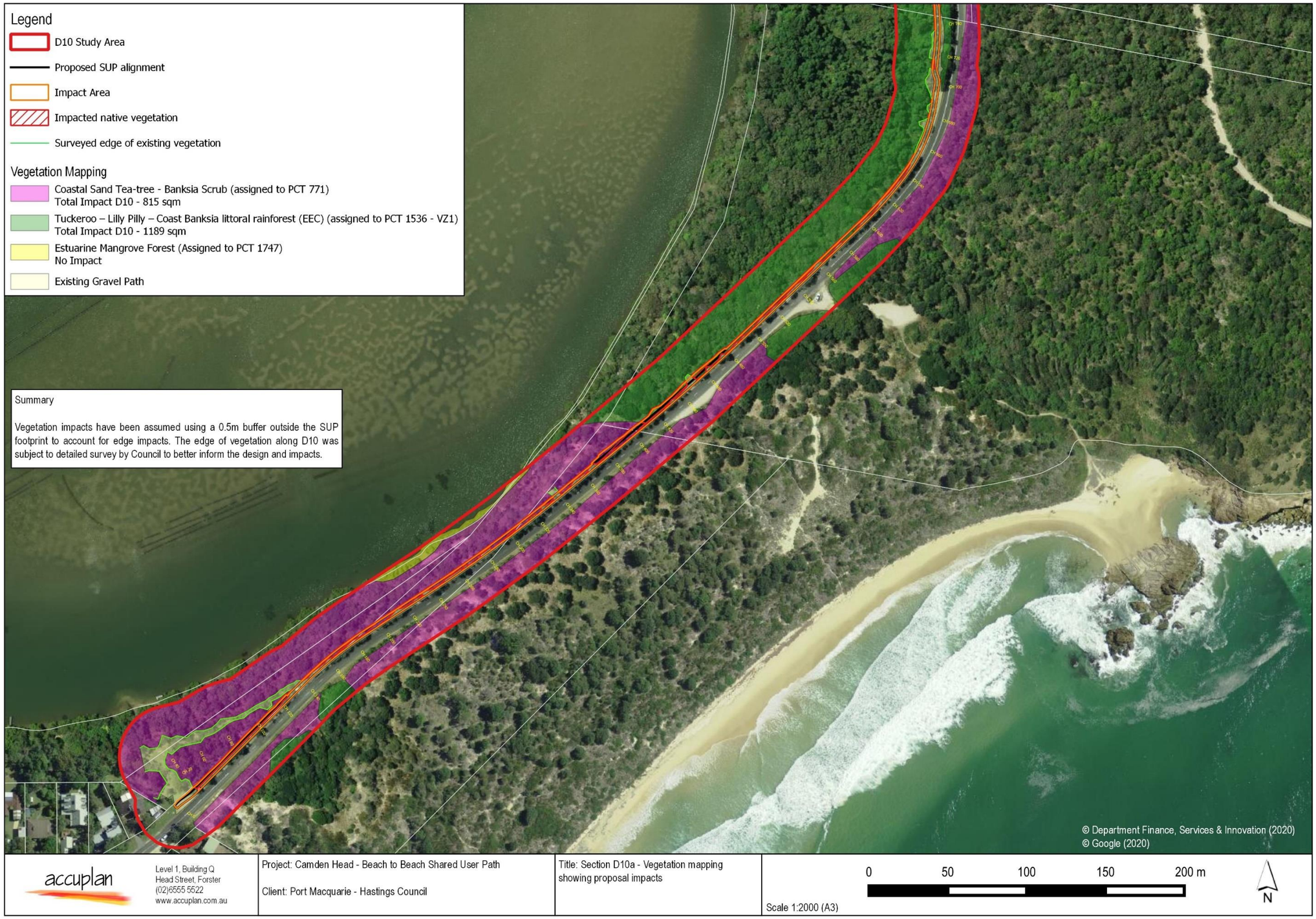


Figure 3.4: Section D10(a) (CH0-CH700) – Vegetation map showing proposal impact area

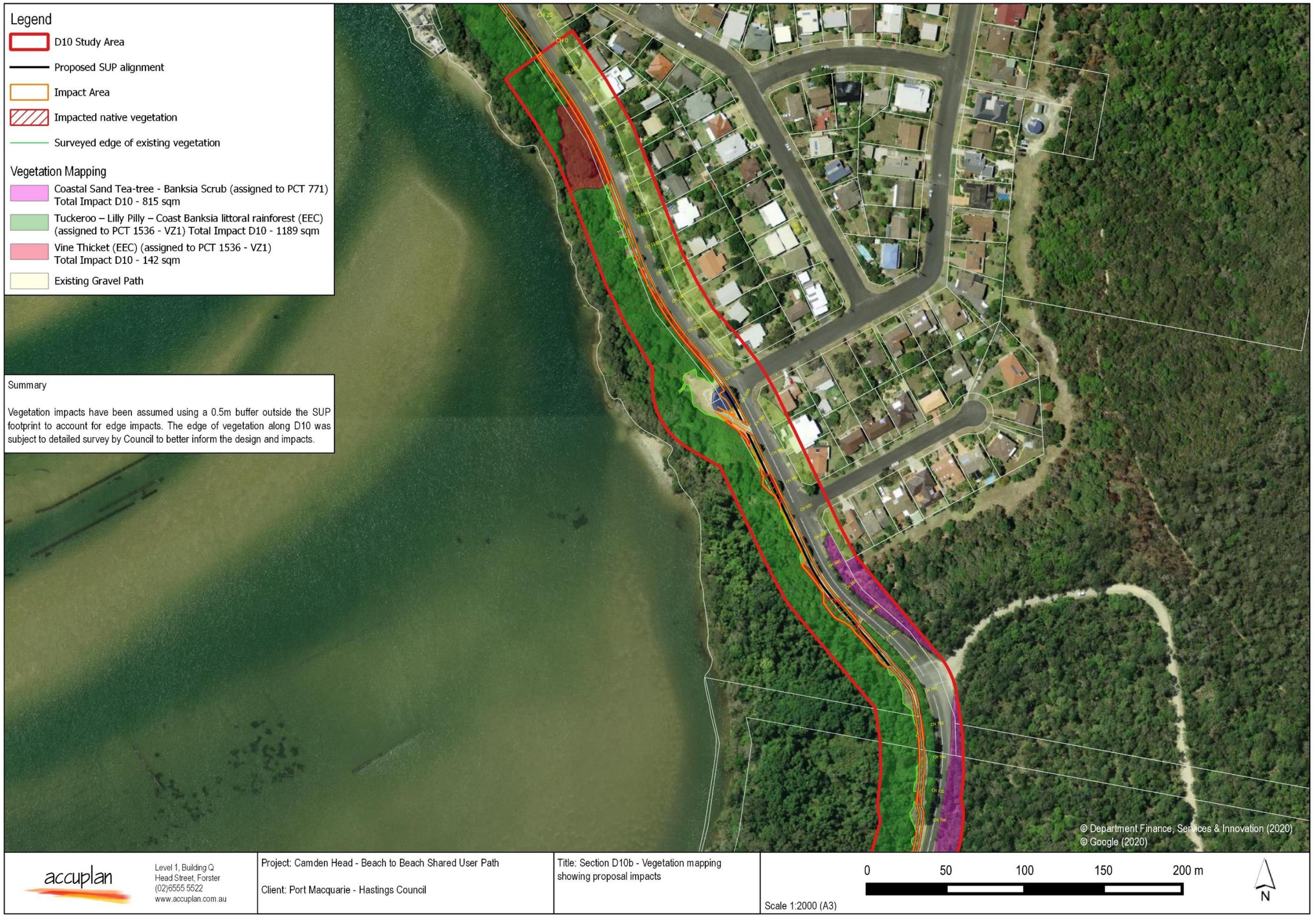


Figure 3.5: Section D10(b) (CH700-CH1250) – Vegetation map showing proposal impact area

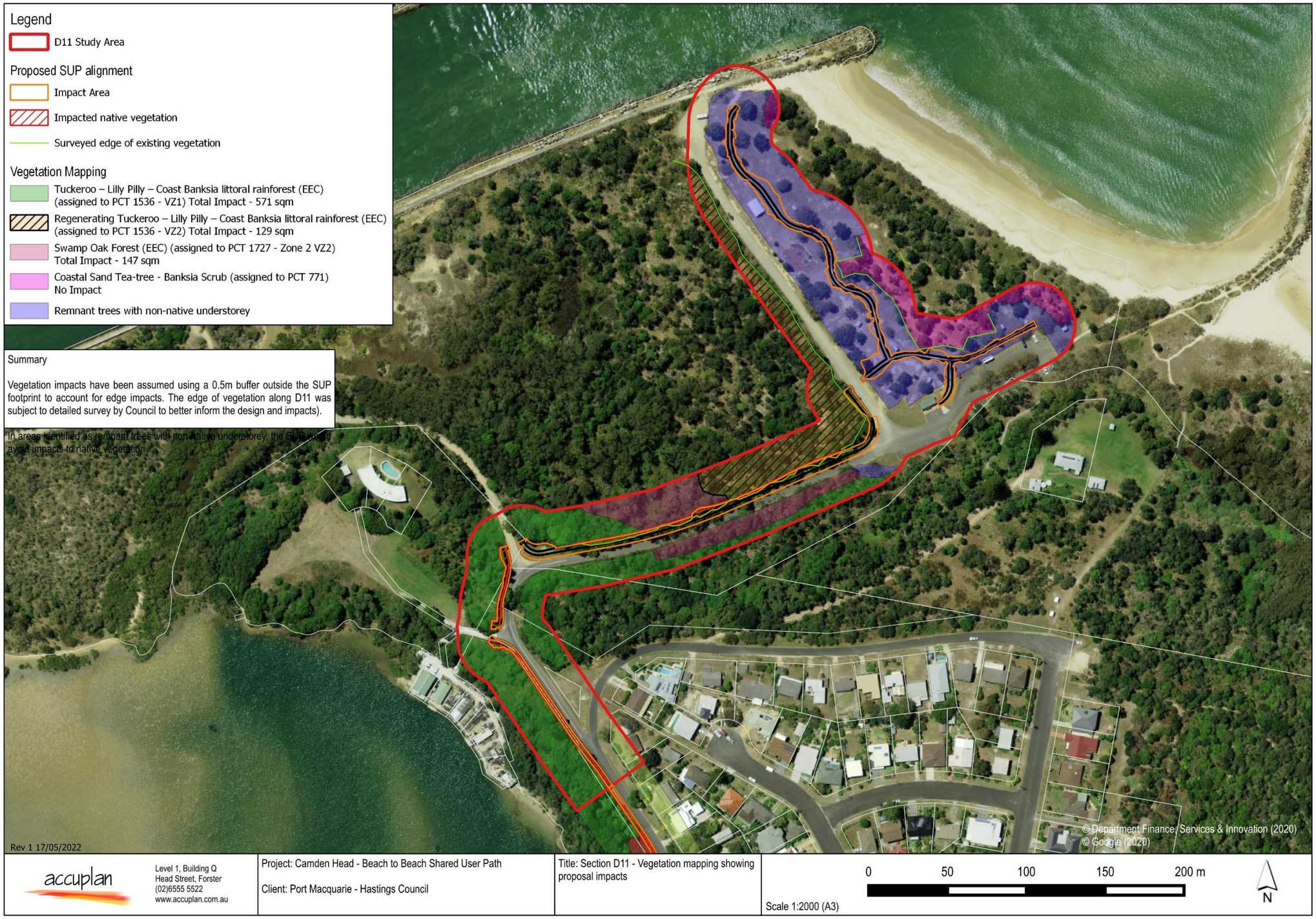


Figure 3.6: Section D11 – Vegetation map showing proposal impact area

Table 3.2: Description of PCT 1536

PCT ID	PCT 1536 *Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest*	
Estimate of % cleared	78% (VIS Database, 2020)	
BC Act Status	Associated with EEC – Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	
EPBC Act Status	Associated with CEEC – Littoral rainforests and coastal vine thickets of eastern Australia	
Vegetation Formation	Rainforests	
Vegetation Class	Littoral Rainforests	
PCT Description	Low open forest to closed forest with a canopy characterised by *Cupaniopsis anacardioides* and *Banksia integrifolia*. The mid-storey is composed mainly of shrubs and climbers. The ground layer consists of ferns; graminoids and scattered forbs. Near coastal areas on coastal lowlands of the lower North coast and Central Coast mainly on sands.	
Extent within proposal area	Primarily occurs within sections D10 and D11.	
Species relied upon for PCT identification	***Species***	***Relative abundance***
	Banksia integrifolia subsp. *integrifolia* (Coastal Banksia)	5-10% coverage
	Cupaniopsis anacardioides (Tuckeroo)	10-20% coverage
PCT justification	PCT 1536 was selected as the best fit option given the presence of a low, mostly closed, diverse canopy comprised of diagnostic species, Coastal Banksia and Tuckeroo, and other rainforest species typical of Littoral Rainforest. The following PCTs were also considered: • PCT 1537 Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast – this PCT has a similar composition and structure and whilst many of the diagnostic species occur within the rainforest on site, this PCT lacks Coastal Banksia which is a key diagnostic species and is a common component of the rainforest vegetation occurring within the study area. • PCT 751 Brush Box - Tuckeroo littoral rainforest on coastal headlands of the NSW North Coast Bioregion – This PCT also has a similar composition and structure although *Lophostemon confertus* (Brush Box) is a key diagnostic species and was not recorded within the study area. This PCT also has a classification confidence level of very low due to a lack of survey data.	
Canopy: **to 15m, 60–80% cover**	*Banksia integrifolia* subsp. *integrifolia* (Coastal Banksia), *Cupaniopsis anacardioides* (Tuckeroo), *Euroschinus falcatus* (Ribbonwood), *Acmena smithii* (Lilly Pilly), *Acacia melanoxylon* (Blackwood), *Polyscias elegans* (Celery Wood)	
Shrubs: **to 6m, 20-60% cover**	*Synoum glandulosum subsp. glandulosum* (Scentless Rosewood), *Breynia oblongifolia* (Breynia), *Notelaea longifolia* (Mock Olive), *Psychotria loniceroides* (Hairy Psychotria), *Pittosporum revolutum* (Rough fruit Pittosporum), *Wilkiea huegeliana* (Veiny Wilkiea), *Acronychia imperforata* (Logan Apple), *Guioa semiglauca* (Guioa), *Wikstroemia indica* (Bootlash Bush), *Elaeocarpus reticulatus* (Blueberry Ash), *Pittosporum multiflorum* (Orange Thorn), *Elaeodendron australe* var. *australe* (Red Olive Plum), *Alectryon coriaceus* (Beach Alectryon)	

Native Goundcover to 1m, 15-30% cover	*Lomandra longifolia* (Spiny Mat-rush), *Dianella caerulea* var. *producta* (Blue Flax-lily), *Oplismenus imbecillis* (Basket Grass), *Entolasia marginata* (Bordered Panic), *Tripladenia cunninghamii, Pteridium esculentum* (Bracken), *Cyperus gracilis* (Slender Flat-sedge)
Climbers	*Cissus antarctica* (Kangaroo Vine), *Cissus sterculiifolia* (Yaroong), *Maclura cochinchinensis* (Cockspur Thorn), *Gynochthodes jasminoides* (Sweet Morinda)
Exotics	*Ehrharta erecta* (Panic Veldtgrass), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana), *Asparagus aethiopicus* (Ground Asparagus)
Condition	Three condition classes were identified in the project area: • **Zone 1 (VZ1):** This zone comprises the high condition vegetation present within sections D10 and D11. This is relatively intact and has minimal weed cover (<5%) (**Photo 3.1** and **Photo 3.2**). • **Zone 2 (VZ2):** This zone comprises a previously disturbed area in Section D11 that is now regenerating, largely with species consistent with this PCT. This is reflected by a more open canopy and shrub layer and a higher prevalence of weeds, particularly *Ehrharta erecta* (Panic Veldtgrass) (**Photo 3.3**). • **Zone 3 (VZ3):** This zone represents steep, previously disturbed sections at the northern end of D10 which are comprised of dense vines and a higher prevalence of weeds (**Photo 3.4**).



Photo 3.1: Section D10 Plot 4 – High condition PCT 1536 (VZ1) occurs adjacent to the proposed alignment



Photo 3.2: Section D10 – Existing unsealed path through PCT 1536 (VZ1) at CH700 to CH860



Photo 3.3: Section D11 Plot 7 – Regenerating PCT 1536 (VZ2) occurs adjacent to the alignment



Photo 3.4: Section D10 – Proposed pathway extends along edge of littoral rainforest vegetation associated with the margins of Gogleys Lagoon (right of photo). Steep, previously disturbed sections at the northern end of D10 are comprised of dense vines (VZ3).

Table 3.3: Description of PCT 1727

PCT ID	PCT 1727 *Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast*
Estimate of % cleared	81% (VIS Database, 2020)
BC Act Status	Associated with EEC – Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
EPBC Act Status	Associated with EEC – Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland
Vegetation Formation	Forested Wetlands
Vegetation Class	Coastal Floodplain Wetlands
PCT Description	Casuarina dominated Swamp Open Forest with a Myrtaceous shrubby mid-stratum. The ground stratum is typically dominated by sedges and rushes with grasses dominating in slightly raised areas. This community is typically found on the margins of brackish water bodies on floodplains. Within the proposal area the composition of the mid-stratum and understorey is influenced by nearby or adjacent rainforest type vegetation and the prevalence of weeds, particularly within Section D3 where Camphor Laurel is very common.
Extent within proposal area	Recorded along sections of D3, D5, D8 and D11.
Species relied upon for PCT identification	***Species*** — ***Relative abundance*** *Casuarina glauca* (Swamp Oak) — 20-30% coverage *Machaerina juncea* (Bare Twig-rush) — 5% coverage
PCT justification	PCT 1727 was selected as the best fit option given: a) the presence of diagnostic species *Casuarina glauca* (Swamp Oak) and *Machaerina juncea* (Bare Twig-rush); and b) the community was typically recorded on floodplain areas near or adjacent to brackish water bodies. The following PCTs were also considered: • PCT 1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast – this PCT is less influenced by brackish water and PCT 1727 likely merges into this PCT as brackish influences decrease. Both the selected best fit PCT (1727) and 1728 are assigned to the same vegetation formation (Forested Wetlands) and vegetation class (Coastal Floodplain Wetlands) and both are consistent with the Swamp Oak Floodplain Forest EEC. Any like-for-like credit requirement would be the same for both PCTs. • PCT 1729 - Swamp Oak swamp forest on coastal lowlands of the Central Coast and Lower North Coast – this PCT is also influenced by brackish water bodies; however, this PCT was excluded due to the absence diagnostic species other than *Casuarina glauca*, and the vegetation class for this PCT, Coastal Swamp Forests, does not represent the PCT occurring on floodplains.

Canopy: **to 20m, 20–30% cover**	*Casuarina glauca* (Swamp Oak)
Mid-stratum **to 12m**	*Archontophoenix cunninghamiana* (Bangalow Palm) (Zone 1 & 2) *Glochidion ferdinandi var. ferdinandi*
Shrubs: **to 3m, 1-20% cover**	*Cupaniopsis anacardioides* (Tuckeroo), *Maclura cochinchinensis* (Cockspur Thorn), *Breynia oblongifolia* (Breynia), *Notelaea longifolia* (Mock Olive), *Pittosporum revolutum* (Rough Pittosporum)
Native Goundcover **to 1m, 20-40% cover**	*Machaerina juncea* (Bare Twig-rush), *Hypolepis muelleri* (Harsh Ground Fern), *Commelina cyanea* (Scurvy Weed), *Phragmites australis* (Native Reed)
Climbers	*Geitonoplesium cymosum* (Scrambling Lily), *Parsonsia straminea* (Monkey Rope), *Stephania japonica* var. *discolor* (Snake Vine)
Exotics **>50% cover**	*Lantana camara* (Lantana), *Cinnamomum camphora* (Camphor Laurel), *Ochna serrulata* (Mickey Mouse Plant), *Senna pendula* var. *glabrata*
Condition	Two condition classes were identified in the project area: • **Zone 1 (VZ1):** This zone comprises the Swamp Oak vegetation subject to high levels of understorey disturbance. This includes the area of PCT 1727 recorded in Section D3 which is subject to a high occurrence of weeds and small patches or gallery vegetation recorded within Sections D5 and D8 where the understorey is reduced or managed (**Photos 5 - 8**). • **Zone 2 (VZ2):** This zone comprises Swamp Oak vegetation recorded in Section D11. This area is relatively intact, although the composition of the mid-stratum is influenced by the adjacent rainforest vegetation. Weed cover is minimal away from the road edge and weeds appear to be regularly managed throughout the zone (**Photo 3.9**).



Photo 3.5: PCT 1727 (VZ1) recorded within section D3 showing dense weedy understorey



Photo 3.6: Small patch (approx. 640m2) of Swamp Oak occurring at northern end of Section D5. Attributed to PCT 1727 (VZ1).



Photo 3.7: Gallery Swamp Oak at southern end of Section D8. Attributed to PCT 1727 (VZ1).



Photo 3.8: Gallery Swamp Oak occurring at northern end of Section D8. Attributed to PCT 1727 (VZ1).



Photo 3.9: Section D11 Plot 5 - PCT 1727 (VZ2) occurring between CH270 to CH330.

Table 3.4: Description of PCT 1747

PCT ID	PCT 1747 *Grey Mangrove low closed forest*
Estimate of % cleared	59% (VIS Database, 2020)
BC Act Status	Not consistent with any listed TECs PCT 1747 is in part associated with the EEC *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*. Areas of this PCT within the proposal area were not consistent with this TEC as mangroves had a relatively high coverage generally exceeding 50% and representative groundcovers were lacking or in very low abundance.
EPBC Act Status	No associated TEC
FM Act Status	Protected Marine Vegetation and Key Fish Habitat
Vegetation Formation	Saline Wetlands
Vegetation Class	Mangrove Swamps
PCT Description	Mangrove Low Open Forest. The ground stratum may or may not be present and becomes more prominent as tidal inundation frequency lessens to landward. Occurs on tidal saline muds along the length of the coast.
Extent within proposal area	Recorded along sections D3, D5 and D8
Species relied upon for PCT identification	***Species*** ***Relative abundance*** *Avicennia marina* (Grey Mangrove) 70% cover *Sporobolus virginicus* (Saltwater Couch)
PCT justification	PCT 1747 has been selected as the best-fit option as it closely matches the floristic composition of the community recorded within the proposal area. The only other option occurring within the North Coast bioregion, and has Grey Mangrove forming the dominant component of the community, is *PCT 916 - Mangrove - Grey Mangrove low closed forest of the NSW Coastal Bioregion*. This is a broadly described vegetation type and has a classification confidence level of very low.
Canopy: to 10m, 50-75% cover	*Avicennia marina* (Grey Mangrove)
Shrubs: to 0.5m, <5% cover	Generally absent or limited to juvenile mangroves
Native Goundcover to 1m, 20-40% cover	Mostly absent in regularly inundated areas. *Sporobolus virginicus* (Saltwater Couch), *Suaeda australis* (Seablite), *Sarcocornia quinqueflora* (Samphire)
Exotics <5% cover	*Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush)
Condition	High condition throughout with minimal weed cover (see **Photo 3.10** and **Photo 3.11**). Weeds may occur along the outer edge of the community.



Photo 3.10: Section D3 Plot 2 - PCT 1747 – Boardwalk alignment through mangrove vegetation.



Photo 3.11: Section D5 – Boardwalk proposed over the estuary to minimise impacts to existing mangroves.

Table 3.5: Description of PCT 1746

PCT ID	PCT 1746 *Saltmarsh Estuarine Complex*
Estimate of % cleared	16% (VIS Database, 2020)
BC Act Status	Associated with EEC – Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
EPBC Act Status	Associated with VEC – *Subtropical and Temperate Coastal Saltmarsh*
FM Act Status	Protected Marine Vegetation / Key Fish Habitat
Vegetation Formation	Saline Wetlands
Vegetation Class	Saltmarshes
PCT Description	Rarely tidally inundated, salt tolerant herbaceous community which may be dominated by chenopods or grasses depending on local conditions. Colonising mangroves may be present as emergent individuals. Open saline mudflats have been included in this type. Occurs on semi-tidal saline muds; usually on the landward side of mangrove stands along the length of the coast.
Extent within proposal area	Small patch (approx. 915m^2) recorded along section D8
Species relied upon for PCT identification	***Species***
	Sporobolus virginicus (Saltwater Couch) *Juncus kraussii* (Sea Rush) *Avicenna marina* (Grey Mangrove)
PCT justification	PCT 1746 has been selected as the best-fit option as it most closely matches the distribution and floristic composition of the community recorded within the proposal area. The following PCTs were also considered: • PCT 1747 *Grey Mangrove low closed forest*. This PCT often occurs along the margins of saltmarsh vegetation and is subject to tidal inundation more regularly. The PCTs are differentiated by a dense ground cover of salt tolerant herbs and grasses and a lower incidence of Mangroves. • PCT 1125 *Saltmarsh complex of the NSW North Coast Bioregion*. This PCT represents the only other saltmarsh community occurring within the North Coast bioregion. This is a broadly described vegetation type and has only a 'very low' classification confidence.
Emergent: to 5m, 10% cover	*Avicennia marina* (Grey Mangrove) *Casuarina glauca* (Swamp Oak)
Native Goundcover	*Sporobolus virginicus* (Saltwater Couch), *Juncus kraussii* (Sea Rush), *Sarcocornia quinqueflora* (Samphire), *Suaeda australis* (Seablite); *Samolus repens*
Exotics	*Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush)
Condition	Small patch with high edge to area ratio. Minimal weed cover, although weeds are more prevalent along the outer edge of the community (**Photo 3.12**).



Photo 3.12: Section D8 – Saltmarsh (PCT 1746) occurring adjacent to proposed SUP at CH350 to CH440.

Table 3.6: Description of PCT 771

PCT ID	PCT 771 *Coastal sand Tea-tree - Banksia scrub*	
Estimate of % cleared	50% (VIS Database, 2020)	
BC Act Status	No associated TEC	
EPBC Act Status	No associated TEC	
Vegetation Formation	Heathlands	
Vegetation Class	Coastal Headland Heaths	
PCT Description	Coastal Sand Tea-tree-Banksia Scrub is a littoral heath and scrub that occupies coastal foredunes and beach ridges near the open ocean. Typically, it comprises a dense cover of coast tea-tree (*Leptospermum laevigatum*) and coast banksia (*Banksia integrifolia*). The height of the scrub varies considerably in response to exposure to prevailing winds. This can result in a dramatically different visual appearance between patches. Despite the exposed locations there is usually some development of a soil profile as a result of clay influence in a sandstone headland or of sheltering and protection from leeward scrubs on dune systems. This is sufficient to support some mesic shrubs and eucalypt species that otherwise prefer more sheltered environments in the littoral zone.	
Extent within proposal area	Primarily occurs within sections D10.	
Species relied upon for PCT identification	***Species***	***Relative abundance***
	Banksia integrifolia subsp. *integrifolia* (Coastal Banksia)	20% cover
	Leptospermum laevigatum (Coastal Tea Tree)	20% cover
	Monotoca elliptica	10% cover
PCT justification	PCT 1536 represented the only PCT occurring in the North Coast bioregion with a heath/ scrub type structure and a dominance of diagnostic species, Coastal Tea Tree, Coastal Banksia and *Monotoca elliptica.* The community had some similarities with the adjoining PCT1536; however; is differentiated by the open nature of the canopy and the prevalence of sclerophyllous species including Coastal Tea Tree, *Monotoca elliptica* and *Dodonaea triquetra*.	
Canopy: **to 15m, 35–50% cover**	*Banksia integrifolia* subsp. *integrifolia* (Coastal Banksia), *Angophora floribunda* (Rough-barked Apple), *Casuarina glauca* (Swamp Oak)	
Shrubs: **to 8m, 35–50% cover**	*Monotoca elliptica, Leptospermum laevigatum* (Coastal Tea Tree), *Dodonaea triquetra* (Large-leaf Hop-bush), *Astrotricha longifolia, Breynia oblongifolia* (Breynia), *Notelaea longifolia* (Mock Olive), *Pittosporum revolutum* (Rough fruit Pittosporum), *Polyscias sambucifolia* (Elderberry Panax)	
Native Goundcover **to 1m, 80-100% cover**	*Lomandra longifolia* (Spiny Mat-rush), *Lepidosperma laterale, Pteridium esculentum* (Bracken), *Pomax umbellata* (Pomax), *Dianella caerulea* var. *producta* (Blue Flax-lily), *Imperata cylindrica* (Blady Grass)	
Climbers	*Hibbertia scandens* (Climbing Guinea Flower), *Geitonoplesium cymosum* (Scrambling Lily), *Pandorea pandorana* (Wonga Vine), *Smilax australis, Smilax glyciphylla*	
Exotics **<5% cover**	*Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana), *Asparagus aethiopicus* (Ground Asparagus)	
Condition	The PCT is in good condition with minimal weed cover (**Photo 3.13** to **Photo 3.15**). This is despite the patch being very narrow with a relatively high edge to area ratio.	



Photo 3.13: Section D10 Plot 3 - PCT 771



Photo 3.14: Section D10 – Existing unsealed path through PCT 771 at CH0 to CH140



Photo 3.15: Section D10 – Proposed SUP alignment adjacent to PCT 771 at CH240

Table 3.7: Description of PCT 1724

PCT ID	PCT 1724 *Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*	
Estimate of % cleared	31% (VIS Database, 2020)	
BC Act Status	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	
EPBC Act Status	No associated TEC	
Vegetation Formation	Forested Wetlands	
Vegetation Class	Coastal Swamp Forests	
PCT Description	Swamp Open Forest with area of standing water dominated by Melaleucas. The mid-stratum comprises small trees and the ground stratum is typically a mix of sedges, ferns, grasses and graminoid species. This community occurs on alluvial sands and muds on floodplains and barrier sands of the lower North Coast and Central Coast. Elevations are in the range of 1 to 350m.	
Extent within proposal area	Section D8 between CH610 and CH820	
Species relied upon for PCT identification	***Species***	***Relative abundance***
	Melaleuca quinquenervia (Broad-leaved Paperbark)	50% cover
	Casuarina glauca (Swamp Oak)	20% cover
	Gahnia clarkei (Tall Saw-sedge)	60% cover
	Machaerina juncea (Bare Twig-rush)	5% cover
	Telmatoblechnum indicum (Swamp Water Fern)	1% cover
PCT justification	PCT 1724 was selected as the best-fit option given: a) This community occurs on alluvial sands and muds on floodplains; b) The dominance of diagnostic species Broad-leaved Paperbark in the canopy with Swamp Oak also common; and c) the low-lying understorey is dominated by water tolerant sedges and ferns, particularly diagnostic species Tall Saw-sedge and Bare Twig-rush. The following PCTs were also considered: • PCT 1725 - Swamp Mahogany - Broad-leaved Paperbark - Swamp Water Fern - Plume Rush swamp forest on coastal lowlands of the Central Coast and Lower North Coast – This PCT was excluded due to the absence of diagnostic species, particularly *Eucalyptus robusta* (Swamp Mahogany) which is a dominant component of the canopy and several understorey species which indicate this PCT occurs in drier environments. • PCT 1728 - Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast – whilst this PCT has similar components in the understorey, Broad-leaved Paperbark is absent and this forms the major component of the community recorded on site. • PCT 1064 - Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion – This PCT has similar components within the canopy and understorey. This PCT is derived from a Forest Ecosystem and is very broad in concept and only has a 'moderate' classification confidence on the North Coast. Both the selected best-fit (PCT 1724) and PCT 1064 are assigned to the same vegetation formation (Forested Wetlands) and vegetation class (Coastal Floodplain	

	Wetlands) and both are consistent with the Swamp Sclerophyll Floodplain Forest EEC. Any like-for-like credit requirement would be the same for both PCTs.
Canopy: **to 20m, 70% cover**	*Melaleuca quinquenervia* (Broad-leaved Paperbark), *Casuarina glauca* (Swamp Oak)
Shrubs: **to 8m, 10% cover**	*Glochidion ferdinandi* var. *ferdinandi* (Cheese Tree), *Cupaniopsis anacardioides* (Tuckeroo), *Cordyline stricta* (Narrow-leaved Palm Lily), *Homalanthus populifolius* (Bleeding Heart), *Hibiscus diversifolius* (Swamp Hibiscus), *Pittosporum undulatum* (Sweet Pittosporum), *Crinum pedunculatum* (Swamp Lily)
Native Goundcover **to 1m, 80-100% cover**	*Machaerina juncea* (Bare Twig-rush), *Hypolepis muelleri* (Harsh Ground Fern), *Oplismenus imbecillis* (Basket Grass), *Viola hederacea* (Ivy-leaved Violet), *Juncus kraussii subsp. Australiensis* (Sea Rush)
Climbers	*Parsonsia straminea* (Monkey Rope) *Hibbertia scandens* (Climbing Guinea Flower), *Geitonoplesium cymosum* (Scrambling Lily), *Stephania japonica* var. *discolor* (Snake Vine), *Gynochthodes jasminoides* (Sweet Morinda)
Exotics **<5% cover**	*Ipomoea cairica* (Coastal Morning Glory), *Senna pendula* var. *glabrata, Asparagus plumosus* (Climbing Asparagus), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Lantana camara* (Lantana)
Condition	The PCT is in good condition with minimal weed cover or disturbance (**Photo 3.16**). Some minor weed growth is present along the margins with Camden Head Road.



Photo 3.16: Section D8 Plot 6 - PCT 1724

Table 3.8: Description of PCT 1808

PCT ID	PCT 1808 *Estuarine reedland*
Estimate of % cleared	41% (VIS Database, 2020)
BC Act Status	In part associated with EEC – Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
EPBC Act Status	In part associated with EEC – Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland
FM Act Status	Protected Marine Vegetation / Key Fish Habitat
Vegetation Formation	Freshwater Wetlands
Vegetation Class	Coastal Freshwater Lagoons
PCT Description	Characterised by tall dense swards of the common reed (*Phragmites australis*). It is found in environments inundated by saline or brackish water. These include low-lying swamps on riverbanks, riverflat depressions, and banks on coastal lagoons that are open to tidal influence. This community is commonly encountered on the landward side of saltmarsh flats. Several salt tolerant species are shared with saltmarshes including sea rush (*Juncus kraussii*), bare twig-rush (*Baumea juncea*) and the small herb creeping brookweed (*Samolus repens*). Estuarine Reedland is common and widespread along estuarine environments of the New South Wales coastline.
Extent within proposal area	None within proposal area. Occurs on the opposite side of Camden Head Road and is associated with areas subject to tidal inundation and freshwater flows from Gogleys Creek and roadside table drains.
Species relied upon for PCT identification	***Species***
	Juncus kraussii (Sea Rush) *Phragmites australis* (Common Reed) *Casuarina glauca* (Swamp Oak) *Baumea juncea* (Bare Twig-rush)
Emergent: to 5m, 10% cover	*Casuarina glauca* (Swamp Oak)
Native Goundcover	*Phragmites australis* (Common Reed), *Baumea juncea* (Bare Twig-rush), *Sporobolus virginicus* (Saltwater Couch), *Juncus kraussii* (Sea Rush),
Exotics	*Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush), *Eragrostis curvula* (African Love Grass)
Condition	Small disturbed patch regularly subject to roadside drain maintenance within road corridor. Weed cover is prevalent along the outer edge of the community (**Photo 3.17**).



Photo 3.17: PCT 1808 occurring on southern side of Camden Head Road

3.4 Vegetation Integrity Assessment

3.4.1 Vegetation zones and survey effort

The six PCTs identified inside the proposal footprint (PCTs 1536, 1727, 1747, 1746, 771 and 1724) were stratified into various condition states to differentiate structural and floristic variations in the proposal area. There were three condition states identified for PCT 1536 and two identified for PCT 1727. A total of eight separate vegetation zones were identified within the proposal footprint. A summary of the plots undertaken in accordance with BAM requirements is provided in Table 3.9.

Table 3.9:BAM Vegetation Plot Summary

PCT / Zone	Patch size (ha)	Area of impact (ha)	Minimum plots required	Quadrats completed
PCT 1727 – VZ1_Moderate	>100	0.0975	1	1
PCT 1727 – VZ2_Good	>100	0.0147	1	
PCT 1536 – VZ1_Good	>100	0.177	1	1
PCT 1536 – VZ2_Regenerating	>100	0.0129	1	1
PCT 1536 – VZ3_Vine Thicket	>100	0.0142	**See note 1**	
PCT 1747 – Good	>100	0.0645	1	1
PCT 1746 – Good	>100	0.0021	**See note 2**	
PCT 771 – Good	>100	0.0815	1	1
PCT 1724 – Good	>100	0.0196		
TOTAL		**0.4839**	**7**	**7**

Note 1: The proposal area impacts a small area (approx. 142m^2) of PCT 1536 – VZ3_Vine Thicket. Due to the small size of this zone, impacts have been combined with the adjoining PCT 1536 – VZ1_Good for the calculation of offsets.

Note 2: The proposal area impacts a small area (approx. 21m^2) of PCT 1746 – Good. Due to the small size of this zone, impacts have been combined with the adjoining PCT 1747 for the calculation of offsets.

3.4.2 Vegetation integrity scores

The vegetation integrity scores for each identified vegetation zone are provided in **Table 3.10** below.

Table 3.10: Summary of Vegetation Integrity Scores

PCT	Condition Class (BAM-C Zone)	Composition Score	Structure Score	Function Score	Vegetation Integrity Score (VIS)
PCT 1727	VZ1_Moderate (2)	36.4	19.4	100	47.8
PCT 1727	VZ2_Good (4)	75.2	30.8	100	61.4
PCT 1536	VZ1_Good (3)	88.3	81.5	74.7	81.3
PCT 1536	VZ2_Regenerating (7)	95.9	60.3	63.8	71.7
PCT 1747	Good (1)	36.4	93.7	N/A	58.4
PCT 771	Good (5)	89.4	100	N/A	94.6
PCT 1724	Good (6)	87.1	90	88.7	88.6

3.5 Threatened Ecological Communities

Several PCTs identified within the proposal area are consistent with threatened ecological communities (TECs) listed under the BC Act or the EPBC Act. The TECs occurring in the proposal area are summarised in **Table 3.11** below.

Table 3.11: TECs occurring within the proposal area

Plant Community Type	BC Act status	EPBC Act status	Proposal Impact
PCT 1536 *Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest*	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC)	Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)	0.2 ha
PCT 1727 *Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast*	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC)	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)	0.11 ha
PCT 1724 *Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (EEC)	Not Listed	0.02 ha
PCT 1746 *Saltmarsh Estuarine Complex*	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (EEC)	Subtropical and Temperate Coastal Saltmarsh (VEC)	0.002 ha

Residual impacts to TECs listed under the BC Act would be offset in accordance with the 'like-for-like' offset rules and the 'offset variation' rules as per the BC Regulation.

The significant impact criteria for EECs listed under the EPBC Act have been addressed and are provided in **Appendix VI** and summarised in **Section 6.7.3**.

3.6 Weeds

A total of 27 exotic species was recorded within the proposal area, including 15 BAM listed high threat weeds. Weeds were most prevalent within previously cleared areas, managed parkland, road verges and the Swamp Oak Forest in Section D3 which had a relatively high proportion of high threat weed growth.

Weeds recorded on site are listed in **Appendix I**.

3.7 Habitat Suitability

The proposed SUP extends along a range of habitats occurring throughout Camden Head. Key habitat features recorded within the proposal area are summarised in **Table 3.12**.

Table 3.12: Habitat types occurring within the proposal area

Habitat Type	Key Features	Relevant Sections
Forest/ rainforest	Forested habitats occupy much of the study area, although with disturbed margins as a result of existing roads and walkways. The condition of these habitats varies between sections of the proposal with some impact areas containing a higher level of weed infestation or disturbance. Overall, forested habitats within the subject site would provide habitat for a broad range of native fauna, including: • Mature trees provide seasonal roosting and/or nesting and/or foraging and/or breeding habitat for a range of birds, mammals, reptiles and frogs. • Koala feed trees – The trees throughout the local area may provide potential foraging habitat and cover for local Koalas, although preferred food trees are mostly absent within the proposal area. • Hollow-bearing trees occur throughout the surrounding area and may provide nesting habitat to a range of birds and mammals. No hollow-bearing trees occur within the proposal area. • Seasonal foraging habitat for insectivorous, frugivorous and nectarivorous birds and mammals. • Understorey flora provides cover and foraging resources for a range of bird, reptiles and mammal species. • Leaf litter and coarse woody debris provide shelter and foraging habitat for small mammals, frogs, birds and reptiles.	D3, D5, D8, D10 & D11
Coastal Saltmarsh, Estuarine Mangrove Forest & Seagrass	Wetland habitats including Coastal Saltmarsh, Estuarine Mangrove Forest or Seagrass occur within Sections D3, D5 & D8 of the proposal area. The vegetation provides suitable habitat for a variety of wetland bird species. Habitat features include: • Zostera Seagrass – Provide habitat to marine fish species, migratory seabirds and waders. • Estuarine Mangrove Forest and Coastal Saltmarsh – provide foraging and roosting habitat for wetland birds and waders.	D3, D5 & D8
Coastal Heathland	Coastal Heathland habitat occurs in Section D10 of the proposal, associated with the PCT – Coastal Sand Tea-tree – Banksia Scrub. Coastal Heathland includes habitat features such as:	D10

Habitat Type	Key Features	Relevant Sections
	• Seasonal foraging habitat for insectivorous, frugivorous and nectarivorous birds and mammals. • Understorey habitat features of leaf litter, grasses and other understorey flora provide habitat for small burrowing mammals including Bandicoots and other small mammals.	
Non-native managed grasslands	Non-native managed grasslands are restricted to the road margins and existing parkland areas throughout the proposal area. Due to the heavily disturbed nature of this vegetation, it is likely to provide only marginal habitat for native fauna.	D3 & D10

4. AQUATIC HABITAT ASSESSMENT

4.1 Methods to assess aquatic habitat

4.1.1 Review of existing information

The following databases and literature relevant to aquatic habitat in the local area were reviewed:

- *Mapping the habitats of NSW estuaries – Camden Haven River* (Creese et al., 2009)
- Key Fish Habitat Map – Port Macquarie Hastings LGA
- Port Macquarie Hastings LGA Vegetation and EEC Maps (2014) VIS IDs 4205 and 4206
- *Policy and guidelines for fish habitat conservation and management* (DPI, 2013)
- EPBC Protected Matters Search (local records within 10 km of proposal area - last accessed 1 September 2020)

4.1.2 Existing Aquatic Habitat Mapping

The proposal is located within the riparian corridor of the Camden Haven River and comprises waterfront land for the purposes of the *Water Management Act 2000*. The proposal also includes work within locations that are below the level defined by High Water Solstice Spring tides (Highest Astronomical Tide) and are included in the definition of 'key fish habitat' under the *Fisheries Management Act 1994* (FM Act). These locations are typically characterised by wetlands, salt marsh or intertidal zones.

The DPI Fisheries mapping of estuarine macrophytes in the Camden Haven River estuary (Creese et al., 2009) shows the occurrence of seagrass beds, mangroves and saltmarsh within the vicinity of the proposal area. Works proposed within Sections D3, D5, and D8 have the potential to impact these areas (See Figure 4.1).

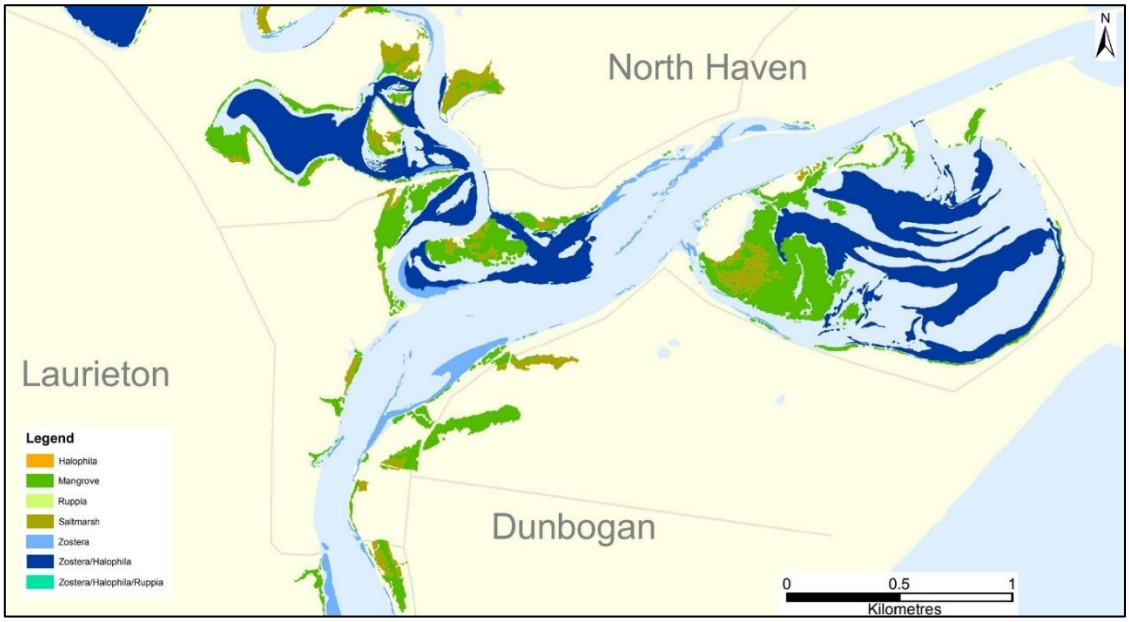


Figure 4.1: Seagrass and Marine Vegetation Mapping in the Camden Haven River Estuary (Creese et al., 2009) showing Zostera and Mangrove occurrence in the vicinity of the proposal area

4.1.3 Survey Methods

A survey of aquatic habitat within proposal areas D3, D5 and D8 was undertaken on 22 October 2020 and 4 November 2020. The survey area includes an approximate 20 m buffer around any part of the proposal that has potential to impact aquatic habitat or marine vegetation.

Due to the relatively good visibility and shallow water depths, the potential presence of seagrass or other marine vegetation within the aquatic habitat was easily and accurately determined via wading and surface inspections by watercraft. Surface inspections were supported by underwater photography throughout the sub-tidal zone of Section D5 which was analysed for the purposes of determining species composition and the condition of any marine vegetation. The extent of habitat types in Section D5 were also mapped using a georeferenced aerial (drone) photograph of the proposal area to ensure all habitats and their extent were adequately identified (**Figure 3.2**).

4.2 Survey Results

4.2.1 Section D3

Section D3 traverses aquatic habitats from approximately CH100 to CH200. This portion of the proposal area is characterised by Estuarine Mangrove Forest (PCT 1747) over a tidal wetland that is mapped as a Coastal Wetland under SEPP (Coastal Management) 2018. At the time of inspection, the community was dry between CH100 and CH180 and traversable on foot, indicating that the wetland is submerged during higher parts of the tidal cycle. A lower lying portion of mangrove forest exists between CH180 and CH200 and contains an intertidal zone that is devoid of marine vegetation and appears to be submerged throughout the lower tidal ranges.

Mangroves were noted to exist throughout the footprint of the proposed boardwalk from CH100 to CH180 and were identified as Grey Mangrove (*Avicennia marina*). Dense pneumatophores existed throughout the impact area and were interspersed with occasional mangrove propagules.

The SUP will be constructed as a boardwalk within the mangrove forest / coastal wetland. Some removal or pruning of mangroves may occur in the footprint of the boardwalk. Mangrove pneumatophores are likely to persist below the boardwalk. The typical condition of the mangrove forest is shown in **Photo 4.1** and **Photo 4.2**.



Photo 4.1: Typical mangrove forest condition and density between CH100 and CH200. Selective removal and pruning required to construct an elevated boardwalk.



Photo 4.2: Intertidal zone with encroaching mangrove forest between CH180 and CH200. Mangrove removal would be required at the transition to Bay Street.

4.2.2 Section D5

Section D5 comprises a section of elevated boardwalk that circulates the northern/estuarine side of mangrove forest entering the estuarine environment for a distance of approximately 180 metres. Part of Section D5 is mapped as Coastal Wetlands under SEPP (Coastal Management) 2018 and the estuarine habitats within Section D5 are also mapped as containing Zostera seagrass beds (**Figure 4.1**).

The proposed SUP will be partly constructed using a boardwalk that will traverse Grey Mangrove (*Avicennia marina*) forest for a short distance (approximately 5-10 metres) before continuing across intertidal and sub-tidal estuarine habitats on the northern (seaward) side of the mangroves and reconnecting with the terrestrial environment at around CH190.

The site was inspected during the middle to top of the flood tide cycle. At the time of the survey, the proposed boardwalk footprint was submerged with water depths ranging from approximately 0.5 to 1.5 metres. The bottom substrate was readily observed from the surface and via underwater photography and comprised a fine sandy and silt substrate with infauna burrows of variable densities. Oyster encrusted mangrove pneumatophores occur below mangrove forest in the upper extent of the intertidal zone.

The survey confirmed the presence of *Zostera capricornia* seagrass occurring within discrete patches, both within the boardwalk footprint and continuing north of the boardwalk, as water depths increased further into the sub-tidal zone. The southernmost portion of the survey area, closest to the mangrove edge, was found to have a lower density and occurrence of seagrass with absence of seagrass delineating the edge of the intertidal zone. Seagrass patches were noted to occur at variable densities, generally increasing in density with increased water depth and exhibiting apparently less sediment and epiphyte coverage (Note: No quantitative analysis of seagrass health was undertaken as part of this survey).

Macro algae were noted to be absent throughout the footprint of the proposed development.

The location of seagrasses was surveyed by aerial photography (drone capture) and both surface and underwater photography (**Photo 4.5)**.



Photo 4.3: Grey Mangrove Forest located at the southern end of the boardwalk and showing the alignment of the proposed boardwalk. Pruning of mature mangroves and removal of immature mangroves will be required in this area.



Photo 4.4: Typical benthic environment within the sub-tidal zone showing occurrence of seagrass (*Zostera capricorni*) and benthic infauna habitat in surrounding sediments.



Photo 4.5: Aerial photograph (4 November 2020) showing occurrence of seagrass in relation to the edge of mangrove forest - showing Section D5 from approximately CH60 to CH170. Refer to Figure 3.2 for overlay of impact areas.

The identified seagrasses occur in sparse patches on the northern edge of the boardwalk alignment between CH 30 and CH 170. **Figure 3.2** indicates that approximately 140m^2 of seagrass (Zostera) would be impacted either directly (via piling) or indirectly by overshadowing.

Seagrasses are photosynthetic plants which are reliant on the availability of light for their survival and the impacts of increased shading and turbidity are a known threat to the long-term survival of seagrasses generally. The construction of the boardwalk has the potential to decrease the availability of light and decrease the growth and

survival of the marine vegetation, including both mangrove propagules and seagrasses existing beneath. In the context of the boardwalk in Section D5, the boardwalk alignment is located to the southern edge of the existing extent of seagrass and is unlikely to result in any notable shading effects to seagrass occurring north of the footprint.

Seagrass occurring below the boardwalk footprint was noted to be relatively sparse, presumably owing to the proximity of that seagrass to the intertidal zone and more turbid channel edges. It is possible that the seagrass occurring below the boardwalk decking may experience some decline due to overshadowing.

If considered feasible, alternative decking materials such as aluminium mesh may provide increased availability of light and may increase the likelihood of seagrass persisting below the decking. Other mitigation options could include:

- Selecting locations for boardwalk 'viewing platforms' to avoid existing seagrass patches;
- Locating the boardwalk as close as practical to the existing mangroves and over intertidal zones.

4.2.3 Section D8

Section D8 traverses the southern bank of Gogleys Creek for a distance of approximately 840 metres south-east of the Dunbogan Jubilee Hall access road. This section of the project involves construction of the SUP close to the edge of Gogleys Creek. It is assumed that the SUP will not involve any further reclamation of the waterway or saltmarsh and that the SUP will be constructed as a cantilevered boardwalk where insufficient space exists between the existing road verge and the waterway.

Seagrass surveys were not undertaken in the vicinity of D8 given the limited potential for any direct impacts below Mean High Water (MHW) (except at the entrance to the culvert at CH320 to 340). Surveys in D8 focused on the terrestrial and near-shore intertidal environment with the objective of identifying marine vegetation or key fish habitat that may be potentially impacted by the works.

The westernmost section of D8 (to CH 320) is contained wholly within the terrestrial environment. No marine vegetation was recorded in the potential impact area up to CH 320 (**Photo 4.6**).



Photo 4.6: Section D8 looking west from CH 240

Section D8 contains an existing culvert at CH 320 to CH340. This culvert is proposed to be extended to provide sufficient width to construct the SUP in that location. Inspection of the existing culvert and surrounds indicates that:

- The intertidal zone extends to the headwall of the culvert and through to wetlands and saltmarsh on the eastern side of The Boulevarde;
- Marine vegetation (mangroves) occurs in the surrounds of the culvert. These mangroves may require either removal or pruning to provide sufficient clearance for construction of the culvert and SUP;
- No other marine vegetation (seagrass or macroalgae) was noted to occur within the immediate vicinity of the culvert extension; however, it may be possible that some seagrass or macroalgae could occur within Gogleys Creek and the associated rock training wall;
- Coastal saltmarsh communities and isolated mangroves exist east of the culvert (CH340-CH440). Mangroves in this zone are located >3m from the existing bank (**Photo 4.7**) and appear capable of being retained. Some pruning may be required to provide sufficient clearance to pedestrians; and
- Coastal saltmarsh encroaches to <2 metres from the existing edge of the road pavement (**Photo 4.8**).



Photo 4.7: Culvert to be extended at CH320 – CH340. Existing mangroves may be impacted.



Photo 4.8: Coastal saltmarsh and isolated mangrove looking west from CH 380.

4.2.4 Key Fish Habitat & Coastal Wetlands

An objective of the FM Act is "the conservation of Key Fish Habitat (KFH)". While KFH is not defined by the FM Act, the term is clarified by the Department of Primary Industries (DPI) as "aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species". KFH includes marine and estuarine habitats up to highest astronomical tide level and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank.

The DPI Policy and guidelines for fish habitat conservation and management (2013 update) provides guidance on the assessment of impacts to KFH and ranks the 'sensitivity' of the fish habitat for the purposes of defining the importance of the habitat to the survival of fish and its ability to withstand disturbance. Review of estuarine habitat mapping (**Figure 4.1**) indicates that the proposal area has potential to contain habitat in each of the three categories as described in **Table 4.1** below. The distribution of these KFH is shown in **Figure 4.2** to **Figure 4.4**.

Table 4.1: Key Fish Habitat Occurrence within the proposal area

Habitat Sensitivity Ranking	Potential Habitat Types in proposal area	SUP Section
Type 1 *– highly sensitive key fish habitat*	• Coastal saltmarsh >5m^2 in area • Zostera seagrass beds >5m^2 in area • Coastal Wetlands	D8 D5 D3, D5, D8
Type 2 *– moderately sensitive key fish habitat*	• Zostera seagrass beds <5^2 in area • Mangroves • Stable intertidal sand/mud flats with large populations of in-fauna	D5 D3, D5, D8 D5
Type 3 *– minimally sensitive key fish habitat*	• Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation	D3, D5, D8

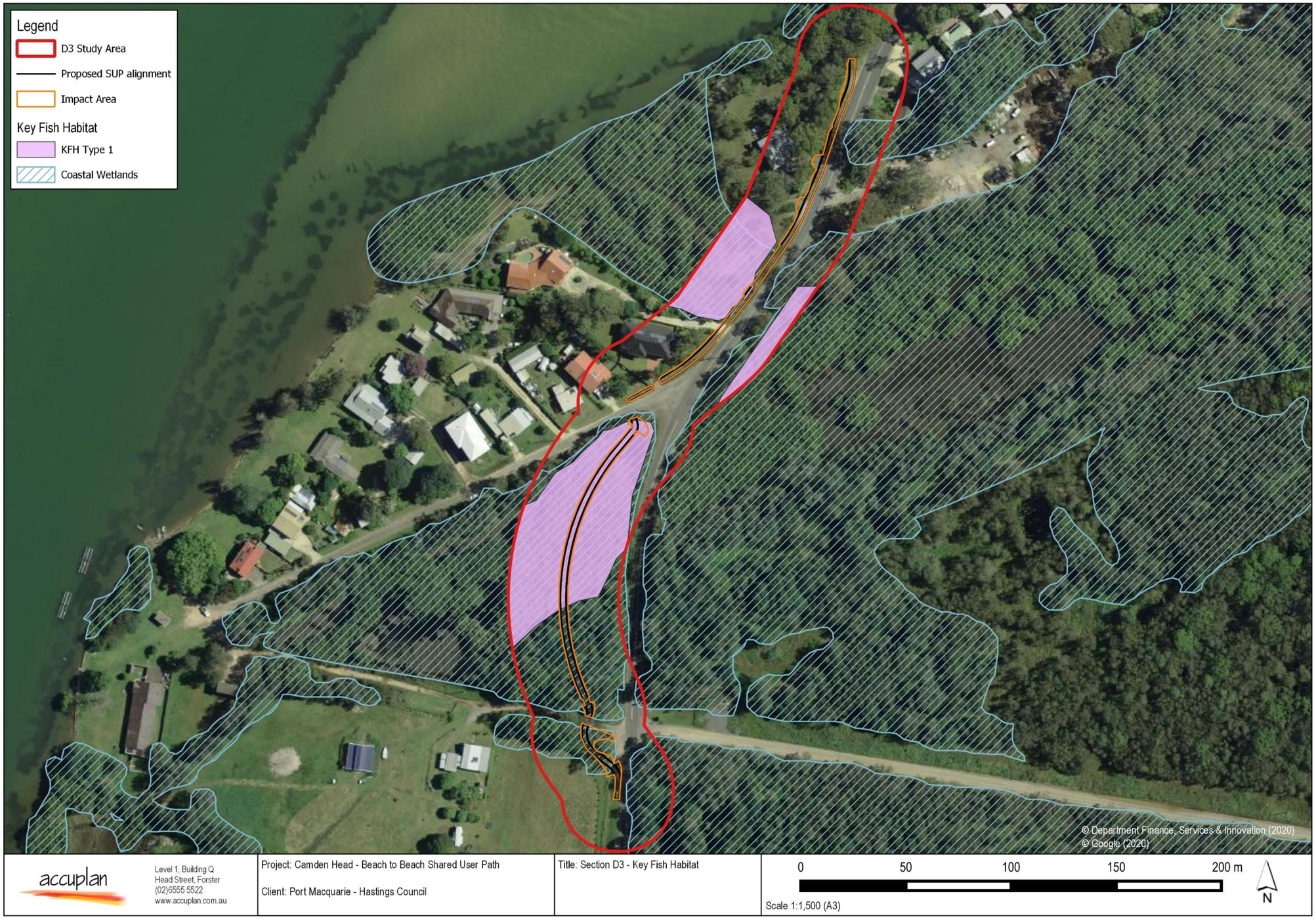


Figure 4.2: Coastal Wetlands and KFH – Section D3

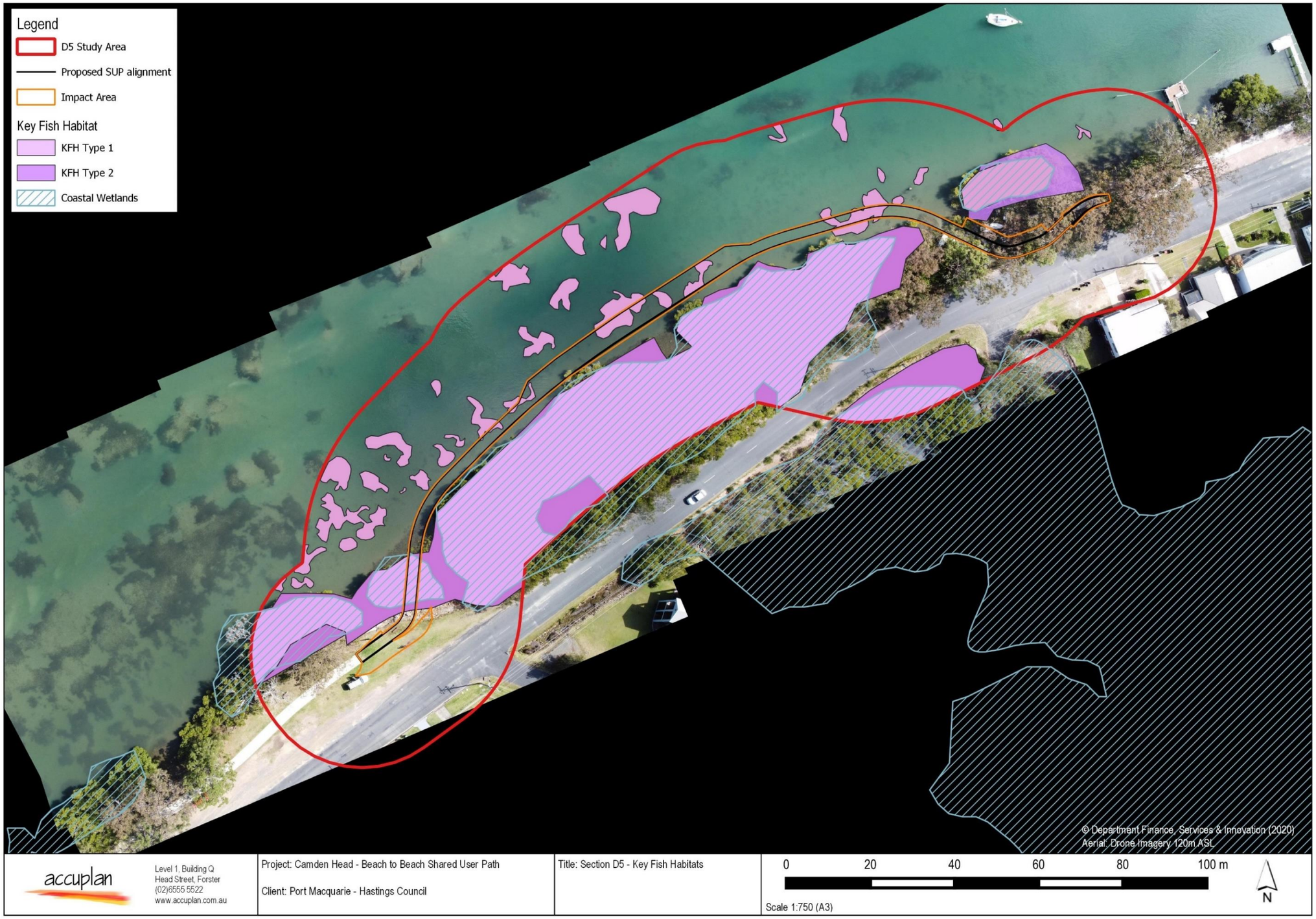


Figure 4.3: Coastal Wetlands and KFH – Section D5

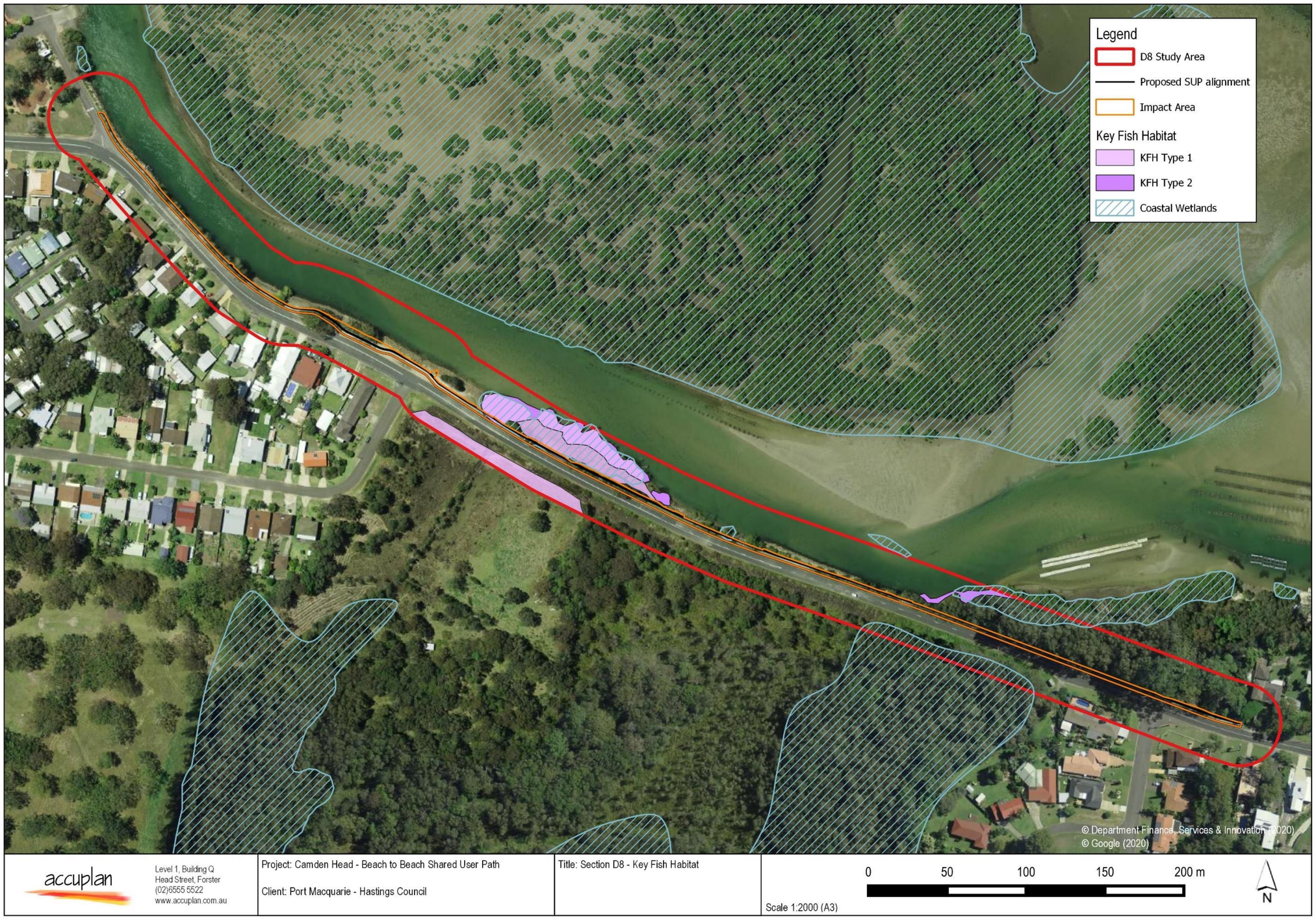


Figure 4.4: Coastal Wetlands and KFH - Section D8

4.3 Aquaculture

The *NSW Oyster Industry Sustainable Aquaculture Strategy 2016* (OISAS) maps priority oyster aquaculture areas (POAA) and oyster aquaculture development within the Camden Haven River.

Part 5 of *State Environmental Planning Policy (Primary Production and Rural Development) 2019* applies to development proposals and requires the consent authority to "consider whether, because of its nature and location, the development may have an adverse effect on oyster aquaculture development or a priority oyster aquaculture area".

The notes to the SEPP state that development may be incompatible with or impede oyster aquaculture if, for example, the development will limit access to oyster leases or have an impact on water quality and, consequently, on the health of oysters and of consumers of those oysters.

The Camden Haven River sustains an industry of oyster aquaculture with existing POAA areas located within both the Camden Haven River and Gogleys Creek and Lagoon. Land-based oyster facilities (Crown Lease) also exist at the foreshore of Gogleys Lagoon and have land-based access via Pilot Beach Road.

With the exception of Sections D3, D5 and D8, the alignment of the proposed SUP traverses predominantly terrestrial environments and does not have the potential to directly impact on access to any POAAs or interfere with access to existing land-based oyster facilities. There are no existing POAAs within the vicinity of Section D5, which is the only section that traverses the waterway. The nearest areas of POAA to the SUP alignment are shown in **Figure 4.5** and exist:

- On the eastern end of the Camden Haven River, extending approximately 400 metres north of the Dunbogan Bridge to approximately the southern end of Bay Street. This area of POAA is located 200 metres west of Section D3;
- On the northern side of Gogleys Creek opposite Section D5;
- On the southern bank of Gogleys Creek, at the opening to Gogleys Lagoon. This POAA is toward the eastern end of Section D8 and separated from the SUP alignment by bushland reserve; and
- Land-based oyster facilities are located at the north-eastern end of Gogleys Creek and are accessed via Pilot Beach Road.

The SUP would be unlikely to have any adverse effects on oyster aquaculture development subject to the incorporation of appropriate safeguards during construction. It is assumed that operational access to the land-based oyster facilities at Pilot Beach Road will be maintained during construction and use of the SUP.

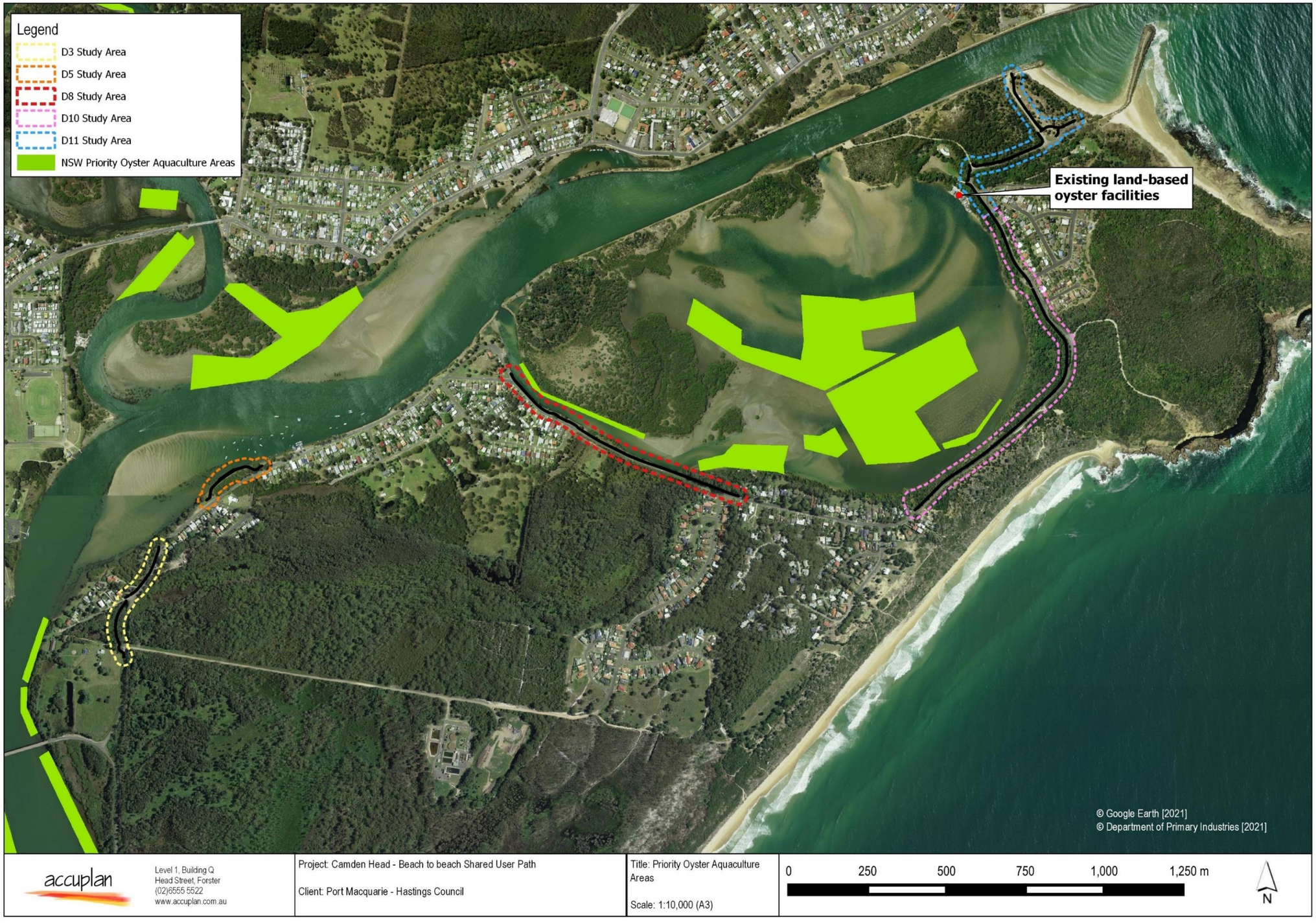


Figure 4.5: Priority Oyster Aquaculture Areas

4.4 FM Act Offset and Monitoring Strategy

Direct impacts to marine vegetation including saltmarsh, mangroves and seagrass generate offsets under the FM Act. Offset requirements for mangroves and saltmarsh also overlap with offsets generated for terrestrial ecosystems under the BC Act.

Due to the overlapping offset requirements and in order that the impact is not offset twice, it is proposed that all entities covered by the BC Act (mangroves and saltmarsh) would be offset via the Biodiversity Offset Scheme as detailed in **Section 8**.

Chapter 3 of the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (Fairfull 2013) outlines the requirements for environmental compensation to ensure there is a 'no net loss' of key fish habitat. Given offsets for mangroves and saltmarsh will be secured in accordance with the requirements of the BOS (see **Section 8.3**), it is proposed to only offset in accordance with the FM Act for potential direct and indirect impacts to 140m^2 of seagrass. The policy and guidelines require a minimum 2:1 offset for impacts to Types 1–3 key fish habitat and this is currently calculated at a rate of $113.50 per m^2 to meet the 2:1 offsetting requirement.

The nature and extent of impacts to seagrasses is to some extent unknown as direct impacts via piling could largely be avoided during construction and any seagrass decline from overshadowing would need to be determined by monitoring. It is proposed that payment of a monetary bond, equating to the total potential impact area of seagrass (140m^2), apply to the proposal. The site would be monitored annually for a period of three years to quantify the actual extent of direct and indirect impacts to seagrass noting that the bond would be returned, partly returned or retained depending on the results of the monitoring program.

5. THREATENED SPECIES

A list of threatened species with potential to occur at the site was generated following input of the landscape analysis and plot data into the BAM Calculator (BAM-C). This identified 45 candidate species (species credit species) and 41 predicted species (ecosystem credit species) requiring consideration for assessment.

Database searches (Licenced Bionet and EPBC protected matters databases) were also undertaken to identify any additional potential candidate species (other than those generated by BAM-C) that are known or predicted to occur in the locality. A habitat assessment determining the likelihood of these species to be impacted by the proposed works is provided in **Appendix III.** Species rated as having a moderate or higher chance of occurring on site, additional to those generated by the BAM-C list, were included for assessment whether they be ecosystem or candidate species.

5.1 Ecosystem credit species

The following ecosystem credit species were returned by the BAM-C as being associated with the PCTs present on the proposal area site (**Table 5.1**). Targeted surveys are not required for ecosystem credit species and each of these species were assumed to have habitat and contribute towards ecosystem credit calculations. No ecosystem credit species were excluded from the assessment.

Table 5.1: Ecosystem credit species subject to assessment

Scientific Name	Common Name	Sensitivity to Gain Class[1]	Associated PCTs
Anthochaera phrygia	Regent Honeyeater	High	PCT 771 PCT 1724
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	PCT 771
Botaurus poiciloptilus	Australasian Bittern	Moderate	PCT 1727
Calidris tenuirostris	Great Knot	High	PCT 1747
Calyptorhynchus lathami	Glossy Black-Cockatoo	High	PCT 771 PCT 1724
Charadrius leschenaultii	Greater Sand-plover	High	PCT 1747
Charadrius mongolus	Lesser Sand-plover	High	PCT 1747
Circus assimilis	Spotted Harrier	Moderate	PCT 1727
Daphoenositta chrysoptera	Varied Sittella	Moderate	PCT 1727 PCT 771 PCT 1724
Dasyurus maculatus	Spotted-tailed Quoll	High	PCT 1727 PCT 1536 PCT 771 PCT 1724

Scientific Name	Common Name	Sensitivity to Gain Class[1]	Associated PCTs
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	PCT 1747 PCT 1724
Epthianura albifrons	White-fronted Chat	Moderate	PCT 1747
Esacus magnirostris	Beach Stone-curlew	High	PCT 1747
Falsistrellus tasmaniensis	Eastern False Pipistrelle	High	PCT 1724
Glossopsitta pusilla	Little Lorikeet	High	PCT 771 PCT 1724
Haliaeetus leucogaster	White-bellied Sea-Eagle	High	PCT 1747 PCT 1727 PCT 1536 PCT 771 PCT 1724
Hieraaetus morphnoides	Little Eagle	Moderate	PCT 1747 PCT 1727 PCT 771 PCT 1724
Hirundapus caudacutus	White-throated Needletail	High	PCT 1747 PCT 1727 PCT 1536 PCT 771 PCT 1724
Ixobrychus flavicollis	Black Bittern	Moderate	PCT 1747 PCT 1727- PCT 1724
Lathamus discolor	Swift Parrot	Moderate	PCT 771 PCT 1724
Limicola falcinellus	Broad-billed Sandpiper	High	PCT 1747
Limosa limosa	Black-tailed Godwit	High	PCT 1747
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	PCT 1747 PCT 771 PCT 1724
Miniopterus australis	Little Bent-winged Bat	High	PCT 771 PCT 1724
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	PCT 771 PCT 1724

Scientific Name	Common Name	Sensitivity to Gain Class[1]	Associated PCTs
Ninox connivens	Barking Owl	High	PCT 1727 PCT 1536 PCT 1724
Ninox strenua	Powerful Owl	High	PCT 771
Pandion cristatus	Eastern Osprey	Moderate	PCT 1747 PCT 1727 PCT 1536 PCT 1724
Petaurus australis	Yellow-bellied Glider	High	PCT 1724
Phascolarctos cinereus	Koala	High	PCT 1724
Phoniscus papuensis	Golden-tipped Bat	High	PCT 1724
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	High	PCT 1724
Pteropus poliocephalus	Grey-headed Flying-fox	High	PCT 1747 PCT 771 PCT 1724
Ptilinopus magnificus	Wompoo Fruit-Dove	Moderate	PCT 1536
Ptilinopus regina	Rose-crowned Fruit-Dove	Moderate	PCT 1536
Ptilinopus superbus	Superb Fruit-Dove	Moderate	PCT 1536
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	PCT 771 PCT 1724
Scoteanax rueppellii	Greater Broad-nosed Bat	High	PCT 1747 PCT 771 PCT 1724
Syconycteris australis	Common Blossom-bat	High	PCT 1536 PCT 1724
Tyto novaehollandiae	Masked Owl	High	PCT 771
Tyto tenebricosa	Sooty Owl	High	PCT 771 PCT 1724
Xenus cinereus	Terek Sandpiper	High	PCT 1747

Note 1: as per Section 5.4 BAM (2020)

5.2 Species Credit Species

5.2.1 Candidate species to be assessed

Species credit species cannot be confidently predicted by vegetation surrogates and landscape features; however, can be reliably detected by survey (BAM, 2020). 'Candidate' species requiring consideration are those 'assumed to be present' or that are 'present or likely to use suitable habitat' in the proposal area.

Potential candidate species are those that could occur in the study area based on the habitat resources observed during field surveys and categorised as confirmed candidate threatened species. These candidate species are either assumed to be present or require targeted surveys in accordance with Section 5.3 of the BAM (DPIE, 2020) to confirm or exclude presence. The list of confirmed candidate species is provided in **Table 5.2**.

Candidate species can be excluded from further consideration if:

a) There are habitat/geographical constraints (as identified in the bionet database); or
b) The field assessment determines that microhabitats required by a species are absent or are degraded to the point that the species is unlikely to use the subject land or specific vegetation zone (see BAM Section 5.2.3); or
c) An expert report states that the species is unlikely to be present on the subject land or specific vegetation zones.

Candidate species excluded from further assessment are listed in **Table 5.3**.

Table 5.2: Candidate species requiring confirmation of presence or absence

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
FAUNA					
Burhinus grallarius Bush-Stone-curlew	Fallen/standing dead timber including logs	All year	Yes Diurnal Sept- Nov Nocturnal Aug-Sept	No (surveyed)	No offsets required. This species was not recorded during targeted surveys (diurnal searches, spotlighting and call-playback). This species is unlikely to occur within the proposal area given the paucity of local records.
Cercartetus nanus Eastern Pygmy-possum	Found in wet and dry eucalypt forest, subalpine woodland, coastal *Banksia* sp. woodland and heath. They feed largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes supplemented by insect and soft fruits.	Oct - Mar	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence. Habitat largely limited to native vegetation in Sections D10 and D11. Also, PCT 1724 occurring at the eastern end of D8.
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Nest trees - living or dead mature trees within suitable vegetation within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines.	Aug - Oct	Yes June-Nov	No (surveyed)	No offsets required. This species was recorded flying over the study area during site surveys. Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Lathamus discolor Swift Parrot	As per mapped areas. The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do not require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.	May - Aug	No	Yes (assumed present)	Requires offsetting. Important habitat mapped within proposal area. 'Important Mapping' will define species polygon for offsetting. Largely limited to native vegetation in Sections D10 and D11.
Litoria brevipalmata Green-thighed Frog	Suitable breeding habitat is any semi-permanent or ephemeral waterbody of >25 square metres in surface area located within native vegetation or immediately adjacent to or within 10 metres of native vegetation. Non-breeding habitat is native vegetation adjacent to the breeding habitat (DPIE, 2020).	Spring – autumn after flooding rains	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence. Potential habitat is limited to low-lying areas subject to flooding in Section D11 between CH180 to CH340.
Myotis macropus Southern Myotis	Hollow-bearing trees within 200 m of riparian zone. Habitat includes the range of PCTs associated with the species (as per the TBDC) within 200 m of any medium to large permanent creeks, rivers, lakes or other waterways (i.e., with pools/ stretches 3m or wider) (Anderson et al., 2005).	Oct - Mar	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence. Large waterbodies within and near proposal area provide preferred foraging habitat and hollow-bearing trees and human-made structures occurring within 200 m of these features may provide breeding habitat. Targeted surveys in accordance with Threatened Bat Survey Guide (DPIE, 2018) required to exclude or confirm presence.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Numenius madagascariensis Eastern Curlew	As per mapped areas. These mapped areas do not require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.	-	No	Yes (assumed present)	Requires offsetting. Important habitat mapped within proposal area. 'Important Mapping' will define species polygon for offsetting. Limited to intertidal habitat in Sections D5 and D8.
Pandion cristatus Eastern Osprey (Breeding)	Nest trees - Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting	Apr - Nov	Yes Sept-Nov	No (surveyed)	No offsets required. This species was recorded within Camden Haven Inlet and flying over the study area during site surveys. Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Phascolarctos cinereus Koala (Breeding)	Important habitat is defined by the density of koalas and quality of habitat determined by on-site survey	All Year	Yes Sept-Nov	No (surveyed)	No offsets required. No signs of Koala, including scats or scratches on tree trunks, were recorded within the proposal area. Local records indicate a resident local population occurs through the Camden Head area and suitable habitat with a high incidence of preferred food trees may provide suitable breeding habitat. Preferred food trees are generally absent from the proposal area; however, a small number of secondary food trees (*M. quinquenervia*) associated with PCT 1724 occur at the eastern end of D8. Consequently, the proposal area is unlikely to support core habitat due to the paucity of preferred food trees. Retained as an ecosystem credit species given the presence of marginal foraging habitat.
Planigale maculata Common Planigale	Common Planigale is a cryptic species that is difficult to detect. Pitfall trapping is required to adequately survey for presence. Inhabit rainforest, eucalypt forest, heathland, marshland, grassland, and rocky areas where there is surface cover, and usually close to water.	All year	No	Yes (assumed present)	Requires offsetting. Targeted survey required to exclude presence. This species has been recorded approx. 550 m to the south of Section D3 within habitat that is largely contiguous with the site (apart from local roads).

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Potorous tridactylus Long-nosed Potoroo	Dense shrub layer or alternatively high canopy cover exceeding 70% (i.e., to capture populations inhabiting wet sclerophyll and rainforest)	All year	Yes Aug-Sept	No (targeted survey)	No offsets required. This species was not recorded during targeted surveys (wildlife cameras). This species has not been recorded locally.
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Breeding camps	Oct - Dec	Yes	Yes (assumed present)	Requires offsetting. No breeding camps were recorded during site surveys although this species is known to seasonally roost in small numbers in rainforest vegetation off Pilot Beach Road (*pers com* J. Cohen, 2020). Despite being absent during the required survey period it is reasonable to assume potential breeding habitat is available along Pilot Beach Road and species credits have been generated for impacts proposed in this area.
FLORA					
Asperula asthenes Trailing Woodruff	Occurs in damp sites, often along river banks	Oct - Dec	Yes Oct-Nov	No (surveyed)	Targeted Survey No specimens recorded.
Cynanchum elegans White-flowered Wax Plant	Associated vegetation types include littoral rainforest; Coastal Tea-tree – Coastal Banksia scrub; Forest Red Gum aligned open forest and woodland; Spotted Gum aligned open forest and woodland; and Bracelet Honeymyrtle scrub to open scrub	All Year	Yes Sept-Nov	No (surveyed)	Targeted Survey No specimens recorded.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Galium australe Tangled Bedstraw	In NSW (and ACT Territory in Jervis Bay), Tangled Bedstraw has been recorded in Turpentine forest and coastal Acacia shrubland.	Oct-Feb	Yes Sept-Nov	No (surveyed)	Targeted Survey No specimens recorded. This species has not been recorded locally (Bionet, 2020).
Lindernia alsinoides Noah's False Chickweed	Damp areas or adjacent to riparian areas (including disturbed areas); Swamps, shallow freshwater areas.	Nov-Feb	Yes Nov	No (surveyed)	Targeted Survey No specimens recorded. This species has not been recorded locally (Bionet, 2020).
Maundia triglochinoides	Riparian areas/ drainage lines, water ponding, man-made dams, and drainage channels up to 1 m deep. Semi-permanent/ ephemeral wet areas/ shallow swamps and waterbodies up to 1 m deep.	Nov-Mar	Yes Nov	No (surveyed)	Targeted Survey No specimens recorded. This species has not been recorded locally (Bionet, 2020).
Melaleuca biconvexa Biconvex Paperbark	South of Kempsey Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	All Year	Yes Sept-Nov	No (surveyed)	Targeted Survey No specimens recorded. This species has not been recorded locally (Bionet, 2020).
Rhodamnia rubescens Scrub Turpentine	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	All Year	Yes Sept-Nov	No (surveyed)	Targeted Survey No specimens recorded.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Rhodomyrtus psidioides Native Guava	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Flowering and fruiting has been severely affected by myrtle rust infection. This species is still known to flower and set fruit although production of viable seed is very limited or non-existent. Fruit consumed by birds, species is very bird attracting. Recent surveys suggest that seedling recruitment is not occurring. Most small plants found in the wild are root suckers, not seedlings.	All Year	Yes Sept-Nov, Feb	Yes (surveyed)	Requires offsetting Several small plants were recorded at Section D10, occurring near the edge of the existing informal walking track between CH690 and CH820.
Syzygium paniculatum Magenta Lilly Pilly	On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Apr-June (requires fruit to confirm species)	Yes (outside of recommended survey period) Sept-Nov	No (surveyed)	Targeted Survey - outside of required survey period No potential specimens recorded within the proposal area. A potential specimen was observed approx. 20 m away from the proposed SUP in Section D11 and would not be impacted by the proposal.

Species	BAM Habitat constraints / Geographic limitations (OEH TBDC)	Recommended Survey Period	Surveyed	Species Presence	Comments
Acronychia littoralis Scented Acronychia	Occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest. Use fruit to accurately identify. Species should be verified, as it can hybridise.	All Year (requires fruit to confirm species)	Yes Sept-Nov, Feb, April	No (surveyed)	Targeted Survey Species added for consideration in BAM-C due to Council feedback. Several *Acronychia* sp. specimens were recorded throughout Section D10 during targeted surveys which were initially identified as *Acronychia imperforata* (Logan Apple). This species can hybridise with *A. littoralis* and fruiting material is needed to accurately identify. An additional survey was undertaken while the plants were in fruit (April 2022) which confirmed that the plants were the non-threatened *A. imperforata* (Logan Apple) which has been previously recorded in remnant vegetation around Gogleys Lagoon (Williams, 2000). *Acronychia littoralis* has not been recorded locally with the nearest located approx. 20 km to the north in Port Macquarie (Bionet, 2021).

Table 5.3: Excluded Candidate Species

Species	BAM / Bionet Habitat constraints; Geographic limitations/ (OEH TBDC)	Justification to exclude candidate species
FAUNA		
Anthochaera phrygia Regent Honeyeater	As per mapped areas. The species is a dual credit species, with the species credit component mapped as an important area. These mapped areas do not require survey as it is presumed that the species is present. Any impact from development could potentially be serious and irreversible. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts.	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Species has been retained as an ecosystem credit species as marginal foraging habitat is available within the site.
Calidris tenuirostris Great Knot (Breeding)	As per mapped areas. Within 5 km of coast or tidal influenced water bodies	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	Habitat constraints No trees with hollows suitable for breeding. Retained as an ecosystem credit species given the presence of marginal foraging habitat.
Charadrius leschenaultii Greater Sand-plover (Breeding)	As per mapped areas. Within 5 km of coast	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Charadrius mongolus Lesser Sand-plover (Breeding)	As per mapped areas. Within 5 km of coast	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.

Species	BAM / Bionet Habitat constraints; Geographic limitations/ (OEH TBDC)	Justification to exclude candidate species
Crinia tinnula Wallum Froglet	Suitable breeding and non-breeding habitat consists of still waterbodies located in acid swamplands (pH <5.5), wallum heaths, open vegetation on sand plains, and flooded areas of swamp forests within the PCTs associated with the species (DPIE, 2020).	Habitat constraints Potential habitat is limited to low-lying wetland areas occurring to the north of the proposed SUP within PCT 1724 (Section D8). The SUP is located on higher ground along Camden Head Road and avoids impacts to any wetland or waterbody suitable for breeding.
Esacus magnirostris Beach Stone-curlew (Breeding)	As per mapped areas. Within 2 km of coast.	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Hieraaetus morphnoides Little Eagle (Breeding)	Nest trees - live (occasionally dead) large old trees within vegetation.	Habitat constraints Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.
Hoplocephalus bitorquatus Pale-headed Snake	Within 500 m of moderate to good vegetation. Hollow-dependent species – preferences habitat with a relatively high abundance hollows, particularly large living trees with hollows (Shelton *et al.,* 2019).	Habitat constraints Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted.
Hoplocephalus stephensii Stephens' Banded Snake	Hollow-bearing trees; arboreal vine tangles; fallen/ standing dead timber including logs - or within 500 m of this habitat.	Habitat constraints Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted.
Limicola falcinellus Broad-billed Sandpiper (Breeding)	As per mapped areas.	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.

Species	BAM / Bionet Habitat constraints; Geographic limitations/ (OEH TBDC)	Justification to exclude candidate species
Limosa limosa Black-tailed Godwit (Breeding)	As per mapped areas.	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Litoria aurea Green and Golden Bell Frog	Suitable breeding and non-breeding shelter habitat consist of any waterbody with emergent aquatic vegetation and without the plague minnow (*Gambusia holbrooki*), although the green and golden bell frog will still occasionally breed in sites with this introduced pest fish. Foraging habitat and migratory habitat are areas of native and non-native vegetation.	Habitat constraints The proposal area lacks suitable waterbodies for this species. This species has not been recorded locally.
Miniopterus australis Little Bentwing-bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.	Habitat constraints No breeding habitat was recorded within the proposal area.
Miniopterus orianae oceanensis Eastern Bentwing-bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding.	Habitat constraints No breeding habitat was recorded within the proposal area.
Ninox connivens Barking Owl (Breeding)	Hollow-bearing trees; living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Habitat constraints No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Ninox strenua Powerful Owl (Breeding)	Hollow bearing trees; living or dead trees with hollow greater than 20 cm diameter.	Habitat constraints No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.

Species	BAM / Bionet Habitat constraints; Geographic limitations/ (OEH TBDC)	Justification to exclude candidate species
Petalura gigantea Giant Dragonfly	Within 500 m of swamps Live in permanent swamps and bogs with some free water and open vegetation.	Habitat constraints The proposal area lacks suitable freshwater swamps and bogs and is unlikely to affect the hydrological regime of any nearby swamps which may provide suitable habitat.
Petaurus norfolcensis Squirrel Glider	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e., no more than 50 m apart).	Habitat constraints Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted and impacts to potential foraging habitat would be minimal.
Petaurus volans Greater Glider	Hollow-bearing trees	Habitat constraints Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted and impacts to potential foraging habitat would be minimal.
Phascogale tapoatafa Brush-tailed Phascogale	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span.	Habitat constraints Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted and impacts to potential foraging habitat would be minimal.
Tyto novaehollandiae Masked Owl	Hollow bearing trees; living or dead trees with hollows greater than 20 cm diameter.	Habitat constraints No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Tyto tenebricosa Sooty Owl (Breeding)	Caves or cliff lines/ledges; Hollow bearing trees; living or dead trees with hollows greater than 20 cm diameter.	Habitat constraints No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.

Species	BAM / Bionet Habitat constraints; Geographic limitations/ (OEH TBDC)	Justification to exclude candidate species
Xenus cinereus Terek Sandpiper (Breeding)	As per mapped areas. Tidal influenced water bodies within 15 km of coast.	Habitat constraints The proposal area is not located within an area mapped as important habitat for this species. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
FLORA		
Eucalyptus seeana - endangered population Eucalyptus seeana population in the Greater Taree local government area	Greater Taree LGA	Geographical constraints The proposal area is located outside the Greater Taree LGA.

5.2.2 Targeted Surveys

Where a potential candidate species is considered to have potential to occur, and it is not assumed to occur for the purposes of the BAM-C, a targeted survey is required to verify its presence or absence. The field surveys and methods used to target threatened flora and fauna are detailed in **Table 5.4**.

As detailed in **Table 5.2**, a total of five species was subject to targeted survey. The methods, times and weather conditions of the targeted surveys are detailed below.

5.2.2.1 Field Surveys

Field surveys were undertaken by Luke Pickett (Accreditor Assessor No: BAAS17100), Matt Clancy and Shannon Baker. The methodology for the targeted surveys undertaken is summarised in **Table 5.4**. A full list of species recorded during field surveys is provided in **Appendix II**.

Table 5.4: Targeted Flora and Fauna surveys conducted on site

Group	Surveys	Methods and Survey Effort	Candidate Species Targeted
Diurnal Birds	Area search	Area searches were undertaken to identify any birds present. These surveys were undertaken for 20-minute periods and recorded birds occurring within the vicinity. Birds were identified from observations or call identification. A search for nests was also undertaken throughout the proposal area during targeted flora surveys.	Woodland birds Raptors
Nocturnal Birds	Spotlighting and Call Playback	Spotlight surveys were undertaken on foot for a total of 6 person hours after dusk over two nights. Call playback surveys targeting Bush Stone-curlews were conducted during spotlighting. Calls were played for 5 to 10 mins using a 15-watt megaphone. No Bush Stone-curlews were recorded during surveys.	Bush Stone-curlew
Herpetofauna	Habitat search	Opportunistic active searches for frogs and reptiles were undertaken during the survey within suitable habitat (i.e., leaf litter, under rocks and long grass).	
Mammals	Search for scats and signs	A search for scats and other signs of animal use (e.g., scratches on trees, echidna and bandicoot diggings) was undertaken during the site survey.	
	Koala SPOT search	A Koala SPOT search was conducted on site and involved inspecting preferred Koala feed trees for scratches and Koala scats.	Koala

Group	Surveys	Methods and Survey Effort	Candidate Species Targeted
	Wildlife Cameras	Four wildlife cameras were deployed targeting Long-nosed Potoroos. The cameras were positioned where diggings were evident and baited using molasses and grain mix. The cameras were left in place for 29 consecutive nights. Files were corrupted on a single camera during the first night of recording and this camera has been excluded from the total number of trap nights giving a total 87 trap nights. No Long-nosed Potoroos were recorded. The wildlife camera survey results are provided in Appendix IX.	Long-nosed Potoroo
Flora	Targeted surveys	Targeted surveys for threatened flora were undertaken in June, July, September, October, November and February over six separate days. This was undertaken along the proposed SUP alignment and adjacent habitat.	*Asperula asthenes* *Cynanchum elegans* *Galium australe* *Lindernia alsinoides* (D3, D5) *Maundia triglochinoides* *Melaleuca biconvexa* *Rhodamnia rubescens* *Rhodomyrtus psidioides* (D10, D11) *Syzygium paniculatum* *Acronychia littoralis*
Hollow dependent species	Habitat Tree Survey	A habitat tree survey was undertaken throughout the proposal area. None were recorded within the proposal area.	Brush-tailed Phascogale Squirrel Glider Microbats
All	Opportunistic sightings	Any opportunistic sightings of fauna on site were recorded.	

5.2.2.2 Survey Timing

A summary of the field surveys undertaken for this report and the prevailing weather conditions at the time is provided below in **Table 5.5.**

Table 5.5: Survey Dates, Times, Activities and Weather Conditions

Date	Time	Activity	Weather[1]
Tuesday 30/06/2020	0900 – 1030	Site inspection – D3 options Targeted flora search (D3) Habitat tree survey Bird and nest searches	2/8 Cloud cover Wind – W Temp – 16°C
Thursday 30/07/2020	1000 – 1400	Site inspection – D10 options Targeted flora searches (D10) Habitat tree survey Bird and nest searches Herpetofauna searches	0-6/8 Cloud cover Wind – SW Temp – 16-18°C
Thursday 3/09/2020	0900 – 1630	Site inspection – D11 options Targeted flora searches (D10, D11) Flying-fox camp inspection Habitat tree survey Bird and nest searches Herpetofauna searches	0/8 Cloud cover Wind – NW Temp – 14-26°C
Thursday 22/10/2020	0900 – 1630	Vegetation Plots 1 to 5 Targeted flora searches (D3, D10, D11) Bird and nest searches Flying-fox camp inspection Bird and nest searches Herpetofauna searches	3/8 Cloud cover Wind – NE Temp – 16-25°C
Wednesday 4/11/2020	0830 – 1630	Vegetation Plots 6 and 7 Targeted flora searches (D3, D5, D8, D10, D11) Aquatic survey (D3, D5, D8) Bird and nest searches Flying-fox camp inspection Herpetofauna searches	0/8 Cloud cover Wind – E Temp – 18-23°C
Wednesday 11/08/2021	1500 – 1730 1730 – 1930	Wildlife camera deployment Spotlighting Call playback (Bush Stone-curlew)	1/8 Cloud cover Wind – NE Temp – 14-21°C
Thursday 9/09/2021	1600 – 1730 1730 – 1930	Retrieve wildlife cameras Bird search Spotlighting Call playback (Bush Stone-curlew)	0/8 Cloud cover Wind – NNW Temp – 17-22°C
Wednesday 16/02/2022	1000 – 1430	Targeted flora searches (D10 and D11)	0/8 Cloud cover Temp – 22-26°C

Date	Time	Activity	Weather[1]
Wednesday 20/04/2022	0900 - 1000	Targeted flora search (D10 - fruiting material *Acronychia* sp.)	0/8 Cloud cover Temp – 17-20°C

Note 1: Weather observations derived from Port Macquarie Airport (Station ID 060139) and Taree Airport AWS (Station ID 060141)

5.2.3 Threatened Species Polygons

Candidate species subject to offsetting are summarised in **Table 5.6**. Species polygons were prepared for each species in accordance with Section 5.2.5 of the BAM (DPIE, 2020) and these are used to calculate the required species credits which are summarised in **Table 6.4**. The species polygons are provided in **Appendix VIII**.

Table 5.6: Summary of species polygons

Species	Justification why species credits apply	Species Polygon
Lathamus discolor Swift Parrot	Important habitat mapped within proposal area.	'Important Mapping' defines species polygon for offsetting. Largely limited to native vegetation in Sections D10 and D11. Mangrove areas (PCT 1747) within mapped important habitat was excluded.
Numenius madagascariensis Eastern Curlew	Important habitat mapped within proposal area.	'Important Mapping' define species polygon for offsetting. Limited to Sections D5 and D8.
Cercartetus nanus Eastern Pygmy-possum	Assumed Present – Targeted survey required to exclude presence.	The species polygon captures PCTs 1536, 771 and 1724 which contain preferred foraging habitat.
Litoria brevipalmata Green-thighed Frog	Assumed Present – Targeted survey required to exclude presence.	The species polygon all associated PCTs occurring within 100 m of potential habitat which is limited to low-lying areas subject to flooding in Section D11 between CH180 to CH340.
Planigale maculata Common Planigale	Assumed Present – Targeted survey required to exclude presence.	The species polygon captures suitable habitat within PCTs 1727, 1536, 771 and 1724. PCT 1727 was excluded within Section D5 and D8 as this was isolated from suitable habitat.
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Assumed Present - No breeding camps were recorded during site surveys although this species is known to seasonally roost in small numbers in rainforest vegetation off Pilot Beach Road (*pers com* J. Cohen, 2020).	The species polygon captures potential breeding habitat present along Pilot Beach Road in Section D11 (PCTs 1727 and 1536).
Myotis macropus Southern Myotis	Assumed Present Targeted survey of large waterbodies or expert report required to exclude absence.	All habitat on the subject land where the subject land is within 200m of a suitable waterbody with pools or stretches 3 m or wider. Species polygon boundaries align with associated PCTs that are within 200 m of mapped waterbodies.

Species	Justification why species credits apply	Species Polygon
Rhodomyrtus psidioides Native Guava	Recorded on site. Ten (10) small plants were recorded at Section D10, occurring along the edge of the existing informal walking track between CH690 and CH820. All recorded plants were small and appeared to be heavily affected by myrtle rust.	Individual plants were recorded by GPS. The species polygon captures habitat (PCT 1536) occurring within a 50 m buffer around any recorded plants. The species polygon only captures 33 m^2 of habitat due to the extent of the existing clearing associated with the informal walking track. For the purposes of credit calculations within BAM-C, the impacted area was increased to 0.01 ha as this is minimum allowable area.

6. IMPACT ASSESSMENT

6.1 Avoid and Minimise Potential Impacts

The proposed alignment of the SUP has considered several options throughout the concept design phase. These options are summarised in **Table 6.1**.

The final alignment and design have implemented the following measures to avoid and minimise impacts to biodiversity:

- The proposed alignment utilises existing disturbed areas including managed road verges, existing gravel walkways and managed parkland wherever possible.
- A boardwalk design would be used in sensitive areas (i.e., coastal wetlands and littoral rainforest) which would otherwise require 'fill' construction methods to minimise impacts to vegetation.
- The boardwalk alignment in Section D5 largely extends along the intertidal zone over Camden Haven Inlet. minimising impacts to existing mangrove and seagrass vegetation.
- Vegetation impacts would be minimised as far as practical during detailed design.
- Site compounds and stockpile sites are to use existing Council facilities or existing cleared hardstand areas and are to avoid additional impacts to native vegetation.
- Mitigation measures to minimise impacts to biodiversity are provided in Section 7. These would be implemented through a Construction Environmental Management Plan (CEMP) to be developed for the works.

Table 6.1: Proposal options considered to avoid and minimise impacts

Section	Options Considered
D3	Three options were considered for Section D3 referred to as D3A, D3B and D3C. **<u>Preferred Option: D3A – Boardwalk through Lot 5 DP 233364</u>** Proposes a raised boardwalk to traverse Lot 5 DP 233364 between Scarborough Way and Bay Street. Less environmental impact associated with raised boardwalk construction. The boardwalk option may also provide better opportunity for the SUP to avoid impacts to adjacent trees and mangroves or target the removal of large Camphor Laurels. **<u>Option 2: D3B – SUP earth fill embankment and culvert construction</u>** Follows the same alignment as D3A but utilises a combination of shorter sections of boardwalk and an embankment construction over swamp areas. This option was excluded due to the additional environmental impact from additional fill and vegetation clearing requirements and the potential loss of storage for flood waters within Lot 5 DP 233364. **<u>Option 3: D3C – SUP to extend along the western side of The Boulevarde</u>** There is limited room to construct this option along the western side of The Boulevarde due to narrow road verges and steep batters into Lot 5 DP 233364. This option was excluded as widening of the verge and relocation of services would require significant fill into the adjacent Swamp Oak and Mangrove vegetation.

Section	Options Considered

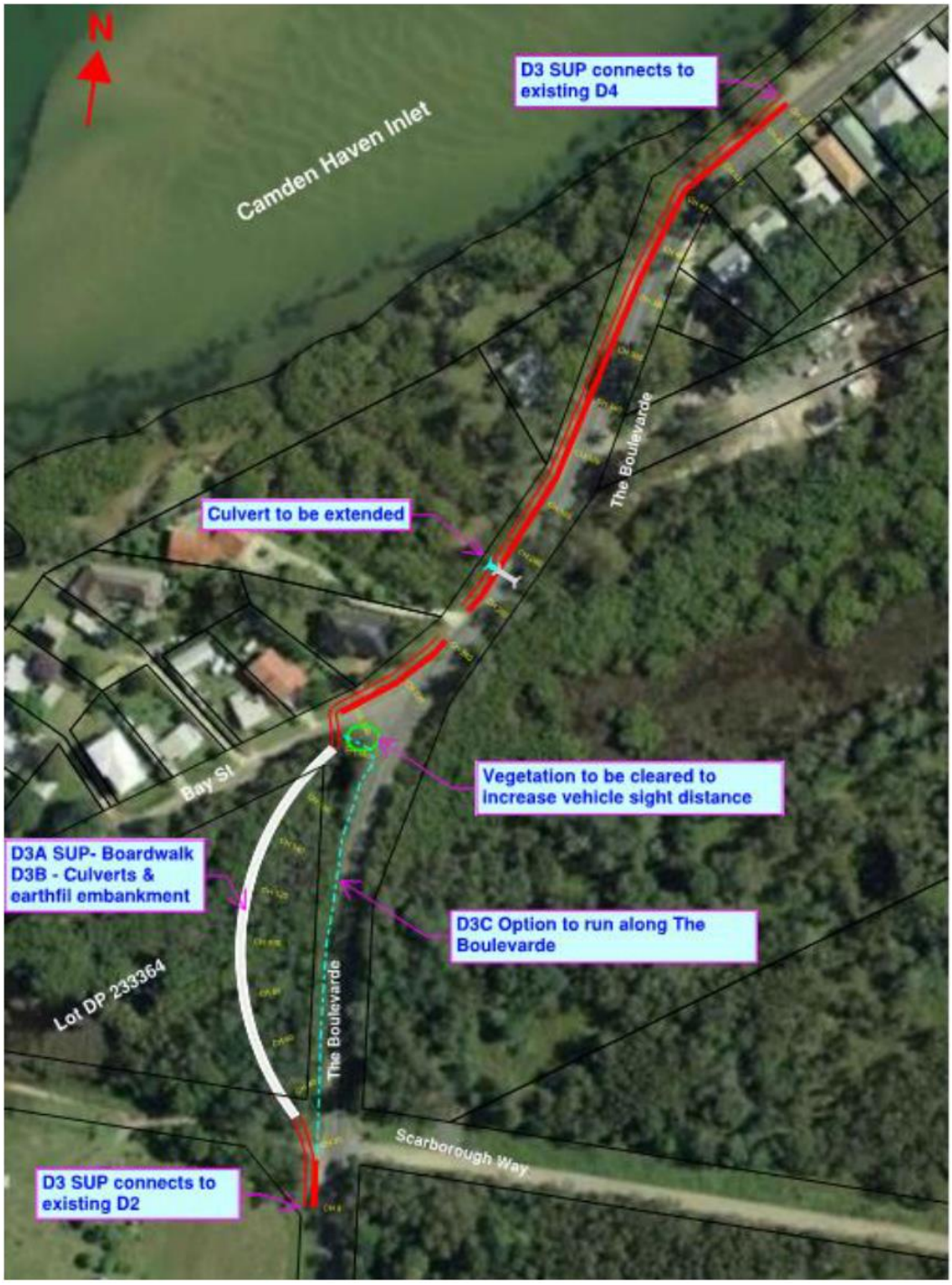
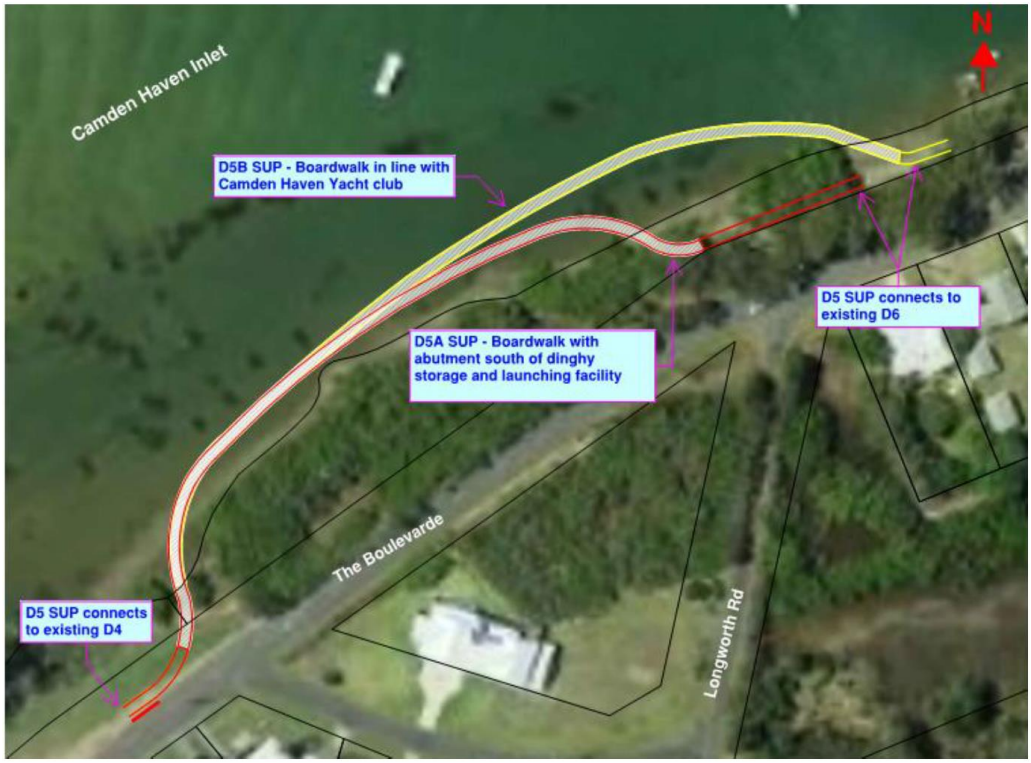


Figure 6.1: D3 options (KBR, 2020)

Section	Options Considered
D5	**Preferred Option: D5A – Boardwalk over Camden Haven Inlet** Several boardwalk options that extend around the existing mangroves and over the estuary have been investigated. The final option will largely avoid impacts to mangrove vegetation by using the area adjacent to the dinghy storage and launching area to tie in with the existing Section D6. Less environmental impact associated with raised boardwalk construction. The boardwalk option allows SUP to be aligned between existing trees and mangroves following detailed survey and design. **Option 2: D5C – SUP to extend along the western side of The Boulevarde** There is limited room to construct this option along the western side of The Boulevarde due to a very narrow road verge. This option was excluded as widening would require significant impacts to the adjacent wetland vegetation.  Figure 6.2: D5 options (KBR, 2020)
D8	Options for Section D8 follow the same alignment between Camden Head Road and Gogleys Creek to the north. The SUP utilises existing managed verges and would avoid existing trees where possible. Vegetation would be impacted where the verge is too narrow to accommodate the SUP design. Modifications to the design have been considered including sections of boardwalk to minimise impacts to vegetation.

Section	Options Considered
D10	Two alignment options were considered for Section D10 between CH0 and CH700. Each option follows the same alignment along the northern side of Camden Head Road between CH700 and the tie in with Section D11. These options follow an existing gravel path between CH700 and CH860 and the remainder of Section D10 utilises the existing managed verge. **Preferred Option D10A: - SUP along northern side of Camden Head Road (CH0-CH700)** This option extends along the northern side of Camden Head Road along the existing managed verge. The verge would require widening to accommodate the SUP design; however, sections of boardwalk would be used where fill would otherwise be required due to steep banks or to limit impacts to adjacent areas of littoral rainforest. This is the preferred option due to safety constraints and vegetation impacts could be better minimised by using the existing verge (which is currently used as an informal walking track) and boardwalk options. **Option D10B: - SUP along southern side of Camden Head Road (CH0-CH700)** This option crosses to the southern side of Camden Head Road and extends along on the southern side before crossing back at CH700. Electricity services extend along the southern side of Camden Head Road and there is minimal verge available to accommodate the SUP. This option was excluded due to safety issues relating to the northern crossing and additional vegetation clearing requirements to accommodate the SUP, the relocation of powerlines, and to provide appropriate sight lines to the crossing (on the northern side of Camden Head Road).  Figure 6.3: D10 options (KBR, 2020)

Section	Options Considered
D11	Several route and design options were considered for Section D11. The final alignment extends off Section D10 and follows the western side of Camden Head Road before extending along the northern side of Pilot Beach Road (Options D11A and D11D). The path would then extend north through existing parkland to the breakwall. This was selected as the preferred route as it represented the option with the least engineering, land ownership and environmental constraints (KBR, 2020). Modifications to the design have been implemented to include sections of boardwalk to minimise impacts to vegetation to adjacent littoral rainforest vegetation.  Figure 6.4: D11 options (KBR, 2020)

6.2 Residual Impacts

6.2.1 Loss of Native Vegetation and Habitat

Residual impacts of the proposed SUP would involve the direct removal of native vegetation, as summarised in **Table 6.2.** **Table 6.3** summarises the impact of the proposal to the vegetation integrity score of each vegetation zone identified on site. The calculated vegetation impacts have assumed a 0.5 metre buffer outside the SUP footprint to account for potential edge impacts associated with the construction and operation of the SUP.

Table 6.2: Summary of proposal impacts to vegetation

Plant community type (PCT)	Status			Proposal Impact (ha)
	BC Act	FM Act	EPBC Act	
PCT 1727 Swamp Oak – Sea Rush – *Baumea juncea* swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	EEC	0.11
PCT 1536 Tuckeroo – Lilly Pilly – Coast Banksia littoral rainforest	EEC	N/A	CEEC	0.20
PCT 1747 Grey Mangrove low closed forest	Not listed	Protected marine vegetation	Not listed	0.07
PCT 1746 Saltmarsh Estuarine Complex[1]	EEC	Protected marine vegetation	VEC	0.002
PCT 771 Coastal sand Tea-tree - Banksia scrub	Not listed	N/A	Not listed	0.08
PCT 1724 Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	EEC	N/A	Not listed	0.02

Note 1: The proposal area impacts a small area (approx. 21m^2) of PCT 1746 – Good. Due to the small size of this zone impacts have been combined with the adjoining PCT 1747 for the calculation of offsets.

Table 6.3: Summary of impact to the vegetation integrity

PCT	Condition Class	BAM-C Vegetation Zone	Area Impacted (ha)	Current VI score	Future VI score	Change in VI Score	BRW[1]
1727	VZ1_Moderate	2	0.1	47.8	0	-47.8	2
1727	VZ2_Good	4	0.015	61.4	0	-61.4	2
1536	VZ1_Good	3	0.19	81.3	0	-81.3	2
1536	VZ2_Regenerating	7	0.01	71.7	0	-71.7	2
1747	Good	1	0.07	94.6	0	-94.6	1.75
771	Good	5	0.08	47.8	0	-47.8	1.75
1724	Good	6	0.02	61.4	0	-61.4	2

Note 1: Biodiversity Risk Weighing (for ecosystem credits). For explanation, see Appendix 7 of the BAM (2020).

Table 6.4 summarises the impact of the proposal to species credit entities relevant to the proposal.

Table 6.4: Summary of impact to species credit species

Species Credit Species	Status	Species Presence Type	Proposal Impact (ha)
Lathamus discolor Swift Parrot	BC Act – E EPBC - CE	Important Areas Mapping	0.23
Numenius madagascariensis Eastern Curlew	BC Act – P EPBC - CE	Important Areas Mapping	0.01
Cercartetus nanus Eastern Pygmy-possum	BC Act – V	Assumed Present	0.31
Litoria brevipalmata Green-thighed Frog	BC Act – V	Assumed Present	0.07
Myotis macropus Southern Myotis	BC Act – V	Assumed Present	0.47
Planigale maculata Common Planigale	BC Act – V	Assumed Present	0.34
Pteropus poliocephalus Grey-headed Flying-fox	BC Act – V EPBC - V	Assumed Present	0.04
Rhodomyrtus psidioides Native Guava	BC Act – CE EPBC - CE	Present	0.01 (see Note 1)

Note 1: Minimum area allowable within BAM-C. Total impact area is approx. 33m^2

6.3 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the subject land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. **Table 6.5** describes and assesses the impacts of the proposal on native vegetation and habitat beyond the proposal area as detailed in Section 9.1.4.2 of the BAM (OEH, 2016).

Table 6.5: Assessment of indirect impacts on adjacent habitat

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats
(a) inadvertent impacts on adjacent habitat or vegetation	Most of the proposed SUP alignment extends along existing edges. The proposed removal of vegetation would increase the edge to area ratio of adjacent vegetation and the removal of large trees may reduce cover and shading of retained vegetation.	EECs - Littoral Rainforest, SOFF, SSFF *Rhodomyrtus psidioides* (Native Guava)	Impacts to adjacent vegetation have been minimised by using the existing disturbed areas including managed road verges, existing gravel walkways and managed parkland wherever possible. A boardwalk design would also be used in sensitive areas (i.e., coastal wetlands and littoral rainforest) which would otherwise require 'fill' construction methods to minimise impacts to adjacent vegetation. Mitigation measures including the retention of large overhanging trees and vegetation outside the SUP footprint would also be implemented to minimise these impacts. Provided these measures are implemented the proposal impacts are likely to be minor and not significantly impact the persistence of the adjoining TECs in the local area. Additionally, the calculated vegetation impacts and resulting offsets have assumed a 0.5 metre buffer outside the SUP footprint to account for potential edge impacts associated with the construction and operation of the SUP.
(b) reduced viability of adjacent habitat due to edge effects	As above	As above	As above
(c) reduced viability of adjacent habitat due to noise, dust or light spill	As above	As above	As above
(d) transport of weeds and pathogens from the site to adjacent vegetation	The proposed construction and works have the potential to introduce or increase weeds occurrence in adjacent habitat.	As above	Mitigation measures regarding weed and pathogen control have been recommended to minimise these impacts. Impacts would be minor given the current condition of the site.

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats
(e) increased risk of starvation, exposure and loss of shade or shelter	The proposal is unlikely to increase the risk of these impacts in adjacent habitat areas.	N/A	N/A
(f) loss of breeding habitats	The proposal is unlikely to impact breeding habitat for any species in adjacent areas.	N/A	N/A
(g) trampling of threatened flora species	The proposed works would be restricted to the identified proposal area and is unlikely to impact any threatened plants in adjacent habitats.	*Rhodomyrtus psidioides* (Native Guava)	Mitigation measures to restrict works to the proposal area have been recommended to avoid unforeseen impacts to adjacent habitats.
(h) inhibition of nitrogen fixation and increased soil salinity	It is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(i) fertiliser drift	It is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(j) rubbish dumping	It is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(k) wood collection	This issue is not likely to affect the subject land.	N/A	N/A
(l) bush rock removal and disturbance	This issue is not likely to affect the subject land as bush rock is largely absent from the proposal area and adjacent habitats.	N/A	N/A
(m) increase in predatory species populations	It is unlikely that the proposal works will influence or alter predatory populations.	N/A	N/A
(n) increase in pest animal populations	It is unlikely that the proposal will influence or alter pest species populations. Pest animals are likely present within the subject land and adjacent habitats.	N/A	N/A
(o) increased risk of fire	The proposal is unlikely to increase the risk of fire in the local area.	N/A	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g., beach nesting for shorebirds	In Section D11, the proposed SUP occurs near forest that has been previously used as a seasonal flying-fox camp. No other specialist breeding or foraging habitat is present in or adjacent to the proposal area.	N/A	N/A

6.4 Assessment of Serious and Irreversible Impacts

The BC Act (and the *Biodiversity Regulation 2017* (BC Regulation)) provides a framework to determine if species are at risk of SAII. The framework consists of a series of principles defined in the BC Regulation and supporting guidance, provided for under section 6.5 of the BC Act, to interpret these principles. Entities are considered at risk of a SAII if they meet the criteria of the following principles:

- observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline (Principle 1);
- observed, estimated, inferred, or reasonably suspected to have a very small population size (Principle 2);
- observed, inferred, or estimated to have very limited geographic distribution (Principle 3);
- unlikely to respond to management and are therefore irreplaceable (Principle 4).

Rhodomyrtus psidioides (Native Guava) is a critically endangered species (BC Act and EPBC Act) that was recorded within the proposal area (**Photos 6.1** and **6.2**). This species is considered at risk of SAIIs as it meets the criteria for Principle 1 in that an 80% reduction in the population across Australia over the three generations is reasonably expected given documented levels of mortality due to *Austropuccinia psidii* (Myrtle Rust) infection and high susceptibility to Myrtle Rust in both mature individuals and seedlings (NSW Threatened Species Scientific Committee, 2018).

There are also two species at risk of SAIIs which have important habitat mapped within the proposal area:

- *Lathamus discolor* (Swift Parrot);
- *Numenius madagascariensis* (Eastern Curlew).

Much of the native vegetation throughout Camden Head and North Haven is mapped by OEH as important migratory foraging habitat for Swift Parrots (**Figure 2.8**). Swift Parrots breed in Tasmania and are only present in NSW during the non-breeding season, occurring in northern NSW for a shorter period than southern NSW.

Camden Haven Inlet is mapped by OEH as important seasonal foraging habitat for Eastern Curlews (**Figure 2.8**). Eastern Curlews are a migratory wetland species that breed in the northern hemisphere and occur in NSW during the non-breeding season.

With regard to Principle 3 above, impacts on the limited areas of important foraging habitat available in NSW for both species has the potential to have serious and irreversible impacts to the future breeding success and the overall population. Any impact from development in mapped areas could potentially be serious and irreversible (Bionet, 2020).

As the proposal has the potential to impact habitat for each of these species, the additional impact assessment provisions for these SAII entities are considered in **Table 6.6, Table 6.7** and **Table 6.8** in accordance with Section 9.1.2 of the BAM (2020).



Photo 6.1: Section D10 – Native Guava occurs within littoral rainforest vegetation occurring on both sides of the existing informal walking track between CH690 and CH820.



Photo 6.2: Section D10 – Small Native Guava recorded adjacent to proposed SUP. All recorded plants appeared to be affected by Myrle Rust.

Table 6.6: Consideration of SAII assessment provisions for Native Guava

Additional impact assessment provision for SAII species	Response
1. Identify actions and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The final alignment and design of the SUP has implemented several measures to avoid and minimise impacts to biodiversity. These are detailed in Section 6.1. Measures specific to *Rhodomyrtus psidioides* (Native Guava) are discussed below. Several small *R. psidioides* were recorded at Section D10, occurring near the edge of the existing informal walking track between CH690 and CH820. The plants were recorded within the adjacent unmanaged vegetation and direct impacts would largely be avoided as the alignment uses the existing informal walking track. A boardwalk design would also be used throughout this section to minimise impacts to root zones and adjoining vegetation. Pre-construction surveys are also recommended to identify and mark any specimens occurring close to the proposed work area. Native vegetation that is outside of the Vegetation Clearing Limit will be clearly marked and/or fenced to exclude access during construction.
2. State of current population including where relevant: a) Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) b) Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) c) Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) d) Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	*R. psidioides* is considered at risk of SAIIs as it meets the criteria for Principle 1. The effect of *Austropuccinia psidii* (Myrtle Rust) infection on *R. psidioides* is severe across the species entire range and the population is projected to continue to decline rapidly as a consequence of infection by *A. psidii*. Within three generations, assuming a generation time of 20 years, a quantitative estimate of decline of 99% has been made based on documented rates of mortality across the range (NSW Threatened Species Scientific Committee, 2018). Flowering and fruiting have been severely affected by myrtle rust infection. This species is still known to flower and set fruit although production of viable seed is very limited or non-existent. Recent surveys suggest that seedling recruitment is not occurring. Most small plants found in the wild are root suckers, not seedlings, and infected plants may sucker from the roots and survive for many years. Seedling recruitment does not appear to be happening due to the extremely high susceptibility of germinating seedling to myrtle rust infection (Bionet, 2022).
3. Assessment of proposal's impact to SAII entity:	*R. psidioides* is a pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest (TSPD, 2019) and is also a characteristic species the EEC *Littoral Rainforest in the New South Wales North Coast, Sydney*

Additional impact assessment provision for SAII species	Response
a) Impact on the species' population (Principles 1 and 2) b) Impact on geographic range (Principles 1 and 3)	*Basin and South East Comer Bioregions*. A survey of littoral rainforests on the western portion of Camden Head identified *R. psidioides* occurs as a rare (<5 plants recorded) component of the littoral rainforest occurring on the eastern edge of Gogleys Lagoon (Williams, 2000). Within the proposal area, at least ten small plants were identified near the edge of the existing informal walking track between CH690 and CH820 (Section D10). All recorded plants were small and appeared to be heavily affected by myrtle rust. No mature plants were observed, and it is most likely the recorded plants are root suckers from plants persisting underground. Whilst impacts to *R. psidioides* have the potential to constitute a SAII, a significant and/ or irreversible impact resulting from the proposed SUP is not considered likely due to the following: • The SUP uses an existing informal walking track and will largely avoid direct impacts and impacts to adjacent *R. psidioides* habitat. A boardwalk design would also be used to minimise impacts to adjoining vegetation and root zones. Whilst no *R. psidioides* plants were recorded along the existing track, there is potential for *R. psidioides* shoots to appear prior to any works being approved. • All recorded plants were small and affected by Myrtle Rust. No mature shrubs or plants showing signs of flowering or fruiting were observed. This is consistent with the Bionet advice in that most individuals infected with Myrtle Rust are no longer flowering or setting seeds although infected plants may sucker from the roots and survive for many years. The absence of mature plants and the lack of successful regeneration likely threatens the long-term viability of *R. psidioides* occurring within the study area. • The proposed SUP alignment is extensively used by walkers and cyclists. The proposal is unlikely to increase threats and indirect impacts that may affect the local habitat given the existing condition of the alignment. Mitigation measures regarding weed and pathogen control have been recommended to minimise impacts to adjacent habitats. • Impacts to potential habitat would be offset via the retirement of species credits. The species credits required to offset the impacts of the proposal are summarised in **Table 8.2**.

Table 6.7: Consideration of SAII assessment provisions for Swift Parrot

Additional impact assessment provision for SAII species	Response
1. Identify actions and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The final alignment and design of the SUP has implemented several measures to avoid and minimise impacts to biodiversity. These are detailed in Section 6.1.
2. State of current population including where relevant: e) Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) f) Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) g) Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) h) Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	The Swift Parrot occurs as a single, migratory population that breeds in Tasmania and is only present in NSW when it migrates to mainland Australia between February and October (Bionet, 2020). The total population is estimated to be no more than 1000 pairs and is at best stable but most likely continuing to decline, given the continued mortality of birds and the ongoing loss of habitat (Saunders *et al*, 2010). Numbers in NSW are likely considerably less than this (NSW Scientific Committee – Final Determination, 2000). Swift Parrots use a diversity of winter foraging habitats in coastal and/ or western slopes regions of New South Wales each year, generally in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees in coastal NSW include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*) and Forest Red Gum (*E. tereticornis*). Commonly used lerp infested trees include Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*) (Bionet, 2020). Swift Parrot abundance fluctuates between years and regions, with coastal areas providing important drought refuge habitats for a large proportion of the population (Saunders and Heinsohn, 2008). The species is known to use sites repeatedly and important foraging habitat areas mapped by OEH are likely to be used regularly. Continued loss of this resource through conversion of native woodlands and forests to other land uses associated with human development threatens the continued existence of this species in NSW (NSW Scientific Committee – Final Determination, 2000).
3. Assessment of proposal's impact to SAII entity: c) Impact on the species' population (Principles 1 and 2) d) Impact on geographic range (Principles 1 and 3)	Swift Parrots are a relatively regular winter visitor to the area with 57 records recorded within the search area between 2000 and 2019 (Bionet, 2020). Records suggest the Swift Parrots were largely recorded feeding on lerp in Blackbutt (*E.* pilularis) and Rough-barked Apple (*Angophora floribunda*) and forest with flowering Swamp Mahogany (*E. robusta*) and Forest Red Gum (*E. tereticornis*). Approximately 872 hectares of native vegetation occurring throughout Camden Head and North Haven is mapped by OEH as important migratory foraging habitat for Swift Parrots. Approximately 0.24 hectares of this mapped important habitat would be impacted by the proposal.

Additional impact assessment provision for SAII species	Response
	Any impacts to mapped important habitat areas trigger the SAII threshold for this species. Whilst the threshold for the SAII is triggered, a significant and/ or irreversible impact is not considered likely due to the following: • The SUP alignment impacts a relative narrow strip of vegetation and is considered minor, relative to the amount of habitat available within the local area. The habitat to be impacted by the proposal represents 0.03% of habitat mapped in the local area. No specimens would be directly impacted by the proposal. • The habitat impacted by the proposal is located along existing disturbed edges and preferred food trees are mostly absent from the proposal area. • Swift Parrots are highly mobile, and the proposed clearing is unlikely to isolate any habitat or limit movements throughout the local area. • The proposed SUP alignment is extensively used by walkers and cyclists, mostly along informal tracks. The proposal is unlikely to increase threats and indirect impacts that may affect the local habitat given the existing condition of the alignment. Mitigation measures regarding weed and pathogen control have been recommended to minimise impacts to adjacent habitats. • Impacts to mapped habitat would be offset via the retirement of species credits. The species credits required to offset the impacts of the proposal are summarised in **Table 8.2**.

Table 6.8: Consideration of SAII assessment provisions for Eastern Curlew

Additional impact assessment provision for SAII species	Response
1. Identify actions and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The final alignment and design of the SUP has implemented several measures to avoid and minimise impacts to biodiversity. These are detailed in Section 6.1.
2. State of current population including where relevant: a) Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) b) Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) c) Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) d) Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation)	The latest population estimates for migratory shorebirds (Hansen *et al*., 2016) lists the East Asian-Australasian Flyway (EAAF) population of the Eastern Curlew at 35,000. The species breeds in Russia and north-eastern China but its distribution is poorly known. During the non-breeding season a few birds occur in southern Korea and China, but most spend the non-breeding season in north, east and south-east Australia. The dominant threats to the Eastern Curlew are associated with development pressure and human disturbance in foraging sites in coastal areas, both in Australia and especially their staging grounds during migration. The species is associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within mangroves (Department of the Environment, 2015). Camden Haven Inlet and its surrounds is known to support individuals of the Eastern Curlew and the inlet is mapped by OEH as important habitat for this species. Important habitat is also mapped in the Hastings River Estuary at Port Macquarie to the north and the Manning River Estuary to the south. The mapping was developed by Birdlife Australia based on monitoring data since 2000. Important areas are those that support bird numbers exceeding the international and national significance thresholds as defined in the Commonwealth EPBC Act and the Wildlife Conservation Plan for Migratory Shorebirds. A single Eastern Curlew was observed on a tidal sandbar in the inlet during site surveys and 32 Bionet records occur within the search area.
3. Assessment of proposal's impact to SAII entity: a) Impact on the species' population (Principles 1 and 2) b) Impact on geographic range (Principles 1 and 3)	Potential habitat within the proposal area is limited to the intertidal zones (Section D5) and areas of mangrove and/ or saltmarsh (Sections D3, D5 and D8). The entirety of Camden Haven Inlet (3198 ha) is mapped by OEH as important migratory foraging habitat for Eastern Curlews. Approximately 0.1 ha of this mapped important habitat would be impacted by the proposal via the construction of a boardwalk over tidal and wetland areas. Any impacts to mapped important habitat areas triggers the SAII threshold for this species. Whilst the threshold for the SAII is triggered, a significant and/ or irreversible impact is not considered likely due to the following:

Additional impact assessment provision for SAll species	Response
	• The SUP alignment impacts a relatively narrow strip of tidal habitat and is considered minor relative to the amount of habitat available within the local area. The habitat to be impacted by the proposal represents 0.003% of habitat mapped in the local area. No specimens would be directly impacted by the proposal. • The boardwalk design would minimise impacts to tidal habitat within the proposal area. • Eastern Curlews are highly mobile, and the proposed construction of the boardwalk / SUP is unlikely to isolate any habitat or limit movements throughout the local area. • The proposed SUP alignment is extensively used by pedestrians and water users and any increase in use is unlikely to significantly alter the behaviour of birds occurring in the local area. • Impacts to mapped habitat would be offset via the retirement of species credits. The species credits required to offset the impacts of the proposal are summarised in **Table 8.2**.

6.5 Prescribed Biodiversity Impacts

The BC Regulation (Division 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme, they include:

- *Impacts of development on the following habitat of threatened species or ecological communities:*
- *Karst, caves, crevices, cliffs and other geological features of significance; or*
- *Rocks; or*
- *Human made structures; or*
- *Non-native vegetation.*
- *Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;*
- *Impacts of development on movement of threatened species that maintains their lifecycle,*
- *Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development);*
- *Impacts of wind turbine strikes on protected animals; and*
- *Impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.*

Prescribed impacts that are relevant to the proposal are limited to habitat connectivity and the movement of animals. The proposal will add to the incremental fragmentation of vegetation within the local area. The relatively narrow nature of the proposed clearing is considered minor and is unlikely to isolate any local habitat areas or limit the movements of any threatened fauna species in the locality.

6.6 Aquatic Impacts

Impacts to marine vegetation are described in Section 3 of this assessment and are summarised in **Table 6.9.**

Table 6.9: Summary of potential impacts to marine vegetation

Site	Habitat Description	Identified Marine Vegetation	Impact Summary
D3	Mangrove Forest	Mangroves	Potential removal of mangroves and/or lopping of mangrove branches within the alignment of the boardwalk. Direct and indirect impacts to pneumatophores through piling.
D5	Mangrove Forest Intertidal flats Sub-tidal estuary channel	Mangroves Oyster encrusted mangrove pneumatophores Seagrass	Potential removal of mangroves and/or lopping of mangrove branches within the alignment of the boardwalk. Direct and indirect impacts to pneumatophores through piling. Direct impacts to seagrass through piling. Indirect impacts to seagrass through shading.
D8	Mangrove Forest Rocky channel edge Salt Marsh	Mangroves Macroalgae and oyster reef	Removal of or lopping mangroves in boardwalk alignment. Potential impact to oyster reef and macroalgae existing on rock edges (only if reclamation occurs). Direct impact to saltmarsh community within boardwalk footprint.

6.6.1 Mangrove Impacts

Sections D3, D5 and D8 present impacts to mangroves. These impacts have been considered in relation to loss of native vegetation as summarised in **Table 6.2** and **Table 6.3.**

6.6.2 Seagrass Impacts

Potential impacts to seagrasses are limited to the raised boardwalk in Section D5. Impacts are likely to result from piling (where occurring in seagrass patches) or as a result of overshadowing. Potential overshadowing impacts are likely to be minimal given the location of the boardwalk alignment over the intertidal zone and to the south of existing seagrass patches. Any decline in the health or persistence of seagrasses would be minimal (if any) with an estimated 140 m^2 of seagrasses occurring within the footprint of the boardwalk and potentially subject to some shading effects.

No macroalgae were detected within the footprint of the proposed development. Therefore, no impacts (either direct or indirect) to macroalgae are likely to occur.

The primary objective of the Fish Habitat Protection Plan No. 2 (Seagrasses) is to ensure that there is no net loss of seagrasses within the coastal and estuarine waters of NSW. The proposal is unlikely to directly remove any seagrass except where seagrass occurs in the footprint of piles. This will be unlikely to result in an overall net decrease in the area of seagrasses in the immediate locality.

Impacts may be avoided or minimised through the following measures:

- Construction of the proposed boardwalk as close as practical to the shoreline/mangrove edge and over the intertidal zone as far as possible;
- Viewing platforms/extension should be located to avoid shading of existing seagrass patches;
- Where the alignment of the boardwalk covers existing seagrass patches, consideration should be given to the use of mesh or similar material to allow increased light penetration through the walkway.

6.6.2.1 Construction Impacts

In relation to construction impacts for Section D5, it is anticipated that disturbance of bottom sediments for piling will result in a short-term increase in the turbidity of water in the vicinity of the construction activities. It is also possible that construction of the structures could result in indirect impacts to seagrass through accidental contact by construction machinery and boats.

Seagrasses and macroalgae are photosynthetic plants which are reliant on the availability of light for their survival and the impacts of increased turbidity are a known threat to the long-term survival of macroalgae and seagrasses generally. Long term increases in turbidity therefore have the potential to decrease the availability of light and decrease the growth and survival of the marine vegetation.

In the context of the proposed development, it is assumed that construction (piling) activities would be limited to a duration of several days. The persistence of sediment within the water column would be likely to be very short; however, a short-term increase in leaf sediment coverage is likely to occur for several days following construction, after which turbidity and sediment levels are likely to return to normal levels.

The potential impact of turbidity and sediment on the survival of the nearby seagrass or macroalgae is likely to be very low. The short duration of the impact is not dissimilar to the natural conditions experienced after heavy rain, wind or storms. Given the relatively shallow water (i.e., high availability of light) and tidal currents within the vicinity of the project, the impacts of short-term sedimentation are also likely to be significantly less than deeper water environments where light availability is the limiting factor for the growth of seagrass and tidal flushing is less.

Therefore, the short-term impacts resulting from construction activities are likely to be to minor. The duration and extent of shading (due to turbidity) is not considered to be detrimental to the survival of seagrass in the immediate locality.

6.6.3 Fish Habitat Protection Plans

Fish Habitat Protection Plans (FHPPs) describe potential threats to fish habitat and recommend actions to mitigate the effects of potentially damaging activities (DPI, 2021). The following two FHPPs apply to the proposal:

- Fish Habitat Protection Plan 1 – General
- Fish Habitat Protection Plan No. 2 (Seagrasses)

FHHP No. 1 applies to activities that involve reclamation or the damaging of marine vegetation (mangroves). FHHP No. 2 applies specifically to activities involving impacts to seagrasses.

The objectives of FHHP 1 are generally reflected in the permit requirements under the FM Act for damage to marine vegetation and permits for dredging and reclamation. These permits would apply in relation to impacts to mangroves, sea grasses and reclamation activities in areas of saltmarsh (such as Section D8, **Photo 4.8**).

The objective of FHHP No. 2 is to ensure no net loss of seagrasses within the coastal and estuarine waters of NSW. The FHHP provides guidelines for the management of specific activities including the construction of jetties, wharves, bridges, ramps and pontoons. These guidelines would be applicable to the proposal.

FHHP No. 1 advises that construction of new structures over Zostera seagrass would be considered on a case-by-case basis and based in part on the regional importance of the seagrass bed. As shown in **Photo 4.5**, the subject seagrass beds are part of a broader estuarine environment that is characterised by small discrete patches of seagrass (Zostera sp.) separated by non-vegetated sand flats.

It appears that seagrass in the subject locality would undergo a high degree of seasonal change depending on movement of sands and other hydrological characteristics of the channel. This is confirmed through review of historical aerial imagery (SIX Maps) which indicates a large degree of seasonal variability compared to current

seagrass distribution (**Figure 3.2**) and an apparent absence of seagrass from the boardwalk footprint during previous seasons.

Figure 4.1 depicts the relative area of seagrasses in the locality and shows the occurrence of large and important seagrass beds within the areas of Queens Lake and Gogleys Lagoon. The subject seagrass beds are shown as narrow and isolated patches and are unlikely to be either temporally stable or of regional importance in comparison to other larger seagrass beds in the estuary.

Relevant to the guidelines, the proposal attempts to minimise impacts to existing seagrass through positioning of the boardwalk over the intertidal zone and minimising shading effects. Subject to the adoption of mitigation measures in Section 5.6.2 above and having regard to the temporal variability in local distribution, there is unlikely to be a long-term net reduction in the area of seagrass in the locality.

6.7 Other Relevant Legislation or Planning Policies Requiring Address

6.7.1 Fisheries Management Act 1994

An Object of the FM Act is to "conserve fish stocks and key fish habitats". Key fish habitats are mapped by the DPI and described in Section 3 of this report.

The FM Act sets out provisions to protect marine vegetation (mangroves, seagrass, and seaweeds whether alive or dead) from 'harm'. 'Harm', under the FM Act, means gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it. For the purposes of the FM Act, attached macroalgae and mangroves are defined as 'marine vegetation'.

A permit is required under Section 205 of the FM Act in relation to any activity that is likely to impact on marine vegetation. As described in Section 3 of this report, the proposal is likely to impact Marine Vegetation in Sections D3, D5 and D8. Furthermore, permits are required under Sections 200 and 201 of the FM Act in relation to any reclamation work. A summary of those impacts is provided in **Table 6.9** above.

The FM Act provides matters that are to be taken into account for the purposes of determining whether a proposed development is likely to significantly affect threatened species, populations or ecological communities listed under the FM Act. Appendix III provides an assessment of potential habitat for threatened species likely to inhabit the proposal area and indicates that there is not more than a "low" chance of occurrence for any listed threatened marine species. No endangered populations or communities exist in the proposal area.

Having regard to the matters under Section 221ZV of the FM Act, the proposal is unlikely to have a significant impact on any threatened species, populations or ecological communities.

6.7.2 SEPP (Biodiversity and Conservation) 2021 - Koala habitat protection 2021

Chapter 4 of *State Environmental Planning Policy (Biodiversity and Conservation) 2021,* Koala habitat protection 2021 (referred to hereafter as the Koala SEPP 2021), seeks to address the declining status of Koalas in NSW

through better conservation and management of Koala habitat as part of the planning and assessment process. The Koala Habitat Protection Guideline (2020) outlines the development control provisions of the SEPP which applicants and consent authorities must address when preparing and assessing development applications in areas of Koala habitat. The control provisions apply to proposals within core habitat areas that have an area of more than 1 hectare under the same ownership.

The definition of core koala habitat under the Koala SEPP 2021 is:

a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

No signs of Koala, including scats or scratches on tree trunks, were recorded within the proposal area. Local records indicate a resident local population occurs throughout the Camden Head area and suitable habitat with a high incidence of preferred food trees may provide suitable breeding habitat.

Highly suitable habitat is described as "areas where 15% or greater of the total number of trees within any Plant Community Type (PCT) are the regionally relevant species of those listed in Schedule 2 of the SEPP". Schedule 2 listed trees are largely absent from the proposal area; however, a small number of *Melaleuca quinquenervia* (Broad-leaved Paperbark) associated with PCT 1724 occurs at the eastern end of Section D8. The proposal would result in the removal of approximately 196 m^2 of this habitat occurring along the northern side of Camden Head Road and would potentially remove a small number of *M. quinquenervia*. No other areas of 'highly suitable' habitat occur within the proposal area.

The proposed SUP footprint is narrow and is unlikely to restrict Koala movement throughout the local area or increase the risk of vehicle strike.

Given the above, it is considered that the potential impact of the proposal to local Koalas is low and no further assessment under the provisions of the SEPP is warranted.

6.7.3 Matters of National Environmental Significance

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval of the Commonwealth Minister representing the Department of Agriculture, Water and the Environment (DAWE), for actions that may have a significant impact on Matters of National Environmental Significance (MNES).

MNES protected under the EPBC Act include:

- World Heritage properties;
- National Heritage places;
- RAMSAR wetlands of international importance;
- Threatened species or ecological communities listed in the EPBC Act;
- Migratory species listed in the EPBC Act;
- The Great Barrier Reef Marine Park;
- Commonwealth marine environment; and
- Nuclear actions.

Regarding biodiversity, the only MNES relevant to the study area are nationally listed threatened species and ecological communities and migratory species. An assessment on potential impacts relating to MNES is provided in **Appendix VI** and are summarised below.

6.7.3.1 Threatened Ecological Communities

Three (3) threatened ecological communities listed under the EPBC Act were recorded within the proposal area. These were:

- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (CEEC)*
- *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)*
- *Subtropical and Temperate Coastal Saltmarsh (VEC)*

The significant impact criteria for Littoral Rainforest and Coastal Swamp Oak Forest have been addressed in **Appendix VI**. This concluded that the proposal was unlikely to have a significant impact on either of these TECs given the following:

- The final alignment and design have implemented measures to avoid and minimise impacts to TECs wherever possible.
- Impacts to TECs would be limited to vegetation along existing edges already subject to edge effects, regular maintenance, pedestrian activity and/or high weed coverage.

- The proposed vegetation impacts are considered minor representing only 0.17% of the Littoral Rainforest CEEC and 0.009% of the Coastal Swamp Oak Forest EEC previously mapped in the Port Macquarie LGA.
- Fragmentation of TECs would be minor and no areas would be isolated by the development.
- The proposal will not impact on habitat that is critical to the survival of either TEC.
- The proposal is unlikely to affect the recovery of either TEC.

The small patch of Subtropical and Temperate Coastal Saltmarsh recorded within the proposal area in Section D8 failed to meet the minimum condition threshold for listing under the EPBC Act as the patch is <0.4 hectares and is isolated from other habitat areas by Camden Head Road. As such, no further assessment is required for this VEC.

6.7.3.2 Threatened Species

Potential habitat is available for the following threatened species listed under the EPBC Act:

- Swift Parrot (CE)
- Eastern Curlew (CE)
- Curlew Sandpiper (CE)
- Great Knot (CE)
- Native Guava (CE)
- Red Knot (E)
- Bar-tailed Godwit (V)
- Grey-headed Flying-fox (V)

The significant impact criteria for these species have been addressed in **Appendix VI**. These concluded that the proposal was unlikely to have a significant impact on any of these threatened species given the following:

- The final alignment and design have implemented measures to avoid and minimise impacts to these threatened species wherever possible.
- Impacts would be limited to vegetation along existing edges already subject to edge effects, regular maintenance and pedestrian activity.
- Fragmentation of the habitat would be minor, and no areas of habitat would be isolated by the development.
- The proposal will not impact on habitat that is critical to the survival of any threatened species.
- The proposal is unlikely to affect the recovery of any threatened species.

Given the above, the proposal was considered unlikely to have a significant impact on any MNES and a Commonwealth referral under the provisions of the EPBC Act is not warranted.

7. MITIGATION MEASURES

The following mitigation measures are recommended to minimise the ecological impact of the proposal. These are to be incorporated into a Construction Environmental Management Plan (CEMP) for the construction phase of the project.

Table 7.1: Environmental safeguards

Impact	Environmental safeguards	Responsibility	Risk of Failure[1]	Timing
General	The Construction Environmental Management Plan (CEMP) to be prepared for the works shall include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas. • Sediment and erosion control measures. • Pre-clearing survey requirements, including pre-construction surveys to identify and mark any Native Guava specimens occurring close to the proposed work area in Section D10. • Procedures for unexpected threatened species finds and fauna handling. • Procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013); and • Protocols to manage weeds and pathogens. • Monitoring and compliance reporting requirements. This may include monitoring and reporting of preparation works, pre-clearance surveys, vegetation clearing and establishment of exclusion fencing.	Proponent / Contractor	Low Council to approve CEMP and monitoring / compliance reports. The CEMP is to be reviewed and approved by Council prior to commencement of any construction works.	Detailed design / pre-construction

Impact	Environmental safeguards	Responsibility	Risk of Failure[1]	Timing
Exclusion Zones	Measures to further avoid and minimise the construction footprint and Vegetated Clearing Limits will be investigated during detailed design and implemented where practicable and feasible. The clearing of native vegetation must be minimised with the objective of reducing impacts to any threatened species, populations and ecological communities to the greatest extent practicable.	Contractor	Low	Detailed design / pre-construction
	Vegetation clearing would be restricted to the identified impact area and trees located outside of the proposed impact area are to be retained. Establishment of exclusion zones and the selection of suitable work methods which aim to minimise impacts to retained vegetation would be documented in the CEMP. This may include: • Exclusion zones shown on a suitable plan. • Selection of a suitable exclusion fence type. • Allowance of enough lead time to establish exclusion zones before clearing. • Mark out exclusion zones with temporary markings such as pegs or paint and where possible use a qualified surveyor. • Place exclusion zone fencing outside tree protection zones wherever possible. • Erect signs to inform personnel of the purpose of exclusion zone fencing. • Inspection and repairs to fencing are made where required. • Communicate the importance of exclusion zones, and any changes to the zones, to all site staff and contractors (e.g., in toolbox talks and inductions).	Proponent / Contractor	Low	Detailed design / pre-construction

Impact	Environmental safeguards	Responsibility	Risk of Failure[1]	Timing
	Any ancillary areas (including site compounds, stockpile areas, construction site parking and site access) are to use existing Council approved sites or existing cleared/ hardstand areas. No additional native vegetation should be impacted by the use of temporary ancillary facilities.	Proponent / Contractor	Low	Pre-construction / construction
Vegetation Clearing	The following vegetation removal measures would apply to the works: • Develop a clearing and grubbing plan with reference to the Vegetation Clearing Limit and other habitat protection measures and communicate the requirements of the plan to site staff regularly. • The selection of suitable work methods which aim to minimise impacts to retained vegetation would be documented in the CEMP. Any trimming of overhanging branches is to be carried out by, or under the supervision of, a qualified arborist to avoid adverse impacts to trees located outside of the proposed impact area. • Large overhanging trees occurring in Section 11 between CH40 and CH60 are located adjacent to the proposed boardwalk. These trees are to be retained and protected from harm during construction.	Proponent / Contractor	Low	Pre-construction/ construction
Threatened Flora	Pre-construction surveys are recommended to identify and mark any Native Guava specimens occurring close to the proposed work area. Methods to further minimise impacts to any specimens occurring close to the construction footprint should be considered in consultation with the project ecologist.	Proponent / Contractor	Low	Pre-construction/ construction

Impact	Environmental safeguards	Responsibility	Risk of Failure[1]	Timing
Weed and Pathogen Management	The following weed and pathogen management measures would apply to the works: • Weed debris and topsoil containing weed plant material should be stored to best prevent the spread of propagules and disposed of at a registered refuse facility. • Weeds should be separated from native vegetation where native vegetation is to be used for mulch. Weeds are not to be used for mulch. • Contractors should be required to ensure that all machinery, materials, and personnel are clean of any weed seed and tyres, boots, hats and clothing are disinfected / laundered prior to entering the site each day to prevent the introduction or spread of weeds and pathogens. • Check the Department of Primary Industries (DPI) website (www.industry.nsw.gov.au) for the most up-to-date hygiene protocols for each pathogen and for the most recent locations of contamination.	Proponent / Contractor	Low	Pre-construction/ construction
Acid Sulphate Soil Management	A management plan in accordance with the Acid Sulphate Soils Manual is to be developed for any works with potential to intercept acid sulphate soils.	Proponent / Contractor	Low	Pre-construction/ construction
Impacts to marine vegetation	Apply for Part 7 permits under the FM Act and operate under any required conditions for works impacting marine vegetation (Sections 3, 5 and 8) or works involving reclamation (i.e., placement of fill in Section 8).	Proponent / Contractor	Low	Pre-construction/ construction

[1] Risk of failure includes constraints to implementation such as financial, biophysical and resource availability

8. BIODIVERSITY OFFSET CREDIT REQUIREMENTS

This chapter summarises the impact to PCTs and the number and type of credits required to offset the proposal. The BAM-C reports are provided in **Appendix IV**.

8.1 Ecosystem Credits

The ecosystem credits required to offset the proposal are provided in **Table 8.1**.

Table 8.1: Summary of proposal impacts to vegetation

PCT ID	BAM-C Zone ID #	Current / Future VI score	Change in VI (loss / gain)	Area Impacted (ha)	BRW	Credits Required
PCT 1727	2	47.8 / 0	-47.8	0.1	2	2
	4	61.4 / 0	-61.4	0.01	2	1
PCT 1536	3	81.3 / 0	-81.3	0.19	2	8
	7	71.7 / 0	-71.7	0.01	2	1
PCT 771	5	94.6 / 0	-94.6	0.08	1.75	3
PCT 1747	1	58.4 / 0	-58.4	0.07	1.75	2
PCT 1724	6	88.6 / 0	-88.6	0.02	2	1
			Total Area	**0.48 ha**	**Total Credits**	**18**

8.2 Species Credits

There are eight (8) candidate threatened species for which offsets are required. The species credits that would be required to offset the impacts of the proposal are summarised in **Table 8.2**.

Table 8.2: Species credits summary

Species	Species presence type	Vegetation Zones	Potential SAII	BRW	Area Impacted (ha)[Note 1]	Credits Required
Lathamus discolor Swift Parrot	Important Areas Mapping	3-7	Yes	3	0.24	16
Numenius madagascariensis Eastern Curlew	Important Areas Mapping	1	Yes	3	0.01	1
Cercartetus nanus Eastern Pygmy-possum	Assumed Present	3, 5, 6, 7	No	2	0.32	15
Litoria brevipalmata Green-thighed Frog	Assumed Present	3, 4	No	1.5	0.07	2
Myotis macropus Southern Myotis	Assumed Present	1-7	No	2	0.47	18
Planigale maculata Common Planigale	Assumed Present	2-7	No	2	0.35	16
Pteropus poliocephalus Grey-headed Flying-fox	Assumed Present	3, 4, 7	No	2	0.04	2
Rhodomyrtus psidioides Native Guava	Present (Surveyed)	3	Yes	3	0.01	1

Note 1: Where possible (Eastern Curlew, Green-thighed Frog, Southern Myotis and Grey-headed Flying-fox), the species credit impact area was attributed to the predominant PCT in BAM-C to avoid duplication of credits across small areas and different vegetation zones.

8.3 Offset obligation options

There are a number of options available to fulfill the required offset obligation, including:

- Retiring like-for-like credits from an established stewardship site. Like-for-like credits can be sourced by purchasing available credits on the market or by establishing a stewardship site that can generate matching credits.
- If like-for-like credits are not available, credits can be sourced in accordance with the 'variation report' generated by the BAM calculator (Appendix IV).
- Monetary payment to the Biodiversity Conservation Trust.
- Funding an approved biodiversity action. This is generally as a last resort, subject to consultation with approval authorities, if all other options are determined to be unsuitable.

9. CONCLUSION

Accuplan was engaged on behalf of Port Macquarie Hastings Council to prepare this BDAR for the proposed Beach to Beach (B2B) Shared User Pathway (SUP) and to address key biodiversity issues identified in the Secretary's Environmental Assessment Requirements (SEARs). Specifically, this report has addressed:

- Stage 1 (Biodiversity Assessment) and Stage 2 (Impact Assessment) of the BAM (BC Act);
- Matters of National Environmental Significance (EPBC Act); and
- Marine Vegetation and Key Fish Habitats (FM Act).

The proposal would connect the existing unconnected SUP sections in Laurieton, Dunbogan and Camden Head; thereby providing a continuous 11 km route following the banks of the Camden Haven River system from North Haven, Laurieton and Dunbogan, and past the shoreline of Gogleys Lagoon to Camden Head. The proposal would impact coastal habitats present along the length of the SUP including areas of Coastal Wetlands and Littoral Rainforest.

In accordance with the objectives of the BAM, the design and alignment of the SUP aimed to avoid and minimise impacts on biodiversity values. This included using a boardwalk design in sensitive areas (i.e., coastal wetlands and littoral rainforest) to minimise the disturbance footprint and using existing disturbed areas including managed road verges, existing gravel walkways and managed parkland wherever possible.

Residual Impacts

The construction of the proposed SUP will require the removal of small areas of native vegetation, largely on the margins of existing roads or tracks. The proposal would impact 0.48 ha of native vegetation including:

- 0.2 hectares of Littoral Rainforest TECs listed under the BC Act and EPBC Act.
- 0.11 hectares of Swamp Oak Forest TECs listed under the BC Act and EPBC Act.
- 0.02 hectares of Swamp Sclerophyll Swamp Forest EEC listed under the BC Act.
- 0.062 hectares of protected marine vegetation under the FM Act comprising of mangrove and saltmarsh.

An additional 0.014 hectares of seagrass, which is protected marine vegetation under the FM Act, may also be impacted by the proposal.

Offsetting under the BC Act

This BDAR identified the following offsetting requirements to address residual impacts of the proposal.

- 18 ecosystem credits to address loss of 0.48 hectares of native vegetation and threatened species habitat.
- 71 species credits to address impacts on eight candidate threatened species including Swift Parrot, Eastern Curlew, Eastern Pygmy-possum, Green-thighed Frog, Common Planigale, Southern Myotis, Grey-headed Flying-fox and Native Guava.

These credit requirements will be satisfied through retiring of credits under the Biodiversity Offset Scheme, based on like-for-like rules wherever possible. Payments into the Biodiversity Conservation Fund may be made where suitable credits are not currently available.

Assessment of Serious and Irreversible Impacts (SAII)

Three (3) threatened species, Native Guava, Swift Parrot and Eastern Curlew, are at risk of SAIIs. Several small Native Guava specimens were recorded within Section D10 and important habitat mapping for Swift Parrots and Eastern Curlews occurs within the proposal area. Much of the native vegetation throughout Camden Head and North Haven is mapped by OEH as important migratory foraging habitat for Swift Parrots and Camden Haven Inlet is mapped as important seasonal foraging habitat for Eastern Curlews. The SAII assessment undertaken for these species identifies that the proposal impacts are minor and are unlikely to have a serious and irreversible impact on these species.

Matters of National Environmental Significance (EPBC Act)

The MNES assessment concluded that the proposed impacts to vegetation and habitat are unlikely to have a significant impact on any TEC or threatened species listed under the EPBC Act. As such, it is considered that a referral under the EPBC Act is not likely to be required for the project.

Aquatic Habitat and Marine Vegetation (FM Act)

The proposal is unlikely to have a significant impact on any key fish habitats, threatened species, populations or ecological communities listed under the FM Act.

The proposal will require the removal of relatively small areas of protected marine vegetation (mangroves, saltmarsh and seagrass) in Sections D3, D5 and D8. A permit will be required under Section 205 of the FM Act for any activity that is likely to impact on marine vegetation. Furthermore, permits under Section 200 and 201 of the FM Act would also be required for any reclamation works.

Mitigation Measures

Mitigation measures are to be implemented to minimise the potential impact of the proposal (see **Section 7)**. These are to be incorporated into a Construction Environmental Management Plan (CEMP) for the construction phase of the project.

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Appendix I

Flora Species List and Plot Data Summary

Flora Species List

The following is a list of all flora species previously recorded within the site. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora. A period of some years is often required to identify all species present in an area, particularly for cryptic or seasonally detectable species (such as orchids, some grasses and grass-like herbs).

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Acanthaceae	*Avicennia marina subsp. australasica*	Tree (TG)	Grey Mangrove	✓						75					
Acanthaceae	*Pseuderanthemum variabile*	Forb (FG)	Pastel Flower	✓			✓		0.5						
Aizoaceae	*Carpobrotus glaucescens*	Forb (FG)	Pigface					✓							0.1
Aizoaceae	*Tetragonia tetragonioides*	Forb (FG)	Warrigal Greens	✓	✓	✓									
Amaryllidaceae	*Crinum pedunculatum*	Forb (FG)	Swamp Lily			✓								1	
Anacardiaceae	*Euroschinus falcatus var. falcatus*	Tree (TG)	Ribbonwood				✓	✓				15			8
Apocynaceae	*Marsdenia rostrata*	Other (OG)	Milk Vine	✓		✓	✓	✓					0.5	0.2	
Apocynaceae	*Parsonsia straminea*	Other (OG)	Monkey Rope			✓	✓	✓					20	8	
Araliaceae	*Astrotricha longifolia*	Shrub (SG)					✓	✓			0.5				
Araliaceae	*Polyscias elegans*	Tree (TG)	Celery Wood				✓	✓			0.1	5			2
Araliaceae	*Polyscias sambucifolia*	Shrub (SG)	Elderberry Panax				✓	✓			0.5				

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Araliaceae	*Hydrocotyle bonariensis*	Exotic	Largeleaf Pennywort	✓	✓	✓		✓							
Araliaceae	*Schefflera actinophylla*	High Threat Exotic	Umbrella Tree	✓			✓		0.1			0.1			
Arecaceae	*Archontophoenix cunninghamiana*	Other (OG)	Bangalow Palm	✓			✓	✓	20			0.1	1		0.1
Asparagaceae	*Asparagus aethiopicus*	High Threat Exotic	Ground Asparagus	✓			✓	✓	0.1		0.1	0.2			0.1
Asparagaceae	*Asparagus plumosus*	High Threat Exotic	Climbing Asparagus Fern	✓			✓	✓	1					0.1	
Asteliaceae	*Cordyline stricta*	Other (OG)	Narrow-leaved Palm Lily			✓	✓	✓						2	
Asteraceae	*Ageratum houstonianum*	Exotic	Blue Billygoat Weed												
Asteraceae	*Bidens pilosa*	High Threat Exotic	Cobblers Pegs		✓	✓	✓	✓							0.2
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata*	High Threat Exotic	Bitou Bush				✓	✓							
Asteraceae	*Cirsium vulgare*	Exotic	Spear Thistle				✓								
Asteraceae	*Conyza spp.*	Exotic	Fleabane					✓							0.1
Asteraceae	*Senecio madagascariensis*	High Threat Exotic	Fireweed												
Bignoniaceae	*Pandorea pandorana*	Other (OG)	Wonga Vine	✓		✓	✓	✓			0.5	0.5		0.2	0.1
Blechnaceae	*Telmatoblechnum indicum*	Fern (EG)	Swamp Water Fern			✓								1	

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Cactaceae	*Opuntia stricta*	High Threat Exotic	Common Prickly Pear	✓			✓	✓							0.1
Campanulaceae	*Wahlenbergia spp.*	Forb (FG)	Bluebell					✓							
Casuarinaceae	*Casuarina equisetifolia subsp. incana*	Tree (TG)	Coastal She-oak				✓								
Casuarinaceae	*Casuarina glauca*	Tree (TG)	Swamp Oak	✓	✓	✓	✓	✓	20		10		20	20	0.1
Celastraceae	*Elaeodendron australe var. australe*	Shrub (SG)	Red Olive Plum	✓			✓	✓				5			
Commelinaceae	*Commelina cyanea*	Forb (FG)	Scurvy Weed				✓	✓					1		0.1
Convolvulaceae	*Ipomoea cairica*	High Threat Exotic	Coastal Morning Glory	✓	✓	✓	✓	✓	5					0.5	
Cyperaceae	*Machaerina juncea*	Grass & grasslike (GG)	Bare Twig-rush	✓		✓		✓					3	5	
Cyperaceae	*Carex appressa*	Grass & grasslike (GG)	Tall Sdege												
Cyperaceae	*Caustis recurvata var. recurvata*	Grass & grasslike (GG)					✓								
Cyperaceae	*Cyperus gracilis*	Grass & grasslike (GG)	Slender Flat-sedge	✓			✓	✓							2
Cyperaceae	*Gahnia aspera*	Grass & grasslike (GG)	Rough Saw-sedge	✓					1						
Cyperaceae	*Gahnia clarkei*	Grass & grasslike (GG)	Tall Saw-sedge											60	
Cyperaceae	*Lepidosperma laterale*	Grass & grasslike (GG)									20				

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Cyperaceae	*Schoenus spp.*	Grass & grasslike (GG)						✓							0.1
Dennstaedtiaceae	*Histiopteris incisa*	Fern (EG)	Bat's Wing Fern			✓									
Dennstaedtiaceae	*Hypolepis muelleri*	Fern (EG)	Harsh Ground Fern	✓		✓	✓	✓	5				5	2	
Dennstaedtiaceae	*Pteridium esculentum*	Fern (EG)	Bracken	✓			✓				30	0.5			
Dicksoniaceae	*Calochlaena dubia*	Other (OG)	Rainbow Fern				✓	✓							
Dilleniaceae	*Hibbertia dentata*	Other (OG)	Trailing Guinea Flower				✓								
Dilleniaceae	*Hibbertia scandens*	Other (OG)	Climbing Guinea Flower			✓	✓	✓			1	0.2		0.5	0.2
Ebenaceae	*Diospyros australis*	Shrub (SG)	Black Plum	✓			✓								
Elaeocarpaceae	*Elaeocarpus reticulatus*	Shrub (SG)	Blueberry Ash				✓	✓				1			0.2
Ericaceae	*Leucopogon parviflorus*	Shrub (SG)	Coastal Beard-heath												2
Ericaceae	*Monotoca elliptica*	Shrub (SG)	Tree Broom-heath				✓	✓			10				0.2
Euphorbiaceae	*Claoxylon australe*	Shrub (SG)	Brittlewood				✓				0.1				
Euphorbiaceae	*Excoecaria agallocha*	Shrub (SG)	Milky Mangrove			✓									
Euphorbiaceae	*Homalanthus populifolius*	Shrub (SG)	Bleeding Heart			✓	✓	✓					1	0.1	0.1

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Euphorbiaceae	*Ricinocarpos pinifolius*	Shrub (SG)	Wedding Bush				✓								
Eupomatiaceae	*Eupomatia laurina*	Shrub (SG)	Bolwarra			✓	✓	✓						0.2	
Fabaceae	*Senna pendula var. glabrata*	High Threat Exotic		✓			✓	✓	0.2			0.1	0.1	0.1	
Fabaceae (Faboideae)	*Dillwynia retorta*	Shrub (SG)					✓								
Fabaceae (Faboideae)	*Kennedia rubicunda*	Other (OG)	Dusky Coral Pea				✓								
Fabaceae (Mimosoideae)	*Acacia fimbriata*	Shrub (SG)	Fringed Wattle				✓								
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. longifolia*	Shrub (SG)	Sydney Golden Wattle	✓			✓	✓							1
Fabaceae (Mimosoideae)	*Acacia longifolia subsp. sophorae*	Shrub (SG)	Coastal Wattle				✓	✓							
Fabaceae (Mimosoideae)	*Acacia maidenii*	Tree (TG)	Maiden's Wattle				✓								
Fabaceae (Mimosoideae)	*Acacia melanoxylon*	Tree (TG)	Blackwood				✓	✓				0.2	1		4
Fabaceae (Mimosoideae)	*Acacia podalyriifolia*	Shrub (SG)	Queensland Silver Wattle				✓								
Juncaceae	*Juncus kraussii subsp. australiensis*	Grass & grasslike (GG)	Sea Rush	✓	✓	✓		✓						2	
Lamiaceae	*Clerodendrum floribundum var. floribundum*	Shrub (SG)						✓							
Lamiaceae	*Clerodendrum tomentosum*	Tree (TG)	Hairy Clerodendrum				✓				0.1				

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Lamiaceae	*Stachys arvensis*	Exotic	Stagger Weed				✓	✓							
Lauraceae	*Cassytha pubescens*	Other (OG)					✓	✓							
Lauraceae	*Endiandra sieberi*	Tree (TG)	Hard Corkwood				✓	✓			1		5		
Lauraceae	*Litsea reticulata*	Tree (TG)	Bolly Gum				✓	✓							12
Lauraceae	*Neolitsea australiensis*	Tree (TG)					✓	✓				2			
Lauraceae	*Cinnamomum camphora*	High Threat Exotic	Camphor Laurel				✓	✓	40						
Liliaceae	*Lilium formosanum*	Exotic	Formosan Lily					✓							0.1
Lobeliaceae	*Lobelia anceps*	Forb (FG)												0.2	
Lomandraceae	*Lomandra longifolia*	Grass & grasslike (GG)	Spiny-headed mat-rush	✓	✓	✓	✓	✓	0.5		10	10		1	2
Luzuriagaceae	*Geitonoplesium cymosum*	Other (OG)	Scrambling Lily	✓		✓	✓	✓	0.1		0.2		0.1	0.1	0.2
Malvaceae	*Brachychiton acerifolius*	Tree (TG)	Flame Tree				✓	✓							
Malvaceae	*Hibiscus diversifolius*	Shrub (SG)	Swamp Hibiscus			✓		✓						0.1	
Malvaceae	*Sida rhombifolia*	Exotic	Paddy's Lucerne					✓							
Meliaceae	*Dysoxylum fraserianum*	Tree (TG)	Rosewood				✓	✓							

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Meliaceae	*Melia azedarach*	Tree (TG)	White Cedar			✓								0.1	
Meliaceae	*Synoum glandulosum subsp. glandulosum*	Shrub (SG)	Scentless Rosewood	✓			✓	✓	0.5		0.2	20			
Menispermaceae	*Sarcopetalum harveyanum*	Other (OG)	Pearl Vine				✓	✓							
Menispermaceae	*Stephania japonica var. discolor*	Other (OG)	Snake Vine	✓			✓	✓	0.1			0.1		1	0.2
Monimiaceae	*Wilkiea huegeliana*	Shrub (SG)	Veiny Wilkiea				✓	✓				10	0.5		
Moraceae	*Ficus fraseri*	Tree (TG)	Sandpaper Fig					✓					0.1		
Moraceae	*Ficus obliqua var. obliqua*	Tree (TG)	Small-leaved Fig					✓							
Moraceae	*Ficus rubiginosa*	Tree (TG)	Rusty Fig				✓	✓							
Moraceae	*Maclura cochinchinensis*	Other (OG)	Cockspur Thorn	✓			✓	✓	0.1				5		8
Myoporaceae	*Myoporum acuminatum*	Shrub (SG)	Boobiala	✓		✓			0.1						
Myrtaceae	*Acmena smithii*	Tree (TG)	Lilly Pilly				✓	✓				5			0.1
Myrtaceae	*Angophora floribunda*	Tree (TG)	Rough-barked Apple				✓	✓			15	15			
Myrtaceae	*Austromyrtus dulcis*	Shrub (SG)	Midgen Berry					✓							
Myrtaceae	*Backhousia myrtifolia*	Shrub (SG)	Grey Myrtle					✓							

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Myrtaceae	*Corymbia gummifera*	Tree (TG)	Red Bloodwood				✓								
Myrtaceae	*Eucalyptus botryoides*	Tree (TG)					✓	✓							
Myrtaceae	*Leptospermum laevigatum*	Shrub (SG)	Coast Teatree				✓	✓			20				0.1
Myrtaceae	*Leptospermum polygalifolium*	Shrub (SG)	Tantoon					✓							
Myrtaceae	*Melaleuca quinquenervia*	Tree (TG)	Broad-leaved Paperbark					✓						50	
Myrtaceae	*Melaleuca styphelioides*	Shrub (SG)	Prickly-leaved Tea Tree					✓							
Myrtaceae	***Rhodomyrtus psidioides***	**Shrub (SG)**	**Native Guava**				✓								
Myrtaceae	*Syzygium australe*	Shrub (SG)	Brush Cherry					✓							
Myrtaceae	*Syzygium oleosum*	Shrub (SG)	Blue Lilly Pilly					✓					10		0.1
Ochnaceae	*Ochna serrulata*	High Threat Exotic	Mickey Mouse Plant	✓				✓	30						0.1
Oleaceae	*Notelaea longifolia*	Tree (TG)	Mock Olive				✓	✓				2			2
Oleaceae	*Olea paniculata*	Tree (TG)	Native Olive				✓	✓							
Orchidaceae	*Caladenia carnea*	Forb (FG)	Pink Fairy				✓								
Orchidaceae	*Dipodium variegatum*	Forbs (FG)	Slender Hyacinth-orchid				✓								

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Orchidaceae	*Pterostylis oblonga*	Forb (FG)					✓	✓							
Oxalidaceae	*Oxalis latifolia*	Exotic						✓							
Phormiaceae	*Dianella caerulea var. producta*	Forb (FG)	Blue Flax-lily				✓	✓			2	0.5			15
Phyllanthaceae	*Breynia oblongifolia*	Shrub (SG)	Breynia				✓	✓			2	0.1	0.1		0.5
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Tree (TG)	Cheese Tree	✓			✓	✓					10	1	
Pittosporaceae	*Billardiera scandens*	Other (OG)	Apple Berry					✓							0.1
Pittosporaceae	*Bursaria spinosa*	Shrub (SG)	Blackthorn					✓							1
Pittosporaceae	*Pittosporum multiflorum*	Shrub (SG)	Orange Thorn			✓	✓	✓				0.1			0.2
Pittosporaceae	*Pittosporum revolutum*	Shrub (SG)	Rough fruit Pittosporum	✓			✓	✓	0.1		0.2	0.1			0.1
Pittosporaceae	*Pittosporum undulatum*	Shrub (SG)	Sweet Pittosporum	✓				✓					0.1	0.2	0.5
Poaceae	*Cymbopogon refractus*	Grass & grasslike (GG)	Barbed Wire Grass				✓	✓							1
Poaceae	*Cynodon dactylon*	Grass & grasslike (GG)	Couch				✓	✓							0.5
Poaceae	*Ehrharta erecta*	High Threat Exotic	Panic Veldtgrass				✓	✓							10
Poaceae	*Entolasia marginata*	Grass & grasslike (GG)	Bordered Panic	✓			✓	✓	0.1			0.1	0.1	8	2

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Poaceae	*Hemarthria uncinata*	Grass & grasslike (GG)	Matgrass					✓					0.1		
Poaceae	*Imperata cylindrica*	Grass & grasslike (GG)	Blady Grass				✓	✓			2		0.5		0.2
Poaceae	*Oplismenus imbecillis*	Grass & grasslike (GG)	Basket Grass	✓	✓	✓	✓	✓				0.1	0.1	4	0.5
Poaceae	*Paspalum dilatatum*	High Threat Exotic	Paspalum				✓	✓							
Poaceae	*Sporobolus virginicus*	Grass & grasslike (GG)	Sand Couch	✓						0.1					
Poaceae	*Sporobolus virginicus*	Grass & grasslike (GG)	Sand Couch	✓	✓	✓								1	
Poaceae	*Themeda triandra*	Grass & grasslike (GG)					✓	✓							
Poaceae	*Axonopus fissifolius*	High Threat Exotic	Narrow-leafed Carpet Grass				✓	✓							
Poaceae	*Briza maxima*	Exotic	Quaking Grass				✓	✓							0.5
Poaceae	*Briza minor*	Exotic	Shivery Grass				✓	✓							
Polypodiaceae	*Platycerium bifurcatum*	Fern (EG)	Elkhorn				✓	✓							
Polypodiaceae	*Pyrrosia confluens var. confluens*	Fern (EG)	Robber Fern					✓					0.2		0.1
Primulaceae	*Myrsine variabilis*	Shrub (SG)					✓	✓					9	0.1	0.2
Proteaceae	*Banksia integrifolia subsp. integrifolia*	Tree (TG)	Coast Banksia	✓			✓	✓	5		20	10			5

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Proteaceae	*Hakea salicifolia subsp. salicifolia*	Shrub (SG)	Willow-leaved Hakea				✓	✓							
Proteaceae	*Persoonia katerae*	Shrub (SG)					✓	✓			1				0.2
Proteaceae	*Persoonia media*	Shrub (SG)					✓								
Putranjivaceae	*Drypetes deplanchei*	Tree (TG)	Yellow Tulipwood				✓	✓							
Rosaceae	*Rubus moluccanus*	Shrub (SG)	Molucca Bramble	✓					0.1						
Rosaceae	*Rubus parvifolius*	Shrub (SG)	Native Raspberry					✓							0.1
Rosaceae	*Cotoneaster glaucophyllus*	Exotic	Cotoneaster					✓							
Rosaceae	*Rhaphiolepis indica*	Exotic	Indian Hawthorn												
Rubiaceae	*Cyclophyllum longipetalum*	Tree (TG)	Coast Canthium	✓			✓	✓							
Rubiaceae	*Gynochthodes jasminoides*	Other (OG)	Sweet Morinda			✓	✓	✓						0.1	
Rubiaceae	*Pomax umbellata*	Forb (FG)	Pomax				✓	✓			5	0.1			
Rubiaceae	*Psychotria loniceroides*	Shrub (SG)	Hairy Psychotria				✓	✓				1			
Rutaceae	*Acronychia imperforata*	Shrub (SG)	Logan Apple	✓				✓			0.1	8			
Rutaceae	*Nematolepis squamea subsp. squamea*	Shrub (SG)	Satinwood					✓				5			

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Rutaceae	*Zieria arborescens subsp. arborescens*	Shrub (SG)	Stinkwood			✓	✓	✓				0.1			
Sapindaceae	*Alectryon coriaceus*	Shrub (SG)	Beach Alectryon			✓	✓	✓			0.1				12
Sapindaceae	*Arytera divaricata*	Tree (TG)	Rose Tamarind				✓	✓							
Sapindaceae	*Cupaniopsis anacardioides*	Tree (TG)	Tuckeroo	✓		✓	✓	✓	0.2			10	0.1	2	20
Sapindaceae	*Dodonaea triquetra*	Shrub (SG)	Large-leaf Hop-bush				✓				10				
Sapindaceae	*Guioa semiglauca*	Tree (TG)	Guioa				✓	✓				5	5		8
Smilacaceae	*Smilax australis*	Other (OG)		✓		✓	✓	✓			0.5	15	3	0.1	1
Smilacaceae	*Smilax glyciphylla*	Other (OG)		✓			✓	✓	0.2		0.2	5			0.1
Thelypteridaceae	*Cyclosorus dentatus*	Fern (EG)	Binung					✓					3		
Thelypteridaceae	*Cyclosorus interruptus*	Fern (EG)						✓					20		
Thymelaeaceae	*Wikstroemia indica*	Shrub (SG)	Bootlace Bush	✓			✓	✓	0.1		0.5	0.1			1
Ulmaceae	*Celtis paniculata*	Tree (TG)	Native Celtis					✓							0.2
Uvulariaceae	*Tripladenia cunninghamii*	Forb (FG)										2			
Verbenaceae	*Lantana camara*	High Threat Exotic	Lantana	✓				✓	15						

Family	Scientific Name	Primary Growth Form Group	Common Name	D3	D5	D8	D10	D11	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Violaceae	*Viola hederacea*	Forb (FG)	Ivy-leaved Violet			✓	✓	✓					5	2	
Vitaceae	*Cayratia clematidea*	Other (OG)	Native Grape			✓	✓	✓						0.1	
Vitaceae	*Cissus antarctica*	Other (OG)	Kangaroo Vine					✓							
Vitaceae	*Cissus hypoglauca*	Other (OG)	Water Vine					✓							
Vitaceae	*Cissus sterculiifolia*	Other (OG)	Yaroong				✓	✓				0.2			
Xanthorrhoeaceae	*Xanthorrhoea macronema*	Other (OG)					✓					0.2			
	Unidentified exotic	*Exotic*						✓							0.1
	Unidentified Fern spp.	Fern (EG)						✓							0.1

Plot Data Summary

Plot	PCT	Condition class	Zone	Easting	Northing	Bearing	Composition - Tree	Composition - Shrub	Composition - Grass	Composition - Forbs	Composition - Ferns	Composition - Other	Structure - Tree	Structure - Shrub	Structure - Grass	Structure - Forbs	Structure - Ferns	Structure - Other	Function – Large Trees	Function – Hollow trees	Function – Litter Cover	Function – Fallen Logs	Function – Trees 5 - 9cm	Function – Trees 10 - 19cm	Function – Trees 20 - 29cm	Function – Trees 30 - 49cm	Function – Trees 50 – 79cm	Function – Tree Regen	Function – HTE
1	1727	D3	56	481365	6497931	335	3	5	3	1	1	5	25.2	0.9	1.6	0.5	5	20.5	1	0	75	15	1	1	1	1	1	1	91.4
2	1747	D3	56	481360	6498061	180	1	0	1	0	0	0	75	0	0.1	0	0	0	0	0	30	10	1	1	1	0	0	1	0
3	771	D10	56	483956	6498419	47	6	12	3	2	1	5	46.2	45.1	32	7	30	2.4	0	0	74	21	1	1	1	1	0	1	0.1
4	1536	D10	56	484278	6498689	35	10	12	3	3	1	8	69.2	50.5	10.2	2.6	0.5	21.3	2	0	86	39	1	1	1	1	1	1	0.4
5	1727	D11	56	484150	6499448	80	7	6	5	2	4	6	41.2	20.7	3.8	6	28.2	29.6	1	0	70	63	1	1	1	1	1	1	0.1
6	1724	D8	56	483208	6498430	78	5	5	7	3	2	10	73.1	0.7	81	3.2	3	12.3	9	3	70	18	1	1	1	1	1	1	0.7
7	1536	D11	56	484263	6499503	225	11	17	8	3	2	9	61.4	19.5	8.3	15.2	0.2	10	0	0	60	50	1	1	1	1	0	1	10.5

Appendix II

Fauna Species List

Fauna Species List

The following is a list of all fauna species recorded within the site during the survey period.

Observation Type:

O – Observed	**B** - Burnt	**F** - Tracks/scratchings
T - Trapped or netted	**H** - Hair, feathers, or skin	**Y** - Bone or teeth
R - Road kill	**P** - Scat	**D** - Dog kill
W - Heard call	**C** - Cat kill	**Z** - In raptor/owl pellet
V - Fox kill	**E** - Nest/roost	**K** - Dead
M - Miscellaneous	**X** - In scat	**U** – Bat Recording
WC – Wildlife Cam		

Notes

Threatened species appear in **bold** font.

? – Indicates a species identified without certainty or to a Genus level only.

^^ - Indicates a species observed flying over the site or nearby in adjacent habitats

* – Indicates an introduced species.

BIRDS

Family Anhingidae - Darter		
Anhinga melanogaster	Australian Darter	O
Family Phalacrocoridae - Cormorants		
Phalacrocorax fuscescens	Pied Cormorant	O
Phalacrocorax sulcirostris	Little Black Cormorant	O
Family Pelecanidae- Pelican		
Pelecanus conspicillatus	Australian Pelican	O
Family Accipitridae - Osprey, Hawks, Eagles and Harriers		
Haliaeetus leucogaster	**White-breasted Sea-Eagle**	O ^^
Haliastur indus	Brahminy Kite	O ^^
Pandion haliaetus	**Osprey**	O ^^
Family Falconidae - Falcons		
Falco peregrinus	Peregrine Falcon	O ^^
Family Scolopacidae - Snipes, Godwits, Curlews, Sandpipers and Stints		
Numenius madagascariensis	**Eastern Curlew**	O ^^

Family Charadriidae - Plovers, Dotterels and Lapwings		
Vanellus miles	Masked Lapwing	O
Family Haematopodidae - Oystercatchers		
Haematopus longirostris	**Pied Oystercatcher**	O ^^
Family Laridae - Gulls and Terns		
Larus novaehollandiae	Silver Gull	O
Sterna bergii	Crested Tern	O ^^
Family Columbidae - Pigeons, Doves		
Geopelia humeralis	Bar-shouldered Dove	WC
Ocyphaps lophotes	Crested Pigeon	O
**Streptopelia chinensis*	Spotted Turtle-Dove	O
Family Cacatuidae - Cockatoos and Corellas		
Calyptorhyncus funereus	Yellow-tailed Black-Cockatoo	O, W
Eolophus roseicapillus	Galah	O
Family Psittacidae - Parrots, Rosellas and Lorikeets		
Alisterus scapularis	King Parrot	O
Platycercus eximius	Eastern Rosella	O
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	O
Trichoglossus haematodus	Rainbow Lorikeet	O
Family Halcyonidae - Tree Kingfishers		
Dacelo novaeguineae	Laughing Kookaburra	O
Todiramphus sancta	Sacred Kingfisher	O, W
Family Meropidae - Bee-eaters		
Merops ornatus	Rainbow Bee-eater	O
Family Maluridae - Fairy-Wrens and Emu-Wrens		
Malurus assimilis	Variegated Fairy-Wren	O, WC
Malurus cyaneus	Superb Fairy-Wren	O
Family Meliphagidae - Honeyeaters		
Acanthorhynchus tenuirostris	Eastern Spinebill	O
Anthrochaera chrysoptera	Little Wattlebird	O
Manorina melanocephala	Noisy Miner	O
Meliphaga lewinii	Lewin's Honeyeater	O
Myzomela sanguinolenta	Scarlet Honeyeater	O

Philemon corniculatus	Noisy Friarbird	O
Phylidonyris nigra	White-cheeked Honeyeater	O
Family Petroicidae - Robins and Jacky Winter		
Eopsaltria australis	Eastern Yellow Robin	O, W
Family Cinclosomatidae - Whipbird and Quail-thrushes		
Psophodes olivaceus	Eastern Whipbird	WC, W
Family Pachycephalidae - Whistlers, Shrike-tit and Shrike-thrushes		
Colluricincla harmonica	Grey Shrike-thrush	O, W
Pachycephala pectoralis	Golden Whistler	O, W
Family Ptilinorhynchidae - Bowerbirds		
Sericulus chrysocephalus	Regent Bowerbird	O
Family Dicruridae - Monarchs, Flycatchers, Fantails, Drongo and Magpie-Lark		
Rhipidura fuliginosa	Grey Fantail	O
Rhipidura leucophrys	Willie Wagtail	O
Grallina cyanoleuca	Magpie-lark	O
Family Artamidae - Wood-swallows, Butcherbirds, Magpie and Currawongs		
Cracticus tibicen	Australian Magpie	O
Cracticus nigrogularis	Pied Butcherbird	O
Strepera graculina	Pied Currawong	O
Family Hirundinidae - Swallows and Martins		
Hirundo neoxena	Welcome Swallow	O

AMPHIBIANS

Family Hylidae - Tree Frogs		
Litoria fallax	Dwarf Tree Frog	W
Litoria peronii	Peron's Tree Frog	O

Reptiles

Family Elapidae – Venomous Snakes		
Pseudechis porphyriacus	Red-bellied Black Snake	O
Family Scinidae - Skinks		
Lampropholis delicata	Grass Skink	O

Family Varanidae - Monitors			
	Varanus varius	Lace Monitor	O, WC
MAMMALS			
Family Tachyglossidae - Echidna			
	Tachyglossus aculeatus	Echidna	WC
Family Dasyuridae - Dasyurids			
	Antechinus stuartii	Brown Antechinus	O
Family Macropodidae - Kangaroos, Wallabies			
	Macropus rufogriseus	Red-necked Wallaby	O, WC
Family Peramelidae - Bandicoots			
	Perameles nasuta	Long-nosed Bandicoot	O, WC
Family Pseudocheiridae - Ringtail Possums and Greater Glider			
	Pseudocheirus peregrinus	Common Ringtail Possum	O, WC
Family Phalangeridae - Brushtail Possums			
	Trichosurus vulpecula	Common Brushtail Possum	O, WC
Family Pteropodidae - Fruit Bats			
	Pteropus poliocephalus	**Grey-headed Flying-fox**	O
Family Muridae - Rodents			
?	**Rattus* spp.	Unidentified Rat	WC

Appendix III

Threatened Species Habitat Assessment Table

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was recorded within the study area during site surveys.
High	It is highly likely that a species inhabits the study area. Criteria for this category includes: ▪ Species recently and/or regularly recorded in contiguous or nearby habitat; ▪ High quality habitat types or resources present within study area; ▪ Species is known or likely to maintain a resident population surrounding the study area; and ▪ Species is known or likely to visit during migration or seasonal availability of resources.
Moderate	Potential habitat for a species occurs within the subject site. Criteria for this category includes: ▪ Species previously recorded in contiguous habitat albeit not recently (>10 years); ▪ Poor quality, depauperate or modified habitat types and/or resources present within study area; ▪ Species has potential to utilise habitat during migration or seasonal availability of resources; and ▪ Cryptic flora species with potential habitat available within the subject site that have not been seasonally targeted by surveys.
Low	It is unlikely that the species inhabits the area and would likely be a transient visitor if encountered. Criteria for this category includes: ▪ The subject site or study area lacks specific habitat types or resources required by the species; ▪ The subject site is beyond the current distribution of the species or is isolated from known populations; ▪ Non cryptic flora species that were found to be absent during targeted surveys; and ▪ The subject site only contains common habitat which would not be considered important for the local survival of a threatened species.
Unlikely	Suitable habitat is absent from the proposal area and/or study area.

Threatened species habitat assessment table

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Flora												
Cynanchum elegans	White-flowered Wax Plant	E	E		Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; coastal scrub; *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum aligned open forest and woodland; and Bracelet Honeymyrtle scrub to open scrub.	8	Habitat known to occur within area.	Yes	Species	No	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. No individuals were identified during targeted site surveys.
Marsdenia longiloba	Slender Marsdenia	E	V		Occurs on the northern NSW coast from Barrington Tops. The species typically occurs in subtropical and warm temperate rainforest, lowland moist or open eucalypt forest adjoining rainforest and occasionally in rocky outcrops.	1	Not predicted	No	Species	No	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. No individuals were identified during targeted site surveys.
Allocasuarina defungens	Dwarf Heath Casuarina	E	E		Dwarf Heath Casuarina is found only in NSW from the Nabiac area to Byron Bay. The species mainly occurs in tall heath on sand but may also grow on clay soils and sandstone. The species also extends onto exposed nearby-coastal hills or headlands adjacent to sandplains.	26	Habitat known to occur within area.	No	Species	No	Low	Habitat is restricted to PCT 771 in Section D10. No individuals were identified during targeted site surveys.
Allocasuarina thalassoscopica		-	E		Previously thought to have been restricted to Mt Coolum on the Sunshine Coast, the species has since been expanded further along the North Coast, to as far south as Diamond Head. Species identified within the Great Lakes area are located within dry sclerophyll shrubland, grading into heathland and *Eucalyptus signata* sclerophyll woodland.	1	Habitat known to occur within area.	No	Species	No	Low	Marginal habitat is available within PCT 771 in Section D10. No individuals were identified during targeted site surveys.
Hibbertia hexandra	Tree Guinea Flower	E			Predominantly found in the coastal ranges of Mount Warning and Nightcap National Parks, with an addition records in the Wauchope-Kendall area. The flower typically grows in heath, open forest or rainforest.	1	N/A	No	Species	No	Unlikely	This species is unlikely to occur given the paucity of local records and lack of associated geology and vegetation types. No individuals were identified during targeted site surveys.
Dracophyllum macranthum		V			Only known from Coorabakh National park and adjacent parts of Lansdowne State Forest and Comboyne State Forest. Typically occurs on moderate to steep slopes with southerly aspects often associated with gaps in the forest canopy. Commonly associated with regrowth eucalypt forest and dense banks of ferns (*Gleichenia dicarpa* and *Sticherus* species).	2	N/A	No	Species	Yes	Unlikely	This species is unlikely to occur given the paucity of local records and lack of associated geology and vegetation types. No individuals were identified during targeted site surveys.
Senna acclinis	Rainforest Cassia	E			Occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Grows on the margins of subtropical, littoral and dry rainforests.	1	N/A	No	Species	No	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. No individuals were identified during targeted site surveys.
Acacia courtii	North Brother Wattle	V	V		Found only in the Laurieton district on the north coast of NSW, occurring on North Brother, Middle Brother and South Brother Mountains. Usually grows on steep, dry, rocky slopes and in mixed dry forest on shallow soils, often under a canopy of White Mahogany and Grey Gum.	62	Habitat known to occur within area.	No	Species	Yes	Unlikely	This species is unlikely to occur given lack of associated geology and vegetation types within the proposal area.

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Maundia triglochinoides		V			Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Associated with wetland species this plant grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay with low nutrients.	3	N/A	Yes	Species	No	Unlikely	This species is unlikely to occur given the lack of suitable freshwater wetland habitat. No individuals were identified during targeted site surveys.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V		Sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock.	2	Not predicted	No	Species	No	Unlikely	Habitat is absent but may occur as a planted tree in the local area. No individuals were identified during targeted site surveys.
Melaleuca biconvexa	Biconvex Paperbark	V	V		Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire.	0	Habitat may occur within area.	Yes	Species	No	Unlikely	Marginal habitat is available within low-lying swamp sclerophyll forest areas. The northern limit of this species occurs to the south of the proposal area. No individuals were identified during targeted site surveys.
Melaleuca groveana	Grove's Paperbark	V			Grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. Also occurs in dry shrubby open forest and woodlands.	7	N/A	No	Species	No	Unlikely	This species is unlikely to occur given lack of associated geology and vegetation types within the proposal area.
Rhodamnia rubescens	Scrub Turpentine	CE			Known to occur in coastal districts north from Batemans Bay in NSW to areas inland of Bundaberg in Queensland. Grows in coastal rainforests, wet sclerophyll associations in rainforest transition zones and creek side riparian vegetation. Severely threatened by infection from the exotic rust fungus *Austropuccinia psidii* (Myrtle Rust).	24	N/A	Yes	Species	Yes	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. No individuals were identified during targeted site surveys.
Rhodomyrtus psidioides	Native Guava	CE			Occurs from Broken Bay to Maryborough in Queensland. Typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to 120km inland in the Hunter and Clarence River catchments. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Extremely susceptible to Myrtle Rust.	11	N/A	Yes	Species	Yes	Present	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. Several small plants were recorded at Section D10, occurring near the edge of the existing informal walking track between CH690 and CH820.
Syzygium paniculatum	Magenta Lilly Pilly	E	V		Found only in NSW, the Magenta Lilly Pilly occurs from Upper Lansdowne to Conjola State Forest. It occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	0	Habitat may occur within area.	Yes	Species	No	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. This species has not been recorded within the search area and no individuals were identified during targeted site surveys.

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V		Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*) often in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	0	Habitat likely to occur within area.	No	Species	No	Unlikely	This species has not been recorded locally and is not associated with any PCT occurring within the proposal area.
Dendrobium melaleucaphilum	Spider orchid	E			Occurs in coastal districts and nearby ranges, extending from Queensland to its southern distributional limit in the lower Blue Mountains. Grows frequently on *Melaleuca styphelioides*, less commonly on rainforest trees or on rocks in coastal districts.	3	N/A	No	Species	No	Low	Marginal habitat is available within the proposal area, particularly within Swamp Sclerophyll Forest and Littoral Rainforest communities. No individuals were identified during targeted site surveys.
Diuris byronensis	Byron Bay Diuris	E			Known from a single location only, at Byron Bay in north-east NSW. Occurs in low-growing grassy heath on clay soil and the known population consists of less than 100 plants.	1	N/A	No	Species	Yes	Unlikely	The only record for this species in the local area is from 1989 (Bionet, 2020). This species is unlikely to occur given the sites' proximity to the known population of this species which is restricted to the Byron Bay area.
Oberonia titania	Red-flowered King of the Fairies	V			Occurs on the NSW north coast north from Kendall, and also in in Queensland and Norfolk Island. It is known from 10 locations in NSW, two of which occur within Dorrigo National Park and Washpool National Park. Occurs in littoral and subtropical rainforest and paperbark swamps, but it can also occur in eucalypt-forested gorges and in mangroves.	3	N/A	No	Species	No	Low	Marginal habitat is available within the proposal area, particularly within Swamp Sclerophyll Forest and Littoral Rainforest communities. No individuals were identified during targeted site surveys.
Phaius australis	Lesser Swamp-orchid	E	E		Grows in swampy grassland or swampy forest including rainforest, eucalypt or paperbark forest, mostly in coastal areas. Occurs in Queensland and north-east NSW as far south as Coffs Harbour. Historically, it extended farther south, to Port Macquarie.	0	Habitat may occur within area.	No	Species	No	Low	Suitable habitat is absent from the proposal area. Marginal habitat may be present within adjoining habitats although no specimens have been recorded locally.
Euphrasia arguta		CE	CE		Rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.	0	Habitat may occur within area.	No	Species	Yes	Unlikely	This species is unlikely to occur given the sites' proximity to known populations and lack of associated vegetation types.
Arthraxon hispidus	Hairy-joint Grass	V	V		Occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW but is never common. Moisture and shade-loving, often found in or on the edges of rainforest and in wet eucalyptus forest, often near creeks or swamps.	0	Habitat likely to occur within area.	No	Species	No	Low	Habitat is available within the proposal area although this is marginalised as this species has not been recorded locally. No individuals were identified during targeted site surveys.
Persicaria elatior	Tall Knotweed	V	V		Tall Knotweed has been recorded in south-eastern NSW, Moruya State Forest, the Upper Avon River catchment and Picton Lakes. In northern NSW it is known from Raymond Terrace and the Grafton area. The species usually occurs in damp places, particularly beside streams and lakes. It also occasionally occurs in swamp forest and is sometimes associated with disturbance.	0	Habitat may occur within area.	No	Species	No	Unlikely	This species is unlikely to occur given the lack of suitable freshwater wetland habitat. No individuals were identified during targeted site surveys.

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Grevillea caleyi	Caley's Grevillea	CE	CE		Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah Local Government Areas. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *E. gummifera.*	1	Not predicted	No	Species	Yes	Unlikely	The Bionet record notes that the local record for this species is almost certainly a naturalised plant as it is known only from a small part of the Sydney Basin.
Hakea archaeoides	Big Nellie Hakea	V	V		Restricted to the hinterland between Kempsey and Taree, around Mt Boss, Broken Bago and Landsdowne. Found on steep, rocky, sheltered slopes and in deep gullies in open eucalypt forest. Commonly occurs at the interface of dry eucalypt forest and gully communities.	5	Not predicted	No	Species	No	Unlikely	This species is unlikely to occur given lack of associated geology and vegetation types within the proposal area.
Macadamia integrifolia	Macadamia Nut	-	V		Occurs from Mt Bauple, near Gympie, to Currumbin Valley in the Gold Coast hinterland, south-east Queensland. Many records, particularly those further south, are thought to be propagated. Found in subtropical rainforest.	0	Habitat may occur within area.	No	Species	No	Unlikely	The site is not within the typical range of this species
Asperula asthenes	Trailing Woodruff	V	V		Occurs in damp sites, often along riverbanks. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area.	0	Habitat may occur within area.	Yes	Species	No	Low	Habitat is available within low-lying areas throughout the proposal area although this is marginalised as this species has not been recorded within the search area. No individuals were identified during targeted site surveys.
Acronychia littoralis	Scented Acronychia	E	E		Found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW. Occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest.	0	Habitat likely to occur within area.	No	Species	Yes	Low	Habitat is available within the proposal area, particularly throughout Sections D10 and D11. This species has not been recorded within the search area and no individuals were identified during targeted site surveys.
Thesium australe	Austral Toadflax	V	V		Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	8	Habitat known to occur within area.	No	Species	No	Unlikely	This species is unlikely to occur given lack of associated vegetation types within the proposal area.
Amphibians												
Crinia tinnula	Wallum Froglet	V			Wallum Froglets are found along the coastal margin from Litabella National Park in south-east Queensland to Kurnell in Sydney. Usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests.	27	N/A	Yes	Species	No	Low	Potential habitat is limited to wetland areas within PCT 1724 occurring to the north of the proposed SUP in Section D8.

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Litoria aurea	Green and Golden Bell Frog	E	V		Formally distributed along the NSW coast. Since 1990, there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.).	0	Habitat known to occur within area.	Yes	Species	No	Unlikely	The proposal area lacks suitable waterbodies for this species. This species has not been recorded locally.
Litoria brevipalmata	Green-thighed Frog	V			The Green-thighed Frog occurs in isolated coastal localities ranging from north of Wollongong to south-east Queensland. The species occurs in a range of habitats including rainforest, moist eucalypt forest, dry eucalypt forest and heath, typically in areas where surface water gathers after rain. The species preferentially inhabits wetter forests.	2	N/A	Yes	Species	No	**Assumed Present**	Targeted survey in accordance with the frog survey guidelines is required to exclude presence. Potential habitat is limited to low-lying areas subject to flooding in Section D11 between CH180 to CH340.
Mixophyes balbus	Stuttering Frog	E	V		Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	0	Habitat likely to occur within area.	No	Species	Yes	Unlikely	This species is unlikely to occur given the absence of and proximity to suitable waterbodies and habitats.
Mixophyes iteratus	Giant Barred Frog	E	E		Distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Declines appear to have occurred at the margins of the species' range, with no recent records south of the Hawkesbury River and disappearances from a number of streams in QLD. Northern NSW, particularly the Coffs Harbour-Dorrigo area is a stronghold. Found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Riparian habitats such as rainforest or wet sclerophyll forest area favoured, but the species may also occur in other riparian habitats such as in drier forest, degraded riparian remnants, and even occasionally around dams. Breeding takes place from late spring to summer.	1	Habitat likely to occur within area.	No	Species	Yes	Unlikely	This species is unlikely to occur given the absence of and proximity to suitable waterbodies and habitats.
Reptiles												
Caretta caretta	Loggerhead Turtle	E	E		Ocean-dwellers, foraging in deeper water for fish, jellyfish and bottom-dwelling animals. The female comes ashore to lay her eggs in a hole dug on the beach in tropical regions during the warmer months.	4	Foraging, feeding or related behaviour known to occur within area	No	Species	Yes	Low	Foraging habitat is widely available within Camden Haven Inlet and Gogleys Lagoon. No breeding habitat occurs within the proposal area.
Chelonia mydas	Green Turtle	V	V		Ocean-dwelling species spending most of its life at sea. Eggs laid in holes dug in beaches throughout their range. Scattered nesting records along the NSW coast.	2	Foraging, feeding or related behaviour known to occur within area	No	Species	No	Low	Foraging habitat is widely available within Camden Haven Inlet and Gogleys Lagoon. No breeding habitat occurs within the proposal area.

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Dermochelys coriacea	Leatherback Turtle	E	E		Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW. Number of sightings in southern waters suggest species actively seeks temperate feeding grounds, rather than occurring only as stray vagrants.	1	Foraging, feeding or related behaviour known to occur within area	N/A	N/A	Yes	Low	Foraging habitat is widely available within Camden Haven Inlet and Gogleys Lagoon.
Eretmochelys imbricata	Hawksbill Turtle	-	V		Typically occur in tidal and sub-tidal coral and rocky reef habitats throughout tropical waters, extending into warm temperate areas as far south as northern NSW.	2	Foraging, feeding or related behaviour known to occur within area	N/A	N/A	No	Low	Foraging habitat is widely available within Camden Haven Inlet and Gogleys Lagoon.
Natator depressus	Flatback Turtle	-	V		Feed in the northern coastal regions of Australia, extending as far south as the Tropic of Capricorn. Their feeding grounds also extend to the Indonesian archipelago and the Papua New Guinea coast. Flatback turtles have a preference for shallow, soft-bottomed sea bed habitats away from reefs.	0	Breeding likely to occur within area	N/A	N/A	No	Low	Foraging habitat is widely available within Camden Haven Inlet and Gogleys Lagoon.
Hoplocephalus bitorquatus	Pale-headed Snake	V			In NSW it has historically been recorded from as far west as Mungindi and Quambone on the Darling Riverine Plains, across the north west slopes, and from the north coast from Queensland to Sydney. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. A highly cryptic species that can spend weeks at a time hidden in tree hollows.	0	N/A	Yes	Species	No	Low	Hollow-bearing trees are sparsely distributed throughout the local area and none occur within the proposal area. No potential breeding or sheltering habitat would be impacted. This species has not been recorded locally.
Hoplocephalus stephensii	Stephens' Banded Snake	V			Coast and ranges from Southern Queensland to Gosford in NSW. Inhabits rainforest and eucalypt forests and rocky areas up to 950 m in altitude. The species uses very old primary forest with many large old hollow bearing trees. Habitat needs to be well connected and geographically large. Juveniles and subadults will regularly inhabit small hollows, while adults are usually found in larger hollows.	2	N/A	Yes	Species	No	Low	Hollow-bearing trees are sparsely distributed throughout the local area and none occur within the proposal area. No potential breeding or sheltering habitat would be impacted.
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	V		Occurs on the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. It is very uncommon south of Grafton. Habitat includes rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. Also recorded from garden beds and urban yards under leaf litter on alluvial soils.	0	Habitat may occur within area.	No	Species	No	Low	The site is not within the typical range of this species and has not been recorded locally.
Fish												
Epinephelus daemelii	Black Rockcod	-	V	V	Black Cod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m. In coastal waters, adult black cod are found in rock caves, rock gutters and on rock reefs. The use of estuaries may be an important part of the ecology of juvenile black cod, at least in NSW waters.	N/A	Habitat likely to occur within area.	N/A	N/A	N/A	Low	Camden Haven Inlet and Gogleys Lagoon may provide habitat for juveniles. Habitat is marginal within the proposal area given the lack of suitable cover.

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Carcharias taurus (east coast population)	Grey Nurse Shark		CE	CE	Oceanic. Local populations known from Camden Head near shore and offshore reefs such as the cod grounds. Known to occasionally forage at the Camden Head breakwater.	N/A	Habitat known to occur within area.	N/A	N/A	N/A	Unlikely	Grey nurse sharks are known to inhabit the oceanic shorelines of the Camden Head area and would occasionally inhabit the lower reaches of the Camden Haven inlet, such as the breakwater, on a temporary basis (i.e. for foraging). The proposed pathway is located in areas of the estuary that are distant from the breakwater and comprise shallow flats that are not considered to be grey nurse shark habitat. Suitable habitat does not occur within the proposal area.
Carcharodon carcharias	White Shark		V	V	Oceanic	N/A	Habitat known to occur within area.	N/A	N/A	N/A	Unlikely	Suitable habitat does not occur within the proposal area.
Sphyrna mokarran	Great Hammerhead Shark				Oceanic	N/A	Habitat known to occur within area.	N/A	N/A	N/A	Unlikely	Suitable habitat does not occur within the proposal area.
Rhincodon typus	Whale Shark		V		Oceanic	N/A	Habitat may occur within area.	N/A	N/A	N/A	Unlikely	Suitable habitat does not occur within the proposal area.
Birds												
Circus assimilis	Spotted Harrier	V			The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely occurs in Tasmania. The species typically occurs in grassy open woodland including *Acacia* and mallee remnants, inland riparian woodland, grassland and shrub steppe. Most commonly found in native grassland but may also occur in agricultural land.	1		Yes	Ecosystem	No	Moderate	Suitable habitat occurs throughout the proposal area. Retained as an ecosystem credit species.
Erythrotriorchis radiatus	Red Goshawk	CE	V		Population in NSW is naturally small (probably only one pair) and lies at extreme of the natural range of species in Australia. Identification may be problematic, it is easily confused with other more common species. Large mature trees are used for nesting. Significant tracts of apparently suitable habitat are not occupied suggesting threats other than land clearing may be contributing to the species on-going decline (possibly egg collection). Note that whilst this is a partnership species in NSW it is listed nationally and therefore retained as a potential SAII species. Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers.	0	Habitat likely to occur within area.	No	Species	Yes	Unlikely	The site is not within the typical range of this species and has not been recorded locally.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V			Distributed around the Australian coastline. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	136		Yes	Dual Credit Species	No	High	This species was recorded flying over the study area during site surveys. Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.

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Hieraaetus morphnoides	Little Eagle	V			Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used.	9		Yes	Dual Credit Species	No	Moderate	Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.
Lophoictinia isura	Square-tailed Kite	V			Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	35		Yes	Dual Credit Species	No	Moderate	Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.
Pandion cristatus	Eastern Osprey	V			Open and swamp forest adjacent to the coast or estuaries, fishing mainly in brackish or saltwater. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	81		Yes	Dual Credit Species	No	High	This species was recorded within Camden Haven Inlet and flying over the study area during site surveys. Large stick nests, indicative of historical breeding, were not recorded within the proposal area. Retained as an ecosystem credit species given the presence of suitable hunting habitat.
Hirundapus caudacutus	White-throated Needletail	-	V		The White-throated Needletail is distributed throughout all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. The species is almost exclusively aerial, from heights of less than 1m up to more than 1000m above the ground. Although they are recorded to occur in a broad range of habitat, the species is most often recorded above open forest, rainforest and heathland and may also fly between trees or in clearings but are less commonly recorded above woodland and treeless areas. In coastal areas they have been recorded above sandy beaches, mudflats and around coastal cliffs, ridges and sand-dunes. Breeding habitat consists of wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests.	16	Habitat known to occur within area.	No	Species	No	Moderate	Aerial species that may forage within the airspace above the proposal area. No breeding habitat is likely to occur within the proposal area. This species is associated with all PCTs recorded in the proposal area and has been retained as an ecosystem credit species.
Botaurus poiciloptilus	Australasian Bittern	E	E		Lives alone or in loose groups and favours permanent freshwaters dominated by sedges, rushes, reeds or cutting grasses (eg. *Phragmites, Scirpus, Eleocharis, Juncus, Typha, Baumea* and *Gahnia* sp.).	5	Habitat known to occur within area.	Yes	Ecosystem	No	Low	This species is associated with PCT 1727 and has been retained as an ecosystem credit species. No specimens were observed during site surveys and habitat is considered marginal given the absence of permanent fresh waters and areas with dense sedges.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V			In New South Wales, this species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. Inhabits woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Generally, the understorey is open with sparse eucalypt saplings, acacias and other shrubs, including heath.	15		Yes	Ecosystem	No	Moderate	This species is associated with PCT 771 and has been retained as an ecosystem credit species. No specimens were observed during site surveys.
Burhinus grallarius	Bush Stone-curlew	E			Found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Still common in northern Australia. Rare or extinct throughout its former range in the south-east. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	1		Yes	Species	No	**Low**	Not recorded during targeted diurnal and nocturnal surveys. Suitable habitat is available within extent vegetation throughout the Camden Head area. The likelihood of occurrence is low given the paucity of local records.

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Esacus magnirostris	Beach Stone-curlew	CE			Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. They breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs, or low trees; also among open mangroves.	10		Yes	Dual Credit Species	Yes	Moderate	The proposal area is not located within an area mapped as important habitat for this species. Associated with PCT 1747 and retained as an ecosystem credit species given the presence of suitable foraging habitat.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V			Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur.	316		Yes	Dual Credit Species	No	Moderate	No trees with hollows suitable for breeding. Retained as an ecosystem credit species given the presence of marginal foraging habitat.
Thinornis rubricollis	Eastern Hooded Plover	CE	V		Presently the Hooded Plover occurs in NSW north to Sussex Inlet. Southern coastal Queensland and northern NSW were probably once part of the range of the Hooded Plover, but the species has not been recorded there since the 1920s. In the late 1920s and early 1930s the species was recorded from Port Stephens but are now considered locally extinct. It has not been seen in the Sydney area since the 1940s. Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.	-	Habitat may occur within area.	No	Dual Credit Species	Yes	Unlikely	The site is not within the known range of this species and has not been recorded locally.
Ephippiorhynchus asiaticus	Black-necked Stork	E			Inhabits swamps associated with river systems and large permanent pools but sometimes appears on the coast or in estuaries. It has also been recorded on farm dams and sewage treatment ponds.	69		Yes	Ecosystem	No	Moderate	This species is associated with PCT 1747 and PCT 1724 and has been retained as an ecosystem credit species. No specimens were observed during site surveys.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V			Occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. The westernmost occurrences run through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell where the species begins to intergrade with the arid zone subspecies. Mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey. Also found in mallee and River Red Gum forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses. Fallen timber is an important habitat component for foraging.	1		No	Ecosystem	No	Unlikely	This species does not typically occur within coastal habitats and the single record of this species is likely to have been a seasonal vagrant.

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Ptilinopus magnificus	Wompoo Fruit-Dove	V			This species occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula, but it is rarely found south of Coffs Harbour. Habitat occurs in or near rainforest, low elevation moist eucalypt forest and brush box forests. Most often seen in mature forests, but also found in remnant and regenerating rainforest.	19		Yes	Ecosystem	No	High	This species is associated with PCT 1536 and has been retained as an ecosystem credit species. No specimens were observed during site surveys.
Ptilinopus regina	Rose-crowned Fruit-Dove	V			The Rose-crowned Fruit Dove has a distribution covering the coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. The species most often occurs in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest.	1		Yes	Ecosystem	No	Moderate	This species is associated with PCT 1536 and has been retained as an ecosystem credit species. No specimens were observed during site surveys.
Diomedea antipodensis	Antipodean Albatross	V	V		Marine environments. Breeding confined to New Zealand.	0	Foraging, feeding or related behaviour likely to occur within area	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Diomedea antipodensis gibsoni	Gibson's Albatross	V	V		Marine environments. Breeding confined to New Zealand.	0	Foraging, feeding or related behaviour likely to occur within area	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Diomedea exulans	Wandering Albatross	E	E		Marine environments. Breed on a number of islands just north of the Antarctic Circle: South Georgia Island (belonging to the UK), Prince Edward and Marion Islands (South Africa), Crozet and Kerguelen Islands (French Southern Territories) and Macquarie Island (Australia).	0	Foraging, feeding or related behaviour likely to occur within area	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Diomedea sanfordi	Northern Royal Albatross	-	E		Marine environments. Breeding confined to New Zealand.	0	Foraging, feeding or related behaviour likely to occur within area	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Phoebetria fusca	Sooty Albatross	V	V		Pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea, and rarely occurs in continental shelf waters. In Australian waters, this species is generally recorded in winter off the south coast from Tasmania to Western Australia, while there are occasional sightings off the NSW coast, north of Grafton.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche bulleri	Buller's Albatross	-	V		Occurs in both inshore and offshore waters, including the continental shelf break and pelagic waters. Only nests on islands off New Zealand.	0	Habitat may occur within area.	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche cauta	Shy Albatross		E		This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Known breeding locations include Albatross Island off Tasmania, Auckland Island, Bounty Island and The Snares, off New Zealand.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.

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Thalassarche eremita	Chatham Albatross	-	E		Principally breeds on Pyramid Rock in the Chatham Islands with one pair nesting on the Western Chain in the Snares Islands. Occasional individuals are encountered both in inshore and offshore over the continental shelf and in pelagic waters off the shelf break.	0	Habitat may occur within area.	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche impavida	Campbell Albatross		V		Nests only at Campbell Island and the adjacent Isle de Jeanette Marie south of New Zealand. Occurs in both inshore and offshore waters, including the continental shelf break and pelagic waters.	0	Habitat may occur within area.	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche melanophris	Black-browed Albatross	V	V		Has a circumpolar range over the southern oceans, and are seen off the southern Australian coast, mainly during winter. Inhabits Antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche salvini	Salvin's Albatross	-	V		Pelagic species that principally nests on the Bounty Islands, with small numbers on the Western Chain Islets in the Snares Islands and a few pairs nesting on Pyramid Rock and The Forty-Fours in the Chatham Islands of New Zealand.	0	Foraging, feeding or related behaviour likely to occur within area	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Thalassarche steadi	White-capped Albatross	-	V		Mostly observed in inshore and offshore waters over the continental shelf and less frequently in pelagic waters off the shelf break. May occasionally enter larger bays. Only nests on islands off New Zealand.	0	Foraging, feeding or related behaviour likely to occur within area	No	N/A	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Falco hypoleucos	Grey Falcon	E	V		Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast	0	Habitat may occur within area.		Ecosystem	No	Unlikely	This species does not typically occur within coastal habitats and would only be a rare vagrant visitor.
Grus rubicunda	Brolga	V			Formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It is still abundant in the northern tropics, but very sparse across the southern part of its range. Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged.	1		No	Ecosystem	No	Unlikely	Marginal habitat is available within the mangrove habitat within the proposal area. Only a single record of this species occurs within the search area and this may have been a vagrant visitor.
Haematopus fuliginosus	Sooty Oystercatcher	V			Sooty Oystercatchers are found around the entire Australian coast, including offshore islands. Habitat includes rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories.	14		No	Species	No	High	Foraging habitat is widespread throughout Camden Haven Inlet and is available within areas of mangroves and saltmarsh in the proposal area. No breeding habitat occurs within the proposal area.

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Haematopus longirostris	Pied Oystercatcher	E			The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	47		No	Species	No	High	This species was recorded within Camden Haven Inlet during site surveys. Foraging habitat is widespread throughout Camden Haven Inlet and is available within areas of mangroves and saltmarsh in the proposal area. No breeding habitat occurs within the proposal area.
Fregetta grallaria grallaria	White-bellied Storm-Petrel	V	V		A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. In Australia breeds only on offshore islands in the Lord Howe Island group.	0	Habitat likely to occur within area.		EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Sternula albifrons	Little Tern	E			Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	10		No	Dual Credit Species	No	Unlikely	Potential foraging habitat is widespread throughout Camden Haven Inlet. No breeding or roosting habitat occurs within the proposal area.
Sternula nereis nereis	Australian Fairy Tern	-	V		Has been known to occur along the coast of New South Wales but it is unknown if it still occurs there or not. Nests on sheltered beaches, spits and banks above the high tide line and below vegetation.	0	Habitat may occur within area.	No	Species	No	Unlikely	Potential foraging habitat is widespread throughout Camden Haven Inlet. No breeding or roosting habitat occurs within the proposal area.
Anthochaera phrygia	Regent Honeyeater	CE	CE		Inhabits eucalypt open forests and woodlands, predominantly box-ironbark types, but also Spotted Gum and Swamp Mahogany on the coast. The species also inhabits River She-oak gallery forest with *Amyema cambagei* (Needle-leaf Mistletoe). There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region.	21	Foraging, feeding or related behaviour likely to occur within area	Yes	Dual Credit Species	Yes	Low	The proposal area is not located within an area mapped as important habitat for this species. Species has been retained as an ecosystem credit species as marginal foraging habitat is available within the site.
Grantiella picta	Painted Honeyeater	V	V		The Painted Honeyeater is a nomadic species but occurs mostly on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. The species habitat includes Boree/Weeping Myall (*Acacia pendula),* Brigalow (*A. harpophylla),* Box-Gum Woodlands and Box-Ironbark Forests. The species preferentially feeds on *Amyema* genus mistletoes and insects.	0	Habitat may occur within area.	No	Ecosystem	No	Unlikely	This species does not typically occur within coastal habitats and would only be a rare vagrant visitor. This species has not been recorded locally.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V			Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	1		No	Ecosystem	No	Unlikely	This species does not typically occur within coastal habitats and would likely only be a rare vagrant visitor.

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Carterornis leucotis	White-eared Monarch	V			In NSW, White-eared Monarchs are generally found from the Queensland border south to Iluka at the mouth of the Clarence River, and inland as far as the Richmond Range. There are occasional records south of the Clarence River, near Woolgoolga and around Port Macquarie. Occurs in rainforest, especially drier types, such as littoral rainforest, as well as wet and dry sclerophyll forests, swamp forest and regrowth forest. They appear to prefer the ecotone between rainforest and other open vegetation types or the edges of rainforest, such as along roads.	3		No	Species	No	Low	No specimens were observed during site surveys. The proposal area is at the southern distribution limit for this species and is only rarely recorded in the local area. Suitable habitat is available throughout the proposal area.
Daphoenositta chrysoptera	Varied Sittella	V			Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy.	24		Yes	Ecosystem	No	Moderate	This species is associated with PCTs 771, 1724 and 1727 and has been retained as an ecosystem credit species. No specimens or characteristic nests were observed during site surveys.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V			This species has a wide distribution and exists in most parts of Australia. The south-eastern form is found from Brisbane to Adelaide and throughout much of inland NSW. The Hooded Robin prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee often in or near clearings or open areas. The species requires structurally diverse habitat, including mature trees, saplings, small shrubs and a ground layer of moderately tall grasses.	1		No	Ecosystem	No	Low	This species does not regularly occur within coastal habitats and the single record of this species is likely to have been a seasonal vagrant. Marginal habitat is available throughout the proposal area.
Petroica boodang	Scarlet Robin	V			The Scarlet Robin has a distribution spanning south east Queensland to south east South Australia, Tasmania and west Western Australia. In NSW it occurs from the coast to the inland slopes. The species prefers dry eucalypt forests and woodlands with open and grassy understories. The species lives in both mature and regrowth vegetation, with most habitat containing abundant logs and fallen timber.	1		No	Ecosystem	No	Low	Not associated with any vegetation types recorded on site and the paucity of records in the local area suggest it may only be an occasional visitor to the area.
Petroica phoenicea	Flame Robin	V			Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees, also occasionally seen in heathland or other shrublands in coastal areas.	3		No	Ecosystem	No	Low	Not associated with any vegetation types recorded on site and the paucity of records in the local area suggest it may only be an occasional visitor to the area.

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Ardenna carneipes	Flesh-footed Shearwater	V			Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	3		No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Macronectes gigantus	Southern Giant-Petrel	E	E		This species has a circumpolar pelagic range from Antarctica to approximately 20°S and is a common visitor off the coast of NSW.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Macronectes halli	Northern Giant Petrel	V	V		This species has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Pachyptila turtur subantarctica	Fairy Prion	-	V		Breeding for this subspecies is currently known from only from two rock stacks off Macquarie Island, one near Langdon Point, the other near Davis Point with a second location on Bishop and Clerk Islands nearby.	0	Habitat likely to occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Pterodroma leucoptera leucoptera	Gould's Petrel	V	E		Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown.	0	Habitat may occur within area.	No	EEC/Marine	N/A	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Pterodroma neglecta neglecta	Kermadec Petrel (western)	V	V		Vagrant birds may occur in coastal NSW waters. Ranges over subtropical and tropical waters of the South Pacific. Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island) are the only known breeding sites in Australian waters.	0	Foraging, feeding or related behaviour may occur within area	No	EEC/Marine	No	Unlikely	Oceanic species. No suitable habitat occurs within the proposal area.
Glossopsitta pusilla	Little Lorikeet	V			Forages primarily in the canopy of open Eucalypt forest and woodland, yet also forages on Angophoras, Melaleucas and other tree species. Riparian habitats are often utilised. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	61		Yes	Ecosystem	No	High	This species is associated with PCTs 771 and 1724 and has been retained as an ecosystem credit species. No specimens were observed during site surveys.
Lathamus discolor	Swift Parrot	E	CE		Migrates to the Australian south-east mainland between March and October. Generally, occur in areas where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark and White Box.	57	Habitat known to occur within area.	Yes	Dual Credit Species	Yes	**Assumed Present – Mapped Important Habitat**	Important habitat mapped within the proposal area and is widespread throughout the Camden Haven area. 'Important Mapping' will define species polygon for offsetting. Largely limited to native vegetation in Sections D8, D10 and D11.
Rostratula australis	Australian Painted Snipe	E	E		Most records are from the south east, particularly the Murray Darling Basin, but also wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	0	Habitat known to occur within area.	No	Ecosystem	No	Low	Not associated with any vegetation types recorded on site and has not been recorded locally. The swampy/ wetland areas in Sections D3, D5, D8 and D11 may provide marginal habitat for any vagrant visitors to the area. No specimens were observed during site surveys.
Calidris canutus	Red Knot	-	E		The migratory species arrives between September and October to occupy major river estuaries and sheltered embayments of the NSW coastline, in particular Hunter River estuary. Predominantly occurs in small numbers on intertidal mudflats, estuaries, bays, inlets, lagoons, harbours and sandflats and sandy beaches of sheltered coasts.	13	Habitat known to occur within area.	No	Dual Credit Species	No	Moderate	The proposal area is not located within an area mapped as important habitat for this species. The species is not associated with any vegetation types recorded on site however, the intertidal areas within Section D5 may provide potential foraging habitat which is widespread throughout Camden Haven Inlet. No specimens were observed during site surveys.

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Calidris ferruginea	Curlew Sandpiper	E	CE		The migratory species occurs in Australia between August and mid-April, occupying littoral and estuarine habitats within intertidal mudflats of sheltered coasts. The species also occasionally occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	15	Habitat known to occur within area.	No	Dual Credit Species	Yes	Moderate	The proposal area is not located within an area mapped as important habitat for this species. The species is not associated with any vegetation types recorded on site however, the intertidal areas within Section D5 may provide potential foraging habitat which is widespread throughout Camden Haven Inlet. No specimens were observed during site surveys.
Calidris tenuirostris	Great Knot	V	CE		Occurs in scattered sites along the NSW coast between August and November and is predominantly founds within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	3	Not predicted	No	Dual Credit Species	Yes	Moderate	The proposal area is not located within an area mapped as important habitat for this species. The species is not associated with any vegetation types recorded on site however, the intertidal areas within Section D5 may provide potential foraging habitat which is widespread throughout Camden Haven Inlet. No specimens were observed during site surveys.
Limosa lapponica baueri	Bar-tailed Godwit	-	V		The migratory species arrives in August and is most commonly found along major coastal river estuaries and sheltered embayments, particularly along the Tweed, Richmond, Clarence, Macleay, Hastings, Hunter and Shoalhaven river estuaries, Port Stephens and Botany Bay. Predominantly found in habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	7	Habitat likely to occur within area.	No	Dual Credit Species	No	Moderate	The proposal area is not located within an area mapped as important habitat for this species. The species is not associated with any vegetation types recorded on site however, the intertidal areas within Section D5 may provide potential foraging habitat which is widespread throughout Camden Haven Inlet. No specimens were observed during site surveys.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	-	CE		During the non-breeding period, the distribution of *L. l. menzbieri* is predominantly in the north of Western Australia and in south-eastern Asia. In Australia, non-breeding *L. l. menzbieri* mainly occur along the north coasts of Western Australia. Typically occurs in coastal intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	-	Habitat may occur within area.	No	Species	Yes	Unlikley	This sub species typically occurs in north Western Australia and Bar-tailed Godwits recorded locally are likely to be the other subspecies known to occur in NSW, *L. l. baueri*. The proposal area is not located within an area mapped as important habitat for this species No specimens were observed during site surveys.
Limosa limosa	Black-tailed Godwit	V	-		Migratory species that arrives in Australia in August and leaves in March. Frequently recorded at Kooragang Island (Hunter River estuary) and occasionally occurring elsewhere along the coast. Usually founds in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	1		Yes	Dual Credit Species	No	Unlikely	The proposal area is not located within an area mapped as important habitat for this species. This species is associated with PCT 1747 and has been retained as an ecosystem credit species. The intertidal areas within Section D5 may also provide potential foraging habitat which is widespread throughout Camden Haven Inlet. No specimens were observed during site surveys.
Numenius madagascariensis	Eastern Curlew	-	CE		A primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. n NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast.	32	Habitat known to occur within area.	No Added as Mapped Important Habitat present	Dual Credit Species	Yes	**Assumed Present – Mapped Important Habitat**	Camden Haven Inlet is mapped as important habitat for this species (OEH). 'Important Mapping' will define species polygon for offsetting. This is limited to the proposed boardwalk over the intertidal zone in Section D5. A single specimen was recorded to the north of the proposal area during site surveys on a sand bar within Camden Haven Inlet.

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Ninox connivens	Barking Owl	V			The Barking Owl is found throughout continental Australia, except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. The species is flexible in its habitat use and may breed along timbered watercourses in heavily cleared habitats. Roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums.	6		Yes	Dual Credit Species	No	Moderate	No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Ninox strenua	Powerful Owl	V			Inhabits a wide range of vegetation types from wet eucalypt forests with a rainforest understorey to dry open forests and woodlands. Requires large hollow-bearing trees for nesting and dense canopy vegetation for roosting.	28		Yes	Dual Credit Species	No	Moderate	No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Tyto longimembris	Eastern Grass Owl	V			The Eastern Grass Owl has been recorded in all mainland states of Australia but is most commonly found in northern and north-eastern Australia. In NSW it is most likely to inhabit the north-east and number can fluctuate greatly, increasing especially during rodent plagues. The species preferentially inhabit areas of tall grass, swampy areas, grassy plain, swampy heath and in cane grass or sedges on flood plains.	8		No	Ecosystem	No	Unlikely	Not associated with any vegetation types recorded within the proposal area. Suitable habitat is absent throughout the proposal area.
Tyto novaehollandiae	Masked Owl	V			Lives in dry eucalypt forests and woodlands from sea level to 1100 m and often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	36		Yes	Dual Credit Species	No	Moderate	No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.
Tyto tenebricosa	Sooty Owl	V			Occurring on the coast, coastal escarpment and eastern tablelands of NSW. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Nests in very large tree-hollows.	29		Yes	Dual Credit Species	No	Moderate	No potential breeding habitat occurs within the proposal area. Retained as an ecosystem credit species given the presence of suitable foraging habitat.

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Mammals												
Cercartetus nanus	Eastern Pygmy-possum	V			The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast, inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Found in a broad range of habitats including rainforest, sclerophyll forest, woodland and heath. Woodlands and heath appear to be preferred. Shelters in tree hollows, wooden stumps, holes in the ground and abandoned bird's nests. The species feeds on nectar and pollen collected from banksias, eucalypts and bottlebrushes.	4		Yes	Species	No	**Assumed Present**	Targeted survey is required to exclude presence. The species has the potential to occur in the wider locality. Species polygon for offsetting is largely limited to native vegetation within Sections D8, D10 and D11 which have high connectivity to surrounding habitats. The species is unlikely to occur within areas isolated by development or within PCTs 1727 and 1747 where preferred foraging habitat is generally absent.
Dasyurus maculatus	Spotted-tailed Quoll	V	E		Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites with basking and latrine sites often nearby.	48	Habitat known to occur within area.	Yes	Ecosystem	No	Moderate	This species is associated with PCTs 771, 1536, 1724 and 1727 and has been retained as an ecosystem credit species. No potential den sites were observed during site surveys.
Phascogale tapoatafa	Brush-tailed Phascogale	V			Prefers dry sclerophyll open forest with a sparse groundcover of herbs, grasses, shrubs or leaf litter but is also known to inhabit heath, swamps, rainforest and wet sclerophyll forest. Nests and shelters in tree hollows with entrances 2.5 – 4 cm wide and uses many different hollows over a short time span.	27		Yes	Species	No	Moderate	Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted and impacts to potential foraging habitat would be minimal.
Planigale maculata	Common Planigale	V			Inhabits rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	4		Yes	Species	No	**Assumed Present**	Targeted survey required to exclude presence. This species has been recorded approx. 550m to the south of Section D3 within habitat that is largely contiguous with the site (apart from local roads). Species polygon for offsetting includes native vegetation within Sections D3, D8, D10 and D11 which have high connectivity to surrounding habitats. The species is unlikely to occur within areas isolated by development.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V			Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	3			Ecosystem	No	High	This species is associated with PCTs 771 and 1724 and has been retained as an ecosystem credit species. Hollow-bearing trees within the study area would be avoided.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V		Extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north.	0	Habitat likely to occur within area.	No	Species	Yes	Unlikely	No suitable habitat.
Miniopterus australis	Little Bent-winged Bat	V			Inhabits a range of generally well-timbered habitats including but not restricted to rainforest, vine thickets, wet and dry sclerophyll forest coastal forests and Banksia scrub. Requires caves for breeding but has been recorded roosting within tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings.	76			Dual Credit Species	Yes	High	No breeding habitat was recorded within the proposal area. This species is associated with PCTs 771 and 1724 and has been retained as an ecosystem credit species.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V			Inhabits a range of timbered habitats. Caves are the primary roosting habitat, but may also use derelict mines, storm-water tunnels, buildings and other man-made structures.	28			Dual Credit Species	Yes	High	No breeding habitat was recorded within the proposal area. This species is associated with PCTs 771 and 1724 and has been retained as an ecosystem credit species.

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Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V			The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	11			Ecosystem	No	High	This species is associated with PCTs 771, 1724 and 1747 and has been retained as an ecosystem credit species. Hollow-bearing trees within the study area would be avoided.
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V			In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isolated records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously.	15		Yes	Ecosystem	No	Moderate	This species is associated with PCT 1724 and has been retained as an ecosystem credit species.
Pseudomys novaehollandiae	New Holland Mouse	-	V		Is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	0	Habitat likely to occur within area.	No	Ecosystem	No	Moderate	This species has not been recorded locally. The heathy vegetation within Section D10 provides potential habitat for this species.
Arctocephalus forsteri	New Zealand Fur-seal	V			Prefers rocky parts of islands with jumbled terrain and boulders, occurring along the southern NSW coast particularly on Montague Island and occasionally at other isolated locations north of Sydney.	1		No	-	No	Unlikely	No suitable habitat.
Arctocephalus pusillus doriferus	Australian Fur-seal	V			Reported to breed at Seal Rocks and Montague Island in southern NSW. Prefers rocky parts of islands with flat, open terrain. Where they occur alongside the New Zealand Fur-seal, the Australian Fur-seal occupies flatter areas.	3		No	-	No	Unlikely	No suitable habitat.
Petaurus australis	Yellow-bellied Glider	V			Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Den, often in family groups, in hollows of large trees. This species is very mobile and occupy large home ranges (20 to 85 ha) to encompass dispersed and seasonally variable food resources.	84		Yes	Ecosystem	No	Low	This species is associated with PCT 1724 and has been retained as an ecosystem credit species. Preferred habitat with large hollow bearing trees is largely absent from the proposal area and surrounds.
Petaurus norfolcensis	Squirrel Glider	V			Inhabits dry sclerophyll forests and woodlands preferably with a canopy composed of multiple species, a shrub or Acacia mid-storey and a heath understorey. Requires abundant tree hollows for refuge and nest sites.	36		Yes	Species	No	Moderate	Hollow-bearing trees within the study area would be avoided. No potential breeding or sheltering habitat would be impacted and impacts to potential foraging habitat would be minimal.
Petauroides volans	Greater Glider	-	V		Distributed along the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Home ranges are typically small (1-4 ha), but are larger in lower productivity forests and more open woodlands, and larger for males than for females, with male home ranges being largely non-overlapping.	25	Habitat known to occur within area.	No	Species	No	Low	Preferred habitat with large hollow bearing trees is largely absent from the proposal area and surrounds.

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Phascolarctos cinereus	Koala	V	V		Inhabits eucalypt woodland and forest containing suitable food trees. Key food trees in the local area include *Eucalyptus tereticornis* (Forest Red Gum), *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus microcorys* (Tallowwood) and *Eucalyptus punctata* (Grey Gum).	1528	Habitat known to occur within area.	Yes	Dual Credit Species	No	High	No signs of Koala, including scats or scratches on tree trunks, were recorded within the proposal area. Local records indicate a resident local population occurs through the Camden Head area and suitable habitat with a high incidence of preferred food trees may provide suitable breeding habitat. Preferred food trees are generally absent from the proposal area; however, a small number of secondary food trees (M. quinquenervia) associated with PCT 1724, occur at the eastern end of D8. Consequently, the proposal area is unlikely to support core habitat due to the paucity of preferred food trees. Retained as an ecosystem credit species given the presence of marginal foraging habitat.
Aepyprymnus rufescens	Rufous Bettong	V			The species' original range from Coen in north Queensland to central Victoria has been reduced to a patchy distribution from Cooktown, Queensland, to north-eastern NSW as far south at Mt Royal National Park. In NSW it has largely vanished from inland areas but there are sporadic, unconfirmed cases from Pilliga and Torrington districts. Rufous Bettongs inhabit a variety of forests from tall, moist Eucalypt forest to open woodland, with tussock grass understorey. A dense cover of tall native grasses is the preferred shelter.	1		No	Species	No	Unlikely	Not associated with any vegetation types recorded within the proposal area. The single record in the search area was from 1994 located to the south in Crowdy Bay National Park. The species has not been recorded in the Camden Head area.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V		Known from a variety of habitats, including Rainforest, Open Forests and Woodlands with dense groundcover, and dense, wet coastal heathlands. Soft (often sandy) substrates are preferred by this species.	0	Habitat likely to occur within area.	Yes	Species	No	Low	Not recorded during targeted surveys Suitable habitat is available within Sections D10 and D11. This species has not been recorded locally.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V		Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy.	172	Foraging, feeding or related behaviour known to occur within area	Yes	Dual Credit Species	No	**Assumed Present**	No breeding camps were recorded during site surveys although this species is known to seasonally roost in small numbers in rainforest vegetation off Pilot Beach Road (pers com J. Cohen, 2020). Despite being absent during the required survey period it is reasonable to assume potential seasonal breeding habitat is available along Pilots Beach Road and species credits have been generated for impacts proposed in this area. Foraging habitat is associated with PCTs 771 and 1724 and the species has been retained as an ecosystem credit species.
Syconycteris australis	Common Blossom-bat	V			The Common Blossom-bat is distributed throughout coastal areas of eastern Australia from Hawks Nest in NSW to Cape York peninsula in Queensland. The species often roosts in littoral rainforest and feeds on nectar and pollen from flowers in heathland and paperbark swamps.	8		Yes	Ecosystem	No	Moderate	This species is associated with PCTs 1536 and 1724 and has been retained as an ecosystem credit species.
Chalinolobus dwyeri	Large-eared Pied Bat	E	V		Occupies dry sclerophyll forest and woodland. Roosts in caves, abandoned mud-nests of Fairy Martins and mine tunnels.	0	Habitat likely to occur within area.	No	Dual Credit Species	Yes	Low	No breeding habitat was recorded within the proposal area and the species has not been recorded locally. This species is not associated with any PCTs recorded within the proposal area.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V			Inhabits sclerophyll forests preferring moist habitats with trees taller than 20m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	1			Ecosystem	No	Moderate	This species is associated with PCT 1724 and has been retained as an ecosystem credit species. Hollow-bearing trees within the study area would be avoided.

Scientific Name	Common Name	BC Act 2016	EPBC Act 1999	FM Act 1994	Habitat Description and Locally Known Populations	Bionet Records[1]	EPBC Act Protected Matters Report[2]	BAM-C[3]	Credit Type	Potential SAII	Likelihood of occurrence	Justification
Myotis macropus	Southern Myotis	V			Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	15		Yes	Species	No	Moderate	Hollow-bearing trees within the study area would be avoided. No potential breeding habitat would be impacted. Preferred foraging habitat (i.e. freshwater bodies) does not occur within the proposal area.
Phoniscus papuensis	Golden-tipped Bat	V			Distributed along the east coast of Australia in scattered locations from Cape York Peninsula in Queensland to south of Eden in southern NSW. It also occurs in New Guinea. Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests.	11		Yes	Ecosystem	No	Moderate	This species is associated with PCT 1724 and has been retained as an ecosystem credit species.
Scoteanax rueppellii	Greater Broad-nosed Bat	V			Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows but has also been recorded in buildings.	15		Yes	Ecosystem	No	Moderate	This species is associated with PCTs 771, 1724 and 1747 and has been retained as an ecosystem credit species. Hollow-bearing trees within the study area would be avoided.
Vespadelus troughtoni	Eastern Cave Bat	V			The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	11		No	Species	Yes	Low	No breeding habitat was recorded within the proposal area. This species is not associated with any PCT occurring within the proposal area.

[1] Number of OEH wildlife atlas records in selected area [North: -31.50 West: 152.65 East: 152.90 South: -31.80] – Database searched (29/7/2020 4:34PM)

[2] EPBC Act Protected Matters Report identifying matters of national environmental significance occurring or predicted to occur within 10kms of the proposal area.

[3] Potential candidate species filtered into BAM-C.

Appendix IV

BAM-Calculator Outputs

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00021726/BAAS17100/20/00021727	Beach to Beach Shared User Path - Camden Head	24/11/2021
Assessor Name	Report Created	BAM Data version *
Luke Pickett	19/05/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17100	Part 4 Developments (General)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
3	19/05/2022	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	1747_Good	1747-Grey Mangrove low closed forest	Good	0.07	1	
2	1727_VZ1_Moderate	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	VZ1_Moderate	0.1	1	
3	1536_VZ1_Good	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	VZ1_Good	0.19	1	
4	1727_VZ2_Good	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	VZ2_Good	0.01	1	
5	771_Good	771-Coastal sand Tea-tree - Banksia scrub	Good	0.08	1	
6	1724_Good	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Good	0.02	1	
7	1536_VZ2_Regen	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	VZ2_Regen	0.01	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021726/BAAS17100/20/00021727	Beach to Beach Shared User Path - Camden Head	24/11/2021
Assessor Name	Report Created	BAM Data version *
Luke Pickett	19/05/2022	50
Assessor Number	Assessment Type	BAM Case Status
BAAS17100	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
3	BOS Threshold: Biodiversity Values Map	19/05/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Australasian Bittern	Botaurus poiciloptilus	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Barking Owl	Ninox connivens	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Beach Stone-curlew	Esacus magnirostris	1747-Grey Mangrove low closed forest
Black Bittern	Ixobrychus flavicollis	1747-Grey Mangrove low closed forest
		1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Black-necked Stork	Ephippiorhynchus asiaticus	1747-Grey Mangrove low closed forest
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Black-tailed Godwit	Limosa limosa	1747-Grey Mangrove low closed forest
Broad-billed Sandpiper	Limicola falcinellus	1747-Grey Mangrove low closed forest
Common Blossom-bat	Syconycteris australis	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Dusky Woodswallow	Artamus cyanopterus cyanopterus	771-Coastal sand Tea-tree - Banksia scrub
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1747-Grey Mangrove low closed forest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Eastern Osprey	Pandion cristatus	1747-Grey Mangrove low closed forest
		1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Glossy Black-Cockatoo	Calyptorhynchus lathami	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Golden-tipped Bat	Phoniscus papuensis	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Great Knot	Calidris tenuirostris	1747-Grey Mangrove low closed forest
Greater Broad-nosed Bat	Scoteanax rueppellii	1747-Grey Mangrove low closed forest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Greater Sand-plover	Charadrius leschenaultii	1747-Grey Mangrove low closed forest
Grey-headed Flying-fox	Pteropus poliocephalus	1747-Grey Mangrove low closed forest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Koala	Phascolarctos cinereus	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Lesser Sand-plover	Charadrius mongolus	1747-Grey Mangrove low closed forest
Little Bent-winged Bat	Miniopterus australis	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Little Eagle	Hieraaetus morphnoides	1747-Grey Mangrove low closed forest
		1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Little Lorikeet	Glossopsitta pusilla	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Masked Owl	Tyto novaehollandiae	771-Coastal sand Tea-tree - Banksia scrub
Powerful Owl	Ninox strenua	771-Coastal sand Tea-tree - Banksia scrub
Regent Honeyeater	Anthochaera phrygia	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Rose-crowned Fruit-Dove	Ptilinopus regina	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
Sooty Owl	Tyto tenebricosa	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Spotted Harrier	Circus assimilis	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Spotted-tailed Quoll	Dasyurus maculatus	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Superb Fruit-Dove	Ptilinopus superbus	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
Swift Parrot	Lathamus discolor	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Terek Sandpiper	Xenus cinereus	1747-Grey Mangrove low closed forest
Varied Sittella	Daphoenositta chrysoptera	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
White-bellied Sea-Eagle	Haliaeetus leucogaster	1747-Grey Mangrove low closed forest

White-bellied Sea-Eagle	Haliaeetus leucogaster	1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
White-fronted Chat	Epthianura albifrons	1747-Grey Mangrove low closed forest
White-throated Needletail	Hirundapus caudacutus	1747-Grey Mangrove low closed forest
		1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
		1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
		771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Wompoo Fruit-Dove	Ptilinopus magnificus	1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest
Yellow-bellied Glider	Petaurus australis	1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	771-Coastal sand Tea-tree - Banksia scrub
		1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Candidate Species Report

Proposal Details

Assessment Id 00021726/BAAS17100/20/00021727	Proposal Name Beach to Beach Shared User Path - Camden Head	BAM data last updated * 24/11/2021
Assessor Name Luke Pickett	Report Created 19/05/2022	BAM Data version * 50
Assessor Number BAAS17100	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 3	Date Finalised 19/05/2022	BOS entry trigger BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Acronychia littoralis Scented Acronychia	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☑ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Asperula asthenes Trailing Woodruff	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Cercartetus nanus Eastern Pygmy-possum	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Cynanchum elegans White-flowered Wax Plant	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Galium australe Tangled Bedstraw	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lindernia alsinoides Noah's False Chickweed	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Litoria brevipalmata Green-thighed Frog	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Maundia triglochinoides Maundia triglochinoides	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Melaleuca biconvexa Biconvex Paperbark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Numenius madagascariensis Eastern Curlew	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pandion cristatus Eastern Osprey	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Planigale maculata Common Planigale	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Potorous tridactylus Long-nosed Potoroo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhodamnia rubescens Scrub Turpentine	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Rhodomyrtus psidioides Native Guava	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☑ Jul ☐ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Syzygium paniculatum Magenta Lilly Pilly	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?

BAM Candidate Species Report

Threatened species Manually Added

Common Name	Scientific Name
Scented Acronychia	Acronychia littoralis

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Beach Stone-curlew	Esacus magnirostris	Geographic limitations
Black-tailed Godwit	Limosa limosa	Refer to BAR
Broad-billed Sandpiper	Limicola falcinellus	Refer to BAR
Brush-tailed Phascogale	Phascogale tapoatafa	Refer to BAR
Eucalyptus seeana population in the Greater Taree local government area	Eucalyptus seeana - endangered population	Refer to BAR
Giant Dragonfly	Petalura gigantea	Habitat constraints
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Great Knot	Calidris tenuirostris	Geographic limitations
Greater Glider	Petauroides volans	Habitat constraints
Greater Sand-plover	Charadrius leschenaultii	Geographic limitations
Green and Golden Bell Frog	Litoria aurea	Refer to BAR
Koala	Phascolarctos cinereus	Habitat constraints
Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Lesser Sand-plover	Charadrius mongolus	Geographic limitations
Little Bent-winged Bat	Miniopterus australis	Habitat constraints
Little Eagle	Hieraaetus morphnoides	Habitat constraints
Masked Owl	Tyto novaehollandiae	Habitat constraints
Pale-headed Snake	Hoplocephalus bitorquatus	Refer to BAR
Powerful Owl	Ninox strenua	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Sooty Owl	Tyto tenebricosa	Habitat constraints

Squirrel Glider	Petaurus norfolcensis	Refer to BAR
Stephens' Banded Snake	Hoplocephalus stephensii	Refer to BAR
Terek Sandpiper	Xenus cinereus	Geographic limitations
Wallum Froglet	Crinia tinnula	Geographic limitations

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00021726/BAAS17100/20/00021727	Beach to Beach Shared User Path - Camden Head	24/11/2021
Assessor Name	Report Created	BAM Data version *
Luke Pickett	19/05/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS17100	Finalised	19/05/2022
Assessment Revision	Assessment Type	BOS entry trigger
3	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast												
6	1724_Good	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	88.6	88.6	0.02	PCT Cleared - 31%	High Sensitivity to Potential Gain	Endangered Ecological Community	Not Listed	2.00		1
											Subtotal	**1**
Coastal sand Tea-tree - Banksia scrub												
5	771_Good	Not a TEC	94.6	94.6	0.08	PCT Cleared - 50%	High Sensitivity to Potential Gain			1.75		3
											Subtotal	**3**
Grey Mangrove low closed forest												
1	1747_Good	Not a TEC	58.4	58.4	0.07	PCT Cleared - 59%	High Sensitivity to Potential Gain			1.75		2
											Subtotal	**2**

Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast												
2	1727_VZ1_Moderate	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	47.8	47.8	0.1	PCT Cleared - 81%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		2
4	1727_VZ2_Good	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	61.4	61.4	0.01	PCT Cleared - 81%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		1
											Subtotal	**3**

Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest											
3	1536_VZ1_Good	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	81.3	81.3	0.19	PCT Cleared - 78%	High Sensitivity to Potential Gain	Endangered Ecological Community	Critically Endangered	2.00	8
7	1536_VZ2_Regen	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	71.7	71.7	0.01	PCT Cleared - 78%	High Sensitivity to Potential Gain	Endangered Ecological Community	Critically Endangered	2.00	1
										Subtotal	**9**
										Total	**18**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Cercartetus nanus / Eastern Pygmy-possum (Fauna)									
1536_VZ1_Good	81.3	81.3	0.19			Vulnerable	Not Listed	False	8

1727_VZ2_Good	61.4	61.4	0.01			Vulnerable	Not Listed	False	1
771_Good	94.6	94.6	0.08			Vulnerable	Not Listed	False	4
1724_Good	88.6	88.6	0.02			Vulnerable	Not Listed	False	1
1536_VZ2_Regen	71.7	71.7	0.01			Vulnerable	Not Listed	False	1
								Subtotal	**15**
Lathamus discolor / Swift Parrot (Fauna)									
1727_VZ1_Moderate	47.8	47.8	0.02			Endangered	Critically Endangered	True	1
1536_VZ1_Good	81.3	81.3	0.13			Endangered	Critically Endangered	True	8
1727_VZ2_Good	61.4	61.4	0.01			Endangered	Critically Endangered	True	1
771_Good	94.6	94.6	0.07			Endangered	Critically Endangered	True	5
1536_VZ2_Regen	71.7	71.7	0.01			Endangered	Critically Endangered	True	1
								Subtotal	**16**
Litoria brevipalmata / Green-thighed Frog (Fauna)									
1536_VZ1_Good	81.3	81.3	0.07			Vulnerable	Not Listed	False	2
								Subtotal	**2**
Myotis macropus / Southern Myotis (Fauna)									
1747_Good	58.4	58.4	0.07			Vulnerable	Not Listed	False	2
1727_VZ1_Moderate	47.8	47.8	0.1			Vulnerable	Not Listed	False	2
1536_VZ1_Good	81.3	81.3	0.19			Vulnerable	Not Listed	False	8

1727_VZ2_Good	61.4	61.4	0.01			Vulnerable	Not Listed	False	1
771_Good	94.6	94.6	0.08			Vulnerable	Not Listed	False	4
1724_Good	88.6	88.6	0.02			Vulnerable	Not Listed	False	1
								Subtotal	**18**
Numenius madagascariensis / Eastern Curlew (Fauna)									
1747_Good	58.4	58.4	0.01			Not Listed	Critically Endangered	True	1
								Subtotal	**1**
Planigale maculata / Common Planigale (Fauna)									
1727_VZ1_Moderate	47.8	47.8	0.03			Vulnerable	Not Listed	False	1
1536_VZ1_Good	81.3	81.3	0.19			Vulnerable	Not Listed	False	8
1727_VZ2_Good	61.4	61.4	0.01			Vulnerable	Not Listed	False	1
771_Good	94.6	94.6	0.08			Vulnerable	Not Listed	False	4
1724_Good	88.6	88.6	0.02			Vulnerable	Not Listed	False	1
1536_VZ2_Regen	71.7	71.7	0.01			Vulnerable	Not Listed	False	1
								Subtotal	**16**
Pteropus poliocephalus / Grey-headed Flying-fox (Fauna)									
1536_VZ1_Good	81.3	81.3	0.04			Vulnerable	Vulnerable	False	2
								Subtotal	**2**
Rhodomyrtus psidioides / Native Guava (Flora)									
1536_VZ1_Good	81.3	81.3	0.01			Critically Endangered	Not Listed	True	1
								Subtotal	**1**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00021726/BAAS17100/20/00021727

Proposal Name
Beach to Beach Shared User Path - Camden Head

BAM data last updated *
24/11/2021

Assessor Name
Luke Pickett

Assessor Number
BAAS17100

BAM Data version *
50

Proponent Names
Port Maquarie Hastings Council

Report Created
19/05/2022

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Part 4 Developments (General)

Date Finalised
19/05/2022

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Rhodomyrtus psidioides / Native Guava
Lathamus discolor / Swift Parrot
Numenius madagascariensis / Eastern Curlew

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1747-Grey Mangrove low closed forest	Not a TEC	0.1	0	2	2
1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3
1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.2	0	9	9
771-Coastal sand Tea-tree - Banksia scrub	Not a TEC	0.1	0	3	3
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	1	0	1

771-Coastal sand Tea-tree - Banksia scrub

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Headland Heaths This includes PCT's: 721, 771, 1701, 1703, 1810	Coastal Headland Heaths >=50% and <70%	771_Good	No	3	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833	-	1536_VZ1_Good	No	8	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833	-	1536_VZ2_Regen	No	1	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1724_Good	Yes	1	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1727_VZ1_Moderate	No	2	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1727_VZ2_Good	No	1	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1747-Grey Mangrove low closed forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Mangrove Swamps This includes PCT's: 915, 916, 917, 918, 919, 920, 1747	Mangrove Swamps >=50% and <70%	1747_Good	No	2	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	**1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good, 1536_VZ2_Regen**	0.3	15.00
Lathamus discolor / Swift Parrot	**1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1536_VZ2_Regen**	0.2	16.00

Litoria brevipalmata / Green-thighed Frog	**1536_VZ1_Good**	0.1	2.00
Myotis macropus / Southern Myotis	**1747_Good, 1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good**	0.5	18.00
Numenius madagascariensis / Eastern Curlew	**1747_Good**	0.0	1.00
Planigale maculata / Common Planigale	**1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good, 1536_VZ2_Regen**	0.3	16.00
Pteropus poliocephalus / Grey-headed Flying-fox	**1536_VZ1_Good**	0.0	2.00
Rhodomyrtus psidioides / Native Guava	**1536_VZ1_Good**	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW

Litoria brevipalmata / Green-thighed Frog	Spp	IBRA subregion
	Litoria brevipalmata / Green-thighed Frog	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Numenius madagascariensis / Eastern Curlew	Spp	IBRA subregion
	Numenius madagascariensis / Eastern Curlew	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW
Pteropus poliocephalus / Grey-headed Flying-fox	Spp	IBRA subregion
	Pteropus poliocephalus / Grey-headed Flying-fox	Any in NSW
Rhodomyrtus psidioides / Native Guava	Spp	IBRA subregion
	Rhodomyrtus psidioides / Native Guava	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00021726/BAAS17100/20/00021727

Proposal Name
Beach to Beach Shared User Path - Camden Head

BAM data last updated *
24/11/2021

Assessor Name
Luke Pickett

Assessor Number
BAAS17100

BAM Data version *
50

Proponent Name(s)
Port Maquarie Hastings Council

Report Created
19/05/2022

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Finalised

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Assessment Type
Part 4 Developments (General)

Date Finalised
19/05/2022

BOS entry trigger
BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Rhodomyrtus psidioides / Native Guava		
Lathamus discolor / Swift Parrot		
Numenius madagascariensis / Eastern Curlew		

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1747-Grey Mangrove low closed forest	Not a TEC	0.1	0	2	2.00
1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	3	3.00
1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.2	0	9	9.00
771-Coastal sand Tea-tree - Banksia scrub	Not a TEC	0.1	0	3	3.00
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	1	0	1.00

771-Coastal sand Tea-tree - Banksia scrub

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Headland Heaths This includes PCT's: 721, 771, 1701, 1703, 1810	Coastal Headland Heaths >=50% and <70%	771_Good	No	3	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Heathlands	Tier 3 or higher threat status	771_Good	No	3	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1536-Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833	-	1536_VZ1_Good	No	8	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833	-	1536_VZ2_Regen	No	1	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Rainforests	Tier 3 or higher threat status	1536_VZ1_Good	No	8	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Rainforests	Tier 3 or higher threat status	1536_VZ2_Regen	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1724-Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1724_Good	Yes	1	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Forested Wetlands	Tier 3 or higher threat status	1724_Good	Yes (including artificial)	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1727-Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1727_VZ1_ Moderate	No	2	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808	-	1727_VZ2_ Good	No	1	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Forested Wetlands	Tier 3 or higher threat status	1727_VZ1_ Moderate	No	2	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Forested Wetlands	Tier 3 or higher threat status	1727_VZ2_ Good	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1747-Grey Mangrove low closed forest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Mangrove Swamps This includes PCT's: 915, 916, 917, 918, 919, 920, 1747	Mangrove Swamps >=50% and <70%	1747_Good	No	2	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Saline Wetlands	Tier 3 or higher threat status	1747_Good	No	2	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Cercartetus nanus / Eastern Pygmy-possum	**1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good, 1536_VZ2_Regen**	0.3	15.00

Lathamus discolor / Swift Parrot	**1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1536_VZ2_Regen**	0.2	16.00
Litoria brevipalmata / Green-thighed Frog	**1536_VZ1_Good**	0.1	2.00
Myotis macropus / Southern Myotis	**1747_Good, 1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good**	0.5	18.00
Numenius madagascariensis / Eastern Curlew	**1747_Good**	0.0	1.00
Planigale maculata / Common Planigale	**1727_VZ1_Moderate, 1536_VZ1_Good, 1727_VZ2_Good, 771_Good, 1724_Good, 1536_VZ2_Regen**	0.3	16.00
Pteropus poliocephalus / Grey-headed Flying-fox	**1536_VZ1_Good**	0.0	2.00
Rhodomyrtus psidioides / Native Guava	**1536_VZ1_Good**	0.0	1.00

Credit Retirement Options

Like-for-like options

Cercartetus nanus/ Eastern Pygmy-possum	Spp	IBRA region	
	Cercartetus nanus/Eastern Pygmy-possum	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lathamus discolor/ Swift Parrot	Spp	IBRA region	
	Lathamus discolor/Swift Parrot	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Litoria brevipalmata/ Green-thighed Frog	Spp	IBRA region	
	Litoria brevipalmata/Green-thighed Frog	Any in NSW	

Litoria brevipalmata/ Green-thighed Frog	**Variation options**		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Myotis macropus/ Southern Myotis	Spp	IBRA region	
	Myotis macropus/Southern Myotis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Numenius madagascariensis/ Eastern Curlew	Spp	IBRA region	
	Numenius madagascariensis/Eastern Curlew	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Not Listed	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Planigale maculata/ Common Planigale	Spp	IBRA region	
	Planigale maculata/Common Planigale	Any in NSW	

Planigale maculata/ Common Planigale	**Variation options**		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Pteropus poliocephalus/ Grey-headed Flying-fox	Spp	IBRA region	
	Pteropus poliocephalus/Grey-headed Flying-fox	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Macleay Hastings, Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Rhodomyrtus psidioides/ Native Guava	Spp	IBRA region
	Rhodomyrtus psidioides/Native Guava *Note: Variation rules do not apply for Critically Endangered species and impacts on Commonwealth listed entities that are a controlled action.*	Any in NSW

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00021726/BAAS17100/20/00021727		3	19/05/2022

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Luke Pickett	BAAS17100	Beach to Beach Shared User Path - Camden Head	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (General)	19/05/2022	BOS Threshold: Biodiversity Values Map

PCT list

Price calculated	PCT common name	Credits
Yes	**1747 -** Grey Mangrove low closed forest	2
Yes	**1727 -** Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	3
Yes	**1536 -** Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	9
Yes	**771 -** Coastal sand Tea-tree - Banksia scrub	3
Yes	**1724 -** Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	1

Species list

Biodiversity payment summary report

Price calculated	Species	Credits
Yes	***Cercartetus nanus*** (Eastern Pygmy-possum)	15
Yes	***Lathamus discolor*** (Swift Parrot)	16
Yes	***Litoria brevipalmata*** (Green-thighed Frog)	2
Yes	***Myotis macropus*** (Southern Myotis)	18
Yes	***Planigale maculata*** (Common Planigale)	16
Yes	***Pteropus poliocephalus*** (Grey-headed Flying-fox)	2
Yes	***Numenius madagascariensis*** (Eastern Curlew)	1
Yes	***Rhodomyrtus psidioides*** (Native Guava)	1

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Macleay Hastings	**1747 -** Grey Mangrove low closed forest	No	Mangrove Swamps >=50% and <70%	19.12%	$348.19	1.7151	$ 10,717.17	2	$21,434.34

Macleay Hastings	**1727 -** Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Yes	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	15.97%	$691.91	3.6333	$ 20,752.23	3	$62,256.69
Macleay Hastings	**1536 -** Tuckeroo - Lilly Pilly - Coast Banksia littoral rainforest	Yes	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.37%	$286.68	1.8297	$8,770.31	9	$78,932.82
Macleay Hastings	**771 -** Coastal sand Tea-tree - Banksia scrub	No	Coastal Headland Heaths >=50% and <70%	20.69%	$455.77	2.2977	$ 14,207.57	3	$42,622.72

Macleay Hastings	**1724 -** Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Yes	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	18.83%	$130.43	2.7038	$4,005.11	1	$4,005.11

Subtotal (excl. GST)	**$209,251.68**
GST	**$20,925.17**
Total ecosystem credits (incl. GST)	**$230,176.85**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10155	***Cercartetus nanus*** (Eastern Pygmy-possum)	Vulnerable	$495.24	20.6900%	$80.00	15	$10,165.58
10455	***Lathamus discolor*** (Swift Parrot)	Endangered	$309.97	20.6900%	$80.00	16	$7,265.64

Biodiversity payment summary report

10485	***Litoria brevipalmata*** (Green-thighed Frog)	Vulnerable	$463.67	20.6900%	$80.00	2	$1,279.21
10549	***Myotis macropus*** (Southern Myotis)	Vulnerable	$741.31	20.6900%	$80.00	18	$17,544.37
10635	***Planigale maculata*** (Common Planigale)	Vulnerable	$463.67	20.6900%	$80.00	16	$10,233.65
10697	***Pteropus poliocephalus*** (Grey-headed Flying-fox)	Vulnerable	$741.31	20.6900%	$80.00	2	$1,949.37
20284	***Numenius madagascariensis*** (Eastern Curlew)	Not Listed	Not listed	-	$0.00	1	Contact BCT for pricing
20342	***Rhodomyrtus psidioides*** (Native Guava)	Critically Endangered	$8,650.83	20.6900%	$346.03	1	$10,786.72

Subtotal (excl. GST) **Contact BCT for pricing**

GST **Contact BCT for pricing**

Total species credits (incl. GST) **Contact BCT for pricing**

Grand total **Contact BCT for pricing**

Appendix V

Vegetation survey plots and tracks



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Level 1, Building Q
Head Street, Forster
(02)6555 5522
www.accuplan.com.au

Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

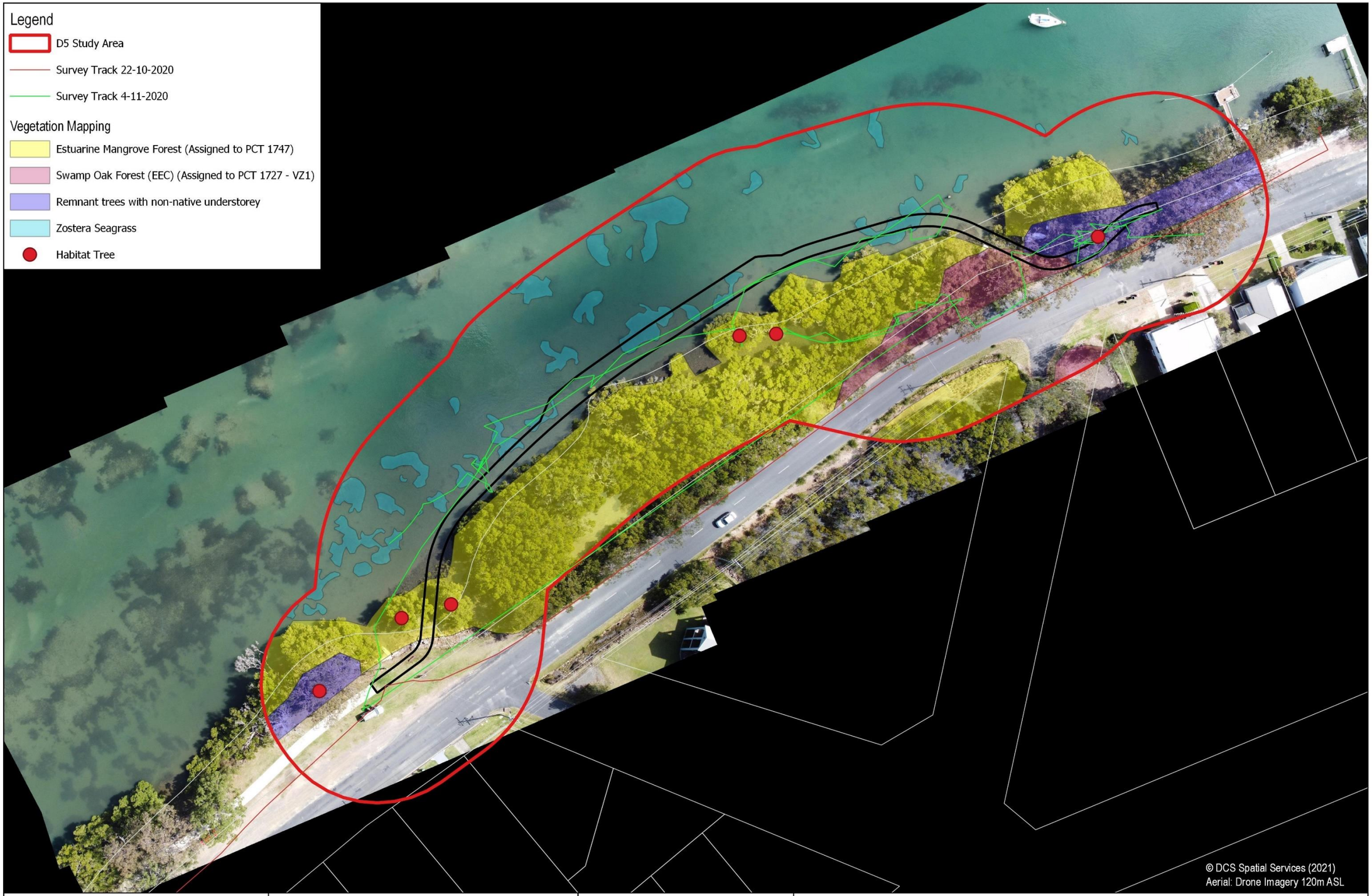
Title: Section D3 - Vegetation mapping showing vegetation plots and survey tracks

0 50 100 150 200 m

Scale 1:2,000 (A3)

N

(20
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

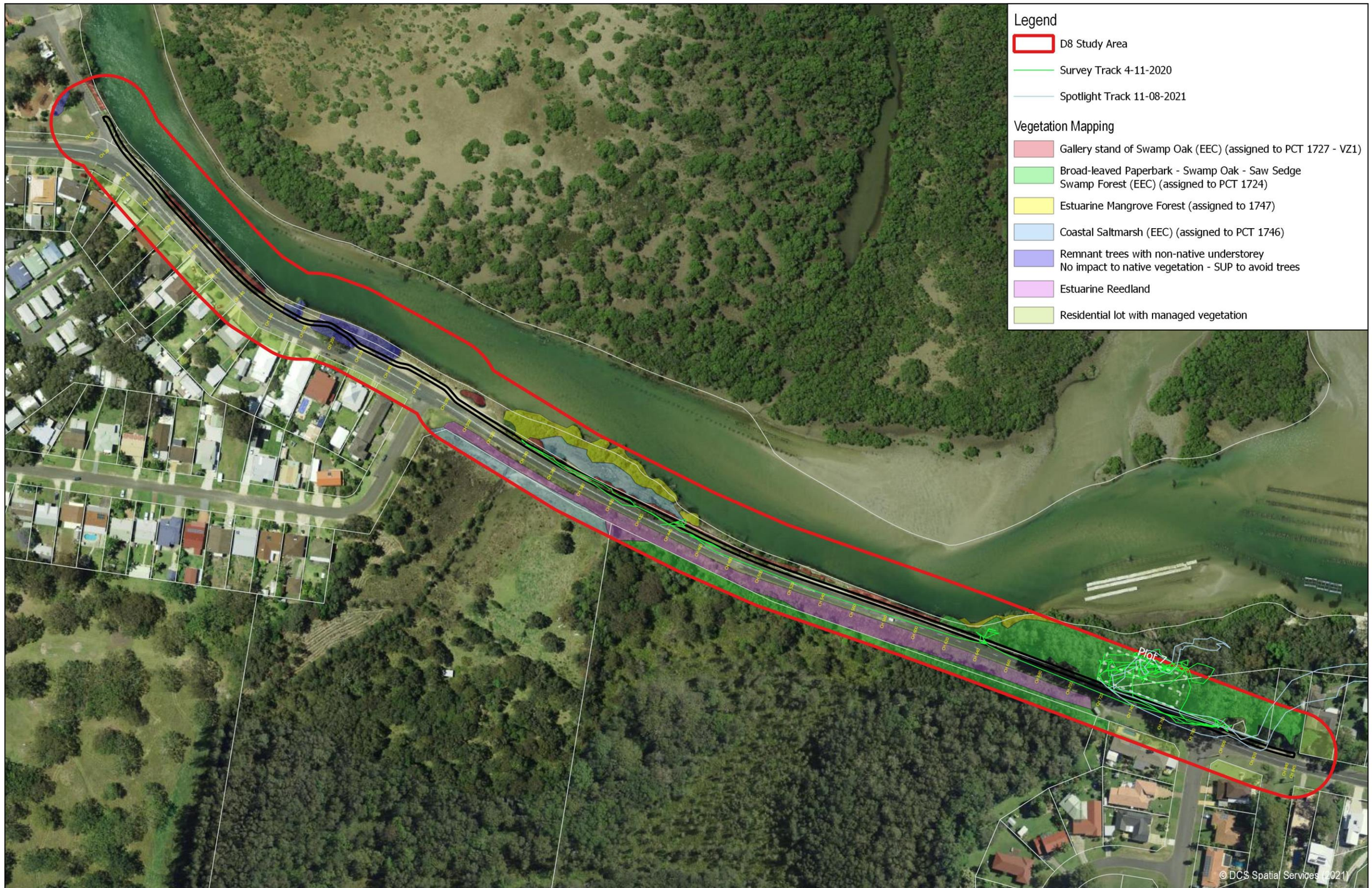
Title: Section D5 - Vegetation mapping showing survey tracks

0 20 40 60 80 m

Scale 1:750 (A3)

N

(201
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D8 - Vegetation mapping showing vegetation plots and survey tracks

0 50 100 150 200 m

Scale 1:2000 (A3)

N



accuplan Level 1, Building Q Head Street, Forster (02)6555 5522 www.accuplan.com.au	Project: Camden Head - Beach to Beach Shared User Path Client: Port Macquarie - Hastings Council	Title: Section D10a -Vegetation mapping showing vegetation plots and survey tracks	0 50 100 150 200 m Scale 1:2000 (A3) N

(20
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D10b - Vegetation mapping showing vegetation plots and survey tracks

0 50 100 150 200 m

Scale 1:2000 (A3)

N

(20
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D11 - Vegetation mapping showing vegetation plots and survey tracks

0 50 100 150 200 m

Scale 1:2000 (A3)

N

(20
Bea

Appendix VI

EPBC Protected Matters Assessment

CONSIDERATIONS UNDER THE EPBC ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval of the Commonwealth Minister representing the Department of Agriculture, Water and the Environment (DAWE), for actions that may have a significant impact on Matters of National Environmental Significance (MNES). The EPBC Act also requires Commonwealth approval for certain actions on Commonwealth land. MNES protected under the EPBC Act include:

- World Heritage properties;
- National Heritage places;
- RAMSAR wetlands of international importance;
- threatened species or ecological communities listed in the EPBC Act;
- migratory species listed in the EPBC Act;
- the Great Barrier Reef Marine Park;
- Commonwealth marine environment; and
- nuclear actions.

With regard to biodiversity, the only MNES relevant to the study area are nationally listed threatened species and ecological communities and migratory species. The DAWE protected matters search for the site is provided in **Appendix VI**. The following threatened ecological communities and threatened species have potential to be impacted by the proposal and the EPBC significant assessment criteria have been addressed below.

Threatened Ecological Communities

- Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)
- Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)

Critically Endangered and Endangered Species

- Swift Parrot (CE)
- Eastern Curlew (CE)
- Native Guava (CE)
- Curlew Sandpiper (CE)
- Great Knot (CE)
- Red Knot (E)

Vulnerable Species

- Bar-tailed Godwit
- Grey-headed Flying-fox

Assessment of Significance for Critically Endangered or Endangered Ecological Communities

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**	**Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)**	**Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)**
Reduce the extent of an ecological community	Approximately 111.65 hectares of Littoral Rainforest CEEC has been previously mapped within the Port Macquarie LGA and 16 hectares of this occurs within the vicinity of the proposal area at Camden Head (locality) (Phillips *et al*, 2013). The total area of Littoral Rainforest CEEC in NSW is estimated to be approximately 1600 ha (DoEE, 2019). Parts of the proposed alignment within Sections D10 and D11 extend along the edge of this community and up to 0.2 hectares would be removed to accommodate the construction of the SUP. This represents 0.18% of the ecological community previously mapped in the Port Macquarie LGA and 1.25% mapped within the locality. The impacts would be limited to vegetation along existing edges already subject to edge effects, regular maintenance, and pedestrian activity. Impacts to retained vegetation would also be avoided and/ or minimised by a boardwalk design to minimise the required clearing footprint and measures to avoid and retain large overhanging trees which provide cover and shading of retained vegetation. The relatively small and narrow area to be impacted by the proposal is considered minor and unlikely to threaten the persistence of the CEEC in the local area.	This EEC is widely distributed along the east coast of Australia between Curtis Island (south-east Queensland) and Bermagui (southern New South Wales), typically within 30km of the coast, but in some areas, such as along tidal river catchments, the ecological community can occur more than 100km inland. Approximately 1832.57 hectares of Swamp Oak dominant forest has been previously mapped within the Port Macquarie LGA and 64.75 hectares of this occurs within the vicinity of the proposal area at Camden Head (locality) (Phillips *et al*, 2013). The total area of Coastal CEEC in NSW is estimated to be approximately 1600 ha (DoEE, 2019). Approximately 0.11 hectares of PCT 1727 would be removed to accommodate the construction of the SUP. This includes minor impacts to patches within Sections D3 and D11 (approximately 422m^2) which would likely meet the minimum condition thresholds for this EEC. This represents 0.006% of the ecological community previously mapped in the Port Macquarie LGA and 0.17% mapped within the locality. Impacts to retained vegetation would be avoided and/ or minimised by a boardwalk design to minimise the required clearing footprint. The relatively small and narrow area to be impacted by the proposal is considered minor and unlikely to threaten the persistence of the EEC in the local area.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposed alignment of the SUP uses existing disturbed areas including managed road verges and existing gravel walkways. The proposed narrow band of clearing along these edges has the potential to slightly increase fragmentation and reduce connectivity. No habitat areas would be isolated by the works and the impacts are considered minor given the relatively small area to be impacted.	The proposed narrow band of clearing has the potential to slightly increase fragmentation and reduce connectivity. No habitat areas would be isolated by the works and the impacts are considered minor given the relatively small area to be impacted.

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**	**Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)**	**Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)**
Adversely affect habitat critical to the survival of an ecological community	The proposed SUP would impact a relatively small proportion of the community occurring in the local area and would be limited to existing disturbed edges. The small area of habitat to be impacted is not considered critical to the survival of the community.	The proposed SUP would impact a very small proportion of the community occurring in the local area. The small area of habitat to be impacted is not considered critical to the survival of the community.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns	The proposed SUP extension is unlikely to modify or destroy abiotic factors necessary for the ecological community's survival, particularly given the narrow development footprint.	The proposed SUP extension is unlikely to modify or destroy abiotic factors necessary for the ecological community's survival, particularly given the narrow development footprint. The proposal does not involve any activities that would affect groundwater levels or significantly alter surface drainage patterns.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	Vegetation clearing associated with the proposal has the potential to increase edge effects although this is likely to be minimal given the narrow nature of the proposal along existing disturbed edges. The removal of large overhanging trees has the potential to reduce cover and shading of retained vegetation. The canopy cover is variable throughout the littoral rainforest in the study area, particularly in areas subject to previous clearing which are now regenerating or subject to dense vine growth. The design of the SUP has considered the retention of a number of large trees located along the edge of the SUP alignment in Section D11 between CH0-120. These trees provide significant shading in an area with an otherwise patchy canopy. The reduction in cover and shading is likely to be minimal elsewhere where the adjacent vegetation has a dense intact canopy. Weed cover is relatively low throughout the community, likely attributable to regular weeding by local land groups. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion. Considering the above, the relatively small area to be impacted is unlikely to cause a substantial change in the species composition of retained vegetation for this CEEC.	Much of this community was subject to high levels of disturbance, particularly Section D3 which is subject to a high occurrence of weeds. Vegetation clearing associated with the proposal has the potential to increase edge effects although this is likely to be minimal given the narrow nature of the proposal and is unlikely to substantially modify the composition of the community.

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**	**Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)**	**Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)**
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: i. assisting invasive species, that are harmful to the listed ecological community, to become established, or ii. causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community	i. As described above, weed cover is relatively low throughout the community, likely attributable to regular weeding by local land groups. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion. The minor nature of vegetation removal is unlikely to cause a substantial reduction in the quality or integrity of the retained areas of CEEC vegetation. ii. The operation of the SUP would be similar to the existing conditions and is unlikely to cause regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the CEEC. There is potential for fuel and oil spills to occur during construction and the potential for these would be avoided and/ or minimised by appropriate safeguards to be prepared and implemented as part of the Construction Environmental Management Plan (CEMP) for the works.	i. As described above, weed cover is relatively high throughout this community. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into this EEC and nearby habitats. The minor nature of vegetation removal is unlikely to cause a substantial reduction in the quality or integrity of the retained areas of this EEC. ii. The operation of the SUP would be similar to the existing conditions and is unlikely to cause regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the EEC. There is potential for fuel and oil spills to occur during construction and the potential for these would be avoided and/ or minimised by appropriate safeguards to be prepared and implemented as part of the Construction Environmental Management Plan (CEMP) for the works.
Interfere with the recovery of an ecological community	The proposal is unlikely to interfere with the recovery of this CEEC. The final alignment and design have implemented the measures to avoid and minimise impacts to this CEEC wherever possible. The proposal would result in a minor reduction in the extent of the CEEC in the local area and is unlikely to threaten its viability or persistence.	The proposal is unlikely to interfere with the recovery of this EEC. The final alignment and design have implemented the measures to avoid and minimise impacts to this EEC wherever possible. The proposal would result in a minor reduction in the extent of the EEC in the local area and is unlikely to threaten its viability or persistence.

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:**	**Littoral rainforests and coastal vine thickets of eastern Australia (CEEC)**	**Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland (EEC)**
Conclusion	The proposal is unlikely to result in a significant impact on this CEEC given: • The final alignment and design have implemented the measures to avoid and minimise impacts to this CEEC wherever possible. • Impacts would be limited to vegetation along existing edges already subject to edge effects, regular maintenance, and pedestrian activity. • The proposed vegetation impacts are considered minor representing only 0.18% of the ecological community previously mapped in the Port Macquarie LGA and 1.25% mapped within the locality. • Fragmentation of the CEEC would be minor and no areas of this CEEC would be isolated by the development. • The proposal will not impact on habitat that is critical to the survival of this CEEC. • The proposal is unlikely to affect the recovery of this CEEC.	The proposal is unlikely to result in a significant impact on this EEC given: • The final alignment and design have implemented the measures to avoid and minimise impacts to this EEC wherever possible. • The proposed vegetation impacts are considered minor representing only 0.006% of the ecological community previously mapped in the Port Macquarie LGA and 0.17% mapped within the locality. • Fragmentation of the EEC would be minor and no areas of this EEC would be isolated by the development. • The proposal will not impact on habitat that is critical to the survival of this EEC. • The proposal is unlikely to affect the recovery of this EEC

Assessment of Significance for Critically Endangered or Endangered Species

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Swift Parrot (CE)**	**Eastern Curlew (CE)**	**Native Guava (CE)**
Lead to a long-term decrease in the size of an important population	The Swift Parrot occurs as a single, migratory population that breeds in Tasmania and is only present in NSW between February and October (Bionet, 2020). Swift Parrots are a relatively regular winter visitor to the area with 57 records recorded within the search area between 2000 and 2019 (Bionet, 2020). Records suggest the Swift Parrots were largely recorded feeding on lerp in Blackbutt (*E.* pilularis) and Rough-barked Apple (*Angophora floribunda*) and forest with flowering Swamp Mahogany (*E. robusta*) and Forest Red Gum (*E. tereticornis*). Approximately 872 hectares of native vegetation occurring throughout Camden Head and North Haven is mapped by OEH as important migratory foraging habitat for Swift Parrots. Approximately 0.24 hectares of this mapped important habitat would be impacted by the proposal. Preferred foraging habitat is largely absent within the proposal area. The SUP alignment impacts a relatively narrow strip of vegetation and is considered minor relative to the amount of habitat available within the local area. Swift Parrots are highly mobile, and the proposed clearing would not directly impact any individuals and is unlikely to isolate any habitat or limit movements throughout the local area. Hence, it is expected that the proposal is unlikely to a lead to a long-term decrease in the size of a population.	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets, and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves (Department of the Environment 2015). The latest population estimates for migratory shorebirds (Hansen *et al*. 2016) lists the East Asian-Australasian Flyway (EAAF) population of the Eastern Curlew at 35,000. Camden Haven Inlet and its surrounds is known to support individuals of the Eastern Curlew. The Inlet is mapped by OEH as important habitat for this species. A single Eastern Curlew was observed on a tidal sandbar in the inlet during site surveys and 32 Bionet records occur within the search area. Potential habitat within the proposal area is limited to the intertidal zones (Section D5) and areas of mangrove and/ or saltmarsh (Sections D3, D5 and D8). The proposal would impact a total of 0.17 hectares of potential habitat consisting of 20m^2 of saltmarsh, 645m^2 of mangrove forest and 900m^2 of intertidal mudflats including 140m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. These marine habitats are suitable for foraging and roosting, although the species appears to preference intertidal mudflats and seagrass for foraging	Native Guava (*Rhodomyrtus psidioides)* is a pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest (TSPD, 2019) and is also a characteristic species the CEEC Littoral rainforests and coastal vine thickets of eastern Australia. The effect of Austropuccinia psidii (Myrtle Rust) infection on Native Guava is severe across the species entire range and the population is projected to continue to decline rapidly as a consequence of infection by A. psidii. Within three generations, assuming a generation time of 20 years, a quantitative estimate of decline of 99% has been made based on documented rates of mortality across the range (NSW Threatened Species Scientific Committee, 2018). A survey of littoral rainforests on the western portion of Camden Head identified *R. psidioides* occurs as a rare (<5 plants recorded) component of the littoral rainforest occurring on the eastern edge of Gogleys Lagoon (Williams, 2000). Within the proposal area, at least ten small plants were identified near the edge of the existing informal walking track between CH690 and CH820 (Section D10). All recorded plants were small and appeared to be heavily affected by myrtle rust. No mature shrubs or plants showing signs of flowering or fruiting were observed. This is consistent with the Bionet advice in that most individuals infected with Myrtle Rust are no longer

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Swift Parrot (CE)**	**Eastern Curlew (CE)**	**Native Guava (CE)**
		(Department of the Environment 2015). This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the abundance of habitat available in the local area and is unlikely to lead to a long-term decrease in the size of the population.	flowering or setting seeds although infected plants may sucker from the roots and survive for many years. The absence of mature plants and the lack of successful regeneration likely threatens the long-term viability of *R. psidioides* occurring within the study area. The EPBC significant impact guidelines defines an 'important population' as a population that is necessary for a species' long-term survival and recovery. Given the absence of mature plants and the prevalence of Myrtle Rust affecting local plants it is unlikely that the small number of plants would constitute an 'important population'. Nevertheless, the proposed SUP largely avoids impacts to recorded specimens and adjoining habitat and is unlikely to lead to a long-term decrease in the size of the local population
Reduce the area of occupancy of the species	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of mapped habitat occurring throughout the local area provide suitable habitat for this species.	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of mapped habitat occurring throughout Camden Haven Inlet provides suitable habitat for this species.	This species occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. The area of occupancy (AOO) within its range is estimated as 884 km^2 (NSW Threatened Species Scientific Committee, 2019). The proposal is unlikely to reduce the area of occupancy given the small area to be impacted.
Fragment an existing important population into two or more populations	Suitable habitat for this species is available throughout the local area. This species is highly mobile, and the proposed removal vegetation is unlikely to fragment any important populations of this species.	Suitable habitat for this species is available throughout Camden Haven Inlet. This species is highly mobile, and the proposed removal vegetation is unlikely to fragment any important populations of this species.	The proposed SUP is narrow and is unlikely to impede pollinators or seed dispersal of this species such that the local population will become isolated.
Adversely affect habitat critical to the survival of a species	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of vegetation which is mapped as	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of intertidal habitat which is mapped as	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of vegetation along an existing informal

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Swift Parrot (CE)**	**Eastern Curlew (CE)**	**Native Guava (CE)**
	important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.	important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.	walking track. The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.
Disrupt the breeding cycle of a population	The proposal will result in a minor reduction of winter foraging habitat available in the local area. The small area to be impacted is unlikely to significantly affect the availability of winter foraging resources or disrupt the breeding cycle of the population.	The Eastern Curlew migrates to Australia during their non-breeding season and breed outside of Australia. The small area to be impacted is unlikely to significantly affect the availability of non-breeding foraging resources or disrupt the breeding cycle of the population.	The small area to be impacted is unlikely disrupt the breeding cycle of the population. All recorded plants were small and appeared to be heavily affected by myrtle rust. No mature shrubs or plants showing signs of flowering or fruiting were observed. This is consistent with the Bionet advice in that most individuals infected with Myrtle Rust are no longer flowering or setting seeds although infected plants may sucker from the roots and survive for many years.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The SUP alignment impacts a relative narrow strip of potential winter foraging habitat and is considered minor relative to the amount of habitat available within the local area. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The SUP alignment impacts a relative narrow strip of potential foraging habitat and is considered negligible relative to the amount of habitat available locally within Camden Haven Inlet. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The proposal will impact a relatively narrow strip of vegetation along an existing informal walking track. The small area to be impacted is considered minor and is unlikely to affect the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The minor nature of vegetation removal is unlikely to result in an invasive species becoming established or cause a substantial reduction in the quality or integrity of the retained areas potential habitat for this species. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.
Introduce disease that may cause the species to decline	The proposed activity is unlikely to introduce a disease that may cause the species to decline.	The proposed activity is unlikely to introduce a disease that may cause the species to decline.	All recorded plants were small and appeared to be heavily affected by myrtle rust. Weed and pathogen management measures would apply to the works and

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Swift Parrot (CE)**	**Eastern Curlew (CE)**	**Native Guava (CE)**
			is unlikely to introduce other diseases that may cause the species to decline.
Interfere substantially with the recovery of the species	Large areas of similar or superior quality habitat are available for this species within the surrounding area. Hence, it is considered unlikely that the relatively small area of habitat to be removed by the proposal will substantially interfere with the recovery of the species.	Extensive areas of similar habitat are available throughout Camden Haven Inlet. While the proposal will remove a minor amount of habitat it will not further degrade or interfere with the ecological integrity of Camden Haven Inlet or its marine habitats and it is unlikely the proposal will substantially interfere with the recovery of the species.	The main risk to this species is susceptibility to Myrtle Rust. It is unlikely that the relatively small area of habitat to be removed by the proposal will substantially interfere with the recovery of the species.

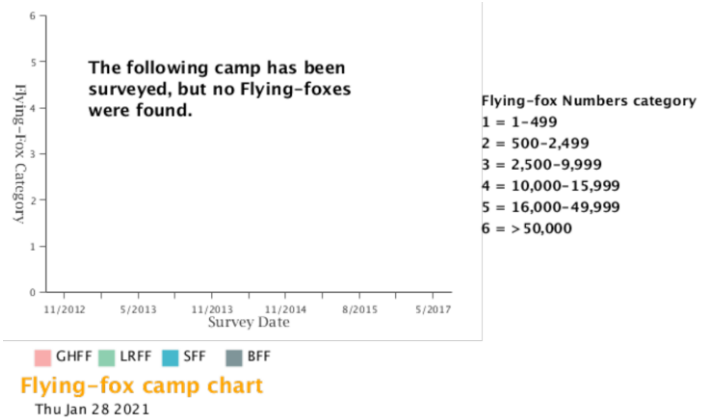
Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Red Knot (E)**	**Great Knot (CE)**	**Curlew Sandpiper (CE)**
Lead to a long-term decrease in the size of an important population	The Red Knot breeds in the northern hemisphere and undertakes migrations along the East Asian-Australasian Flyway (EAAF) to spend the boreal winter in Australasia. The bulk of the population is considered to spend the non-breeding period in Australia (Bamford *et* al, 2008). In Australia, the species mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms. The latest population estimates for migratory shorebirds (Hansen *et al*. 2016) lists the EAAF population of the Red Knot at 110,000. Camden Haven Inlet and its surrounds is known to occasionally support individuals of this species. 13	The Great Knot breeds in the northern hemisphere and undertakes biannual migrations along the East Asian-Australasian Flyway (EAAF). Most of the population winters in Australia (probably >90%), mainly at sites on the northern coast (Bamford *et al*. 2008). In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. The species prefers sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries, and lagoons. The latest population estimates for migratory shorebirds (Hansen *et al*. 2016) lists the EAAF population of the Red Knot at 425,000.	The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. The latest population estimates for migratory shorebirds (Hansen *et al*. 2016) lists the East Asian-Australasian Flyway (EAAF) population at 90,000 birds. Camden Haven Inlet and its surrounds is known to occasionally support individuals of this species. 15 Bionet records occur within the search area although all of these are from Lake Cathie located about 10km to the north of the proposal area. Preferred habitat within the proposal area is limited to the intertidal zones

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Red Knot (E)**	**Great Knot (CE)**	**Curlew Sandpiper (CE)**
	Bionet records occur within the search area although most of these are from Lake Cathie located about 10km to the north of the proposal area. Preferred habitat within the proposal area is limited to the intertidal zones within Section D5 and more marginal habitat occurs within the areas of mangrove and/ or saltmarsh in Sections D3, D5 and D8. Important habitat for this species in NSW is mapped by OEH and none occurs within the vicinity of the proposal area. The nearest mapped important habitat for this species is the Hastings River Estuary at Port Macquarie. The proposal would impact a total of 0.17 hectares of potential habitat consisting of 20m^2 of saltmarsh, 645m^2 of mangrove forest and 900m^2 of intertidal mudflats including 140m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the absence of 'important habitat', the relatively small disturbance area and abundance of habitat available in the local area. Considering the above, the proposal is unlikely to lead to a long-term decrease in the size of the population.	Camden Haven Inlet and its surrounds is known to rarely support individuals of this species. 3 Bionet records occur within the search area although all of these are from Lake Cathie located about 10km to the north of the proposal area. Preferred habitat within the proposal area is limited to the intertidal zones within Section D5 and more marginal habitat occurs within the areas of mangrove and/ or saltmarsh in Sections D3, D5 and D8. Important habitat for this species in NSW is mapped by OEH and none occurs within the vicinity of the proposal area. The nearest mapped important habitat for this species is the Hastings River Estuary at Port Macquarie. The proposal would impact a total of 0.17 hectares of potential habitat consisting of 20m^2 of saltmarsh, 645m^2 of mangrove forest and 900m^2 of intertidal mudflats including 140m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the absence of 'important habitat', the relatively small disturbance area and abundance of habitat available in the local area. Considering the above, the proposal is unlikely to lead to a long-term decrease in the size of the population.	within Section D5 and more marginal habitat occurs within the areas of mangrove and/ or saltmarsh in Sections D3, D5 and D8. Important habitat for this species in NSW is mapped by OEH and none occurs within the vicinity of the proposal area. The nearest mapped important habitat for this species is the Hunter Estuary River Estuary at Newcastle. The proposal would impact a total of 0.17 hectares of potential habitat consisting of 20m^2 of saltmarsh, 645m^2 of mangrove forest and 900m^2 of intertidal mudflats including 140m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the absence of 'important habitat', the relatively small disturbance area and abundance of habitat available in the local area. Considering the above, the proposal is unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of the species	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of similar habitat occurring throughout Camden Haven Inlet provides suitable habitat for this species.	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of similar habitat occurring throughout Camden Haven Inlet provides suitable habitat for this species.	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of similar habitat occurring throughout Camden Haven Inlet provides suitable habitat for this species.

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Red Knot (E)**	**Great Knot (CE)**	**Curlew Sandpiper (CE)**
Fragment an existing important population into two or more populations	Suitable habitat for this species is available throughout Camden Haven Inlet. This species is highly mobile, and the proposed removal of vegetation is unlikely to fragment any important populations of this species.	Suitable habitat for this species is available throughout Camden Haven Inlet. This species is highly mobile, and the proposed removal of vegetation is unlikely to fragment any important populations of this species.	Suitable habitat for this species is available throughout Camden Haven Inlet. This species is highly mobile, and the proposed removal of vegetation is unlikely to fragment any important populations of this species.
Adversely affect habitat critical to the survival of a species	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of intertidal habitat which is mapped as important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of intertidal habitat which is mapped as important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of intertidal habitat which is mapped as important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.
Disrupt the breeding cycle of a population	The Red Knot migrates to Australia during their non-breeding season and breed outside of Australia. The small area to be impacted is unlikely to significantly affect the availability of non-breeding foraging resources or disrupt the breeding cycle of the population.	The Great Knot migrates to Australia during their non-breeding season and breed outside of Australia. The small area to be impacted is unlikely to significantly affect the availability of non-breeding foraging resources or disrupt the breeding cycle of the population.	The Curlew Sandpiper migrates to Australia during their non-breeding season and breed outside of Australia. The small area to be impacted is unlikely to significantly affect the availability of non-breeding foraging resources or disrupt the breeding cycle of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The SUP alignment impacts a relatively narrow strip of potential foraging habitat and is considered negligible relative to the amount of habitat available locally within Camden Haven Inlet. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The SUP alignment impacts a relatively narrow strip of potential foraging habitat and is considered negligible relative to the amount of habitat available locally within Camden Haven Inlet. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The SUP alignment impacts a relatively narrow strip of potential foraging habitat and is considered negligible relative to the amount of habitat available locally within Camden Haven Inlet. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.

Significant Impact Criteria **An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:**	**Red Knot (E)**	**Great Knot (CE)**	**Curlew Sandpiper (CE)**
critically endangered species' habitat			
Introduce disease that may cause the species to decline	The proposed activity is unlikely to introduce a disease that may cause the species to decline.	The proposed activity is unlikely to introduce a disease that may cause the species to decline.	The proposed activity is unlikely to introduce a disease that may cause the species to decline.
Interfere substantially with the recovery of the species	Extensive areas of similar habitat are available throughout Camden Haven Inlet. While the proposal will remove a minor amount of habitat it will not further degrade or interfere with the ecological integrity of Camden Haven Inlet or its marine habitats and it is unlikely the proposal will substantially interfere with the recovery of the species.	Extensive areas of similar habitat are available throughout Camden Haven Inlet. While the proposal will remove a minor amount of habitat it will not further degrade or interfere with the ecological integrity of Camden Haven Inlet or its marine habitats and it is unlikely the proposal will substantially interfere with the recovery of the species.	Extensive areas of similar habitat are available throughout Camden Haven Inlet. While the proposal will remove a minor amount of habitat it will not further degrade or interfere with the ecological integrity of Camden Haven Inlet or its marine habitats and it is unlikely the proposal will substantially interfere with the recovery of the species.

Assessment of Significance for Vulnerable Fauna Species

Significant Impact Criteria **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**	**Grey-headed Flying-fox**	**Bar-tailed Godwit (subspecies baueri)**
Lead to a long-term decrease in the size of an important population of a species	The proposed action is unlikely to impact a nationally important flying-fox camp. The referral guideline for management actions in grey-headed flying-fox camps (2015) identifies nationally important camps as "*Camps that have contained ≥ 10,000 grey-headed flying-foxes in more than one year in the last 10 years, or have been occupied by more than 2,500 grey-headed flying-foxes permanently or seasonally every year for the last 10 years*".  Monitoring data for the Dunbogan Camp (see camp chart below) suggests the camp does not exceed this threshold as monitoring surveys have previously failed to detect any flying-foxes. No breeding camps were recorded during site surveys although this species is known to seasonally roost in small numbers in rainforest vegetation off Pilot Beach Road (pers com J. Cohen, 2020). This is potentially in response to the availability of local food resources. The proposed impacts are limited to the construction and operation of the SUP along the northern side of Pilot Beach Road. When present, the flying-foxes are known to roost in the canopy near Pilot Beach Road. The removal of a	The Bar-tailed Godwit is a migratory wader which undertakes the largest non-stop flight of any bird. The trans-Pacific route from its breeding grounds in the Arctic to its non-breeding grounds in the southern hemisphere covers over 11,000 km. Birds arrive in New South Wales between August and October and then leave between February and April, with a small number of individuals overwintering. The subspecies is most frequently recorded along major coastal river estuaries and sheltered embayments, particularly the Tweed, Richmond, Clarence, Macleay, Hastings, Hunter and Shoalhaven river estuaries, Port Stephens and Botany Bay. It often occurs around beds of seagrass, and sometimes in nearby saltmarsh or the outer margins of mangrove areas. It forages at low to mid tide in shallow water or along the water's edge on sandy substrates on intertidal flats, banks and beaches or on soft mud substrates. At high tide, it roosts on sandy beaches, sandbars, spits, and near-coastal saltmarsh, often shared with other shorebirds. The latest population estimates for migratory shorebirds (Hansen *et al*. 2016) lists the East Asian-Australasian Flyway (EAAF) population at 325,000 birds. The Bar-tailed Godwit has two subspecies but the report does not individualise population estimates for this species; however, the Commonwealth Species Profile and Threats Database (SPRAT) lists the *Limosa lapponica baueri* subspecies population at 155 000 (Department of the Environment 2019). Camden Haven Inlet and its surrounds is known to occasionally support individuals of this species. 7 Bionet records occur within the search area, 3 of which are from Camden Haven Inlet. Preferred habitat within the proposal area is limited to the intertidal zones within Section D5 and more marginal habitat occurs within the areas of mangrove and/ or saltmarsh in Sections D3, D5 and D8.

Significant Impact Criteria **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**	**Grey-headed Flying-fox**	**Bar-tailed Godwit (subspecies baueri)**
	relatively thin strip of vegetation along the edge of the existing road to accommodate the SUP is unlikely to significantly alter the amount of available roosting habitat. If flying-foxes are present during construction, any works would be undertaken in accordance with a site-specific Flying-fox Management Plan which would implement Federal and State mitigation standards to minimise the impacts to roosting Flying-foxes. Pilot Beach Road is regularly used by pedestrians and vehicles to access Pilot Beach Reserve and any roosting flying-foxes would be accustomed to such activity. The proposed SUP would provide a formalised track for pedestrian traffic and its operation is unlikely to significantly alter the existing conditions of roosting habitat in the area. Given the minor nature of the works, the proposal is unlikely to have a significant impact on flying-fox species, or lead to a long term decrease in the size of the population, regardless of whether the camp affected is a nationally important camp.	Important habitat for this species in NSW is mapped by OEH and none occurs within the vicinity of the proposal area. The nearest mapped important habitat for this species is the Hastings River Estuary at Port Macquarie. The proposal would impact a total of 0.17 hectares of potential habitat consisting of 20m^2 of saltmarsh, 645m^2 of mangrove forest and 900m^2 of intertidal mudflats including 140m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the absence of 'important habitat', the relatively small disturbance area and abundance of habitat available in the local area. Considering the above, the proposal is unlikely to lead to a long-term decrease in the size of the population. Important habitat for this species in NSW is mapped by OEH and none occurs within the vicinity of the proposal area. The nearest mapped important habitat for this species is the Hunter Estuary River Estuary at Newcastle. The proposal would impact a total of 0.16 hectares of potential habitat consisting of 0.009 hectares of saltmarsh, 0.0975 hectares of mangrove forest and 0.05 hectares of intertidal mudflats including 20m^2 of seagrass. This habitat is widespread throughout Camden Haven Inlet. The impact associated within the proposal is considered negligible given the absence of 'important habitat', the relatively small disturbance area and abundance of habitat available in the local area. Considering the above, the proposal is unlikely to lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of an important population	The proposed action will not reduce the area of occupancy of an important population.	The proposal is unlikely to reduce the area of occupancy of this species given the relatively small area to be impacted and extensive areas of similar habitat occurring throughout Camden Haven Inlet provides suitable habitat for this species.
Fragment an existing important population into two or more populations	The proposed action will not fragment an important population into two or more populations.	Suitable habitat for this species is available throughout Camden Haven Inlet. This species is highly mobile, and the proposed removal vegetation is unlikely to fragment any important populations of this species.

Significant Impact Criteria **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**	**Grey-headed Flying-fox**	**Bar-tailed Godwit (subspecies baueri)**
Adversely affect habitat critical to the survival of a species	The habitat on site, while locally important for the species, is unlikely to be critical to the survival of Grey-headed Flying-foxes. This species is known to occur from north to south eastern NSW and throughout QLD. Habitat at the proposal site is not listed on the critical habitat register.	No areas of critical habitat have been declared for this species in NSW. The proposal will impact a relatively narrow strip of intertidal habitat which is mapped as important migratory foraging habitat for this species (OEH, 2020). The small area to be impacted is considered minor and is unlikely to be critical to the survival of the species.
Disrupt the breeding cycle of an important population	The proposed action is unlikely to disrupt the breeding cycle of an important population. If present, the proposed works would be undertaken in accordance with a site-specific Flying-fox Management Plan which would implement Federal and State mitigation standards to minimise the impacts to roosting Flying-foxes. Construction works would only be undertaken outside of periods of significant population stress, including the species breeding season (gestation and birthing) and periods of extreme weather.	The species migrates to Australia during their non-breeding season and breed outside of Australia. The small area to be impacted is unlikely to significantly affect the availability of non-breeding foraging resources or disrupt the breeding cycle of the population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed impacts are limited a thin strip of vegetation adjacent to the existing road. If flying-foxes are present, these works would be undertaken in accordance with a site-specific Flying-fox Management Plan which would implement Federal and State mitigation standards to minimise the impacts to roosting Flying-foxes. The proposed impacts are minor given the relatively small area of habitat to be impacted and are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The SUP alignment impacts a relatively narrow strip of potential foraging habitat and is considered negligible relative to the amount of habitat available locally within Camden Haven Inlet. It is considered that the proposed action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Weed control protocols shall be developed and implemented as part of the CEMP for the works. The proposal is unlikely to result in invasive species that would be harmful to the *Pteropus poliocephalus* by becoming established in the species habitat.	The proposal is not expected to result in an invasive species or disease that would cause any species to decline. Ongoing management of weeds during and post construction is warranted to prevent further weed incursion into adjacent habitats.
Introduce disease that may cause the species to decline	Pathogen control protocols shall be developed and implemented in accordance with the requirements of the *Biosecurity Act 2015* and implemented as part of the CEMP.	The proposed activity is unlikely to introduce a disease that may cause the species to decline.

Significant Impact Criteria **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:**	**Grey-headed Flying-fox**	**Bar-tailed Godwit (subspecies baueri)**
Interfere substantially with the recovery of the species	The proposed development is unlikely to interfere substantially with the recovery of the species. The proposal is unlikely to have a significant impact on the known population at the subject site and is therefore unlikely to have an overall impact on greater species conservation efforts.	Extensive areas of similar habitat are available throughout Camden Haven Inlet. While the proposal will remove a minor amount of habitat it will not further degrade or interfere with the ecological integrity of Camden Haven Inlet or its marine habitats and it is unlikely the proposal will substantially interfere with the recovery of the species.

MIGRATORY SPECIES PROTECTED UNDER INTERNATIONAL AGREEMENTS

Sixty-one (61) migratory species were listed on the EPBC protected matters search as having the potential to occur in the local area. Migratory species with potential to use habitats available within the proposal area are listed in **Table A3**. * Indicates threatened species which have been assessed above.

Table A3: Migratory species with the potential habitat available within the proposal area.

Migratory Terrestrial Species	
Cuculus optatus	Oriental Cuckoo
Hirundapus caudacutus	White-throated Needletail
Monarcha melanopsis	Black-faced Monarch
Monarcha trivirgatus	Spectacled Monarch
Myiagra cyanoleuca	Satin Flycatcher
Rhipidura rufifrons	Rufous Fantail
Migratory Wetlands Species	
Actitis hypoleucos	Common Sandpiper
Calidris acuminata	Sharp-tailed Sandpiper
**Calidris canutus*	Red Knot
**Calidris ferruginea*	Curlew Sandpiper
Calidris melanotos	Pectoral Sandpiper
Gallinago hardwickii	Latham's Snipe
Gallinago megala	Swinhoe's Snipe
Gallinago stenura	Pin-tailed Snipe
**Limosa lapponica*	Bar-tailed Godwit
**Numenius madagascariensis*	Eastern Curlew
Numenius minutus	Little Curlew
Numenius phaeopus	Whimbrel
Pandion haliaetus (syn. cristatus)	Osprey
Tringa nebularia	Common Greenshank

The project is considered to have negligible impact on these species, on the basis that all species are highly mobile, and the proposal impacts are minor in the context of surrounding habitat. The proposed works are unlikely to impact on any area considered to be 'important habitat' for the above migratory species or is it likely to impact a significant proportion of a migratory population.

Appendix VII

EPBC Protected Matters Search

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

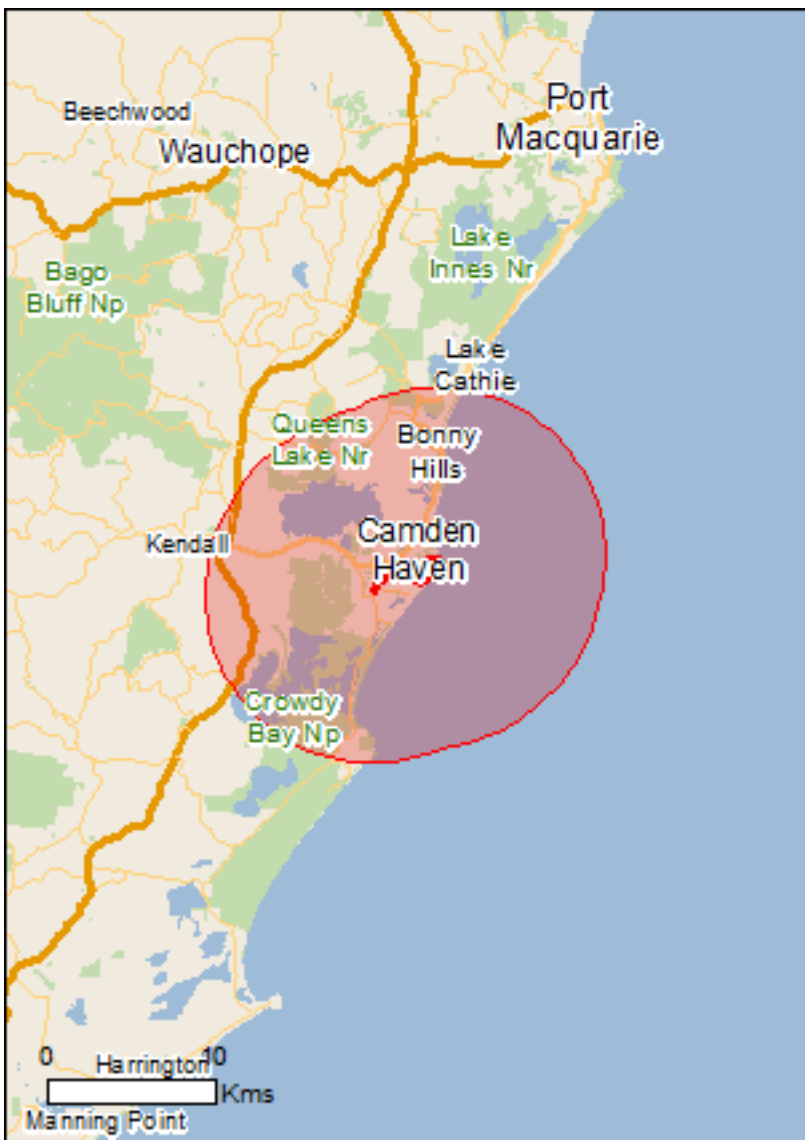
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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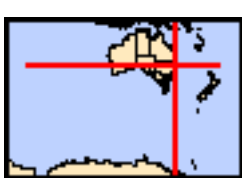
Summary
Details
Matters of NES
Other Matters Protected by the EPBC Act
Extra Information
Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	77
Listed Migratory Species:	61

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	82
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	8
Regional Forest Agreements:	1
Invasive Species:	33
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
Temperate East

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Pterodroma neglecta neglecta		
Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis		
Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei		
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita		
Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus		
Hooded Plover (eastern), Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus		
Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat likely to occur within area
Insects		
Argynnis hyperbius inconstans		
Australian Fritillary [88056]	Critically Endangered	Species or species habitat may occur within area
Mammals		

Name	Status	Type of Presence
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Acacia courtii Northern Brother Wattle [56299]	Vulnerable	Species or species habitat known to occur within area
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat likely to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
[Rhincodon typus](#)		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Anous stolidus](#)		
Common Noddy [825]		Species or species habitat likely to occur within area
[Apus pacificus](#)		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#)		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
[Ardenna grisea](#)		
Sooty Shearwater [82651]		Species or species habitat likely to occur within area
[Calonectris leucomelas](#)		
Streaked Shearwater [1077]		Species or species habitat may occur within area
[Diomedea antipodensis](#)		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#)		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#)		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#)		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Fregata ariel](#)		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
[Fregata minor](#)		
Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
[Macronectes giganteus](#)		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#)		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
[Phoebetria fusca](#)		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
[Sternula albifrons](#)		
Little Tern [82849]		Species or species habitat may occur within area
[Thalassarche bulleri](#)		
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius ruficapillus Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]		Species or species habitat likely to occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Solegnathus dunckeri Duncker's Pipehorse [66271]		Species or species habitat may occur within area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera borealis Sei Whale [34]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Balaenoptera physalus Fin Whale [37]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area

Name	Status	Type of Presence
Tursiops aduncus		
Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str.		
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Australian Marine Parks [Resource Information]

Name	Label
Cod Grounds	National Park Zone (IUCN II)

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Crowdy Bay	NSW
Dooragan	NSW
Kattang	NSW
LNE Special Management Zone No1	NSW
Lake Innes	NSW
Middle Brother	NSW
Queens Lake	NSW
Queens Lake	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Crowdy Bay National Park	NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.656605 152.8024,-31.652367 152.804031,-31.649737 152.806434,-31.647911 152.810811,-31.646522 152.814159,-31.646084 152.81433,-31.646157 152.816648,-31.647326 152.817849,-31.649007 152.821626,-31.650176 152.825746,-31.650541 152.828235,-31.650322 152.829951,-31.649591 152.831153,-31.648568 152.83287,-31.646815 152.83493,-31.645719 152.835187,-31.644842 152.835187,-31.644184 152.834243,-31.642869 152.833299,-31.641334 152.832441,-31.640604 152.83287,-31.640604 152.834071,-31.640677 152.835616,-31.640384 152.836732,-31.639142 152.837075,-31.638411 152.837075,-31.638338 152.837333,-31.638338 152.83699

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

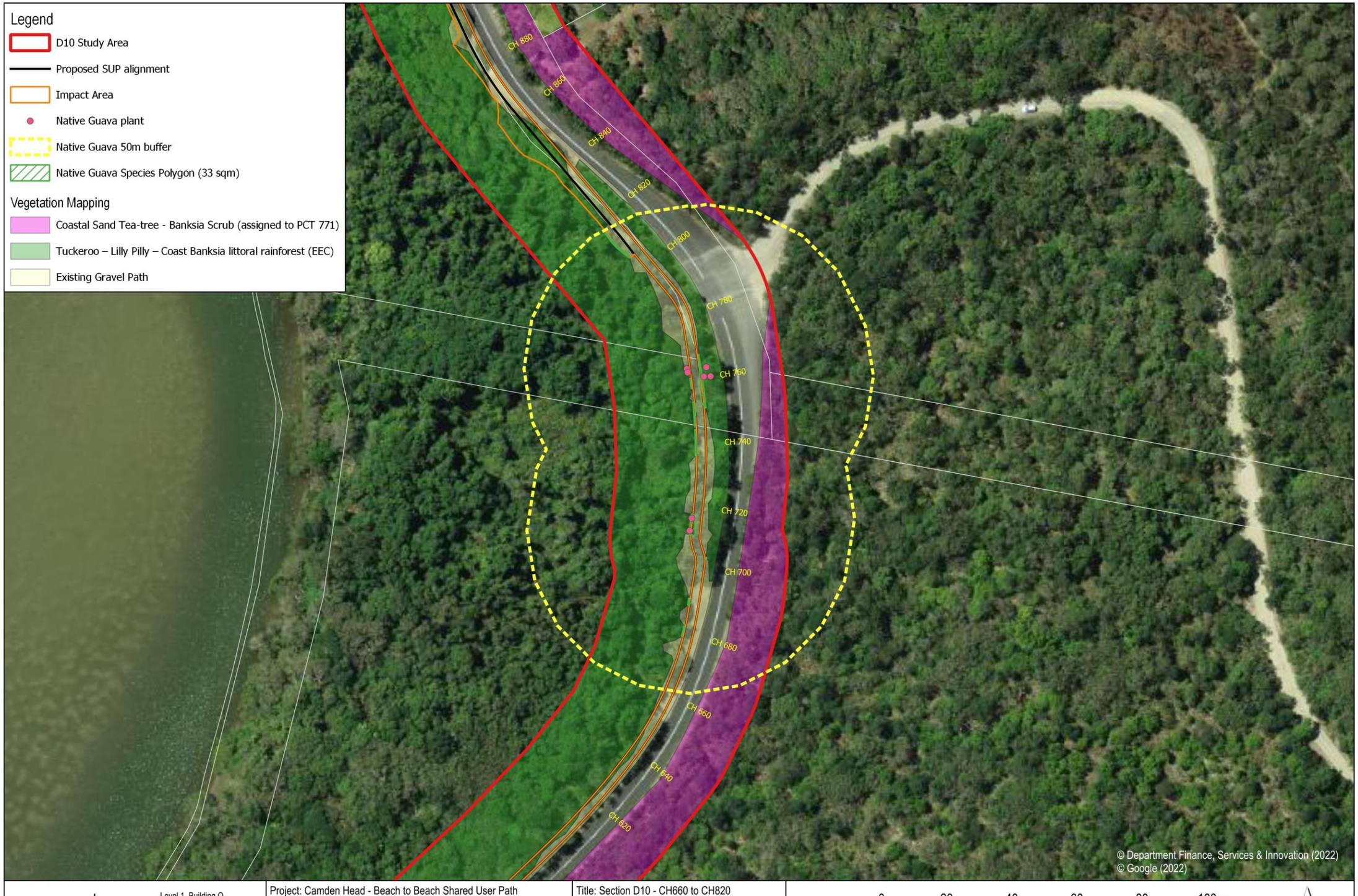
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix VIII

Species Credit Polygons



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D10 - CH660 to CH820
Native Guava Species Polygon

0 20 40 60 80 100 m

Scale 1:1000 (A3)

N

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Bea



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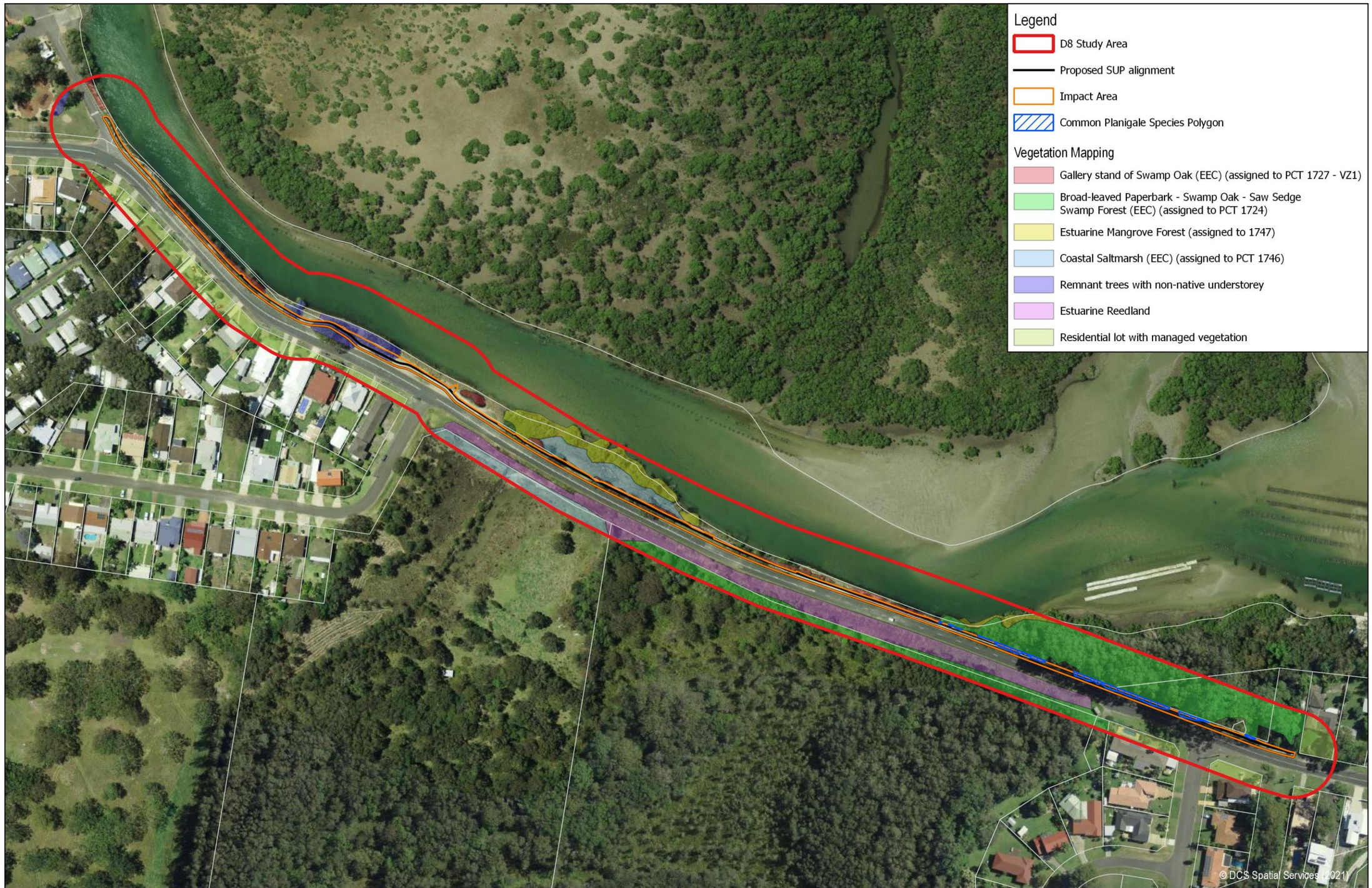
Title: Section D3 - Common Planigale Species Polygon

0 50 100 150 200 m

Scale 1:2,000 (A3)

N

(20
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D8 -
Common Planigale Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

N

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Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D10a -
Common Planigale Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

N

(20
Bea



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D10b -
Common Planigale Species Polygon

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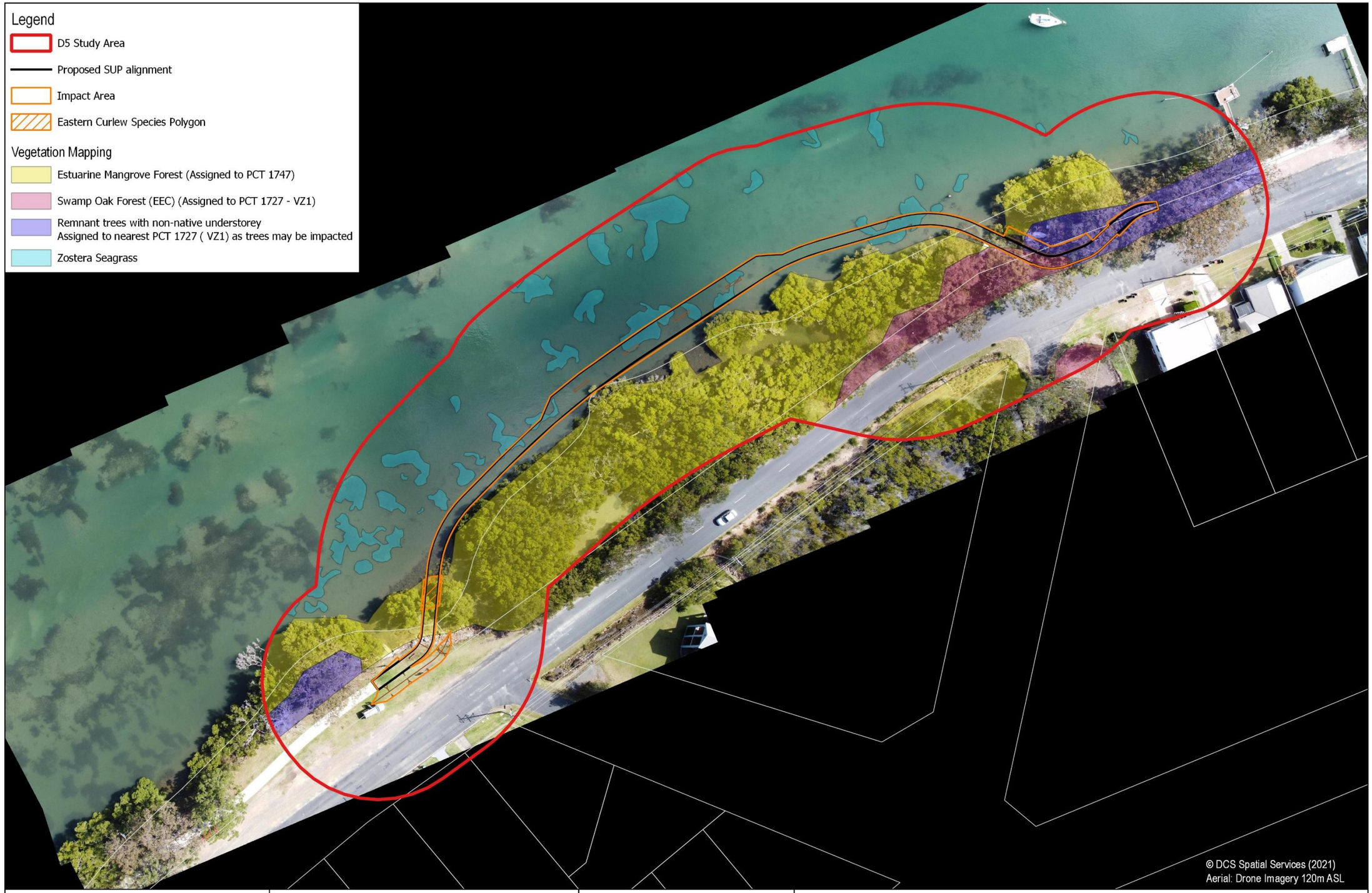
Scale 1:2000 (A3)

N

(20
Bea



accuplan Level 1, Building Q Head Street, Forster (02)6555 5522 www.accuplan.com.au	Project: Camden Head - Beach to Beach Shared User Path Client: Port Macquarie - Hastings Council	Title: Section D11 - Common Planigale Species Polygon	0 50 100 150 200 m Scale 1:2000 (A3) N



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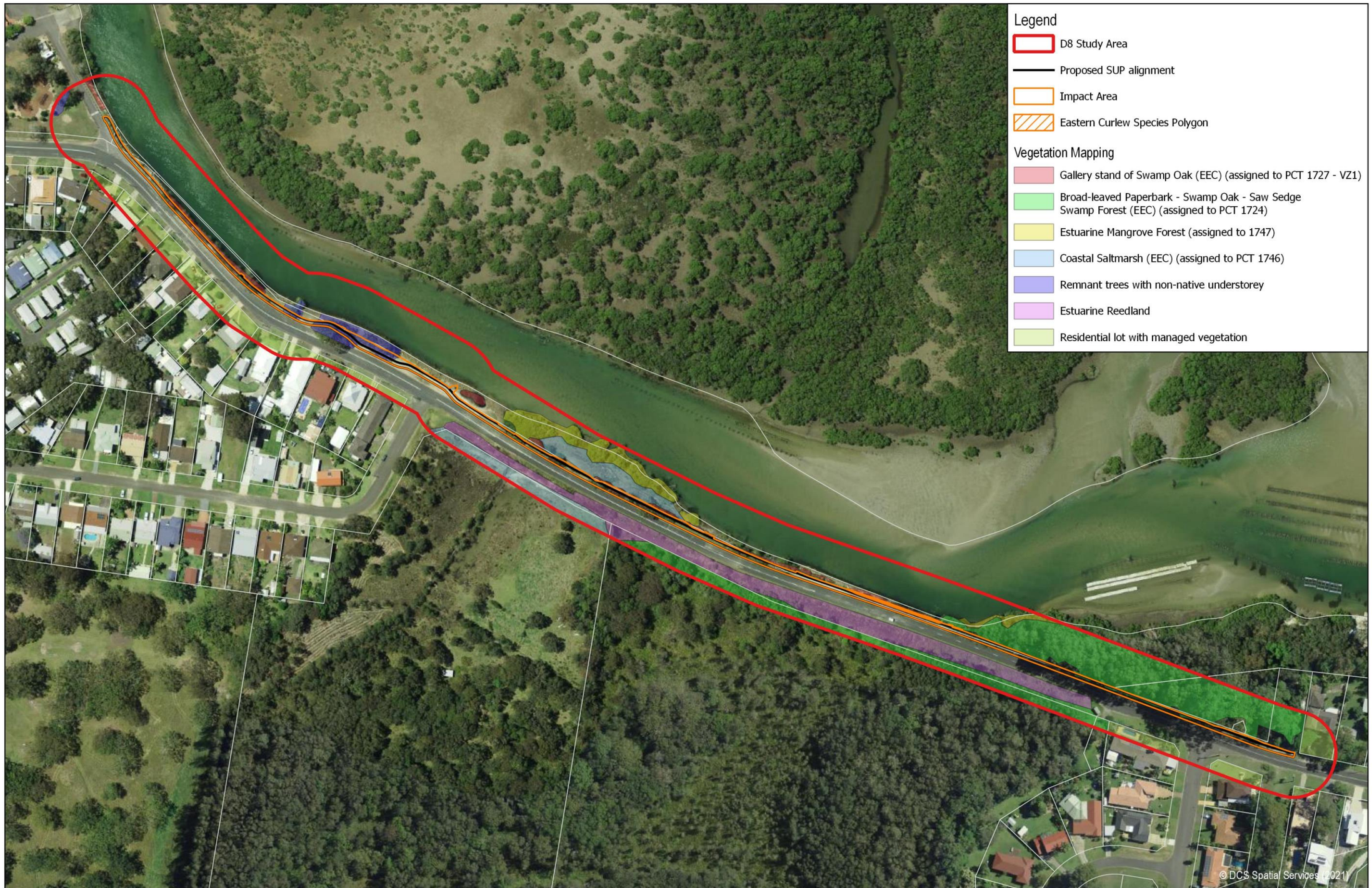
Title: Section D5 - Eastern Curlew

0 20 40 60 80 m

Scale 1:750 (A3)

N

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Bea



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Client: Port Macquarie - Hastings Council

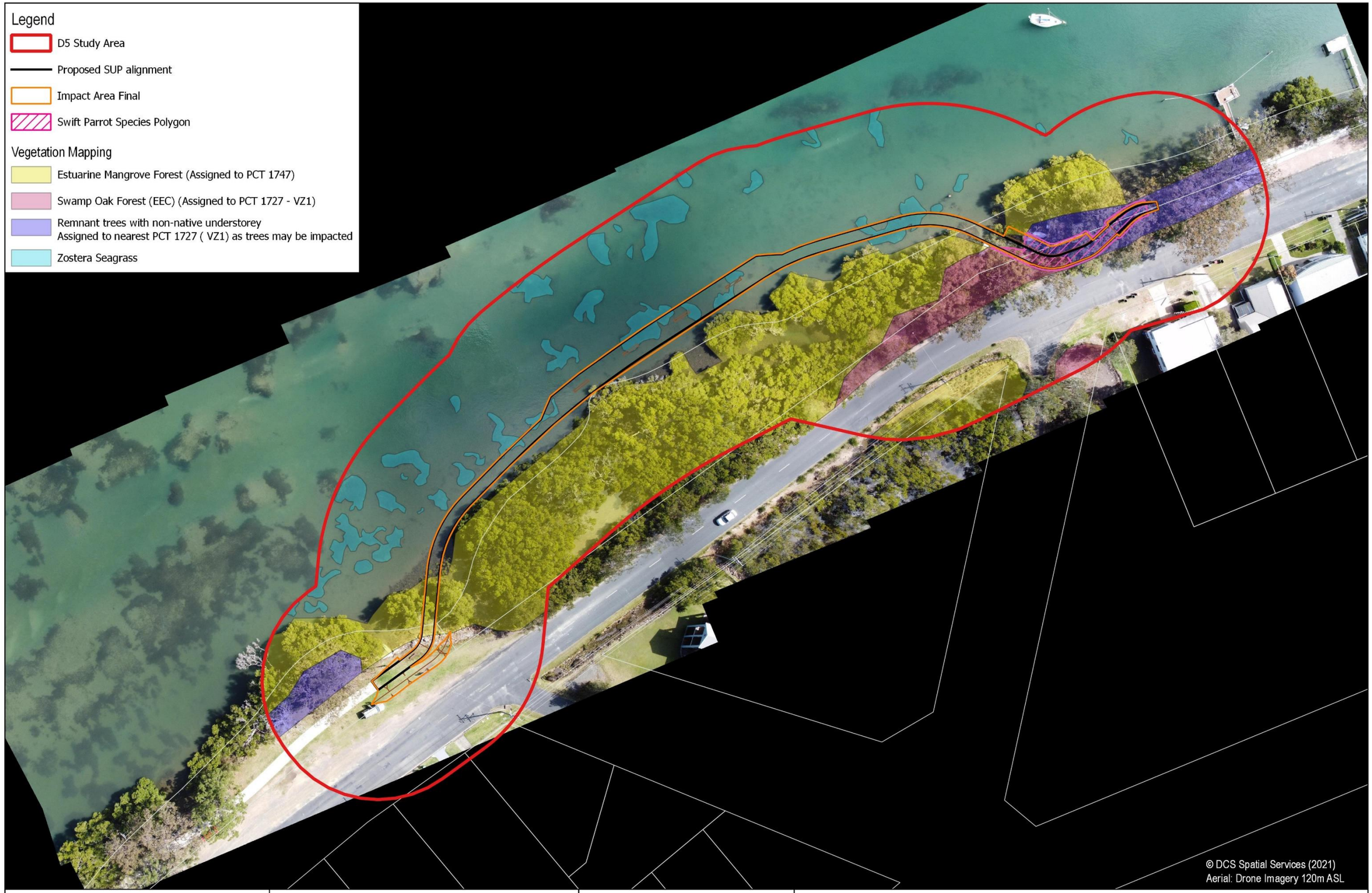
Title: Section D8 -
Eastern Curlew Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D5 - Swift Parrot

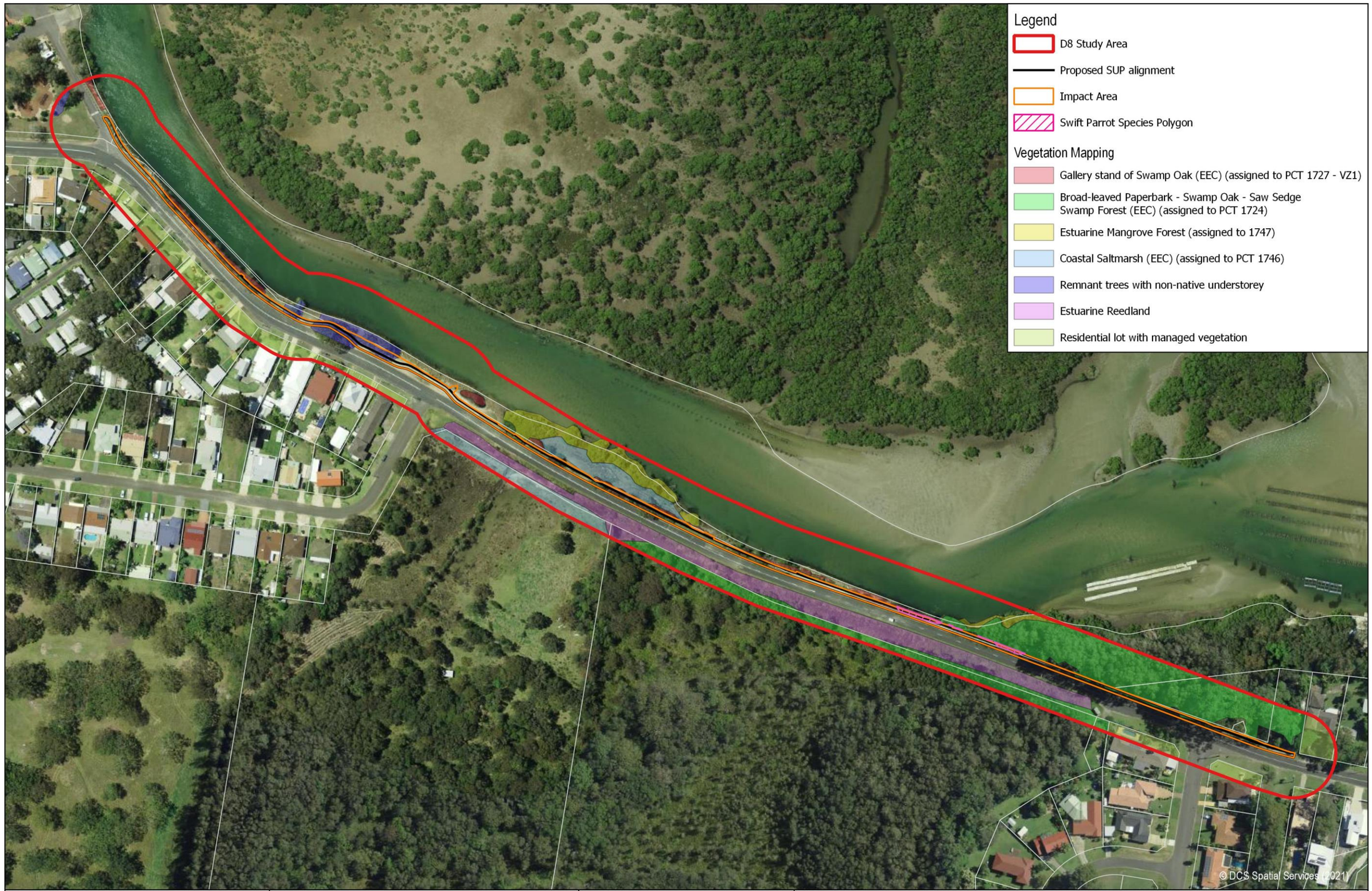
0 20 40 60 80 m

Scale 1:750 (A3)

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Client: Port Macquarie - Hastings Council

Title: Section D8 -
Swift Parrot Species Polygon

0 50 100 150 200 m

N

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Client: Port Macquarie - Hastings Council

Title: Section D10a -
Swift Parrot Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

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Client: Port Macquarie - Hastings Council

Title: Section D10b -
Swft Parrot Species Polygon

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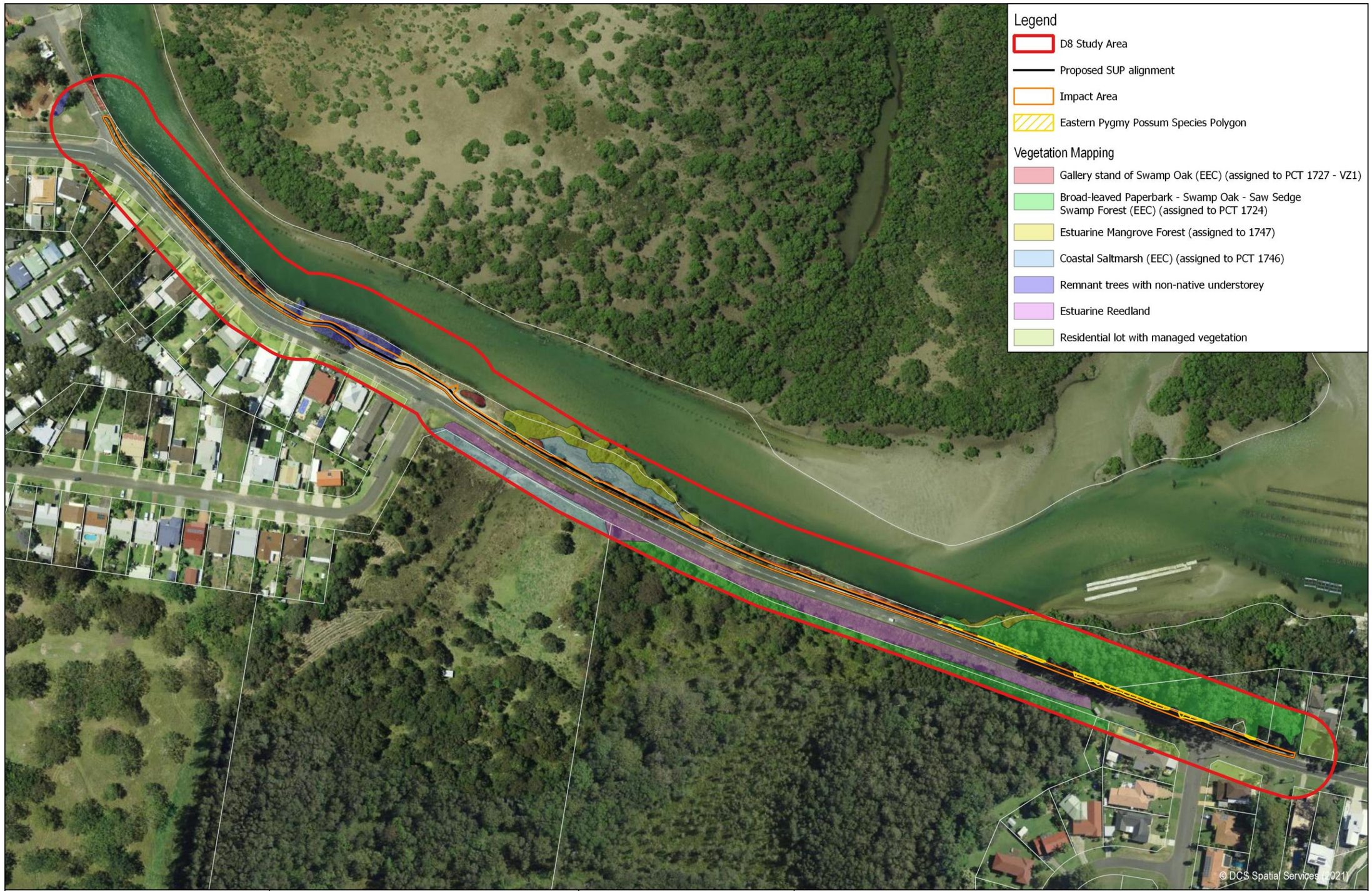
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Scale 1:2000 (A3)



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Client: Port Macquarie - Hastings Council

Title: Section D8 -
Eastern Pygmy Possum Species Polygon

0 50 100 150 200 m

N

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Client: Port Macquarie - Hastings Council

Title: Section D10a -
Eastern Pygmy Possum Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

N



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Client: Port Macquarie - Hastings Council

Title: Section D10b -
Eastern Pygmy Possum Species Polygon

0 50 100 150 200 m

N

Scale 1:2000 (A3)

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Client: Port Macquarie - Hastings Council

Title: Section D11 -
Eastern Pygmy Possum Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

N



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D11 -
Green-thighed Frog Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

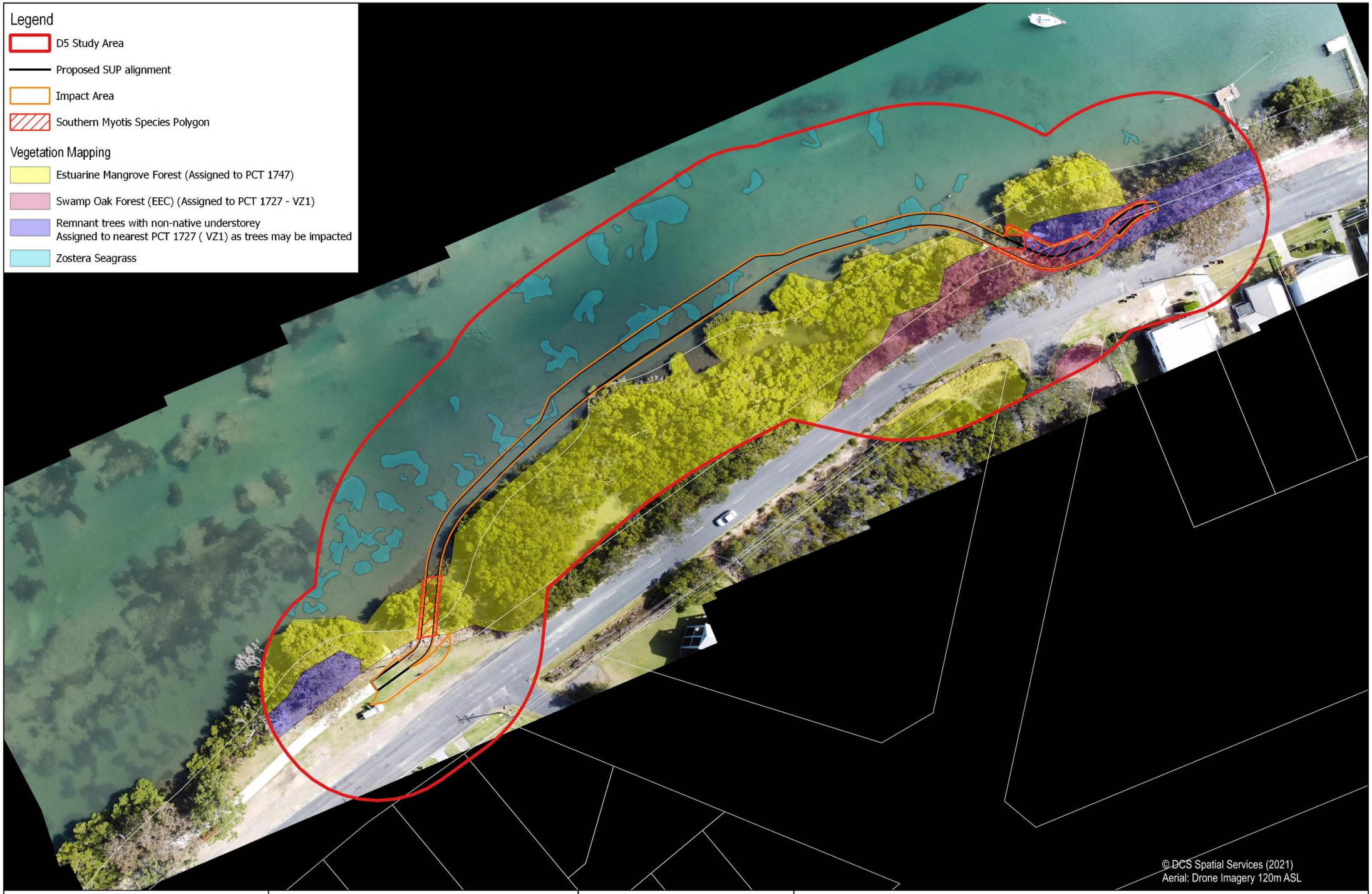
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accuplan Level 1, Building Q Head Street, Forster (02)6555 5522 www.accuplan.com.au	Project: Camden Head - Beach to Beach Shared User Path Client: Port Macquarie - Hastings Council	Title: Section D11 - Grey-headed Flying Fox Species Polygon	0 50 100 150 200 m Scale 1:2000 (A3) N



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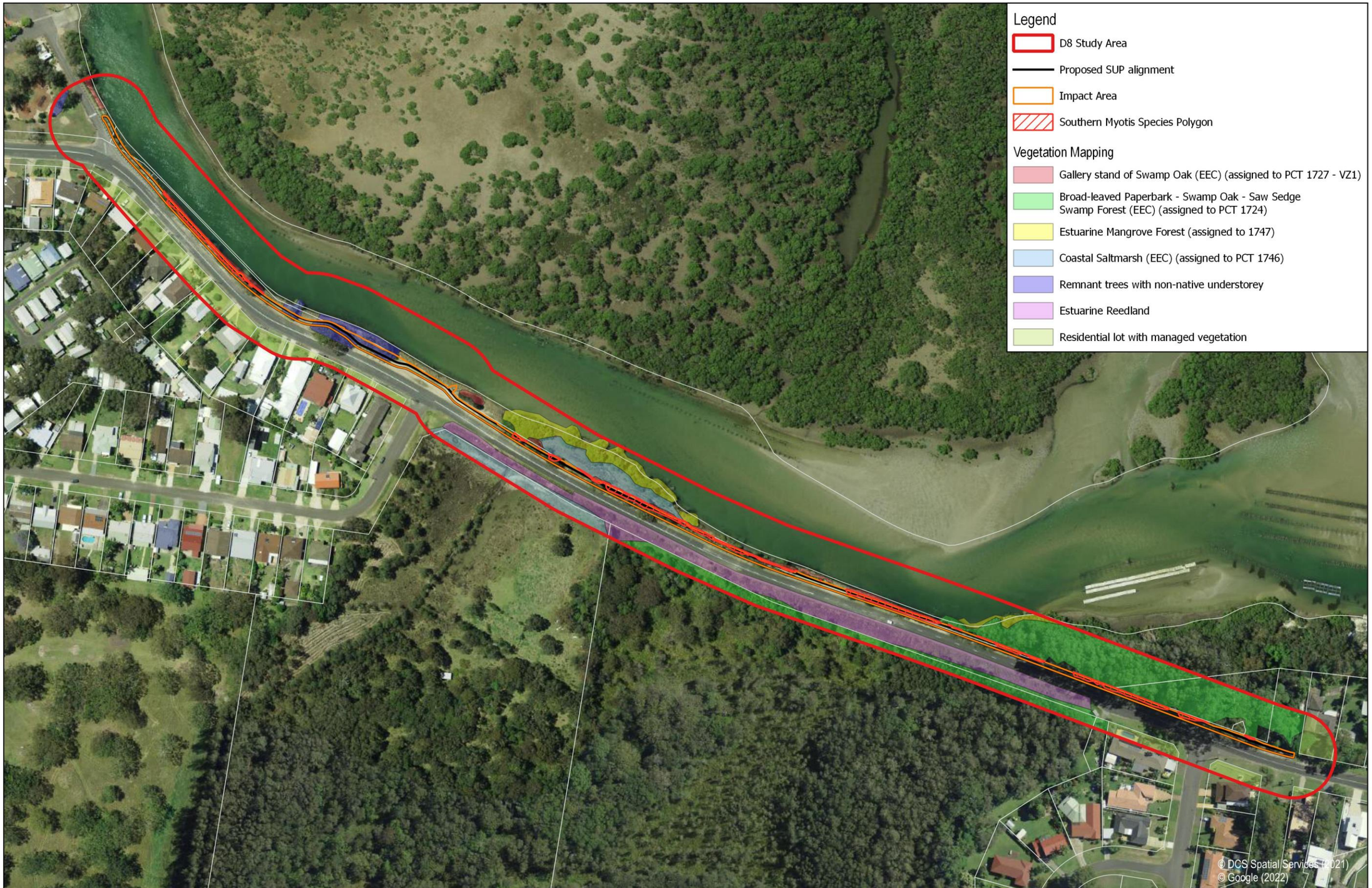
Client: Port Macquarie - Hastings Council

Title: Section D5
Southern Myotis Species Polygon

0 20 40 60 80 m

Scale 1:750 (A3)

N



accuplan Level 1, Building Q Head Street, Forster (02)6555 5522 www.accuplan.com.au	Project: Camden Head - Beach to Beach Shared User Path Client: Port Macquarie - Hastings Council	Title: Section D8 - Southern Myotis Species Polygon	0 50 100 150 200 m Scale 1:2000 (A3) N



accuplan Level 1, Building Q Head Street, Forster (02)6555 5522 www.accuplan.com.au	Project: Camden Head - Beach to Beach Shared User Path Client: Port Macquarie - Hastings Council	Title: Section D10a - Southern Myotis Species Polygon	0 50 100 150 200 m Scale 1:2000 (A3) N



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Project: Camden Head - Beach to Beach Shared User Path

Client: Port Macquarie - Hastings Council

Title: Section D11 -
Southern Myotis Species Polygon

0 50 100 150 200 m

Scale 1:2000 (A3)

N

Appendix IX

Wildlife Camera Survey Results

Wildlife Camera No. 1 – Section D3 (Swamp Oak Forest adjacent to Estuarine Mangrove Forest)

Species	1st Recorded
Rattus sp.	11/08/2021
Bandicoot sp.	11/08/2021

Total Files	Total Trap Nights	Notes
1022	1	Last Recording - 11/08/2021 - Photos corrupt during first night
		Total Trap Nights < 1



Bandicoot sp. recorded at WC 1

Wildlife Camera No. 2 – Section D10 (PCT 1536 -VZ1)

Species	1st Recorded
Brushtail Possum	12/08/2021
Rattus sp.	13/08/2021
Red-necked Wallaby	1/09/2021

Total Files	Total Trap Nights	Notes
142	29	Last Recording - 8/09/2021
		Total Trap Nights 1 trap night





Brushtail Possum and unidentified rats recorded at WC 2.

Wildlife Camera No. 3 – Section D11 (Boundary between PCT 1536 -VZ1 and PCT 1727 VZ2)

Species	1st Recorded
Rattus sp.	12/08/2021
Red-necked Wallaby	12/08/2021
Brushtail Possum	14/08/2021
Ringtail Possum	17/08/2021
Bandicoot sp.	19/08/2021
Lace Monitor	20/08/2021
Echidna	27/08/2021

Total Files	Total Trap Nights	Notes
683	29	Last Recording - 9/09/2021
		Total Trap Nights = 29



Echidna recorded at WC 3 (Note: Camera date is incorrect)



Ringtail Possum recorded at WC 3 (Note: Camera date is incorrect)

Wildlife Camera No. 4 – Section D11 (Boundary between PCT 1536 -VZ1 and PCT 1727 VZ2)

Species	1st Recorded
Rattus sp.	11/08/2021
Echidna	11/08/2021
Bandicoot sp.	14/08/2021
Little Wattlebird	14/08/2021
Brushtail Possum	14/08/2021
Whipbird	15/08/2021
Red-necked Wallaby	21/08/2021
Variegated Fairy Wren	25/08/2021
Bar-shouldered Dove	29/08/2021
Lace Monitor	31/08/2021

Total Files	Total Trap Nights	Notes
2853	29	Last Recording - 8/09/2021
		Total Trap Nights = 29



Bandicoot sp. recorded at WC 4



Pair of Bar-shouldered Doves recorded at WC 4



Echidna recorded at WC 4



Lace Monitor recorded at WC 4



Rattus sp. recorded at WC 4



Red-necked Wallaby recorded at WC 4.

Appendix X

BDAR Checklist

Table 24: Minimum information requirements for the Biodiversity Development Assessment Report and the Biodiversity Certification Assessment Report – Stage 1: Biodiversity assessment

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
Introduction	***Chapters 2 and 3***	Section 1.1, Section 1.5, Section 3.3	**INFORMATION** Introduction to the biodiversity assessment including: ☑ Brief description of the proposal ☑ Identification of subject land[1] boundary, including: ☑ Operational footprint (if BDAR) ☑ Construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR) ☐ Land proposed for biodiversity certification (if BCAR) ☑ General description of the subject land ☑ Sources of information used in the assessment, including reports and spatial data		
		Section 1.1 & Section 3.3	**MAPS AND TABLES (in document)** ☑ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)		
			DATA (to be supplied) – N/A		
Landscape Context	***Sections 3.1 and 3.2, Appendix E***	Section 2 - Table 2.1	**INFORMATION** Identification of site context components and landscape features, including: ☑ General description of subject land topographic and hydrological setting, geology and soils ☑ Percent native vegetation cover in the assessment area (as described in BAM Section 3.2) ☑ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.)) ☑ Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E) ☑ Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.)) ☑ Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.)) ☑ Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.) ☑ Areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM Subsection 3.1.3(8–9.)) ☑ Any additional landscape features identified in any SEARs for the proposal ☑ NSW (Mitchell) landscape on which the subject land occurs		
		Section 1.1, Section 2	**MAPS and TABLES (in document)** ☑ Site Map ☑ Boundary of subject land ☑ Cadastre of subject land ☑ Landscape features identified in BAM Subsection 3.1.3 ☑ Location Map		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☑ Digital aerial photography at 1:1,000 scale or finer ☑ Boundary of subject land ☑ Assessment area, (i.e., the subject land and either 1500m buffer area *or* 500m buffer for linear development ☑ Landscape features identified in BAM Subsection 3.1.3 ☑ Additional detail (e.g., local government area boundaries) relevant at this scale ☑ Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: ☑ IBRA bioregions and subregions ☑ Rivers, streams and estuaries ☑ Wetlands and important wetlands ☑ Connectivity of different areas of habitat ☑ Karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ☑ Areas of outstanding biodiversity value occurring on the subject land and assessment area ☑ Any additional landscape features identified in any SEARs for the proposal ☑ NSW (Mitchell) Landscape		
			DATA (to be supplied) ☑ All report maps as separate jpeg files Individual digital shape files of: ☑ Subject land boundary ☑ Assessment area (i.e., subject land and 1500m buffer area) boundary ☑ Cadastral boundary of subject land ☑ Areas of native vegetation cover ☑ Landscape features		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
Native Vegetation	***Chapter 4, Appendix A and Appendix H***	Section 3, Figures 3.1-3.6, Section 3.3.1, Section 3.2, Section 3.2.1, Section 3.3, Section 3.4,	**INFORMATION** ☑ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1-3) and Subsection 4.1.1) ☑ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2) ☑ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1) ☑ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2 ☐ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A) For each PCT within the subject land, describe: ☑ Vegetation class ☑ Extent (ha) within subject land ☑ Evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1-3)) ☑ Plant species relied upon for identification of the PCT and relative abundance of each species ☑ If relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1-2)) ☑ Estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5)) Describe the vegetation integrity assessment of the subject land, including: ☑ Identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1) ☑ Assessment of patch size (as described in BAM Subsection 4.3.2) ☑ Survey effort (i.e., number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1-2) ☑ Use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5)) Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5) and BAM Appendix A): ☐ Identify the PCT or vegetation class for which local benchmark data will be applied		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☐ Identify published sources of local benchmark data (if benchmarks obtained from published sources) ☐ Describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) ☐ Provide justification for use of local data rather than BioNet Vegetation Classification benchmark values ☐ Provide written confirmation from the decision-maker that they support the use of local benchmark data		
		Section 3 – Figures 3.1-3.6 Appendix 5 Table 3.1 Table 3.4.2,	**MAPS and TABLES (in document)** ☑ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2) ☑ Map of PCTs within the subject land (as described in BAM Section 4.2(1.)) ☑ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1) ☑ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries ☑ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha) ☐ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2) ***– N/A – >100 hectare patch size applies to all vegetation zones.*** Table of current vegetation integrity scores of each vegetation zone within the site and including: ☑ Composition condition score ☑ Structure condition score ☑ Function condition score ☑ Presence of hollow bearing trees		
			DATA (to be supplied) ☑ All report maps as separate jpeg files ☑ Plot field data (MS Excel format) ☑ Plot field data sheets Digital shape files of: ☑ PCT boundaries within subject land ☑ TEC boundaries within subject land ☑ Vegetation zone boundaries within subject land ☑ Floristic vegetation survey and vegetation integrity plot locations		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
Threatened Species	***Chapter 5***	Section 5.1 Section 5.2 – Table 5.2-5.3 Section 5.2.2 Section 1.4 Section 5.2.3 Table 8.2	**INFORMATION** Identify ecosystem credit species likely to occur on the subject land, including: ☑ List of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) ☐ Justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) ☑ Justification for addition of any ecosystem credit species to the list Identify species credit species likely to occur on the subject land, including: ☑ List of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) ☑ Justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) ☑ Justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) ☑ Justification for addition of any species credit species to the list From the list of candidate species credit species, identify: ☑ Species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) ☑ Species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) ☑ Species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) ☐ Species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.)) Present the outcomes of species credit species assessments from: ☑ Threatened species survey (as described in BAM Section 5.2.4) ☐ Expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3) Where survey has been undertaken include detailed information on: ☑ Survey method and effort, (as described in BAM Section 5.3)		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☐ Justification of survey method and effort (e.g., citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published ☑ Timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys ☑ Survey personnel and relevant experience ☑ Describe any limitations to surveys and how these were addressed/overcome Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: ☐ Justification of the use of an expert report ☐ Identify the expert, provide evidence of their expert credentials and Departmental approval of expert status ☐ All requirements of Box 3 have been addressed in the expert report Where use of local data is proposed (BAM Subsection 1.4.2): ☐ Identify relevant species ☐ Identify data to be amended ☐ Identify source of information for local data, e.g., published literature, additional survey data, etc. ☐ Justify use of local data in preference to VIS Classification or TBDC data ☐ Provide written confirmation from the decision-maker that they support the use of local data Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: ☑ The unit of measure for each species is documented For species assessed by area: ☑ The polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) ☑ A description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied For species assessed by counts of individuals: ☐ The number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) ☐ The method used to derive this number (i.e., threatened species survey or expert report) and		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			evidence-based justification for the approach taken ☐ The polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land ☑ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)		
		Table 5.1 Table 5.2 Table 5.3 Table 8.2 Appendix VIII	**MAPS and TABLES (in document)** ☑ Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: ☐ The ecosystem credit species removed from the list (N/A – None excluded) ☑ The sensitivity to gain class of each species ☑ Table detailing species credit species in accordance with BAM section 5.2 and identifying: ☑ The species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present ☑ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map ☑ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4) ☑ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM Subsection 5.2.5)		
			DATA (to be supplied) ☑ Digital shape files of suitable habitat identified for survey for each candidate species credit species ☑ Survey locations including GPS coordinates of any plots, transects, grids ☑ Digital shape files of each species polygon including GPS coordinates of located individuals ☑ Species polygon map in jpeg format ☐ Expert reports and any supporting data used to support conclusions of the expert report ☑ Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc.		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
Prescribed Impacts	***Chapter 6***	Section 6.5	**INFORMATION** Identify potential prescribed biodiversity impacts on threatened entities, including: ☑ Karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) ☑ Occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) ☑ Corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) ☑ Water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) ☑ Protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) ☑ Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6) ☐ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts **– N/A** ☐ Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3) **– N/A** Where the proposed development is for a wind farm: ☐ Identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5) ☐ Provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.) ☐ Predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))		
			MAPS and TABLES (in document) ☐ Map showing location of any prescribed impact features (i.e., karst, caves, crevices, cliffs, rocks, human-made structures, etc.) **– N/A** ☐ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			for threatened aerial species resident on the site (for wind farm developments only) **– N/A**		
			DATA (to be supplied) ☐ Digital shape files of prescribed impact feature locations ☐ Prescribed impact features map in jpeg format		

Table 25: Minimum information requirements for the BDAR or BCAR – Stage 2: Impact Assessment (biodiversity values)

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
Avoid and Minimise Impacts	***Chapter 7***	Section 6.1	**INFORMATION** Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: ☑ Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology ☑ Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route ☑ Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location ☑ Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site ☑ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Sections 7.1 and 7.2) ☑ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Section 7.2.1(3.))		
		Section 6.1 Figures 3.1-3.6	**MAPS AND TABLES (in document)** ☑ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility ☑ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation ☑ Maps demonstrating indirect impact zones where applicable – 0.5m buffer applied to account for indirect impacts		
			DATA (to be supplied) Digital shape files of: ☑ Alternative and final proposal footprint – **Alternative proposal footprints provided in jpeg** ☑ Direct and indirect impact zones ☑Maps in jpeg format		
Assessment of Impacts	***Chapter 8, Sections 8.1 and 8.2***	Section 6.2 Section 6.3 Section 6.5	**INFORMATION** ☑ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1) Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2):		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☑ Description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal ☑ Documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications ☑ Reporting any limitations or assumptions, etc. made during the assessment ☑ Identification of the threatened entities and their habitat likely to be affected Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: Assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: ☑ Karst, caves, crevices, cliffs, rocks and other features of geological significance ☑ Human-made structures ☑ Non-native vegetation ☑ Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range ☑ Movement of threatened species that maintains their life cycle ☑ Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities ☑ Assessment of the impacts of wind turbine strikes on protected animals ☑ Assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC		
		Table 6.3	**MAPS and TABLES (in document)** ☑ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts		
			DATA (to be supplied) – N/A		
Impact Summary	***Chapter 9***	Section 6.4 Section 6.2 Section 3.3.1	**INFORMATION** Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: ☑ Addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land ☑ Addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land ☑ Documenting assumptions made and/or limitations to information ☑ Documenting all sources of data, information, references used or consulted ☑ Clearly justifying why any criteria could not be addressed ☑ Identification of impacts requiring offset in accordance with BAM Section 9.2 ☑ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.) ☑ Identification of areas not requiring assessment in accordance with BAM Section 9.3		
		Appendix V Table 5.6 Figures 3.1-3.6	**MAPS and TABLES (in document)** ☐ Map showing the extent of TECs at risk of an SAII within the subject land **– N/A** ☑ Map showing location of threatened species at risk of an SAII within the subject land Map showing location of: ☑ Impacts requiring offset ☑ Impacts not requiring offset		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☑ Areas not requiring assessment		
			DATA (to be supplied) Digital shape files of: ☐ Extent of TECs at risk of an SAII within the subject land ☑ Location of threatened species at risk of an SAII within the subject land ☑ Boundary of impacts requiring offset ☑ Boundary of impacts not requiring offset ☑ Boundary of areas not requiring assessment ☑ Maps in jpeg format		
Impact Summary	***Chapter 10***	Section 3.4 Section 8.1 Section 8.2	**INFORMATION** Ecosystem credits and species credits that measure the impact of the development of biodiversity values, including: ☑ Future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☑ Change in vegetation integrity score (BAM Subsection 8.1.1) ☑ Number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM Subsection 9) ☑ Number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM Subsection 10.1.3)		
		Table 8.1 Table 8.2	**MAPS and TABLES (in document)** ☑ Table of PCTs requiring offset and the number of ecosystem credits required ☑ Table of threatened species requiring offset and the number of species credits required		
			DATA (to be supplied) ☑ Submitted proposal in the BAM Calculator		
Biodiversity Credit Report	***Chapter 10***	Appendix IV	**INFORMATION** ☑ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)		
		Appendix IV	**MAPS and TABLES (in document)** ☑ Table of credit class and matching credit profile		
		Appendix IV	**DATA (to be supplied)** ☑ BAM credit report in pdf format		
Biodiversity certification offsets and strategy (biodiversity certification only)	***Chapter 12 and Appendix J***		**INFORMATION** Land-based conservation measures including (strategic biodiversity certification only): ☐ Identification of parcels subject to land-based conservation measures ☐ Identification of land-based conservation measures proposed for each parcel ☐ Supporting information to demonstrate suitability of land-based conservation measures (Appendix J) ☐ Credit score of land-based conservation measures (Appendix J) Biodiversity certification strategy including: ☐ Land proposed for biodiversity certification ☐ Land proposed for biodiversity conservation ☐ Proposed conservation measures ☐ Legal mechanisms for securing delivery of proposed conservation measures		

Report Section	BAM ref.	Report ref.	Information	Maps & tables (in document)	Data (to be supplied)
			☐ Parties to the biodiversity certification and responsibilities, noting where biodiversity certification agreements are proposed ☐ Timing for delivery of conservation measures ☐ Funding sources for delivery of conservation measures ☐ Framework for monitoring, reporting or auditing implementation of conservation measures		
			MAPS and TABLES (in document) ☐ Maps of parcels of land proposed for land-based conservation measures ☐ Maps as per Appendix M as required in relation to any land-based conservation measures ☐ Tables as per Appendix M as required in relation to any land-based conservation measures ☐ Table of credit scores for land-based conservation measures, including scores produced by BAM and weighting adjusted scores as per Appendix J		
			DATA (to be supplied) ☐ Digital shape files of parcels of land proposed for land-based conservation measures ☐ Maps in jpeg format		

Appendix E

Aboriginal Cultural Heritage Assessment Report

Report

Beach to Beach Shared Pathway
Dunbogan to Pilot Beach

Aboriginal Cultural Heritage Assessment

LGA: Port Macquarie-Hastings Council

31 May, 2021
Rev 2 (Final)

advitech.com.au

Report Details

Beach to Beach Shared Pathway - Aboriginal Cultural Heritage Assessment

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History

Date	Revision	Comments
15 February, 2021	A	Draft
13 April, 2021	B	Draft
24 April, 2021	C	Peer review
26 April, 2021	0	Draft Issue for Client Review
28 April, 2021	1	Draft Issue for RAP Review
31 May, 2021	2	Final

Endorsements

Function	Signature	Name and Title	Date
Prepared by		Jake Brown Archaeologist	31 May, 2021
Authorised for Release by		Dr Rod Bennison Lead Environmental Scientist	31 May, 2021
Peer reviewed by		Viki Gordon Senior Archaeologist	24 April, 2021

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EXECUTIVE SUMMARY

Advitech Pty Limited (trading as Advitech Environmental) was engaged by KBR on behalf of Port Macquarie-Hastings Council to undertake an Aboriginal Cultural Heritage Assessment Report for the proposed Beach to Beach shared pathway at Camden Head and Dunbogan (the project).

The project aims to create a shared user path (SUP) along the banks of the local Camden Haven River system at Camden Head. The path will complete a 11km scenic route of uninterrupted shared pathway from North Haven traversing through Laurieton and Dunbogan, while terminating at Pilot Beach in Camden Head. The assessment focuses on sections D3, D5, D8, D10 and D11 of the pathway.

The site survey was undertaken on Tuesday 20 April 2021. Based on the field survey, background research and the environmental context, the area when undisturbed would have provided a possible transitory location for Aboriginal people. The lack of nearby fresh water would have limited occupation. Oral history, given by the officers of the Bunyah LALC, reveals that Aboriginal shell middens were considered once common in the area. No stone artefacts, hearths or other evidence of extended occupation were found during the site survey. This provides a connection to transitory and hunting activities in the area. Given the historical disturbance to the area through road construction, residential development flooding and land reformation many sections of the study area have been highly disturbed. Shell is also a common natural feature due to oyster farming, the adjoining Pacific Ocean and tidal movements. The recent March 2021 floods would also have had an impact on some of the low lying areas that were investigated. The marsh/swamp areas of the project area, though likely to have a naturally higher level of shell, would be impacted through a boardwalk construction. Any impacts would be minimised through pier construction. The remainder areas proposed for the construction of pavement, retaining walls or boardwalks are within highly disturbed areas unlikely to contain evidence of Aboriginal occupation due to steep slopes or natural erosion.

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1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by KBR on behalf of Port Macquarie-Hastings Council to undertake an Aboriginal Cultural Heritage Assessment Report for the proposed Beach to Beach shared pathway at Camden Head and Dunbogan.

It should be noted that this report was prepared by Advitech Pty Limited for KBR ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Purpose of Report

The purpose of this Aboriginal Cultural Heritage Assessment Report (ACHAR) is to consult the Aboriginal community to understand the cultural heritage values that exist in the development area.

Advice from the Biodiversity and Conservation Division in 2019 referenced Aboriginal Cultural Heritage through Secretary's Environmental Assessment Requirements (SEARS). The SEARs included:

1. A description of Aboriginal objects and declared Aboriginal places located within the area of the proposal;
2. A description of cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposal, and the significance of these values for the Aboriginal people who have a cultural association with the land;
3. A description of any consultation with Aboriginal people regarding the proposal and the significance of any Aboriginal cultural heritage values identified through that consultation. The Biodiversity and Conservation Division advises that the proponent may utilise the former OEH's *Aboriginal Consultation Requirements for Proponents 2010* as best practice guidelines for such consultation (these requirements much be followed if the proposal requires an Aboriginal Heritage Impact Permit or the Aboriginal heritage assessment requires archaeological testing);
4. The views of those Aboriginal people regarding the likely impact of the proposal on their cultural heritage. If any submissions have been received as part of the consultation requirements, then the report must include a copy of each submission and your response;
5. A description of the actual or likely harm imposed to the Aboriginal objects or declared Aboriginal places from the proposal, with reference to the cultural heritage values identified;
6. A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise harm).

1.2 The Proposed Activity

The Beach to Beach project aims to create a shared user path (SUP) along the banks of the local Camden Haven River system through Camden Head. The path will complete a 11km scenic route of uninterrupted shared pathway from North Haven traversing through Laurieton and Dunbogan, while terminating at Pilot Beach in Camden Head. The assessment focuses on sections D3, D5, D8, D10 and D11 of the pathway. See **Appendix IV** for plans.

1.3 Investigators and Contributors

Jake Brown, Archaeologist, has four years of experience in Aboriginal archaeological assessments, research, reporting, analysis and consultation. This experience has included cataloguing stone artefacts from the Hunter region, conducting field surveys, test excavations and monitoring of potential find sites during surface/subsurface disturbance across Queensland, NSW and ACT. Jake's educational qualifications include a Bachelor of Social Science (Hons) in Sociology and Anthropology, University of Newcastle 2015, and a Graduate Certificate of Archaeology from Flinders University 2017 and a Master of Environmental Management and Sustainability University of Newcastle 2020. Jake is a member of the Australian Archaeological Association and the Australasian Society of Historical Archaeology. Jake Brown prepared the report, participated in the field activities and community consultation.

Viki Gordon, Senior Archaeologist has over 12 years of experience in Aboriginal archaeological assessments, excavation, research, reporting, analysis and consultation. She also has over 6 years of experience in historical archaeological assessments, excavations, research and reporting. Viki has spent time in remote communities in Arnhem Land and the Northern Territory learning from Aboriginal Elders and communities about traditional and modern Aboriginal culture, tool making, rock art and bush resources. Viki's educational qualifications include a BA (Ancient History), Macquarie University, 2009, Grad. Dip. Archaeology, Flinders University 2013, 'Drawing artefacts' intensive course (Museum of Antiquity, Macquarie University), 'The Archaeology of Stone' intensive course (Dr. Alice Gorman), Flinders University, 'Human Osteology' intensive course (Dr. Keryn Walshe), South Australian Museum, 'Aboriginal Heritage Impact Permits' short course, OEH Sydney, Heritage Advisor Training and Workshop, OEH Sydney and Advanced Lithics short course (Dr. Peter Hiscock), Sydney University. Viki is a member of the Australian Archaeological Association, the Australia Society of Historical Archaeologists and the World Archaeological Congress. Viki is also a qualified property conveyancer with over 20 years of experience in property laws, title searching, contracts and related negotiations. Viki provided a review of this report and participated in the survey.

Dr Rod Bennison is an environmental specialist with over 20 years of experience (over 15 in a consulting environment). Rod has diverse expertise in construction management and social research and is responsible for managing construction projects, community liaison and public relations strategies and services, and environmental and social impact assessments. Rod manages and coordinates the provision of environmental and community relations services, including environmental planning, acoustics and air quality assessments, archaeological and ecological services. A biogeographer, ecologist and animal ethicist by profession, he is a certified Biodiversity Assessment Method Assessor (BAAS 19023) and contributes to the effective implementation of the BDAR. Dr Rod Bennison directed the project and provided general project oversight, quality assurance and financial management. He provided a review of this report and leads the environmental team at Advitech.

The Aboriginal community members who attended the site survey were Raymond Donovan and Trevor Roberts representing Bunyah Local Aboriginal Land Council.



Figure 1: Beach to Beach Location

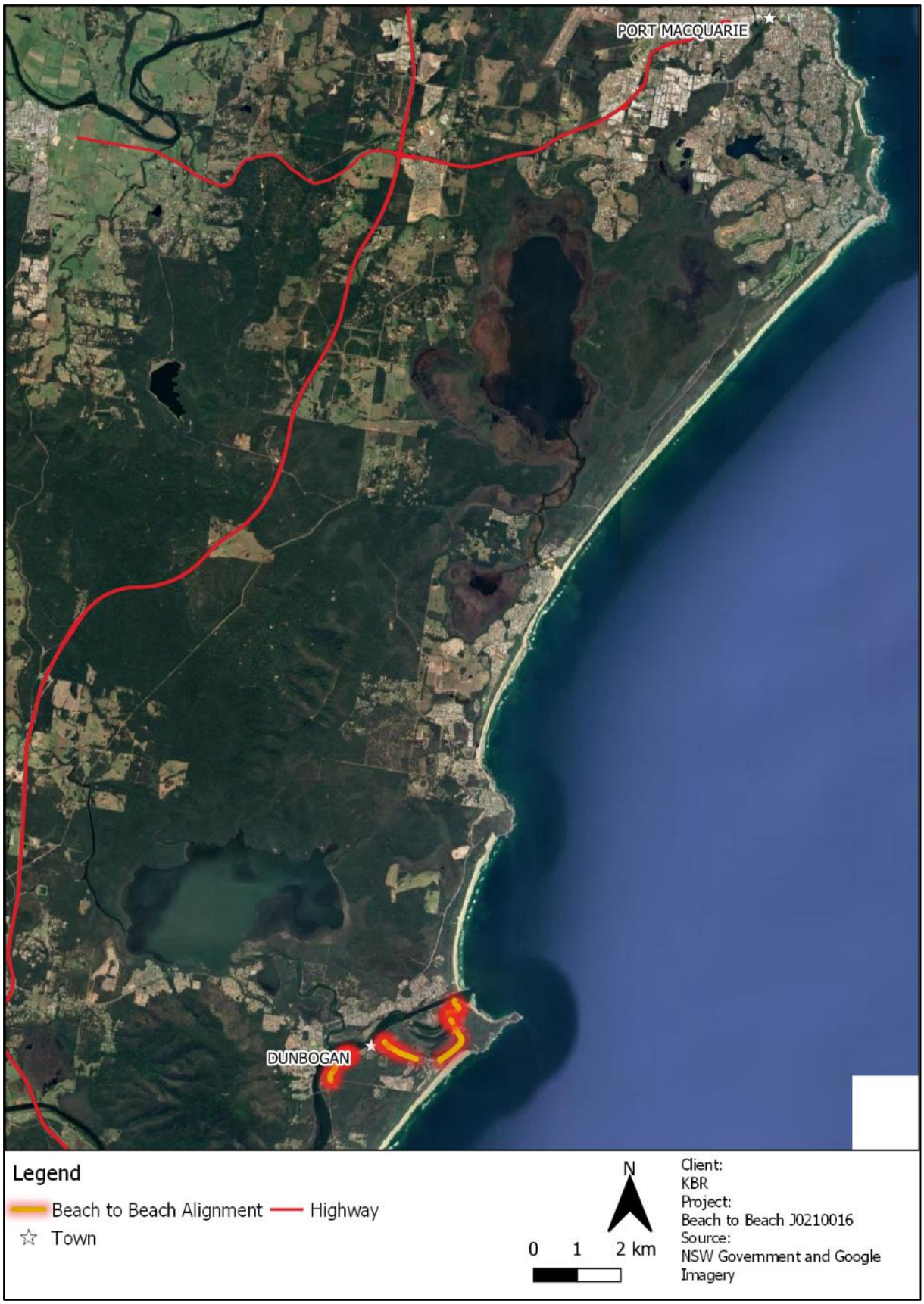


Figure 2: Beach to Beach Regional Location

1.4 Legislation and Statutory Obligations

All work described in this report was carried out in accordance with the following legislation:

- *National Parks and Wildlife Act, 1974* (NPW Act);
- *National Parks and Wildlife Amendment Regulation*, 2009 (NPW Regulation);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) insofar as this relates to the assessment; and
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) insofar as this relates to the assessment.

Under the NPW Act, it is an offence to harm an Aboriginal object whether or not a person knows it is an Aboriginal object. Property owners, developers and land managers are required to consider their proposed activities, and whether any harm may occur to Aboriginal objects and places under several pieces of legislation. The NPW Act is administered by the Department of Planning, Industry and Environment (DPIE) and is the primary legislation for the protection of Aboriginal cultural heritage in New South Wales. Under Part 6 of the Act, it is an offence to knowingly harm or desecrate an Aboriginal object or Aboriginal place. If harm to an object or place is anticipated, an Aboriginal Heritage Impact Permit (AHIP) must be applied for and Heritage NSW may issue an AHIP under s90 of the Act.

The following legislation also relates to the protection of Aboriginal Heritage:

Environmental Planning and Assessment Act 1979 (EPA Act)
The potential impacts of a development on Aboriginal heritage are a key component of the environmental impact assessment process under the EPA Act. In NSW, the EPA Act is the principal law overseeing the assessment and determination of development proposals which are considered under the Act.

Heritage Act 1977 (NSW) (the Heritage Act)
The Heritage Act protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. While Aboriginal heritage sites and objects are protected primarily by the NPW Act 1974, if an Aboriginal site, object or place is of great significance, it can be protected by a heritage order issued by the Minister on the advice of the Heritage Council.

The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (as amended 1987) (Commonwealth)
The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 protects areas and/or objects which are of significance to Aboriginal people and which are under threat of destruction. A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition.

The Aboriginal Land Rights Act 1983 (NSW)
The NSW Aboriginal Land Rights Act 1983 is administered by the Department of Human Services: Aboriginal Affairs NSW and establishes the NSW Aboriginal Land Council and local Aboriginal land councils. The Act requires these bodies to take action to protect the culture and heritage of Aboriginal persons in the council's area and promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

The Native Title Act 1993 (Commonwealth)
The Native Title Act 1993 provides the legislative framework to recognise and protect native title, establishes ways in which future dealings affecting native title may proceed and to set standards for those dealings, including providing certain procedural rights for registered native title claimants and native title holders in relation to acts which affect native title.

The Australian Heritage Commission Act 1975 (Commonwealth)
The Australian Heritage Commission Act 1975 established the Australian Heritage Commission, which assesses places to be included in the National Estate and maintains a register of these places, which are significant in terms of their association with particular community or social groups for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

2. LANDSCAPE AND ENVIRONMENTAL CONTEXT

The Beach to Beach SUP development area at Camden Head is located approximately 25kms southwest of Port Macquarie. The assessment is focused on five sections of the development (**Figure 1** and **Figure 2**):

- D3;
- D5;
- D8;
- D10; and
- D11.

The approximate proposed development area is approximately 4 km long. The land zoning includes a mix of residential, environmental, waterways and public recreation including R1, RE1, E1, E2 and W1.

2.1 Topography

The biodiversity subregion is the Manning-Macleay, the characteristic landforms include complex ridges and valleys running to the great escarpment. The character also includes structural controls along fault lines, coastal beaches, lagoons and dune barrier systems reaching their peak at the Myall Lakes (NPWS, 2003, p.177).

The beach to beach project consists of dunes, a lagoon, river flats and wetlands. The dunes can be characterised as a dune system linking Camden Head to Dunbogan. The dune system consists of a berm of variable height (depending on erosion), grading to a broad flat swale, rising to a low fore dune. Gogley's Lagoon, adjacent to the coastal dunes, may be flat and/or very sharply falls down a steep slope to the water's edge. Around the east, it is a high undercut bank, which becomes more gradual sloping to the north, before becoming a steep bank again. In the north is a low sand hill rises, falling moderately to the north and east to the Riverflats area. The Riverflats are low-lying land. Much of this area has been artificially formed and has a complex micro-topography. In the west and northwest, the land is flat and at least sub-tidal over much of its extent. The largest flat area around the breakwall access has a complex mix of depressions, minor billabongs, and micro-undulating sand.

2.2 Hydrology

The Camden Haven estuary consists of two major lakes, Watson Taylor Lake and Queens Lake connected to the ocean by the Inlet of Camden Haven. The Camden Haven and its tributaries drain a 720 km2 catchment (NSW DNR in TierraMar, 2011 p.15). that is mainly undeveloped with 77% covered in native vegetation (DEC 2005), being mostly State Forest, and National Park (PMHC 2008).

The approximate length of the Camden Haven River is 40km. Several major tributaries enter the Camden Haven in the tidal zone (~29km from the mouth) including Queens Lake, Camden Haven River and Gogleys Lagoon (TierraMar, 2011 p.15).

2.3 Geology, Soils and Geomorphology

The geology of Camden Head is detailed in the Kattang Nature Reserve Plan of Management as follows (NPWS 2005):

> "The majority of the reserve comprises the headland referred to as Camden Head. Camden Head is flat to gently undulating, with sheer cliff edges. Camden Head is composed of Triassic sediments (laid down approximately 190-225 million years ago).
>
> Conglomerates form a major part of the lithology of the headland and outcrop towards the eastern end of the plateau and along the shoreline, where interesting colour patterns have resulted from coastal weathering. Progressive periods of sedimentation have formed layers of conglomerate, sandstone and shales. These are seen on the cliffs of the southern aspects of the headland and boulder strewn coastal slopes. As in most sedimentary basins, sediments are progressively finer in the upper layers, with conglomerate as a basal bed, followed by coarse and fine sandstones, shale and mudstone.
>
> Another interesting feature of Camden Head is that the bedrock has been overlain, in part, by Quaternary sand dunes related to wind blown sand from the last glacial period (Pleistocene Period approximately 1 million years ago). It was during this time that the headland, perhaps previously an island, was joined to the mainland. These overlaying dune formations result in different soil fertility and hence a greater diversity of plant species than usual for headlands of the NSW north coast. These sand dunes are presently referred to as the "Flower Bowl", due to the heath communities providing a profusion of wildflowers during the spring"

The dune complex is derived from Aeolian/Barrier landscape forming processes. Typically, deep unconsolidated siliceous Aeolian dune sands overlying Pleistocene barrier sands. Soils typically consist of deep Podzols and Siliceous Sands which rapidly drain to a deep freshwater water table (Atkinson 1999 cited in Darkheart 2010, p.14).

Gogley's Lagoon consists of overlapping and/or overlaying Estuarine soil landscapes. The latter generally consists of deep unconsolidated Holocene estuarine sediments composed of sand, silt, clay and muds, often with shell layers. This soil landscape underlies areas where mangroves and saltmarsh occur, and also at least some if not all of the Swamp Oak on the 'Riverflats' site, where shells were noted in bandicoot excavations. It may also underlay part of the southern Riverflats site where a watercourse reportedly originally flowed by below Camden Head Road. Soils in this landscape consist of deep, very poorly drained, saturated Solonchaks and Calcareous Sands (Atkinson 1999 cited in Darkheart 2010, p.14).

As part of the Lorne Basin, Triassic in origin, the Beach to Beach study area has geomorphic expressions relating to the undulating terrain, with the potential for cliffs (Pratt, 2010).

2.4 Climate

Table 1: BOM Port Macquarie Climate Statistics 1995-2021.

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean max temp (°C)	28.0	27.7	26.5	24.4	21.7	19.5	19.0	20.4	22.7	24.1	25.4	26.9	23.9
Mean minimum temp (°C)	18.5	18.4	17.1	13.9	10.3	8.3	6.4	6.6	9.3	12.1	15.1	17.0	12.8
Mean rainfall (mm)	145.9	167.6	182.3	131.3	104.4	138.2	63.1	60.5	58.8	75.4	139.7	120.6	1385.6

Source: Bureau of Meteorology: Port Macquarie airport 1995-2021.

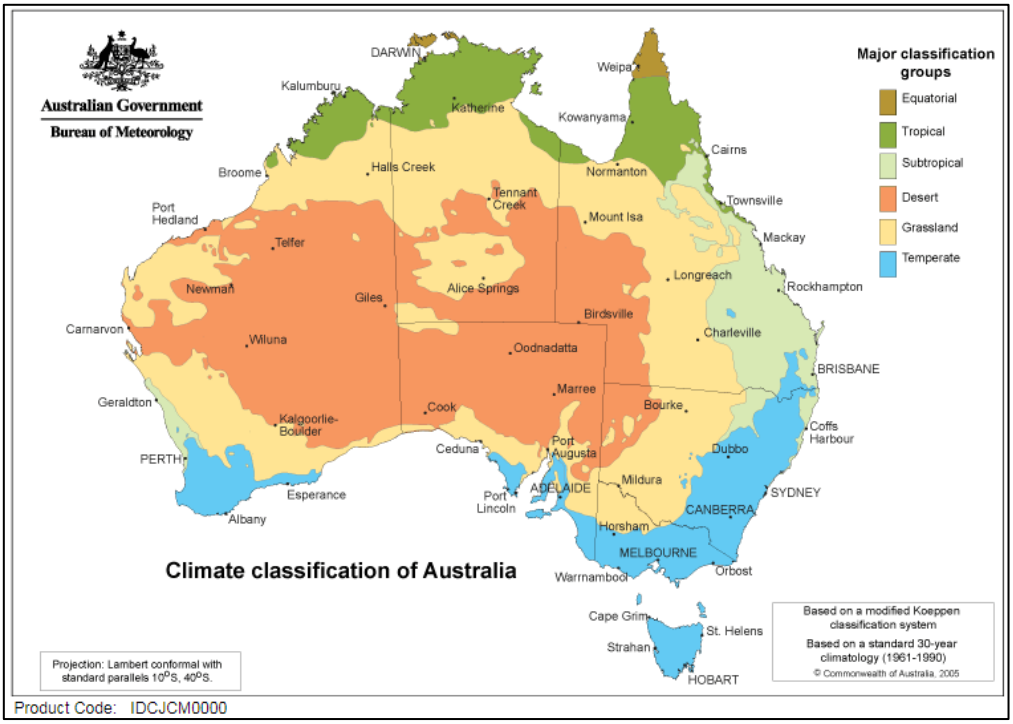


Figure 3: Climate classification map of Australia

2.5 Flora and Fauna

Please refer to the biodiversity assessment report by Accuplan dated 2021 (draft April 2021 for detailed information. Five Endangered Ecological Communities and nine threatened species requiring biodiversity offsets were located in the study area (Accuplan 2021, pp.102-103). The vegetation that previously existed in the study area would have most likely provided habitat for many small mammals, birds and reptiles. Food, water and other resources required for Aboriginal occupation would have most likely been more plentiful on the surrounding coastline as evidenced by the presence of Aboriginal shell middens throughout the study area and region. Implements and utensils from bark, plant, shell and bone would have been made from resources available.

2.6 Landscape history, disturbances and impacts

Settlement of the Camden Haven generally occurred through the 1820's and 1830's associated with the main penal settlement of Port Macquarie. The first permanent European settler in the area occupied land at Laurieton in 1872, and by 1890 the Camden Haven was regarded as one of the main centres of the northern timber industry (DEC 2005 as cited in Darkheart 2010, p.15).

As detailed by DEC (2005 as cited in Darkheart 2010, p.15):

> *"Settlement of the Camden Haven occurred in a piecemeal fashion through the 1820's and 1830's as an outpost of the more structured penal settlement of Port Macquarie. Between 1820 and 1860, the Camden Haven area was important in order to intercept convicts who escaped from Port Macquarie. The towering headland of Perpendicular Point sheltered the area from strong winds and provided a haven for vessels during storms. The area was also visited by limeburners, cedar getters and graziers.*
>
> *The first permanent European settler occupied land at Laurieton (Peach Grove) in 1872. By 1890 the Camden Haven had come to be regarded as one of the strongholds of the northern timber trade, giving employment to "a small army of puntsmen, snaggers, rivermen, lumberers, coasting seamen, sawmill hands, wharf labourers, engineers, teamsters, splitters and shinglers" (Sharp, 1890 in Patterson Britton and Partners, 1999)."*

The region in general was known for logging and pastoral activities in the early settlement period (Heritage Office (HO) and Department of Urban Affairs and Planning (DUAP) 1996, pp.50-69). Later in the 20th century, activities such as tourism and sand mining became important activities for the area.

Prior to construction of the breakwall, the north western area of Pilots Beach was subject to tidal inundation (see **Figure 4**).

2.7 Environmental Context Summary

The environmental context of the study area indicates that the most likely use would have been opportunistic hunting and gathering with potential for short term habitation near suitable potable water. Nearby water sources may have been able to provide access to flora and fauna, as well as potential for drinking water if the salinity was not too high. The topography provides opportunity for ridge lines and crests, although this is outside of the study area and around Camden Head. However, contours indicate that most of the project area is located between 0 – 22m in elevation. The landscape also represents modern infrastructure demands such as; dams, roads, underground and above ground services, landfill and residential development.. The combination of tidal waters, flooding events and a lack of permanent potable water, would have made the study area unsuitable for any long term habitation.

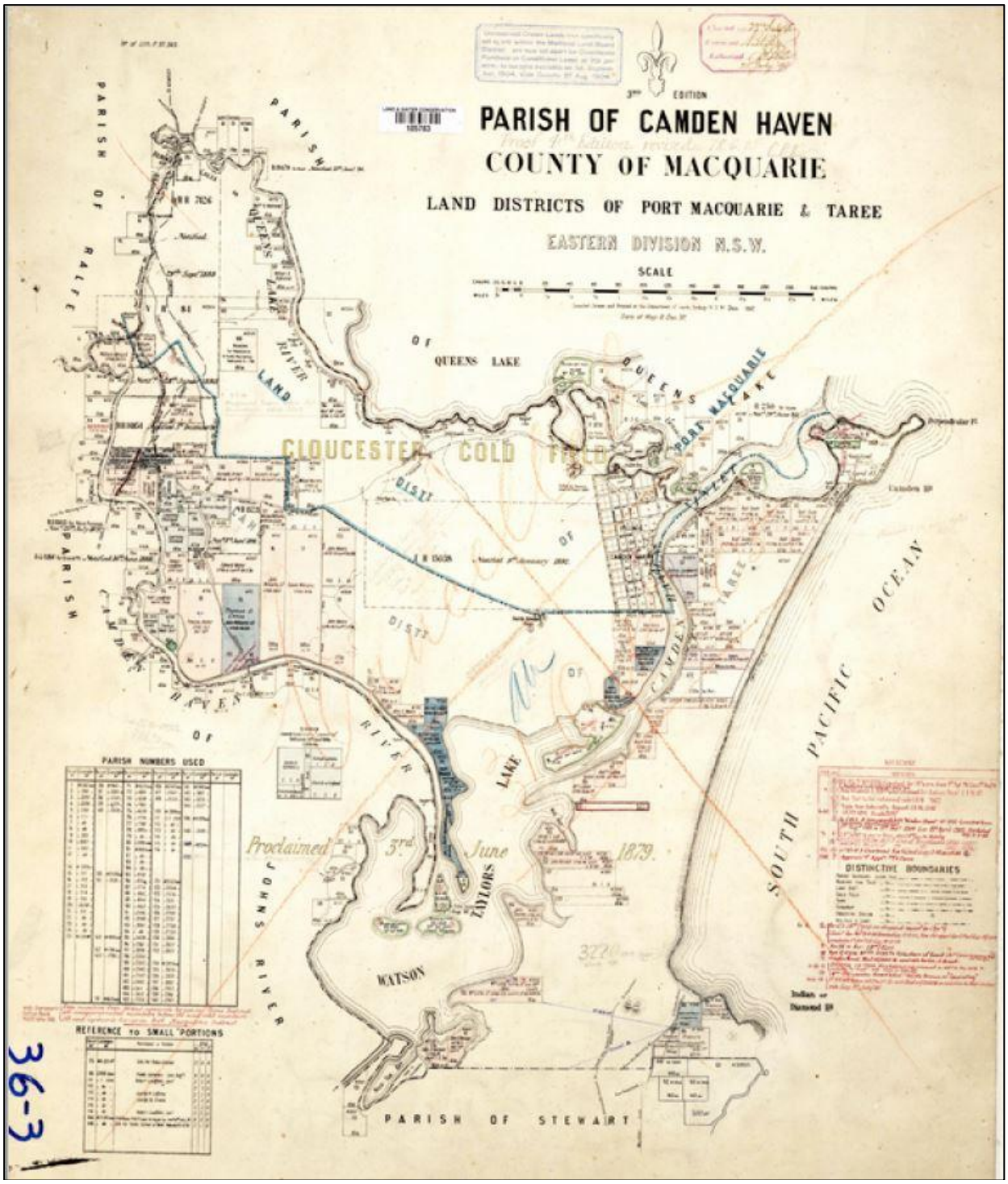


Figure 4: Parish Map of Camden Haven 1898

3. CONSULTATION PROCESS

3.1 Community Consultation

3.1.1 Stage 1: Notification of project proposal and registration of interest

Table 3 and **Table 4** relate to community consultation and follow NSW legislative requirements. **Table 2** details the initial consultation letters. The initial consultation letters and newspaper advertisement provided a number of potential interested parties and the opportunity for broader community consultation. The parties in **Table 3** registered interest.

Table 2: Initial Consultation letters

Contacted party	Method	Date	Response
Heritage NSW	Email	10 February 2021	Replied with contact list 15/2/21
Registrar	Email	10 February 2021	Replied - 15/2/21
Bunyah LALC	Email	10 February 2021	Phone call - 16/2/21
NTSCORP	Email	10 February 2021	No Reply
Port Macquarie-Hastings Council	Email	10 February 2021	Replied 23/2/21 - Three contacts provided, two overlapped with other responses.
Local Land Service	Email	10 February 2021	Replied - 22 /2/21, Three contacts listed
National Native Title Tribunal	Email	10 February 2021	Replied - 11/2/21, no title or agreements in search area.

Table 3: Registered Parties

Registered Party	Representative	Date registered
Bunyah LALC	Amos Donovan	16 February 2021
Biripai Traditional Owner Corporation	Jason Holton	24 February 2021
Athlea Sullivan	-	2 March 2021

3.1.2 Stage 2: Presentation of Information about the proposed project

Information about the proposed development at Dunbogan and Camden Head was presented in the document sent to registered parties. The document included a test excavation methodology and request for information about the cultural heritage significance of the study area, as well as a form asking whether the registered party agrees with the methodology (see **Appendix III**).

3.1.3 Stage 3: Gathering information about cultural significance

Information about the cultural significance of the Dunbogan and Camden Head development was requested in the presentation of information document (**see Appendix III**). Any forms returned with a registration of cultural knowledge was included in **Appendix II** consultation log.

No comments were received.

3.1.4 Stage 4: Review of draft cultural heritage assessment report

Table 4 summarises responses from the review of the draft ACHA report sent on the 28 April, 2021 with a last day for reply set as 26 May, 2021. See **Appendix II** for full report replies from registered parties.

Table 4: Review of draft assessment report

Registered Party	Representative	Comments about report
Bunyah LALC	Amos Donovan	No Comment Received
Biripai Traditional Owner Corporation	Jason Holton	No Comment Received
Athlea Sullivan	-	No Comment Received

4. CULTURAL CONTEXT

4.1 The Landscape and Cultural Heritage

The following is extracted from '*What is an Aboriginal Cultural Landscape*?' (DECCW 2010):

> *All landscapes contain evidence of human use. The way that perceptions, beliefs, stories, experiences and practices give shape, form and meaning to a landscape is termed a cultural landscape (ACH 1998). An Aboriginal cultural landscape is 'a place or area valued by an Aboriginal group (or groups) because of their long and complex relationship with that land. It expresses their unity with the natural and spiritual environment and embodies their traditional knowledge of spirits, places, land uses, and ecology. Material remains of the association may be prominent but will often be minimal or absent.*
>
> *The landscape scale of cultural heritage is similar to the concept of 'whole-of-landscape' in ecosystem conservation – just as there is connectivity between all parts of natural ecosystems (e.g. plants, animals, soils and water) there is connectivity between cultural objects and places through past human behaviour patterns. The cultural landscape concept emphasises the landscape-scale of history and the connectivity between people, places and heritage items. It recognises that the present landscape is the product of long-term and complex relationships between people and the environment.*
>
> *Aboriginal cultural landscapes are comprised of:*
> *Significant biodiversity and a diverse range of ecological systems and associations, all of which contributed to the continuing existence of Aboriginal peoples in the region over many thousands of years, and which are valued in different ways by Aboriginal communities today;*
>
> - *Material remains of this continuing occupation in the form of a diverse array of Aboriginal sites and places known to the Aboriginal communities, some of which will be recorded on the Department of Environment, Climate Change and Water's Aboriginal Heritage Information Management System.*
> - *Extensive historical records from 1788 through to today which record observations of Aboriginal people and lifestyles, wars, massacres, social and cultural events, population census, social interactions, language etc, and which influence Aboriginal community values today.*
> - *An Aboriginal population made up of people who have traditional association and knowledge of the region, as well as others who live, work and play within the region, all of*

whom may attribute various values with the area, derived from the distant and recent past, through to the present day.

For Aboriginal people, the significance of individual landscape features is derived from their inter-relatedness within the cultural landscape. This means features cannot be assessed in isolation and any assessment must consider the feature and its associations in a holistic manner. This may require a range of assessment methods and will always require the close involvement and participation of Aboriginal people. By consulting with Aboriginal people and using the concept of cultural landscapes, the story behind the features can be told which demonstrates the associations that may exist between Aboriginal objects and other features within the landscape (DECCW 2010).

4.1.1 Cultural Context

It is generally accepted that traditional Aboriginal people of Lake Cathie-Bonny Hills belonged to the Birpai 'tribe' and spoke a closely related variant of the Kattang language (Holmer 1966). Dialect groups composed of interlinked extended families traditionally inhabited distinct territories within the wider Kattang language association. Land belonged to individual clans whose estate boundaries were known and well defined. At the time of first European settlement, the Birpai maintained alliances with other 'tribes' via a system of regulated movement for ceremonial, ritual, and social/secular purposes (Breton 1833; Howitt 1904; Fitzpatrick 1941:61.124).

During the course of everyday traditional life, resource exploitation seems to have been undertaken by a number of extended family units that would gather and then disperse as conditions demanded (Henderson 1851; Godwin 1990:97). As disclosed by Birpai Elder, the late Bill Hotlen (Collins 1996:8), a seasonal landuse system was generally followed, with hinterland hunting through spring and summer, and movement to the coast for autumn and winter fishing.

The first written account of the Birpai comes from the journal of Surveyor-General John Oxley, whose exploration party travelled down the Hastings River valley from the west in 1818. Oxley (1820:307-328) noted that "the natives in the vicinity (of Port Macquarie) appeared very numerous", where "a great many natives' canoes were seen on the river". On travelling south, the party camped near a freshwater spring at Bonny Hills, but no mention is made of encountering either Aboriginal people or evidence of their camps here or anywhere else between Port Macquarie and the Camden Haven.

Upon skirting the northern shore of Queens Lake (part of the Camden Haven River estuarine system, 5.4km south of the project area), Oxley (1820:328) "disturbed a large party of natives, some of whom were busily employed in preparing bark for a new canoe". These people were residing in a lakeside encampment comprising "guniahs or bark huts'" and possessed "arms and utensils of every description". There were "many large canoes on the lake … one of which was sufficiently large to hold nine men, and resembled a boat" (Oxley 1820:332-333). The discovery of this occupied campsite in the mid-spring of 1818 suggests that the margins of resource-rich estuaries may have been used on a semi-permanent basis irrespective of the usual seasonal round followed elsewhere.

Other significant landscape features associated with the area includes the Three Brothers Mountains. The closest and most northern mountain is located in Dooragan National Park. The park is a declared Aboriginal Place because of its' traditional significance relating to ceremonial and mythological sites to local Aboriginal people (Navin Officer 2004, p. 14; DEC 2004).

5. ARCHAEOLOGICAL CONTEXT

5.1 Regional Context

The regional archaeological context is provided by previous assessments that have tended to focus near prominent infrastructure (such as the M1 Pacific Highway) and areas around Port Macquarie with a higher population. The coast or prominent bodies of water (such as Pacific Ocean, Hasting River and Camden Haven estuary) provide sources of regional importance as noted in **Section 4.1.1**. The most common finds reported were shell middens, while artefacts, open camp sites and a modified tree have also been documented. Due to the coastal influence, middens have been documented at a number of sites, as close as 200m from the study area (**Figure 4**). The regional pattern also presents stone artefacts and open campsites as examples of evidence of human occupation. It can be predicted from the previous assessments that early regional occupation was strongly connected to waterways and coastal areas.

Regional based assessments are summarised below.

Appleton, J. 1996. The archaeological investigation of the site of proposed quarry operations at Sancrox Road, Wauchope, Central Coast, NSW. Report for Anthony Thorne & Associates, for CTK Constructions Pty Ltd.
This report was commissioned by Anthony Thorne & Associates pursuant to information received from the local Aboriginal community that a ceremonial site once existed at the site of a proposed quarry. Appleton found that there was no evidence to support the existence of a ceremonial site; however, he theorised that any such evidence may have been removed earlier in the process during the removal of overburden at the site. Appleton also identified a single artefact but believed that it was in a secondary context.

Appleton, J. 2013. Archaeological Assessment for lot 1 DP 222740, lot 229 DP 754434 & lot 1 DP318920 Fernbank Creek Rd, Port Macquarie. Report for King & Campbell, for Hastings Estate Pty Ltd.
This assessment was performed for King & Campbell Pty Ltd to facilitate a Proposed rezoning of the Cassegrain Winery, Fernbank Creek Road, Port Macquarie. In the absence of any archaeological or cultural remains in the project site and no cultural information that might pose a constraint to the proposed development ASR recommends that there are no constraints on either cultural or archaeological grounds to the proposed development. It was also detailed in the report, previous 2005 and 2007 assessment of the Sancrox Road and quarry based on the 1995 Collins report. None of the 1995 sites were relocated and no additional sites found.

Collins, J. 1995. Aboriginal Archaeology – Area 13 (Thrumster). Port Macquarie, NSW. Unpublished Technical Report.
The most wide-ranging archaeological survey so far completed for the lower Hastings hinterland is that done by Collins (1995) as part of an environmental study for Hastings Council's urban investigation 'Area 13'. The Area 13 Project area encompassed 4,200ha of land between the Hastings River and Lake Innes west of Lindfield Park Road. 17 isolated artefacts, 30 artefact scatters, 3 scarred trees 1 shell midden, two traditional cultural significant sites and 1 Aboriginal historical significant site were recorded. With specific reference to the current study area, Collins reports that a Corroboree/ceremonial ground lies west of the Pacific Highway and north of Sancrox Road and is thought to have occupied the hill crest now being worked as a hard rock quarry. Aboriginal informants were told of the site many years ago by elderly European residents who described hearing the music and chanting and seeing the many large campfires. The closest recorded sites were the Bittrow site complex located approximately 100m to the south and west of the current Project area comprising a

large and complex open campsite, three isolated artefacts and two small campsites. It is considered highly likely that further materials will occur across hillslopes and associated with Haydons Creek. Subsequent surveys by Appleton in 2005 and 2007 have not relocated these sites.

The survey identified that site locations were associated with certain landforms. Sites identified were all located within 350m of water, and tended to be on decreased elevation with low gradient slopes facing NNW and NE. Management recommendations included:

- Any floodplain excavation works which will be greater than 80cm in depth to be monitored by a representative of the BLALC in case archaeological materials are unearthed;
- Any urban rezoning proposal for any non-floodplain area which has not already been substantially impacted, and which was not covered during the present survey or during any past archaeological survey in Area 13 should be subject of a separate archaeological survey of all slopes of 10° and less which are within 350m of any existing or former permanent or semipermanent water source (including drained swamps); and
- Any rezoning proposal for any land which does not encompass slopes of 10° and less within 350m of a present or former permanent or semi-permanent water source is unlikely to threaten archaeological materials and an archaeological survey is not considered warranted in such areas.

Collins, J. 1997, SH-10 Pacific Highway, Proposed Coopernook traffic relief route. Aboriginal archaeological assessment. Report to Connell Wagner. And **Collins, J. 1999a, Pacific Highway Coopernook traffic relief route. Archaeological investigation of the area to be affected by the northern abutment of Lansdowne River bridge. Report to Connell Wagner.**
In 1997, Collins assessed the 4.2km long Pacific Highway Coopernook Bypass corridor, which traversed the Lansdowne River floodplain and a ridge system on the northern end. One archaeological site (nine stone artefacts exposed by ploughing) was located on a floodplain rise between Coopernook Creek and back swamp just outside the construction impact zone. The artefacts comprised four unmodified flakes, two flake tools, two nuclear tools (a split pebble with usewear and a bifacially flaked axe with usewear), and a flaked piece, made on quartz, chert, chalcedony, greywacke and mudstone. While it was anticipated that many additional artefacts would remain concealed within the ploughed topsoil, the number, distribution and character of the recorded items suggested that the site was most likely the product of a short-term camping event that centred on the preparation of plant resources (Collins 1997, p.31).

A natural levee to be impacted by the northern abutment of a bridge over the Lansdowne River was identified as having subsurface archaeological potential. Further investigation of the levee (Collins 1999a) involved the excavation and sieving of 99 (mechanical) auger holes, each 45cm in diameter, and one 50 x 50cm shovel test pit. Five stone artefacts (four unmodified flakes and a flaked piece made on siltstone, mudstone, quartzite and chalcedony) were recovered. On the basis of their distribution, density and types, it was concluded that the recovered artefacts were probably discarded during a single transient stop-over, made during the course of gallery rainforest exploitation or canoe transit along the river (Collins 1999ap. 33).

Collins, J. 1998, SH-10 Pacific Highway. Proposed upgrade Taree bypass to Coopernook bypass. Aboriginal heritage assessment. Report to Connell Wagner. And **Collins, J. 2000, Pacific Highway Taree bypass to Coopernook bypass. Archaeological investigation of the area to be affected by the southern abutment of Ghinni Ghinni Creek bridge. Report to Connell Wagner.**
No Aboriginal cultural heritage materials were detected during a field survey of the 7.2km length of Pacific Highway upgrade corridor between the Taree Bypass and Coopernook Bypass (Collins 1998), which crossed low-lying Jones Island and Ghinni Ghinni Creek south of Coopernook. However, an

owner of floodplain land just south of Jones Island reported finding several Aboriginal pebble axes over many years of ploughing. 'Aboriginal items' had apparently also been uncovered on the southern end of Jones Island (Collins 1998, p.43). In addition to the likelihood of isolated artefact finds, a natural levee on the southern bank of Ghinni Ghinni Creek was assessed to have the potential to contain subsurface archaeological material.

Investigation of that section of the Ghinni Ghinni Creek levee to be affected by construction of a bridge abutment was undertaken by Collins in 2000, via the excavation and sieving of 25 (mechanical) 45cm diameter auger holes, and three 50 x 50cm shovel test pits. Three stone artefacts (two unmodified flakes and a flaked piece) were recovered in association with introduced gravel and rusted metal and nails, indicating a low level of traditional Aboriginal use and extensive disturbance.

An Aboriginal informant identified a fig tree on the northern end of Jones Island as marking an historic campsite location, used from time to time by small groups travelling between the coast and inland. However, due to its relatively young age it was concluded that this was not likely to be the same tree that served as a focus for the reported historical occupation (Collins 1998, pp.47,54). No cultural materials were detected during Aboriginal monitoring of removal of the fig tree or initial surrounding Pacific Highway upgrade earthworks.

Collins, J.P. 1996a, Proposed Meridian residential subdivision, Bonny Hills, NSW mid-north coast. Archaeological assessment. Report to Luke and Company NSW. And **Collins, J.P. 1996b, Proposed 40 lot residential subdivision area at Bonny Hills, NSW mid-north coast. Archaeological survey for Aboriginal sites. Report to Luke and Company NSW.**
A survey of a 130ha proposed residential development area that encompassed the northern half of that inspected by Happ and Bowdler (1983), including the present project area, was undertaken by Collins in 1996 and resulted in the recording of 11 Aboriginal stone artefact occurrences within and near the property boundaries. The sites comprised nine scatters of stone artefacts (open campsites) and two isolated artefact finds. Apart from one isolated artefact on the alluvial flat in centre of the Duchess Gully basin (470m south-east of the project area), the recorded sites were situated on inner barrier sands, the alluvial flat and bedrock-soil footslopes near Duchess Gully, within 500m and less of the coastline.

The recorded stone artefact assemblage comprised flakes, flaked pieces, cores, split pebbles, pebble and flake tools made on a range of raw stone materials, primarily siltstone, quartz and chert. Almost half of the identified artefacts featured pebble cortex, suggesting that their constituent stones were most likely collected from Rainbow Beach.

Consultation with Birpai Elder and knowledge-holder the late William 'Gulah' Holten, revealed that the Rainbow Beach area was not known to contain any sites/places of ceremonial, mythological or otherwise spiritual importance. However, Mr Holten was aware that a large, traditionally-used base camp did occur in the general locality, though he was not able to recall its exact whereabouts.

Collins, J. 1999b, Pacific Highway upgrade Moorland. Aboriginal heritage assessment. Report to Connell Wagner. And **Environmental Management Resources (ERM) 2007, Pacific Highway Coopernook to Moorland upgrade- RTA design refinement. Aboriginal and historical heritage assessment. Report to the NSW Roads and Traffic Authority.**
In 1999, Collins assessed the 10km long Pacific Highway upgrade corridor between the Coopernook Bypass and Moorland (North). The corridor traversed a series of low undulating hills separated by wide low-gradient valleys comprising the floodplains of small stream channels. No Aboriginal sites were recorded during the field survey or reported by Aboriginal informants. On the basis of historical reports (Mooney 1990, p.13; Moorland School Centenary undated p.71), a parcel of Crown Land fronting

Pipeclay Creek between Moorland (North) and Moorland (South) was identified as a PAD, with the potential to contain subsurface evidence of post-contact Aboriginal camping activities (this PAD was avoided by highway construction works). ERM (2007) assessed design refinements later made to the Pacific Highway Coopernook-Moorland upgrade proposal. No Aboriginal sites or PADs were identified on the gentle hillslopes, valley flats or creeklines to be affected by the deisgn refinements.

Collins, J 2005, Aboriginal Heritage Assessment - Structure Plan Area 13 Urban Investigation Area. Port Macquarie NSW.
A further survey of a 780ha portion of the 1995 Area 13 Study Area resulted in the recording of four isolated stone artefacts and three small artefact scatters on footslopes and valley flats adjacent to swamps and streams. Two extensive campsites were also recorded, both on the terminal ends of low spurs extending into swamps. Reinspection of previously registered sites revealed several of those south of the upgrading corridor, including the Site #30-3-169 scarred tree, to have been destroyed by land clearing since 1995.

Collins, J.P. 2009, Proposed development at Rainbow Beach, Bonny Hills, NSW mid-north coast. Aboriginal cultural heritage assessment of proposed 'eco-tourist' site and previously unassessed southern portion of proposed development area. Report to Luke and Company NSW.
The project aimed to assess the proposed development on coastal land at Rainbow Beach. The area of the eco-tourism site and previously unassessed area of the development covers 65 hectares included Lot 92 DP 1078055 and Lot 5 DP 25886. The area contained two registered sites, both of which are artefact scatters. Mitigation measures included monitoring by RAPs and a management plan for unexpected discoveries be put in place.

Collins, J.P. 2016, Planning Proposal, Part Lots 1 & 2 DP 32272, Lot 9 DP 32272 and Lot 48 DP 1090335, Macquarie and West Streets, Coopernook NSW, Greater Taree LGA Aboriginal cultural heritage assessment. Report to McGlashan & Crisp Pty Ltd on behalf of Mr John Hogg.
The assessment concerns residential development within part Lots 1 & 2 and Lot 9 DP 32272 and Lot 48 DP 1090335, Macquarie and West Streets, Coopernook, on the NSW mid-north coast. The project size was 17.6ha. The area includes part of the narrow crest and slopes of an undulating ridge that extends into the floodplain around 350m north of the estuarine reach of the Lansdowne River. No registered Aboriginal sites or places occur within or in the immediate vicinity of the Planning Area, or were artefacts or Potential Archaeological Deposits (PADs) identified during a field survey of the Planning Area conducted.

Collins, J.P. 2019, Lake Cathie Public School Redevelopment, 1240 Ocean Drive, Lake Cathie NSW- Aboriginal Cultural Heritage Assessment. Report to SHAC on behalf of NSW Department of Education.
The NSW Department of Education proposes to redevelop the Lake Cathie Public School to cater for projected student population growth in the Lake Cathie-Bonny Hills area, within the Port Macquarie-Hastings LGA on the NSW mid-north coast. Lake Cathie Public School is situated within the Port Macquarie-Hastings LGA, around 6 km south of Port Macquarie and 1.5 km inland of Rainbow Beach on the NSW mid-north coast. Archaeological surveys have been completed in the project locality, the results of which demonstrate that the coastal foredune and well-drained rises on the degraded inner sand barrier were preferred for traditional occupation. It was concluded that the project area has a low level of Aboriginal cultural heritage sensitivity and that redevelopment of Lake Cathie Public School should be allowed to proceed without further cultural heritage constraints, providing the following management recommendations are adhered to.

Everick Heritage Consultants 2017. Dunbogan Flood Access Upgrade, Dunbogan, NSW Aboriginal Cultural Heritage Assessment. Report to Geolink on behalf of Port Macquarie – Hastings Council.
The project was for raising the pavement by 1m to allow for access during floods at the intersection of Reid Street, Diamond Head Road and the Boulevarde Dunbogan. The assessment included a pedestrian transect over the project area and surrounding landscape. The survey was affected by vegetation though it was not considered a significant constraint. Based on the middens located to the east of the project area and post European settlement impact the area is not considered to be a Potential Archaeological Deposit. Recommendations included unexpected finds procedure, procedure for Aboriginal human remains and conservation principles.

Gay, L. 2000. Greater Taree Local Government Area: Aboriginal cultural heritage management plan. Report to Greater Taree City Council.
The broad predictive model of Aboriginal site location developed by Klaver and Heffernan (1991) was revised and updated in the Aboriginal Cultural Heritage Management Plan prepared for Greater Taree City Council (Gay 2000). The revised model (Gay 2000, p.25) predicts that:

- Areas with the highest environmental productivity such as- margins of riverine and woodland vegetation communities adjacent to rivers and major creeks, or protected bays and beaches adjacent to estuaries, rock platforms and swamps would have been the primary focus of domestic occupation;
- Primary focuses of domestic occupation would be reflected in the archaeological record through the presence of large artefact assemblages with some areas of high density and more complex assemblages in those areas;
- Low hills, hills and mountains away from major water sources would have been occupied on a less intensive basis;
- Occupation would have been associated with group movement, hunting parties and short-term camps that related to the gathering of particular resources such as stone or medicines for transport to larger camps;
- Narrow and steep sided sections of river and creek valleys would not have been used for extended occupation or avoided;
- Ridgelines would have been used by Aboriginal people as travel routes between river valleys, plateau, lookouts and peaks; and
- Level sections of broad valley would have been preferred camping places.

GHD 2010, Oxley Highway to Kempsey Pacific Highway Upgrade – Aboriginal Heritage Working Paper. Report to Roads & Traffic Authority.
The Aboriginal heritage assessment for the Oxley Highway to Kempsey Pacific Highway Upgrade has been undertaken in two phases, an initial predictive study to assist with selection of feasible route options (Kuskie 2005), followed by a comprehensive field survey and sub-surface investigations undertaken in 2007 by South East Archaeology. Five areas of cultural sensitivity, ten archaeological sites and six PADs were identified as potentially impacted. Archaeological test excavation was undertaken at two locations. No Aboriginal sites were recorded within the current Project area although an Ochre Sites were mapped approximately 800 m to the south east of the current Project area. This ochre vein was exposed by road construction in about 1968.

Happ, G. and Bowdler, S. 1983, An Aboriginal sites survey at Bonny Hills, near Port Macquarie, NSW. Report to McDonald Cox Corkill.
In 1983, Happ and Bowdler surveyed a 225ha property east of Ocean Drive, proposed for the development of an 'international sports and leisure village'. The property included the present project

area. The survey resulted in the detection of three silcrete artefacts laying on a lag of pebbles, ochre nodules and sand in the bed of a small tributary of Duchess Gully around 1.3km south-east of the project area, and a silcrete flake in a spill of sand on the tributary bank. Although no other archaeological evidence was found, the survey was constrained by vegetation cover.

Kelleher Nightingale Consulting 2012, Aboriginal Archaeological Assessment and artefact Salvage Methodology and Cultural Heritage Assessment Report, Oxley Highway to Kempsey Pacific Highway Upgrade. Prepared for Roads and Maritime Services.

This report provides a detailed methodology for archaeological excavation of the identified sites and PADs along the Oxley Highway to Kempsey upgrade (GHD 2010) to obtain a representative sample of the archaeology that will be impact by the project. A series of management policies for the management and conservation of Aboriginal heritage were provided. With relevance to the Project area, the seam of ochre site was confirmed along the highway, approximately 800 m to the south east of the current Project area. This ochre vein was exposed by road construction in about 1968.

Klaver, J. and K.J. Heffernan 1991, Greater Taree Aboriginal heritage study. Report to Greater Taree City Council.

Klaver and Heffernan completed an Aboriginal heritage study of the Greater Taree LGA in 1991. This study included a comprehensive review of literary sources, Aboriginal site registers and archaeological survey reports, Aboriginal consultation, and field surveys that included small samples of the four broad terrain units and five broad vegetation types represented within the LGA.

The Planning Area is situated within Klaver and Heffernan's 'undulating to hilly terrain' unit, which encompassed undulations and low hills/ridges in coastal, mid-valley, up-river and plateau contexts. Ten Aboriginal sites were recorded on the 2.67ha sample of 'undulating to hilly terrain' effectively inspected, half of which were open scatters of stone artefacts. The other sites comprise two scarred trees, one Bora/ceremonial ground, one burial area, and a natural mythological feature (coastal cave). On the basis of their results, Klaver and Heffernan (1991) predicted that Aboriginal sites are likely to occur at a density of around 3.74 per hectare on 'undulating to hilly terrain', with a bias towards sclerophyll forest locations in the non-coastal environment.

In summary, the archaeological and ethnographic data compiled by Klaver and Heffernan demonstrated traditional occupation and/ or use of all parts of the Greater Taree LGA. The sample surveys pointed to a similar likelihood for Aboriginal site occurrence across all broad terrain units, irrespective of inland distance. Although a number of site types were recorded on the 'undulating to hilly terrain', small low-density scatters of stone artefacts, located in sclerophyll forest environments, appeared to be the most common.

Kuskie 2006 Pacific Highway Upgrade: Oxley Highway to Kempsey – Supplementary Indigenous Heritage Impact. Report to GHD on behalf of the Roads & Traffic Authority.

Three main sites of cultural sensitivity were identified. The first was the Sancrox Quarry ceremonial site, the second is the land surrounding the Hastings River, as it was the site of frequent battles between the Birpai and the Dunghutti. The third was an area near Maria Creek. Other information provided by the Aboriginal representatives include:

- Native resources included the wild apple (giving rise to the name Kundabung), and Cobra grubs (giving rise to the name Copperabung, later corrupted to Cooperabung)
- Birpai people lived in the mountains in summer and the coast in winter; and
- Known Aboriginal camps in historic times are on the south side of the Hastings River, especially in the area between the Pacific Highway and Haydons Creek (to the immediate west of the current Project area).

Navin Officer Heritage Consultants 2001, Moorland to Herons Creek Pacific Highway upgrade, route selection study. Cultural heritage assessment. Report to Ove Arup and Partners. And **Navin Officer Heritage Consultants 2004, Pacific Highway upgrade Moorland to Herons Creek EIS working paper. Cultural heritage assessment. Report to Ove Arup and Partners.**

The 21.9km Pacific Highway upgrade corridor from Moorland (North) to Herons Creek was assessed by Navin Officer Heritage Consultants, commencing with selective field surveys within a broad area to inform the design of feasible route options. The initial surveys resulted in the recording of six isolated stone artefacts, three artefact scatters, three possible scarred trees, a reported PAD, a reported corroboree ground, and a reported stone arrangement. Of the nine stone artefact occurrences recorded, four were situated on low spur or knoll crests and their upper slopes, three on the elevated edges of alluvial terraces, one (an isolated artefact) on a basal slope, and one (an isolated artefact) on a mid-slope.

Navin Officer Heritage Consultants (2004) subsequently conducted a comprehensive inspection of the preferred Pacific Highway Moorland to Herons Creek upgrade corridor. In addition to the sites recorded during the route selection study, the 2004 assessment resulted in the recording of one possible scarred tree and six PADs "expected to contain traces of Aboriginal occupation based on predictive site location modeling, but where poor ground surface visibility precluded an adequate assessment of archaeological sensitivity" (Navin Officer Heritage Consultants 2004, pp.26-27). All of the identified PADs were associated with the larger streams (Stewarts River, Camden Haven River and Herons Creek), and comprised locally elevated alluvial landforms such as bank levees and terraces.

Packard, P. 1992, An archaeological assessment of the Kempsey and Wauchope Forestry Management Areas. Report to Forestry Commission of NSW.

The Kempsey and Wauchope Forestry Management Areas cover a considerable area (315,000 hectares) north, west and south of the Wauchope area. Packard identified a high proportion of places of cultural significance including a bora, ceremonial places and stone arrangements. The assessment also identified scarred or modified trees and stone artefacts, both isolated artefacts and artefact distributions. The assessment defined sensitive archaeological landforms within the Kempsey and Wauchope Forestry Management Areas and its surrounds. The assessment considered coastal landscapes as the most sensitive landform, with a high density of Aboriginal objects identified. The assessment identified the Wauchope Forestry Management Areas as a broad vale, with a lower intensity of occupation. Packard considered that crests, upper slopes, saddles and to a lesser degree lower slopes demonstrated archaeological sensitivity, with Aboriginal objects often identified on flat to low slopes (0º to 10º) with an open south or western aspect.

RPS HSO. 2008. Aboriginal and European Cultural Heritage Assessment for Le Clos Verdun at Sancrox. NSW. Report for Hopkins Consulting.

RPS Harper Somers O'Sullivan (RPS HSO) was commissioned by Hopkins Consultants to provide an Aboriginal and European Cultural Heritage Assessment for the land known as "Le Clos Verdun" at Sancrox, near Port Macquarie, New South Wales. No Aboriginal heritage sites were identified. With regards European cultural heritage, HSO shows that the Sancrox area was the location of one of the early government farms of nearby Port Macquarie. The exact location of the farm is not known. No remnant of that farm was located and it is considered highly unlikely given the temporary nature of the farm and the changing landscape of the Hastings River that any record would remain if it was in the vicinity of the study area.

RPS 2013, Aboriginal cultural heritage mapping project Port Macquarie-Hastings local government Area. Report to Northern Rivers Catchment Management Authority.
In 2013 RPS was engaged to conduct an Aboriginal cultural heritage mapping project within the Port Macquarie-Hastings local government area. RPS consulted with the Biripai Local Aboriginal Land Council and Bunyah Local Aboriginal Land Council to define landscape of cultural significance at a local level, with the areas identified used to inform the planning process through local planning controls and the LEP. The project demonstrated the breadth of the Aboriginal cultural landscape across the local government area.

Umwelt Australia Pty Ltd 2018, Lake Cathie Public School. Aboriginal due diligence assessment. Letter report to SHAC.
A field inspection was conducted in 2018 to inform an Aboriginal archaeological due diligence assessment of the Lake Cathie Public School redevelopment (Umwelt 2018). The inspection included all accessible ground surface exposures and the trunks of mature trees. No Aboriginal objects were detected. It was concluded that the area is "relatively unlikely to have been a preferred location for occupation by Aboriginal people in the past" (Umwelt 2018, p.10).

Virtus Heritage Pty Ltd 2013, Cattai Wetlands cultural heritage values and constraints report. Confidential report to Gondwana Consulting and Greater Taree City Council.
In 2013, Virtus Heritage assessed the cultural heritage values of the Cattai Wetlands, an area of approximately 509ha managed by Greater Taree City Council, situated north east of Coopernook and the Pacific Highway at the confluence of Coopernook and Cattai Creeks. The area encompasses the terminal end of a ridge flanked by floodplain wetlands. Whilst the report produced by Virtus Heritage (2013) is confidential, available information indicates that the survey and related Aboriginal consultation resulted in the recording of five Aboriginal sites. These sites comprise three small stone artefact scatters (two with PAD), one isolated stone artefact, and a possible massacre and burial site, all of which are situated on the crest and slopes of the central ridge (Gondwana Consulting 2014, pp.31-35; AHIMS site cards).

5.2 AHIMS sites

An AHIMS extensive search of the project area was conducted on 15 February, 2021, based on the coordinates Latitude, Longitude From: -31.656, 152.8025 - Latitude, Longitude To: -31.6352, 152.8356 with a Buffer of 50 metres. Based on the coordinates of the nine AHIMS sites, none will be directly impacted by the proposed works.

A copy of the Advitech Environmental extensive AHIMS search is attached at **Appendix I**. The results of the search are noted in **Tables 5**. The locations of all registered sites noted in this search are provided in **Figure 5**. **Figure 5 is not for public disclosure and should be removed prior to any publication of this assessment.**

Table 5: AHIMS Sites within the vicinity of the project

NPW Site No.	Site Name	Site Description
30-6-0037	Gogley's Lagoon;Dunbogan;	Shell, Artefact
30-6-0047	D. 6;	Shell, Artefact
30-6-0010	North Haven;	Shell, Artefact
30-6-0011	Dunbogan;	Artefact
30-6-0026	Gogley's Lagoon Dunbogan duplicate copy 30-6-0027	Modified Tree (Carved or Scarred)

30-6-0027	Gogley's Lagoon Dunbogan duplicate copy 30-6-0026	Shell, Artefact
30-6-0028	Gogley's Lagoon 2;	Shell, Artefact
30-6-0104	Gogleys Lagoon;	Shell, Artefact
30-6-0246	McCoubrie midden	Shell

There are many variables that must be considered when using the Aboriginal Heritage Information System (AHIMS). More particularly, site coordinates, and descriptions are not always correct due to the following factors:

- Errors resulting from the evolution of subsequent computer systems used by DPIE that have failed to account for or correctly translate old coordinate systems, such as topographic map references, to new systems;
- Errors resulting from human error or incorrect descriptions of locality on the site cards submitted to AHIMS;
- Errors resulting from data input. Most commonly the naming of the correct mapping system used; and
- Few sites have been updated on the AHIMS register to record if they have been subject to a s87 or s90 permit and, as such, what sites remain in the local area and what sites have been destroyed is unknown.

5.3 Previous Archaeological Assessments within the project area

5.3.1 Existing Predictive Models of Past Aboriginal Land Use

The main aim of this assessment is to attempt to define both the potential nature and extent of Aboriginal occupation across the study area. As a result, the nature of the analysis focused on both the landform units and known sites. The purpose of this strategy is to highlight any variations between sites and associated assemblages, landforms and resources across the area. In doing this, it is possible to identify variation across the landscape, landforms and assemblages that correspond with variation in the general patterns of landscape use and occupation. The nature of activities and occupation can often be identified through the analysis of stone artefact distribution across a landscape. A general model of forager settlement patterning in the archaeological record has been established by Foley (1981). This model distinguishes the residential 'home base' site with peripheral 'activity locations'. Home base sites generally occur in areas with good access to a wide range of resources (reliable water, raw materials, and so on). The degree of environmental reliability, such as reliable water and subsistence resources, may influence the rate of return and length of occupation of sites and, hence, the complexity of evidence. Home base sites generally show a greater diversity of artefacts and raw material types (which represent a greater array of activities performed at both the site and immediate area). Activity locations occur within the foraging radius (approximately 10km) of a home base camp (Renfrew and Bahn 1991). Based on the premise that these sites served as a focus of a specific activity, they will show a low diversity in artefacts and are not likely to contain features reflecting a base camp (such as hearths). However, it is also possible that the location of certain activities cannot be predicted or identified, adding to the increased dispersal of cultural material across the landscape. If people were opting to carry stone tools during hunting and gathering journeys throughout the area rather than manufacturing tools at task locations, an increased number of used tools should be recovered from low density and dispersed assemblages.



Figure 5: AHIMS Search Results (NOT FOR PUBLIC DISCLOSURE)

5.3.2 Refined predictive model

A predictive model of site types and site patterning for the study area is generally achieved through a review of previous archaeological studies undertaken throughout the locality and the region, the AHIMS register and the environmental context of the study area. The aim of a predictive model is to understand the nature of previous Aboriginal occupation and determine the nature of land use. This theme often aims to identify and explain archaeological patterning in site type, content and distribution. General archaeological theories have been developed outlining the relationship between land use patterns and the resulting archaeological evidence.

Comparable data from archaeological research within the locality to support a predictive model for the study area is disparate. However, and based on the landscape of an alluvial river plain, it is considered that in its natural condition, the study area would have historically provided Aboriginal people with a variety of flora and faunal resources. The surrounding lake systems could also have provided different resources such as water (depending on salinity). In accordance with Foley's model (1981), it is envisaged that the area was most likely used for opportunistic hunting or gathering of resources whilst accessing the watercourses.

Notwithstanding the predictive model above, the highly disturbed state of the study area reduces the likelihood for the presence of Aboriginal objects excepting those areas which have previously been assessed as sensitive. However, limitations should be noted with the predictive model when attempting to predict past human actions and behaviour, including:

- Biases due to differential sampling of landforms based on decisions made by archaeologists;
- Aboriginal people involved in previous studies or surveys may not have disclosed the existence of places with cultural heritage values as they may not have been under immediate threat when the earlier study was undertaken;
- Variation in the classificatory definitions employed by archaeologists will significantly influence the range of artefact types identified within a study area. For example, the distinction between a waste flake, a debitage flake and a flaked piece may be heavily subject to the perspective of the recorder. Thus, it is not productive to attempt to quantify the proportionate representation of artefact types identified in previous studies; and
- Levels of exposure of different landforms.

Based on the previous assessments and AHIMS results, a predictive model for the project area has been developed:

- A preference for sites within 50 metres of reliable water sources or a confluence of water sources, on ridge lines, spurs and on crests. There is an elevated position located adjacent to the study area and hydro lines are present in the study area (see **Figure 1**);
- Previous finds in the area where ground disturbance has occurred;
- Based on previous surveys the likely majority of finds will be middens; and
- The sand dunes present in and in proximity to the study area may increase the likelihood of certain archaeological record such as shell.

Following on from this, limitations may occur through the assumption of archaeological sensitive areas meaning a greater chance of artefact yield.

5.4 Predictive Model for the project area

The background literature, previous assessments and AHIMS results, provide an outline of previous or known Aboriginal use of the land. Use of the land can be confirmed through artefact locations. The proximity of water (nonperennial unnamed hydrolines and a nonperennial creek cross the study area, though potentially saline) and food resources in the area, as well as the proximity of elevated areas, present the likelihood of occupation and transitory activities in the area.

6. 2021 SURVEY SAMPLING STRATEGY

The survey will be conducted using a systematic sampling strategy. The systematic random sampling strategy (Burke and Smith, 2004, p. 65-69) was chosen to allow for an even data sample and that all areas of the proposal is surveyed. The proposed route which will be used as a centre line for transects, aiming for three people covering 2.0-5.0 metres each (approximately 1.0-2.5 metres either side of a person). Limitations when surveying the extraction area may include dense vegetation along certain sections of the proposed pathway, and the distance between the road and water may converge to a narrow point. The survey will be recorded with a GPS (indicative of survey path). The transects are planned to be 6.0-15.0 metres in width (based on a field team of 4 people and depending upon the site conditions).

7. RESULTS AND DISCUSSION

The survey was undertaken on Tuesday 20 April 2021. Transects were limited in width by landscape such as roads, coast and vegetation. The widest possible area was covered at all times. Each section of the survey area is discussed below.

7.1 Survey Coverage

Table 6: Survey Unit Coordinates

Survey Unit	Start Latitude	Start Longitude	End Latitude	End Longitude
Survey Unit 1	-31.65425	152.803569	-31.651078	152.804757
Survey Unit 2	-31.649769	152.806344	-31.648822	152.808039
Survey Unit 3	-31.646191	152.816453	-31.649666	152.824156
Survey Unit 4	-31.650076	152.830021	-31.637565	152.833515

Table 7. Survey effective coverage

Landform	Area (sq m)	Vis. %	Exp. %	Exposure type	Previous disturbances	Effective coverage (sq m)	Effective Coverage %
Beach/bank/flat	36785.979	20%	20%	Road, bank, nature strip, paths, parks	Construction, recreation, transport	1471.439	4%

Cliff/undulating terrain	31586.223	20%	20%	Road, bank, nature strip, paths, parks	Construction, recreation, transport	1263.449	4%
Swamp/tidal flat	9118.373	20%	20%	Road, bank, nature strip, paths	Construction, recreation, transport	364.735	4%

Table 8: Landform

Landform	Landform area (sq m)	Area effectively surveyed (sq m)	% of landform surveyed	Number of Sites	Number of Artefacts or features
Beach/bank/flat	36785.979	1471.439	4%	0	0
Cliff/undulating terrain	31586.223	1263.449	4%	0	0
Swamp/tidal flat	9118.373	364.735	4%	0	0

7.2 D3

The investigation started at D3 swamp section near chainage (CH) 180, the area was deemed inaccessible due to the current water height and mangroves. A brief discussion on site occurred with RAPs and archaeologists. The general consensus was that construction, although impacting vegetation and being invasive to the area, was highly unlikely to disturb archaeological deposits. The lower chainage of D3 was accessible and appeared to have been disturbed in the past with tree clearing and agricultural (timber post and wire) fencing. The area adjacent to the Boulevarde (side road) had a number of subsurface services such as water and telecom installed providing a lower likelihood of finding archaeological deposits. Surface disturbance was prolific. CH200 to the existing section of D4 was all disturbed with nature strips, culverts, rock embankments, with some tidal landscaping. Consensus was reached that the proposed works would have a low probability of impacting Aboriginal heritage or cultural values. See **Tables 6-8** and **Figure 6** for additional details. Photographs are available in **Appendix V**.

7.3 D5

The marshy nature of this area made investigation difficult. Mud and recent flooding has recently impacted the study area,. Consensus was reached that the proposed works would have a low probability of impacting Aboriginl heritage or cultural values. This extended to the secondary option being proposed (see **Figure 7**). Disturbance included boat storage, roads and associated drainage as well as embankment/coastal protection through rock barriers. An alternative route is being discussed for the project, these are minor alternation and shown on **Figure 7**. When discussed on site, it was concluded that the impact from either option would be the same See **Tables 6-8** and **Figure 7** for additional details. Photographs are available in **Appendix V**.

7.4 D8

D8 recorded no heritage issues. It was cited by the RAPs that midden/s had previously been recorded along this section and through the general development of the area (road, coastal protection, occupation, oyster farming) the middens had been destroyed. These midden/s are not recorded on AHIMS as per the search conducted for the project. Some evidence of shell was noticed in the area, though with oyster farming, the tidal nature and recent flooding (March 2021) the shell is unsurprising. One section had erosion evidence from the recent floods with rock and geofabric used to repair/stabilise the bank. Evidence, such as this approximately 10 metres long section (see Photos 6 and 7 in D8 of **Appendix V**), shows the natural variability of the landscape. Potential heritage landscapes may have disappeared though mass movement of water. Consensus was reached that the proposed works would have a low probability of impacting Aboriginal heritage or cultural values. However, the Bunyah LALC representatives did ask for the inclusion of a mitigation measure regarding inspection of any shell found in any excavation works (see **7.6 Conclusion**). It is recommended that an unexpected finds procedure, acceptable to Bunya LALC. be established for all site workers for this purpose. See **Tables 6-8** and **Figure 8** for additional details. Photographs are available in **Appendix V**.

7.5 D10 and D11

Along the D10 and D11 section, partially existing tracks are already present (grass tracks, etc.). Two alternative routes are being discussed for the project, these are minor alternations and shown on **Figure 9**. When discussed on site, it was concluded that the impact from either option would be the same overall result of a low impact probability. As with section D8, RAPs cited midden/s recorded as being previously identified in the sections. The general development of the area (road, coastal protection, occupation) the middens had been destroyed. These middens are not recorded on AHIMS as per the search conducted for the project. Further along the section the breakwall landscape has been altered. When built, the landscape was different and given the time elapsed none of the original landscape is likely to have survived. This drastically alters the likelihood of any evidence of Aboriginal occupation being retained in the area.

7.6 Conclusion

Based on the field survey, background research and the environmental context, the area when undisturbed would have provided possible transitory and resource location for Aboriginal people. The lack of nearby fresh water would have limited occupation. Given the low exposure and visibility the survey was limited predominantly due to vegetation cover. An oral history of the presence of Aboriginal middens given by the Bunya LALC Officers indicates at least transitory and hunting activities in the area. Given the European disturbance of the area through roads, residential development and ancillary services as well as the reshaping of the land due to the breakwalls, floods and tidal surges, large sections of the study area have been altered. This was noted in onsite discussions. Shell is also a common natural feature due to oyster farming and the study area's tidal location adjoining the Pacific Ocean. The recent March 2021 floods would also have had an impact on some of the low lying areas that were investigated. The marsh/swamp areas of the project area, though likely to have a naturally higher level of shell would be impacted though a boardwalk construction, though the impact would be minimised through pier construction. The remaining areas proposed for construction of pavement, retaining walls or boardwalks are within areas that are disturbed or unlikely to contain intact Aboriginal shell middens.

As an onsite mitigation measure, Bunyah LALC would request that any shell found from a direct result of construction (regardless of cultural origin) be left onsite and spread out on the landscape. Please refer to **Sections 10** and **11** for recommendations which include the preparation of an 'Unexpected Finds Procedure'.



Figure 6: D3 survey



Figure 7: D5 Survey



Figure 8: D8 Survey



Figure 9: D10 and D11 Survey

8. CULTURAL HERITAGE VALUES AND STATEMENT OF SIGNIFICANCE

8.1 Cultural Significance

The Burra Charter (2013) defines 'cultural significance' very broadly to include 'aesthetic, historical, scientific, social or spiritual value for past, present or future generations'. This definition captures places of cultural significance to Indigenous cultures. It also includes places that provide a physical location that is integral to the existence, observation and practice of intangible heritage. The Burra Charter definition of cultural significance encompasses all forms of spirituality, regardless of the culture from which it emanates. Similarly, aesthetic value is not limited to a 'western' perception of aesthetics (taken from ICOMOS Practice Note: The Burra Charter and Indigenous Cultural Heritage Management).

8.1.1 Aesthetic Significance

The Burra Charter (2013) defines 'aesthetic significance' as the sensory and perceptual experience of a place which includes visual, sound, smell and other strong influences on human attitudes, feelings and thoughts. The area has aesthetic value through the location, the path intends to make human movement through these areas safer, allowing for greater access. The construction is meant to emphasise the aesthetic nature.

As no Aboriginal heritage items have been located within or adjoining the study area the aesthetic significance is assessed to be low.

8.1.2 Historic Significance

The Burra Charter (2013) defines 'historic significance' though aspects such aesthetics, architecture, art, science, society and spirituality. Additionally, the historical value may have an influence or may have been influenced by events.

As no Aboriginal heritage items have been located within or immediately adjoining the study area the historic significance is assessed to be nil to low.

8.1.3 Scientific Significance

The Burra Charter (2013) defines 'scientific significance' as relating to information and data such as rarity, quality, representativeness, potential to contribute to knowledge and answer research questions.

As no Aboriginal heritage items have been located within or immediately adjoining the study area the scientific significance is assessed to be nil to low.

8.1.4 Social/Spiritual Significance

The Burra Charter (2013) defines 'social and spiritual significance' as the association with a particular community or cultural group as well as meanings, values and practices that could contribute to an identity, community or cultural group. This could relate to physical or intangible connections.

The nearby registered Aboriginal Place in Dooragan National Park, is an area of high social and cultural significance to Aboriginal people. The Bunya LALC Officers have not indicated, to date, that the study area is of any social or spiritual significance to Aboriginal people. Moreover, as no Aboriginal heritage items have been located within or immediately adjoining the study area the social or spiritual significance to Aboriginal people is assessed to be low.

9. ASSESSMENT OF IMPACTS

9.1 Impacts

The Heritage NSW (formerly DECCW) *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (2010b, p. 21) describes impacts to be rated as follows:

1. Type of harm: is either direct, indirect or none
2. Degree of harm is defined as either total, partial or none
3. Consequence of harm is defined as either total loss, partial loss, or no loss of value

The site will be developed into a shared user pathway.

It can be concluded that the survey and community consultation has identified considerable disturbance to, and adjoining, the project area since European colonisation and further impacts to the area are unlikely to disturb Aboriginal heritage. No impact to Aboriginal heritage is expected to occur in the assessed areas.

As no sites or PADs were identified in the project area, there are no impacts to the archaeological record. Please refer to **Section 10** for mitigation measures such as unexpected finds.

10. MITIGATION AND MANAGEMENT STRATEGIES

Specific strategies considered below for the management of the study area relate to the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), and the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010c).

10.1 Conservation/protection

Conservation is the first option considered and can be suitable for all sites, including high archaeological significance and/or cultural significance. Conservation considers the care required for an indigenous site or place so to retain its significance, whilst also managing the site in a way that considers the attachment that people have.

As no sites or PADs were identified conservation/protection is not required.

10.2 Further investigation

If an excavation is conducted in accordance with the *Code of Practice for Archaeological Investigations in NSW* than an Aboriginal Heritage Impact Permit (AHIP) will not be required. Subsurface testing is appropriate when a PAD with sub-surface Aboriginal objects that have potential conservation value has been identified and the area cannot be avoided.

As no sites or PADs were identified in this study, no further investigations is recommended.

10.3 AHIP

If the project cannot avoid harm to an Aboriginal object or Place, then an AHIP is required. This can allow for an appropriate strategy to be undertaken such as salvage excavation or surface collection that must be approved by the Biodiversity Conservation Division.

As no sites or PADs were identified an AHIP is not required.

10.4 Mitigation measures

1. The individual or persons responsible for the management of onsite works will ensure that all site personnel are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974; and
2. In the case of unexpected Aboriginal heritage items being identified during any excavation works, an 'Unexpected Heritage Items Procedure' be created, adopted and provided to all workers, contractors, sub-contractors and employees at their time of their work induction to the site.

11. RECOMMENDATIONS

11.1 General

1. The individual or persons responsible for the management of onsite works will ensure that all site personnel are made aware of the statutory legislation protecting sites and places of significance. Of particular importance is the National Parks and Wildlife Amendment (Aboriginal Objects and Aboriginal Places) Regulation 2010, under the National Parks and Wildlife Act 1974; and
2. Should any Aboriginal objects be uncovered during works, activities should halt in that location and the Environmental Line contacted on 131 555 to report the discovery.
3. In the case of unexpected Aboriginal heritage items being identified during any excavation works, an 'Unexpected Heritage Items Procedure' should be created, in accordance with Aboriginal Community members expectations and be provided to all workers, contractors, sub-contractors and employees at their time of their work induction to the site. The 'Unexpected Heritage Items Procedure' should:
   - Define a relic;
   - Provide that, if a relic is discovered in the course of excavation, that is likely to be disturbed damaged or destroyed by works, then all works must be suspended in that area and Bunyah LALC and a Senior Archaeologist contacted to assess the find; and
   - Provide that if the proponent must notify the Heritage Branch, Office of Environment and Heritage, or its delegate and suspend work in the vicinity of the object that might have the effect of disturbing, damaging or destroying such relic until the requirements of the Heritage Branch have been satisfied and be developed in consultation with Registered Aboriginal Parties.

As mentioned in **Section 7.6** Bunyah LALC would request that any shell found from a direct result of construction (regardless of cultural origin) be left onsite and spread out on the landscape. If suspected of being of cultural origin, please follow an Unexpected Heritage Items Procedure.

12. REFERENCES

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Appendix I AHIMS Search

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Beach to Beach

Client Service ID : 567995

Advitech Pty Limited

PO Box 207
Mayfield New South Wales 2304

Attention: Rod Bennison

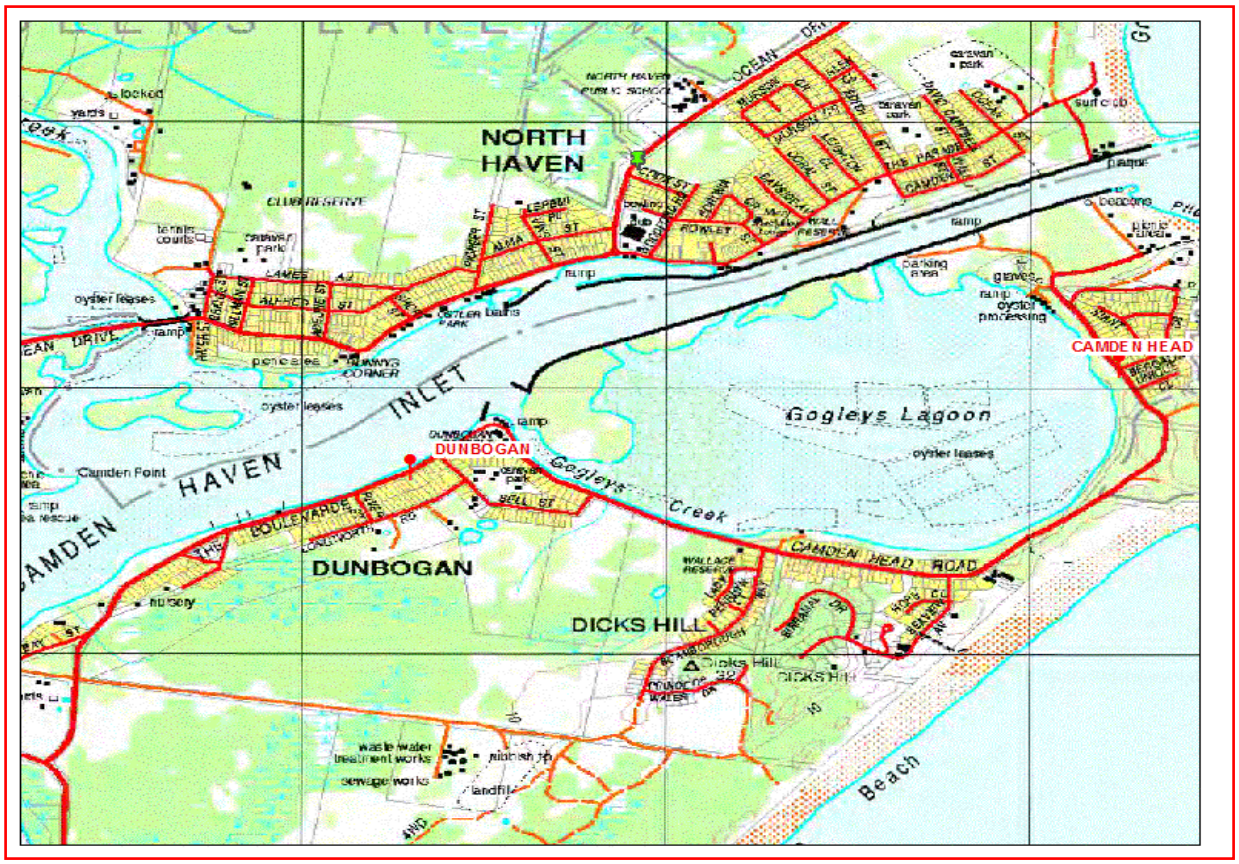
Email: rod.bennison@advitech.com.au

Date: 15 February 2021

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.656, 152.8025 - Lat, Long To : -31.6352, 152.8356 with a Buffer of 50 meters, conducted by Rod Bennison on 15 February 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

9	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Beach to Beach

Client Service ID : 567995

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
30-6-0037	Gogley's Lagoon;Dunbogan;	AGD	56	483000	6497800	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Unknown Author					**Permits**		
30-6-0047	D. 6;	AGD	56	482450	6497750	Open site	Valid	Shell : -, Artefact : -	Midden	1768
	Contact	**Recorders**	Elizabeth Rich,Laura-Jane Smith					**Permits**	4137	
30-6-0010	North Haven;	AGD	56	482200	6498700	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Unknown Author					**Permits**	755,1123	
30-6-0011	Dunbogan;	AGD	56	483200	6497900	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	J.A Starling					**Permits**		
30-6-0026	Gogley's Lagoon Dunbogan duplicate copy 30-6-0027	AGD	56	482500	6498500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	**Recorders**	Coleman					**Permits**		
30-6-0027	Gogley's Lagoon Dunbogan duplicate copy 30-6-0026	AGD	56	482500	6498500	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Coleman					**Permits**		
30-6-0028	Gogley's Lagoon 2;	GDA	56	483547	6498396	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Julie Coleman,Ms.Jacqueline Collins					**Permits**	4462,4570	
30-6-0104	Gogleys Lagoon;	AGD	56	483750	6499250	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		
30-6-0246	McCoubrie midden	GDA	56	482031	6498042	Open site	Valid	Shell : -		
	Contact	**Recorders**	Ms.Jacqueline Collins					**Permits**		

Report generated by AHIMS Web Service on 15/02/2021 for Rod Bennison for the following area at Lat, Long From : -31.656, 152.8025 - Lat, Long To : -31.6352, 152.8356 with a Buffer of 50 meters. Additional Info : for an ACHA.. Number of Aboriginal sites and Aboriginal objects found is 9

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Appendix II Consultation Log

Beach to Beach- JO210016 (F21105)

Date	Communication Type	Sent/Received	Advitec Personnel Making/Taking Comms	Internal/External Comms	Name of Sending/Receiving Stakeholder	Content of Comms	Actions
10.2.21	Email	Sent By	Jake Brown	External	Initial parties as per consultation guide	Seeking RAPs or information about interested parties	
11.2.21	Email	Received By	Jake Brown	External	NNTT	No title or agreements	
15.2.21	Email	Received By	Jake Brown	External	ORALRA	Reply to initial letter, no RAOs in area, suggested Bunyah LALC	
15.2.21	Email	Received By	Jake Brown	External	Heritage NSW	Six parties to contact	Drafted and sent letters on 24 Feb
16.2.21	Phone	Sent By	Jake Brown	External	Bunyah LALC	Called Amos after receiving his name from Client. Turned out he was with Bunyah LALC. Confirmed registration.	Sent follow up email confirming phone call and registration.
22.2.21	Email	Received By	Jake Brown	External	North Coast LLS	Replied with three names to contact	Drafted and sent letters on 24 Feb
23.2.21	Email	Received By	Jake Brown	External	Port Macquarie Hastings Council	Sam replied with three names to contact. Two names already on contact list from other parties.	Drafted and sent letters on 24 Feb
24.2.21	Email	Sent By	Jake Brown	External	Potentially interested parties	sent letter to names received from initial parties.	8 parties contact via email
24.2.21	Letter	Sent By	Jake Brown	External	Potentially interested parties (Saltwater Tribal Council)	sent letter to names received from initial parties.	
24.2.21	Phone	Sent By	Jake Brown	External	Marcus Ferguson	Phoned Marcus due to provided email address from LLS bouncing back. Left message. Call at 9:04am.	Marcus called back at 9:10am, to many 7s in email address from LLS. Sent email
24.2.21	Email	Received By	Jake Brown	External	Jason Holton Birpai Traditional Owners Corporation	Registered interest	Replied say thank you and would be intouch once registration period ended.
2.3.21	Email	Received By	Jake Brown	External	Athlea Sullivan	Registered interest	Contact email - athlea.sullivan1@gmail.com
17.3.21	Email	Sent By	Jake Brown	External	All RAPS	Methodology for review	
7.4.21	Phone	Sent By	Jake Brown	External	Bunyah LALC	Called Amos about fieldwork. Left message. He called back and following that I sent an email with details of project, proposed date of survey and Advitech requirements prior to work.	Spoke to Amos again on 15 April. Received email confirming survey invovlement and pricing. Reply sent to ask for representatives names and a contact number.
28.4.21	Email	Sent By	Jake Brown	External	All RAPS	Draft ACHAR sent for review by RAPs. Consultation ends 26 May.	No replies
24.5.21	Email	Sent By	Jake Brown	External	Bunyah LALC	Invoice received from LALC for fieldwork	Sent to client

Cultural Heritage Assessment

Registration of Interest for Aboriginal people who hold cultural knowledge

PROJECT: Aboriginal Cultural Heritage Assessment at Camden Head and Dunbogan – Proposed shared pathway between The Boulevarde/Scarborough Way Dunbogan and Pilot Beach Camden Head.

The purpose of community consultation with Aboriginal people is to assist the proposed applicant in the preparation of an Aboriginal Cultural Heritage Assessment and if required an Aboriginal Heritage Impact Permit. The outcome of the assessment is to assist the construction of a shared pathway.

This is an invitation for Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project to register an interest in a process of community consultation with the proposed applicant regarding the proposed activity.

As per the Aboriginal Cultural Heritage Requirements for Proponents (2010), interested parties are advised of the following;

· Unless otherwise specified, if you register your interest your details will be provided to Heritage NSW and the Local Aboriginal Land Council (LALC);

· The LALC's who hold cultural knowledge relevant to the proposed project area that is relevant to determining the significance of Aboriginal objects and/or places within the proposed project are who wish to register, do so as an Aboriginal organisation not an individual; and

· Where an Aboriginal organisation representing Aboriginal people who hold cultural knowledge relevant to the proposed project area and that is relevant to determining the significance of Aboriginal objects and/or places within the proposed project area who wish to register, must nominate a contact person and provide written confirmation and contact details of this person or persons.

PROPONENT: Kellogg Brown & Root Pty Ltd on behalf of Port Macquarie Hastings Council.

Registration from Aboriginal people and/or Aboriginal groups wishing to be consulted must be received by phone, email or in writing no later than: **Friday, 12th March 2021.**

To register your interest, please contact: Jake Brown, Archaeologist, Advitech Environmental, PO Box 20, Mayfield NSW 2304. Email: jake.brown@advitech.com.au or Phone 02 4924 5400

Jake Brown

From: Jake Brown
Sent: Wednesday, 28 April 2021 8:20 AM
Subject: ACHAR Review Beach to Beach Camden Head
Attachments: 21105 KBR Beach to Beach Shared Pathway ACHAR Rev1.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Dear RAPs,

Please find attached the draft ACHAR for the Beach to Beach shared user path at Camden Head.

The review period is set to end on the **26 May 2021**.

If you have any questions please contact us, we will respond as soon as possible.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental
www.advitech.com.au

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Jake Brown

From: Kirrily Slater <admin@bunyah.com.au>
Sent: Thursday, 15 April 2021 10:25 AM
To: Jake Brown
Subject: RE: Bunyah LALC

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Hi Jake,
Yes that is right $250 per hour for 2 site officers, the site officer that will be going are Raymond Donovan and Trevor Roberts The contact number for Ray is 0468 307 901.

Thanks

Kirrily Slater
Executive Assistant
Bunyah Local Aboriginal Land Council
208 High Street
WAUCHOPE NSW 2446
02 6585 3882 admin@bunyah.com.au

Language shared is the Language of the Gathang Language Speaking People, The Birrbay, Guringay, and Warrimay.
I respect and acknowledge Aboriginal peoples as the traditional owners of the land on which I work, live and visit.

-----Original Message-----
From: Jake Brown <Jake.Brown@advitech.com.au>
Sent: Monday, 12 April 2021 10:22 AM
To: Kirrily Slater <admin@bunyah.com.au>
Subject: RE: Bunyah LALC

Hello Kirrily,

Thank you for providing the insurance policies and rate. I believe Amos said the $250 per hour was for two site officers , is that correct? Additionally would you be able to provide a contact number for the site officers attending next week.

My mobile number is 0421555894 if they need to contact me next Tuesday.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

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-----Original Message-----
From: Kirrily Slater <admin@bunyah.com.au>
Sent: Monday, 12 April 2021 9:43 AM
To: Jake Brown <Jake.Brown@advitech.com.au>
Subject: Bunyah LALC

Hi Jake,
The insurance policies that you requested Also the hourly rate is $250 per hour

Thanks

Kirrily Slater
Executive Assistant
Bunyah Local Aboriginal Land Council
208 High Street
WAUCHOPE NSW 2446
02 6585 3882 admin@bunyah.com.au

Language shared is the Language of the Gathang Language Speaking People, The Birrbay, Guringay, and Warrimay.
I respect and acknowledge Aboriginal peoples as the traditional owners of the land on which I work, live and visit.

-----Original Message-----
From: scanner@bunyah.com.au <scanner@bunyah.com.au>
Sent: Monday, 12 April 2021 9:40 AM
To: Kirrily Slater <admin@bunyah.com.au>
Subject: Message from "RNP58387947CB70"

This E-mail was sent from "RNP58387947CB70" (IM C2000).

Scan Date: 04.12.2021 09:39:30 (+1000)
Queries to: scanner@bunyah.com.au

Jake Brown

From: Jake Brown
Sent: Monday, 12 April 2021 10:22 AM
To: Kirrily Slater
Subject: RE: Bunyah LALC

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Kirrily,

Thank you for providing the insurance policies and rate. I believe Amos said the $250 per hour was for two site officers , is that correct? Additionally would you be able to provide a contact number for the site officers attending next week.

My mobile number is 0421555894 if they need to contact me next Tuesday.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

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-----Original Message-----
From: Kirrily Slater <admin@bunyah.com.au>
Sent: Monday, 12 April 2021 9:43 AM
To: Jake Brown <Jake.Brown@advitech.com.au>
Subject: Bunyah LALC

Hi Jake,
The insurance policies that you requested Also the hourly rate is $250 per hour

Thanks

Kirrily Slater
Executive Assistant
Bunyah Local Aboriginal Land Council
208 High Street
WAUCHOPE NSW 2446
02 6585 3882 admin@bunyah.com.au

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I respect and acknowledge Aboriginal peoples as the traditional owners of the land on which I work, live and visit.

-----Original Message-----
From: scanner@bunyah.com.au <scanner@bunyah.com.au>
Sent: Monday, 12 April 2021 9:40 AM
To: Kirrily Slater <admin@bunyah.com.au>
Subject: Message from "RNP58387947CB70"

This E-mail was sent from "RNP58387947CB70" (IM C2000).

Scan Date: 04.12.2021 09:39:30 (+1000)
Queries to: scanner@bunyah.com.au

Jake Brown

From: Jake Brown
Sent: Monday, 12 April 2021 10:04 AM
To: Rod Bennison
Subject: FW: Bunyah LALC
Attachments: 20210412093930962.pdf

-----Original Message-----
From: Kirrily Slater <admin@bunyah.com.au>
Sent: Monday, 12 April 2021 9:43 AM
To: Jake Brown <Jake.Brown@advitech.com.au>
Subject: Bunyah LALC

Hi Jake,
The insurance policies that you requested Also the hourly rate is $250 per hour

Thanks

Kirrily Slater
Executive Assistant
Bunyah Local Aboriginal Land Council
208 High Street
WAUCHOPE NSW 2446
02 6585 3882 admin@bunyah.com.au

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I respect and acknowledge Aboriginal peoples as the traditional owners of the land on which I work, live and visit.

-----Original Message-----
From: scanner@bunyah.com.au <scanner@bunyah.com.au>
Sent: Monday, 12 April 2021 9:40 AM
To: Kirrily Slater <admin@bunyah.com.au>
Subject: Message from "RNP58387947CB70"

This E-mail was sent from "RNP58387947CB70" (IM C2000).

Scan Date: 04.12.2021 09:39:30 (+1000)
Queries to: scanner@bunyah.com.au

Jake Brown

From: Jake Brown
Sent: Wednesday, 17 March 2021 11:45 AM
Subject: Methodology for ACHAR Camden Head Pathway
Attachments: ACHA Information for Community Members Rev0.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Dear Registered Aboriginal Parties,

Thank you for registering your interest in the Beach to Beach shared pathway Aboriginal Cultural Heritage Assessment. Please find attached the methodology for the survey for your review. The review period ends on the 14 April, 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental
www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Monday, 8 March 2021 8:27 AM
To: doowakee@virginbroadband.com.au
Subject: FW: Beach to Beach Shared Path Consultation
Attachments: Lakkari NTCG 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Mick,

Not sure if the last email reached you but noticed an issue on my end with one of your email addresses. I thought I would forward it again.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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From: Jake Brown
Sent: Wednesday, 24 February 2021 8:30 AM
To: dowakee@virginbroadband.com.au
Cc: doowakee@gmail.com
Subject: Beach to Beach Shared Path Consultation

Hello Mick,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

I have cc'd another email address I had for you as I am not sure which is active.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Tuesday, 2 March 2021 9:41 AM
To: athlea Sullivan
Subject: RE: Cultural Heritage Assessment/Dunbogan NSW

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Athlea,

Thank you for registering your interest. I will be in contact with further information after the registration period has finished on 12 March.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

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-----Original Message-----
From: athlea Sullivan <athlea.sullivan1@gmail.com>
Sent: Tuesday, 2 March 2021 9:38 AM
To: Jake Brown <Jake.Brown@advitech.com.au>
Subject: Cultural Heritage Assessment/Dunbogan NSW

Good morning,
I wish to register my interest in the process of community consultation re proposed shared pathway between The Boulevarde/Scarborough Way Dunbogan and Pilot Beach Camden Head.
My best contact is through email - athlea.sullivan1@gmail.com Regards Athlea Sullivan

Sent from my iPhone

Jake Brown

From: athlea Sullivan <athlea.sullivan1@gmail.com>
Sent: Tuesday, 2 March 2021 9:38 AM
To: Jake Brown
Subject: Cultural Heritage Assessment/Dunbogan NSW

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Good morning,
I wish to register my interest in the process of community consultation re proposed shared pathway between The Boulevarde/Scarborough Way Dunbogan and Pilot Beach Camden Head.
My best contact is through email - athlea.sullivan1@gmail.com Regards Athlea Sullivan

Sent from my iPhone

Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 1:23 PM
To: Jason Holten
Subject: RE: Beach to Beach Shared Path Consultation

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Thank you for registering Jason. I will be in touch again once the registration period has ended.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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From: Jason Holten <jasonholten88@gmail.com>
Sent: Wednesday, 24 February 2021 12:34 PM
To: Jake Brown <Jake.Brown@advitech.com.au>
Subject: Re: Beach to Beach Shared Path Consultation

Hi my name is Jason holten chairman of the birpai traditional owner corporation we would like to register our interest in the project.

On Wed., 24 Feb. 2021, 8:44 am Jake Brown, <Jake.Brown@advitech.com.au> wrote:

> Hello Jason,
>
> As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.
>
> Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

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Jake Brown

From: Jason Holten <jasonholten88@gmail.com>
Sent: Wednesday, 24 February 2021 12:34 PM
To: Jake Brown
Subject: Re: Beach to Beach Shared Path Consultation
Attachments: image001.jpg

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Hi my name is Jason holten chairman of the birpai traditional owner corporation we would like to register our interest in the project.

On Wed., 24 Feb. 2021, 8:44 am Jake Brown, <Jake.Brown@advitech.com.au> wrote:

> Hello Jason,
>
> As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.
>
> Regards,
>
> Jake
>
> **Jake Brown** Archaeologist
> jake.brown@advitech.com.au
>
> 
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>
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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 9:11 AM
To: mferguson310574@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Marcus Ferguson 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Marcus,

Thank you for calling back and your time this morning. As I mentioned as part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental
www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:44 AM
To: jasonholten88@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Birpai Traditional Owners Indigenous Corporation 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Jason,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:35 AM
To: yanggaay@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Yanggaay 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Danial,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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If you have received this email in error, please delete it and notify us immediately.

Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:33 AM
To: mferguson3105774@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Marcus Ferguson 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Marcus,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:31 AM
To: jtmanagement@live.com.au
Subject: Beach to Beach Shared Path Consultation
Attachments: Norm Archibald 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Norm,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

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If you have received this email in error, please delete it and notify us immediately.

Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:30 AM
To: dowakee@virginbroadband.com.au
Cc: doowakee@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Lakkari NTCG 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Mick,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

I have cc'd another email address I had for you as I am not sure which is active.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental
www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:28 AM
To: ashley.moran@environment.nsw.gov.au
Subject: Beach to Beach Shared Path Consultation
Attachments: Ash Moran 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Ash,

Your name was mentioned by Local Land Services as a potential contact in the Aboriginal Cultural Heritage Assessment Process for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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If you have received this email in error, please delete it and notify us immediately.

Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:24 AM
To: jasonholton88@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Birpai Traditional Owners Indigenous Corporation 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello Jason,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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If you have received this email in error, please delete it and notify us immediately.

Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:25 AM
To: dcarroll.birpai@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Birpai LALC 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

Hello David,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

7 Riverside Drive | Mayfield West | NSW | 2304 | PO Box 207 | Mayfield | NSW | 2304 | P 02 4924 5400

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Jake Brown

From: Jake Brown
Sent: Wednesday, 24 February 2021 8:22 AM
To: ghinnighinniyouthandculture@gmail.com
Subject: Beach to Beach Shared Path Consultation
Attachments: Ghinni Ghinni Youth and Culture Aboriginal Corporation 24.2.21 Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

As part of the Aboriginal Cultural Heritage Assessment for the Beach to Beach Shared Path in Dunbogan and Camden Head NSW, your name was recommended as a potentially interested party. Please find attached a letter with further detail. If you are an interested party and wish to register for consultation as part of the assessment process, please let me know by Friday 12 March 2021.

Regards,

Jake

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Jake Brown

From: LLS Admin NorthCoast Mailbox <admin.northcoast@lls.nsw.gov.au>
Sent: Monday, 22 February 2021 12:05 PM
To: Jake Brown
Subject: RE: ACHA Stage 1 request for potential interested parties list
Attachments: 20210212 - Advitech Environment - Aboriginal Cultural Heritage Assessment Camden Head Shared Pathway.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Dear Jake

Please see the enclosed response to your request.

Kind regards

Rachael Wilson | Acting Executive Support Officer
North Coast Local Land Services
79 Conway St, Lismore NSW 2480
T: 02 6623 3903 M: 0427 267 152
E: rachael.wilson@lls.nsw.gov.au
W: www.lls.nsw.gov.au/regions/north-coast

Your feedback helps us to improve our service. Please take the time to rate your experience with us: rateitnow.com/northcoastllsregion



From: Jake Brown
Sent: Wednesday, 10 February 2021 2:11 PM
To: LLS Admin NorthCoast Mailbox
Subject: ACHA Stage 1 request for potential interested parties list

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

Jake Brown Archaeologist

jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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Jake Brown

From: Rachel Rewiri <rachel.rewiri3@oralra.nsw.gov.au>
Sent: Monday, 15 February 2021 10:09 AM
To: Jake Brown
Subject: RE: ACHA Stage 1 request for potential interested parties list
Attachments: Advitech Environmental Pty Ltd - Reply Letter 15.02.2021 .pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Good Morning Jake,

Please find attached, results as per your Aboriginal Cultural Heritage Assessment request.

Regards

Rachel Rewiri
Project Officer (Aboriginal Owners)
Office of the Registrar, *Aboriginal Land Rights Act 1983*

Ph: 8633 1266
www.oralra.nsw.gov.au

****
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privileged information or confidential information or both. If you
are not the intended recipient please delete it and notify the sender.
****

Jake Brown

From: Rosalie Neve <Rosalie.Neve@environment.nsw.gov.au>
Sent: Monday, 15 February 2021 9:37 AM
To: Jake Brown
Subject: Re: RAP request Camden shared path
Attachments: HNSW CR rersponse Camden shared Path Advitech.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Response attached

Rosalie Neve | **Aboriginal Heritage Planning Officer**
Heritage NSW, Community Engagement, Department of Premier and Cabinet
T: 0472 828 864 | rosalie.neve@environment.nsw.gov.au



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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:11 PM
To: admin.northcoast@lls.nsw.gov.au
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: LLS Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

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jake.brown@advitech.com.au

advitech environmental
www.advitech.com.au

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Jake Brown

From: Geospatial Search Requests <GeospatialSearch@NNTT.gov.au>
Sent: Wednesday, 10 February 2021 2:11 PM
To: Jake Brown
Subject: RE: Geospatial search request

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

Your email has been received and is being actioned. For information regarding timeframes and what you will receive in response please refer to our website at this address:
http://www.nntt.gov.au/assistance/Pages/Searches-and-providing-Register-information.aspx

Geospatial Searches
National Native Title Tribunal | Perth
Email: GeospatialSearch@nntt.gov.au **| www.nntt.gov.au**

Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:05 PM
To: adminofficer@oralra.nsw.gov.au
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: ORALRA Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

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jake.brown@advitech.com.au

advitech environmental

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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:08 PM
To: Geospatial Search Requests
Subject: Geospatial search request
Attachments: NNTT Geospatial search request 10.2.21.docx

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

Please find attached the search request for the Camden Head beach to beach shared pathway. The project is being undertaken in conjunction with an Aboriginal Cultural Heritage Assessment as per NSW legislation. This request is to assist with section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents* and potentially interested parties.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:04 PM
To: information@ntscorp.com.au
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: NTSCORP Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

Jake Brown Archaeologist
jake.brown@advitech.com.au

advitech environmental

www.advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:03 PM
To: council@pmhc.nsw.gov.au
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: PMHC Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

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jake.brown@advitech.com.au

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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 2:02 PM
To: admin@bunyah.com.au
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: Bunyah LALC Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

To whom it may concern,

I am writing regarding the Stage 1 consultation process for a Aboriginal Cultural Heritage Assessment. As per section 4.1.2 of the *Aboriginal cultural heritage consultation requirements for proponents,* I am requesting information about any potentially interested parties for the Beach to Beach shared pathway project in Dunbogan and Camden Head NSW. I have attached a letter regarding the project and consultation request.

Regards,

Jake

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jake.brown@advitech.com.au

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Jake Brown

From: OEH HD Heritage Mailbox <HERITAGEMailbox@environment.nsw.gov.au>
Sent: Wednesday, 10 February 2021 1:56 PM
To: Jake Brown
Subject: Automated Response
Attachments: image002.png; image001.png

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\3_Corresp-In

NSW GOVERNMENT | Heritage NSW

Thank you for your email to Heritage NSW, Department of Premier and Cabinet. We will respond to your email as soon as possible.

A new Heritage Management System is coming!
We are working to improve our systems to make it easier for you to work with us. We will be releasing a new Heritage Management System in early 2021, which will provide:

- improved heritage search tools, and
- the ability to submit, pay and track the progress of applications online.

Further updates will be provided as work progresses.

Reinvigorated s170 program commences 1 February 2021
Heritage NSW is working with state agencies to help them meet their obligations for managing heritage assets under section 170 of the *Heritage Act 1977*. Please get in touch if you do not know your Heritage NSW single point of contact. For further information about an agency's heritage responsibilities, please refer to the State Agency Heritage Guide available on our website. Section 170 notifications, registers and heritage asset management strategies should be submitted in accordance with this guide.

New Standard Exemptions and s60 fast track approval pathway
New Standard Exemptions and a fast track approval pathway for items listed on the State Heritage Register (SHR) or subject to an Interim Heritage Order (IHO) came into force on 1 December 2020. The new Standard Exemptions, fast track application form and supporting information are available on the Heritage NSW website.

Coronavirus (COVID 19)
Given the rapid spread of coronavirus (COVID-19) Heritage NSW has taken steps to protect the safety, health and wellbeing of our staff, partners and communities. We have implemented a number of safeguards that meet official Australian Government COVID-19 guidelines. Whilst our offices remain open, we have well established flexible working arrangements for our teams across NSW, and we will continue to adapt as necessary as these guidelines continue to evolve. Face-to-face meetings and field work/site visits with our customers are now subject to new rules on gatherings and social distancing measures. There may also be some short delays in processing postage in the coming weeks.

We are committed to supporting our communities during this developing situation and we thank you for your patience and understanding.

Aboriginal cultural heritage regulation is now part of Heritage NSW

From 1 July 2020 Heritage NSW began managing Aboriginal cultural heritage regulatory functions under the *National Parks and Wildlife Act 1974*. Now the government functions for the management of Aboriginal cultural heritage is within the one State government agency. All the staff that previously carried out these functions in the Department of Planning, Industry and Environment have been welcomed into Heritage NSW.

Applications and section 170 notifications

If you have submitted an application under the *Heritage Act 1977* or the *National Parks and Wildlife Act 1974*, or a section 170 notification, it will first be reviewed for completeness and then allocated to the appropriate assessment team or officer. An officer will contact you if any additional information is required. The completeness check is generally completed within 7-14 business days.

We aim to process applications or notifications within the timeframes below:

Application/ notification type	**Timeframe (Commences once an application or notification is**
Planning Proposals Section 139 Exceptions Section 140 Permits Section 4.55 Modifications	21 days
Integrated Development Applications	If advertised: 21 days following receipt of submissions, or If not advertised: 40 days
Section 60 Application (fast track) Section 60 Applications (standard/ major works) Section 65A Modifications	21 days 40 days (or 60 days if advertised)
Section 90 Aboriginal Heritage Impact Permit	60 days
Section 170 notifications – local heritage items Section 170 notifications – state heritage/SHR items Section 170 registers and heritage asset management strategies	14 days 40 days As advised/ negotiated with an agency's single point of

Nominations for listing under the *Heritage Act 1977* (State Heritage Register) must accompany a nomination form available on our website (https://www.heritage.nsw.gov.au/protecting-our-heritage/nominate-listing-on-the-state-heritage-register/). SHR Nominations are considered by the State Heritage Register Committee who will decide whether the nomination will proceed to the next stage of assessment.

Nominations for Aboriginal Place listings under the *National Parks and Wildlife Act 1974*, are allocated to the relevant team within 2 business days. An officer will contact you if any additional information is required. The Aboriginal Place proposal form is available on our website: https://www.heritage.nsw.gov.au/protecting-our-heritage/nominating-an-aboriginal-place/

Aboriginal Cultural Heritage (ACH) Conservation and Repatriation

Programs supported by Heritage NSW include the ACH Conservation and Repatriation of Aboriginal ancestors and objects. This work is managed by staff located across NSW. Enquiries into these programs are sent to the relevant team within 2 business days. One of our staff will respond to you directly. Please advise us of any requests to modify our projects or timeframes to better accommodate your needs.

Further information is also available at https://www.heritage.nsw.gov.au/

Sincerely

NSW Premier & Cabinet

Customer Strategies
Heritage, Department of Premier and Cabinet.

Locked Bag 5020, Parramatta 2124
T (02) 9873 8500

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Jake Brown

From: Jake Brown
Sent: Wednesday, 10 February 2021 1:55 PM
To: OEH HD Heritage Mailbox
Subject: ACHA Stage 1 request for potential interested parties list
Attachments: Heritage NSW Consultation Letter.pdf

Categories: Filed: F:\21105 KBR PMC Camden Head BioArch\Env\4_Corresp-Out

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Jake

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jake.brown@advitech.com.au

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Appendix III Information Presentation for Community Members

INFORMATION FOR COMMUNITY MEMBERS

PROPOSED BEACH TO BEACH SHARED USER PATH

Advitech Environmental (Advitech Pty Limited) has been contracted to conduct an Aboriginal Cultural Heritage Impact Assessment. The assessment may also result in an application for an Aboriginal Heritage Impact Permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974* should any Aboriginal Objects or Places be located within the proposed impact area.

The Beach to Beach project aims to complete the shared user path along the backs of the local Camden Haven River system, located in the Port Macquarie Hastings Council area. The path will complete a 11.0 km scenic route of uninterrupted shared pathway from North Haven, traversing through Laurieton and terminating at Pilot Beach in Camden Head. The assessment will examine D3, D5, D8, D10 and D11 sections of the pathway. The proposed area is shown in the map below (**Figure 1**).

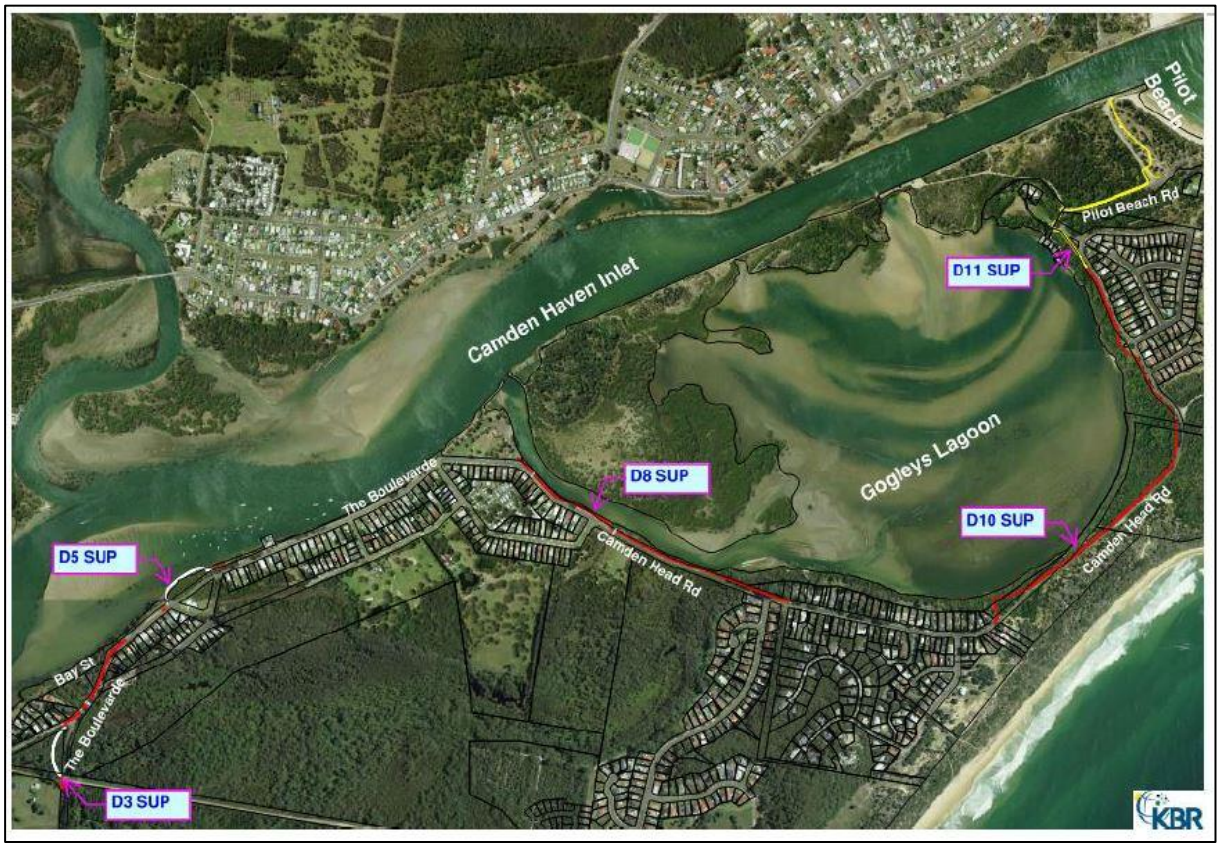


Figure 1: KBR proposed alignment of shared user pathway

Indicative Timeline

Stages	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Stage 1: Consultation	X	X	X	X	X	X	X	X	X	X	X	X
Stage 2: Survey							X					
Stage 3: Reporting					X	X	X	X				
Stage 4: Finalisation											X	X

Survey Methodology

The survey methodology which will be conducted at site the Week of **19 April, 2021,** will include a predictive model, proposed assessment survey and recording procedure.

Predictive model

Based on the environmental and archaeological context, and using Kuskie and Kaminga's (2000) model, it is considered that the study area would have been most likely suitable for transitory hunting and foraging as well as occupation due to proximity to water and using this predictive model with an adapted regional model as based on UCHQU (2017, pp. 33-35) which details that sites are more likely to occur within:

- 200m of a named watercourse;
- 100m of a mapped drainage line;
- 50m of a known Aboriginal cultural heritage site; and
- On landforms with a slope no greater than 30 degrees, except where sandstone bedrock or limestone outcrops are present.

Based on the predictive modelling from the regional data and following an inspection of the study area, a final predictive model for the study area and its archaeological potential, reveals that there is a moderate likelihood of Aboriginal object(s) being present within the study area due to limited disturbance.

The predictive model suggests that the area has potential for transitory use based on landscape features and proximity to water. The mapped AHIMS sites suggest that areas closer to the Camden Haven estuary have the potential for heritage sites including shell middens, modified trees and isolated finds close to water.

Existing Predictive Models of Past Aboriginal Land Use

The main aim of this assessment is to attempt to define both the potential nature and extent of Aboriginal occupation across the study area. As a result, the nature of the analysis focused on both the landform units and known sites. The purpose of this strategy is to highlight any variations between sites and associated assemblages, landforms and resources across the area. In doing this, it is possible to identify variation across the landscape, landforms and assemblages that correspond with variation in the general patterns of landscape use and occupation. The nature of activities and occupation can often be identified through the analysis of stone artefact distribution across a landscape.

A general model of forager settlement patterning in the archaeological record has been established by Foley (1981). This model distinguishes the residential 'home base' site with peripheral 'activity locations'. Home base sites generally occur in areas with good access to a wide range of resources (reliable water, raw materials, and so on). The degree of environmental reliability, such as reliable water and subsistence resources, may influence the rate of return and length of occupation of sites and; hence, the complexity of evidence. Home base sites generally show a greater diversity of artefacts and raw material types (which represent a greater array of activities performed at both the site and immediate area).

Activity locations occur within the foraging radius (approximately 10.0 kms) of a home base camp (Renfrew and Bahn, 1991). Based on the premise that these sites served as a focus of a specific activity, they will show a low diversity in artefacts and are not likely to contain features reflecting a base camp (such as hearths). However, it is also possible that the location of certain activities cannot be predicted or identified, adding to the increased dispersal of cultural material across the landscape. If people were opting to carry stone tools during hunting and gathering journeys throughout the area rather than manufacturing tools at task locations, an increased number of used tools should be recovered from low density and dispersed assemblages.

Refined predictive model

A predictive model of site types and site patterning for the study area is generally achieved through a review of previous archaeological studies undertaken throughout the locality and the region, the AHIMS register and the environmental context of the study area. The aim of a predictive model is to understand the nature of previous Aboriginal occupation and determine the nature of land use. This theme often aims to identify and explain archaeological patterning in site type, content and distribution. General archaeological theories have been developed outlining the relationship between land use patterns and the resulting archaeological evidence.

Comparable data from archaeological research within the locality to support a predictive model for the study area is disparate. However, and based on the landscape of an alluvial river plain, it is considered that in its natural condition, the study area would have historically provided Aboriginal people with a variety of plant and animal resources. The surrounding lake systems could also have provided different resources such as food. In accordance with Foley's model (1981), it is envisaged that the area was most likely used for opportunistic hunting or gathering of resources whilst accessing the watercourses.

Notwithstanding the predictive model above, the highly disturbed state of the study area removes virtually all likelihood for the presence of Aboriginal objects except in those areas which from previous assessment have been deemed sensitive. However, limitations should be noted with the predictive model when attempting to predict past human actions and behaviour, including:

- Biases due to differential sampling of landforms based on decisions made by archaeologists;
- Aboriginal people involved in previous studies or surveys may not have disclosed the existence of places with cultural heritage values as they may not have been under immediate threat when the earlier study was undertaken;
- Variation in the classificatory definitions employed by archaeologists will significantly influence the range of artefact types identified within a study area. For example, the distinction between a waste flake, a debitage flake and a flaked piece may be heavily subject to the perspective of the recorder. Thus, it is not productive to attempt to quantify the proportionate representation of artefact types identified in previous studies; and
- Levels of exposure of different landforms.

Based on the previous assessments and AHIMS results, a predictive model for the project area has been developed:

- A preference for sites within 50 metres of reliable water sources or a confluence of water sources, on ridge lines, spurs and on crests. There is an elevated position located within the study area and hydro lines are present in the study area;
- Previous finds in the area where ground disturbance has occurred;
- Based on previous surveys the likely majority of finds will be middens; and
- The sand dunes present in and in proximity to the study area may increase the likelihood of certain archaeological record such as shell.

The background literature, previous assessments and AHIMS results, provide an outline of previous or known Aboriginal use of the land. Use of the land can be confirmed through artefact locations. The proximity of water and food resources in the area, as well as the proximity of elevated areas present the likelihood of occupation and transitory activities in the area.

Following on from this, limitations may occur through the assumption of archaeological sensitive areas meaning a greater chance of artefact yield.

Survey

The proposed survey is to assess the development area with the assistance of the local Aboriginal community.

The proposed method of field assessment is a pedestrian survey. The pedestrian survey will be conducted by four people, comprising two representatives from Advitech and two community members. The Local Aboriginal Land Council will be asked to provide field representatives for the survey. Transects will be planned with a proposed spacing for each individual to cover 2.0-5.0 metres, depending on vegetation density and width of disturbance.

The survey will be conducted using a systematic sampling strategy. The systematic random sampling strategy (Burke and Smith, 2004, p. 65-69) was chosen to allow for an even data sample and that all areas of the proposal is surveyed. The proposed survey route is recorded in **Table 1**. **The map (figure 2)** shows the proposed route which will be used as a centre line for transects, aiming for three people covering 2.0-5.0 metres each (1.0-2.5 metres either side of a person). Limitations when surveying the extraction area may include dense vegetation along certain sections of the proposed pathway, and the distance between the road and water may converge to a narrow point. The survey will be recorded with a GPS. The transects are planned to be 6.0-15.0 metres in width (based on a field team of 3 people and depending upon the site conditions).

Table 1: Pedestrian transect details

Transect ID	Length (m)	Start / End Point	Latitude	Longitude
1	400	1	-31.65425	152.803569
		2	-31.651078	152.804757
2	210	3	-31.649769	152.806344
		4	-31.648822	152.808039
3	845	5	-31.646191	152.816453

Transect ID	Length (m)	Start / End Point	Latitude	Longitude
		6	-31.649666	152.824156
4	1950	7	-31.650076	152.830021
		8	-31.637565	152.833515
Total length of Transects = 3405m				



Figure 2: Proposed project area and survey route

Recording will be conducted in the following methods adapted from Burke and Smith (2004):

Table 2: Examples of recording

Item	Recording Action
Isolated Artefact/s (up to 5 within 1m²)	▪ Photos of multiple sides with scale card (e.g. flake ventral and dorsal) ▪ GPS location ▪ Field notes including measurements, material and artefact type
Open scatter (5+artefacts within 1m²)	▪ Photos of individual artefacts, extent of scatter ▪ GPS location ▪ Field notes including measurements, number of artefacts, material and artefacts type
Scar tree	▪ Photos of scar and tree ▪ GPS location ▪ Field notes including measurements, species, direction and condition of scar/s
Shell and shell middens	▪ Photos of individual items, area (extent) ▪ GPS location ▪ Field notes including measurements, number of items and material
Stone arrangement	▪ Photos of individual stones and pattern ▪ GPS location ▪ Sketch of pattern ▪ Field notes including type and size of stone

Records including photos of landscape and a GPS trail will be kept for the survey as well as field notes which may include details of any finds.

Safety measures and survey protocol

The transects, once confirmed through community consultation, will be undertaken by four field personal. The field personal will start at approximately 8:30am. If field personal are not on site within 15 minutes of the start time, it will be assumed non-attendance for the day and the survey will start without said participant. Community members will be expected to provide in advance proof of insurances:

- Public liability;
- Workers compensation;
- Public indemnity; and
- Car insurance for the vehicle used for transport to and from site.

Given the terrain, community members that commit to the survey will be expected to have reasonable fitness and fully participate in the survey. Terrain is generally flat but is undulating in places, and ground visibility may be limited due to patchiness of vegetation, meaning hazards may be present. Other safety factors that may be present include environmental factors (weather extremes, snakes, road). The survey is expected to take one day. Community members will sign an attendance log when starting and finishing for the day, as well as transect recording forms to indicate people agreeing with the field results.

Consultation

- Consultation with registered Aboriginal parties involves obtaining the views of, and information from, Aboriginal parties and reporting on these. It should not to be confused with other field assessment processes involved in preparing a proposal and an application;
- Consultation does not mean the employment of Aboriginal people to assist in field assessment and/or site monitoring;
- The proponent is not obliged to employ those Aboriginal people registered for consultation. Consultation as per these requirements will continue irrespective of potential or actual employment opportunities (i.e. pay disputes) for Aboriginal people; and
- A daily fee for service will be provided to registered Aboriginal participants of the survey.

Forms

You will find a number of forms attached for your convenience. However, you are most welcome to provide the information required in any form that you would like. Please ensure that answers to all the questions are returned to Advitech Environmental no later than **14 April, 2021**.

Forms attached:

- Register of cultural knowledge holder;
- Cultural significance; and
- Comments on proposed methodology.

Advitech would welcome community feedback and any additional cultural information that could help inform the assessment process including the survey methodology and potential AHIP application.

Thank you for your cooperation in this process.

Please contact Jake Brown either via email or phone (details below) no later than **14 April, 2021**.

Regards,

Jake Brown

Email – jake.brown@advitech.com.au
Phone – 02 4924 5400

FORMS

Advitech Pty. Limited (trading as Advitech Environmental) would like to clearly state that, should you wish to provide feedback in another form, you are encouraged to do so. You are under no obligation to complete the attached forms which are as follows:

- Registration of Cultural Knowledge Holders;
- Cultural Significance; and
- Comments on proposed methodology.

However, should you wish to use these forms, please complete, sign and return to Advitech Environmental by 13 April 2021 (at the very latest).

Postal address:
Jake Brown
Advitech
P O Box 207
Mayfield NSW 2304

Email: jake.brown@advitech.com.au

REGISTRATION OF CULTURAL KNOWLEDGE HOLDER

Advitech and the proponent would like to facilitate a process whereby all registered Aboriginal parties are provided the opportunity to contribute to culturally appropriate information gathering, provide information that will enable the cultural significance of Aboriginal sites/places on the project area to be determined, and have input into the development of any cultural heritage management options. To enable this to occur, it is necessary to consult with the cultural knowledge holder(s).

To this end, as per the OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010), you are required to provide details of the individual(s) who hold cultural knowledge (according to traditional lore) relevant to the project area. If your group has no knowledge holders, this is important information too.

Please fill in the following information for cultural knowledge holder(s). If there are more than three in your organisation, please feel free to attach another sheet. If there are no knowledge holders in your group please send the form back blank.

Name:_____

Address:_____

Phone:_____ **Mobile:**_____

Fax:_____ **E-mail:**_____

Name:_____

Address:_____

Phone:_____ **Mobile:**_____

Fax:_____ **E-mail:**_____

Name:_____

Address:_____

Phone:_____ **Mobile:**_____

Fax:_____ **E-mail:**_____

CULTURAL SIGNIFICANCE

As per the Heritage NSW *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010), the proponent seeks information on the following:

1) **Are there Aboriginal <u>objects</u> of cultural value in the proposed project area?**

_____
_____
_____
_____
_____

2) **Are there Aboriginal <u>places</u> of cultural value to the Aboriginal people in the area of the proposed project? This may include places of social, spiritual and cultural value, historic places with cultural significance, and potential places/areas of historic, social, spiritual and/or cultural significance that may be either pre-contact, post contact or contemporary in age.**

_____
_____
_____
_____
_____

3) **Is there any other cultural information relevant to the proposed project area?**

_____
_____
_____
_____
_____

4) **Advitech and the proponent would like to develop and implement appropriate protocols for sourcing and holding cultural information. Please provide your preferred method of providing detailed information on the above (for example, written, verbal, this form) and any restrictions you would like to place on your information.**

_____
_____
_____
_____
_____
_____

COMMENTS ON PROPOSED METHODOLOGY

I, _____ (*please insert your name*) of _____ (*please insert the name of your group*), **agrees to the methodology** outlined by Advitech in relation to the proposed assessment at Beach to Beach Shared User Path.

Additional comments:_____

_____

_____

_____

Signed: _____ Date: _____

Position within organisation: _____

I, _____ (*please insert your name*) of _____ (*please insert the name of your group*), **does not agree to the methodology** outlined by Advitech in relation to the proposed Project at Beach to Beach Shared User Path for the following reasons (*please explain your reasons for disagreeing):*

_____

_____

_____

I would like to suggest the following (please provide your reasoning):_____

_____

_____

Signed: _____ Date: _____

Position within organisation: _____

Appendix IV Project Drawings November 2020

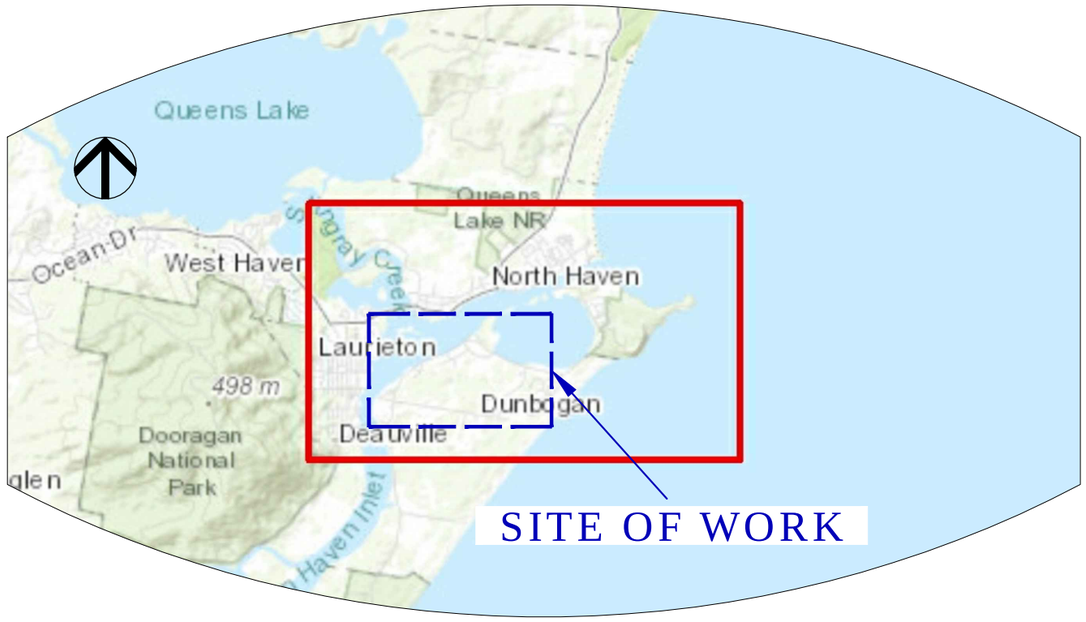
PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

BEACH TO BEACH D3 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
RU-DUN-30-01

KBR

LIST OF DRAWINGS	
DRG.NO	**DRAWING TITLE**
GENERAL	
RU-DUN-30-01	COVER SHEET, LOCALITY MAP AND DRAWING LIST
RU-DUN-30-02	GENERAL NOTES
CIVIL	
RU-DUN-30-20	PLAN
RU-DUN-30-21	PLAN AND SECTION - SHEET 01
RU-DUN-30-22	PLAN AND SECTION - SHEET 02
RU-DUN-30-60	CROSS SECTION - SHEET 01
RU-DUN-30-61	CROSS SECTION - SHEET 02
RU-DUN-30-70	TYPICAL DETAILS



LOCALITY PLAN
NOT TO SCALE

SCHEDULE OF SERVICE ALERTS		
SERVICE	**LOCATION**	**DESCRIPTION**

ISSUE No. 1 - REV. C
DATE 03/11/2020

GENERAL

1. ALL LEVELS ARE IN METRES REFERENCED TO AUSTRALIAN HEIGHT DATUM (AHD) . ALL COORDINATES ARE IN METRES TO MGA.
2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT PMHC AUSPEC CONSTRUCTION SPECIFICATIONS AVAILABLE ON COUNCILS WEBSITE. WHERE DIFFERENCES EXIST BETWEEN THE PLANS AND THE AUSPEC REQUIREMENTS, THESE PLANS SHALL TAKE PRECEDENCE
3. NO VEGETATION SHALL BE REMOVED WITHOUT PRIOR APPROVAL OF THE SUPERINTENDENT UNLESS NOTED ON THE DRAWINGS OR SCHEDULED IN THE REVIEW OF ENVIRONMENTAL FACTORS
4. THE IMPACT ON THE ENVIRONMENT SHALL BE MINIMISED BY OBSERVING THE FOLLOWING MINIMUM CONSTRUCTION PRACTICES:
* AREAS DISTURBED BY CONSTRUCTION TRAFFIC AND PROCEDURES SHALL BE MINIMISED.
* HYDROMULCHING (OR ALTERNATIVE APPROVED TREATMENT) FOR SLOPE STABILISATION SHALL BE CARRIED OUT SOON AFTER THE COMPLETION OF TOPSOIL PLACEMENT
* FLOW DIVERSION SHALL BE CARRIED OUT BY EARLY INSTALLATION OF DRAINS ALONG TOPS OF BATTERS WITH APPROPRIATE SILTATION CONTROL DEVICES IN ACCORDANCE WITH STANDARD DRAWING ASD602.
* SEDIMENT INTERCEPTION BY THE PLACEMENT OF TEMPORARY SILT FENCING AND GRAVEL FILLED GEOTEXTILE SAUSAGES ACROSS DRAINAGE LINES AND AT INTERCEPTION POINTS FOR BOTH THE CONSTRUCTION AND STOCKPILE AREAS IN ACCORDANCE WITH PHMC STANDARD DRAWING ASD601
* INSTALLATION OF SEDIMENT TRAPS AT GRATED PITS AND KERB INLET PIT IN ACCORDANCE WITH STANDARD DRAWING ASD600
5. SETOUT AND POINT INFORMATION TO BE PROVIDED IN ELECTRONIC FORMAT UPON REQUEST TO THE CONSTRUCTION SURVEYOR AT THE TIME OF CONSTRUCTION.
6. CONTRACTOR TO CONFIRM LEVELS OF EXISTING SERVICES AT ALL CROSSINGS AND IN THE PROXIMITY OF EXCAVATIONS PRIOR TO COMMENCING EXCAVATION.
7. AS CONSTRUCTED DETAILS SHALL BE RECORDED BY BY A REGISTERED SURVEYOR OR APPROVED ENGINEERING SURVEYOR AT THE CONTRACTORS COST. AS CONSTRUCTED DETAILS SHALL BE SUBMITTED TO THE SUPERINTENDENT PRIOR TO PRACTICAL COMPLETION.
8. WORKS SHALL NOT BE UNDERTAKEN WITHOUT CONSIDERATION OF THE EIS.
9. DRAWINGS REFERENCES QUOTED SHOW ONLY THE LAST SIX CHARACTERS FOR SIMPLICITY.
10. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING DESIGN REPORT.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETERES UNLESS SPECIFIED OTHERWISE.

CONCRETE AND DURABILITY

1. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF ALL STRUCTURAL CONCRETE SHALL BE 40MPa AND 20MPa FOR MASS CONCRETE
2. TOP SURFACE OF CONCRETE SHALL BE SLIP RESISTANT
3. EDGES SHALL BE CHAMFERED 20x20 AND RE-ENTRANT ANGLES FILLETED 20x20 UNLESS SPECIFIED OTHERWISE
4. MINIMUM CEMENTITIOUS CONTEXT AND MAX WATER/CEMENT RATIO FOR ALL CONCRETE WORKS SHALL BE AS FOLLOWS:

CLASSIFICATION	MAX W/C RATIO	MIN TOTAL CEMENTITIOUS CONTENT (kg/m3)	TYPE OF BLINDER	SORPTIVITY
B1	0.460	370	MIN. 30% FA/GGBS	25
B2	0.460	370	MIN. 30% FA/GGBS	20

REINFORCEMENT NOTES

1. ALL REINFORCEMENT BARS TO BE GRADE D500N TO AS/NZS4671. ALL MESH TO BE GRADE D500L TO AS/NZS4671.
2. UNLESS NOTED OTHERWISE, NOMINAL COVER TO REINFORCEMENT NEAREST TO ALL CONCRETE SURFACE SHALL BE AS FOLLOWS:

	B1		B2	
	IN-SITU AND SHOTCRETE	PRECAST**	IN-SITU AND SHOTCRETE	PRECASE**
AGAINST FORMWORK	40	40*	55	45
AGAINST BLINDING	40	---	55	---
AGAINST SOIL	70	---	85	---

* DENOTES ADDITIONAL COVER ADDED TO MEET REQUIREMENTS FOR CARBONATION RESISTANCE.
** DENOTES REQUIREMENT FOR INTENSE COMPACTION CASE IN RIGID FORMWORK.

3. UNLESS NOTED OTHERWISE, THE MINIMUM DEVELOPMENT LENGTHS AND LENGTH OF LAPS SHALL BE AS FOLLOWS:

BAR SIZE	N12	N16	N20
A) HORIZONTAL BARS WITH >300mm OF CONCRETE CAST BELOW THE BAR	400	500	750
B) OTHER BARS	300	400	600

LAPS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION. WHERE MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION, THE LAPS SHOWN IN THE TABLE ABOVE ARE INCREASED BY A FACTOR OF 1.3

4. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE NECESSARY TO CLEAR STEEL DOWELS
5. REINFORCEMENT ABBREVIATIONS FOR PLACEMENT ARE IN ACCORDANCE WITH AS/NZS1100.501 EXCEPT WHERE LV - DENOTES LENGTH VARIES
6. FABRIC SHALL BE LAPPED TWO (2) TRANSVERSE WIRES PLUS 25mm. A MAXIMUM OF THREE (3) SHEETS SHALL BE LAPPED AT ANY ONE POINT
7. ON-SITE CUTTING GALVANISED BARS AND MESH SHALL BE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATION
8. REINFORCEMENT IS NOT TO BE WELDED EXCEPT AS NOTED ON DRAWINGS OR APPROVED BY THE DESIGNER. WELDING TO BE IN ACCORDANCE WITH AS1554.3

SHARED USER PATH

1. MINIMUM SHARED USER PATH WIDTH SHALL BE 2.5m
2. CONCRETE FOOTPATH SURFACE TO HAVE A NON-SLIP BRUSH FINISH. TACTILE GROUND SURFACE INDICATORS ARE TO BE PROVIDED AT ALL KERB RAMPS AND LOCATIONS WHERE FOOTPATHS MEET THE ROADS

PAVEMENTS

1. ALL PAVEMENTS ARE DESIGNED ASSUMING A CBR OF 3 FOR THE SUB-GRADE

SIGNAGE AND LINE MARKING

1. TO ELIMINATE EXCESSIVE GLARE FROM THE SURFACE OF A SIGN, IT SHOULD BE TURNED APPROXIMATELY 5 DEGREES AWAY FROM THE NORMAL TO THE HEADLIGHT BEAM/LINE OF SIGHT
2. ALL SIGNAGE TO BE CLEAR OF ALL VEGETATION AND OBSTRUCTIONS
3. SIGNS TO BE INSTALLED IN ACCORDANCE WITH AS174.2
4. ANY OBSTRUCTIONS ALONG FOOTPATHS SHALL BE DELINEATED WITH YELLOW LINE MARKINGS
5. PEDESTRIAN CROSSING MARKINGS SHALL HAVE A NON-SLIP FINISH

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING SERVICES MUST BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCING WORK. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES AND SUBSEQUENTLY RESOLVED WITH THE DESIGN TEAMS SITE REPRESENTATIVE
2. CONTRACTOR TO ENSURE THE PROPOSED WORKS AND ADOPTED METHOD OF CONSTRUCTION WILL AVOID DAMAGE TO ALL UTILITIES
3. IN ORDER TO AVOID DAMAGE TO THE UTILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORKS ADJACENT TO ANY UTILITY WITH THE RELEVANT UTILITY AUTHORITY IN ACCORDANCE WITH THE AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE RELEVANT UTILITY AUTHORITIES AND THE DESIGN TEAM WITH RESPECT TO ANY TEMPORARY DIVERSIONS NECESSARY FOR CONSTRUCTION STAGING WORKS.
5. PRIOR TO THE START OF EXCAVATION, ALL PROPOSED TEMPORARY EXCAVATIONS FOR UTILITIES NEAR CUT OR FILL BATTERS ARE TO BE ASSESSED ON SITE BY AN EXPERIENCED ENGINEERING GEOLOGIST OR DESIGNERS SITE GEO-TECHNICAL REPRESENTATIVE FOR THEIR POTENTIAL IMPACT ON BATTER STABILITY DURING CONSTRUCTION.

DRAINAGE

1. ALL EXISTING DRAINAGE PITS TO BE RETAINED SHALL BE MODIFIED TO SUIT ANY CHANGES TO FINISHED SURFACE LEVEL
2. ALL DRAINAGE INFRASTRUCTURE MUST BE MANUFACTURED IN ACCORDANCE WITH DESIGN LIFE SPECIFICATIONS OUTLINED IN AS4508, AS/NZS2566 AND AS1597
3. ALL NEW AND EXISTING DRAINAGE THAT CONNECTS TO PROPOSED DRAINAGE IS TO BE CLEANED FREE OF DEBRIS PRIOR TO ASSET HANDOVER
4. ALL REINFORCED CONCRETE PIPES TO BE CLASS 3 WITH RUBBER RING JOINTS AND HS2 SUPPORT UNLESS STATED OTHERWISE
5. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL AND CONSTRUCTIONAL LOADS ACTING ON COMPLETED STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION

SCOUR PROTECTION

1. THICKNESS OF THE RIP-RAP PROTECTION SHALL BE A MINIMUM OF TWICE THE D50 ROCK SIZE SPECIFIED ON THE DRAWINGS. D50 = 250mm U.N.O. THE ROCK SHALL BE REASONABLY WELL GRADED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ROCK SIZE	% PASSING (BY WEIGHT)
2 x D50	100%
D50	40% - 60%
0.3 x D50	10% - 20%

2. ROCK TO BE HARD, DENSE, DURABLE, RESISTANT TO WEATHERING AND ANGULAR IN SHAPE. IT SHALL BE FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER. ROCK THAT IS LAMINATED, FRACTURED, POROUS OR OTHERWISE PHYSICALLY WEAK IS UNACCEPTABLE. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON SLOPES STEEPER THAN 3H:1V.
3. ROCKS AND ROCK BOULDERS SHALL HAVE A RELATIVE DENSITY OF 2.2 TO 2.8
4. THE ROCK SHALL BE REASONABLY WELL GRADED THROUGHOUT THE RIP-RAP LAYER. ROCK SIZES SHALL BE DEPENDANT ON THE D50 VALUE SPECIFIED ON THE DRAWINGS. D10 SHALL BE 0.5xD50 AND D90 SHALL BE 1.35xD50
5. ROCKS SMALLER THAN THE SPECIFIED D10 ARE NOT TO EXCEED 20% BY WEIGHT OF EACH LOAD
6. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON THE SLOPES GREATER THAN 3H:1V

VEGETATED CATCH DRAINS AND SWALES

1. VEGETATED SWALES ARE TO BE GRASSED LINED
2. ALL CHANNELS ARE NOT LINED WITH ROCK OR CONRETE ARE TO BE VEGETATED

REFERENCES

1. AUS-SPEC HASTINGS COUNCIL EDITION 2004

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
C	ISSUED FOR CONCEPT DESIGN	03.11.2020	PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	20.08.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	07.08.2020			

KBR DRAWING No.
SEC052-0002-CV-GEN-0002

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D3 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
GENERAL NOTES

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: DANIEL TAING
DRAWING No.: RU-DUN-30-02
REVISION: C

© Kellogg Brown & Root
DATE: Tuesday, November 3, 2020 2:35:37 PM
FILE: \\SYDFILE300\DATA$\G&I\CAD\PROJECTS\3EC34\103 CAD\CONCEPT DESIGN D3\CIVIL\01 DRAWINGS\RU-DUN-30-02.DWG



PLAN - THE BOULEVARDE (NORTH)
SCALE: 1:1000

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- PAVED ROAD / SEALED
- GRAVEL ROAD / UNSEALED
- HEADWALL
- PIPE WITH DIRECTION OF FLOW
- SEWER
- WATER MAIN
- STORMWATER

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- EARTHWORKS - BATTER
- HEADWALL
- STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- NEW ROAD PAVEMENT

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-30-02.
2. SUP DETAILS FOR DRIVEWAY CROSSING AND PEDESTRIAN CROSSING TO BE DEVELOPED AT DETAILED DESIGN.
3. MODELED EARTHWORKS HAVE REFERENCED DETAILED SURVEY.
4. THE BOARDWALK TO BE ALIGNED BETWEEN TREES WITHIN LOT DP 233364 WHICH IS LOCATED IN SWAMPY MANGROVE AND ESTUARIAN FORESTS.
5. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
6. CONSTRUCT THE BOARDWALK ABOVE HIGH TIDE. BAORDWALK SECTION TO HAVE 500mm FREEBOARD.

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
C	ISSUED FOR CONCEPT DESIGN	03.11.2020	PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	20.08.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	07.08.2020			

KBR DRAWING No.
SEC052-0002-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D3 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
PLAN

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

DRAWING No.
RU-DUN-30-20

REVISION
C

FILE: \\SYDFILE300\DATA$\GA\CAD\PROJECTS\3EC34\103 CAD\CONCEPT DESIGN D3\CIVIL\01 DRAWINGS\RU-DUN-30-20.DWG
DATE: Tuesday, November 3, 2020 2:35:42 PM
Kellogg Brown & Root
©

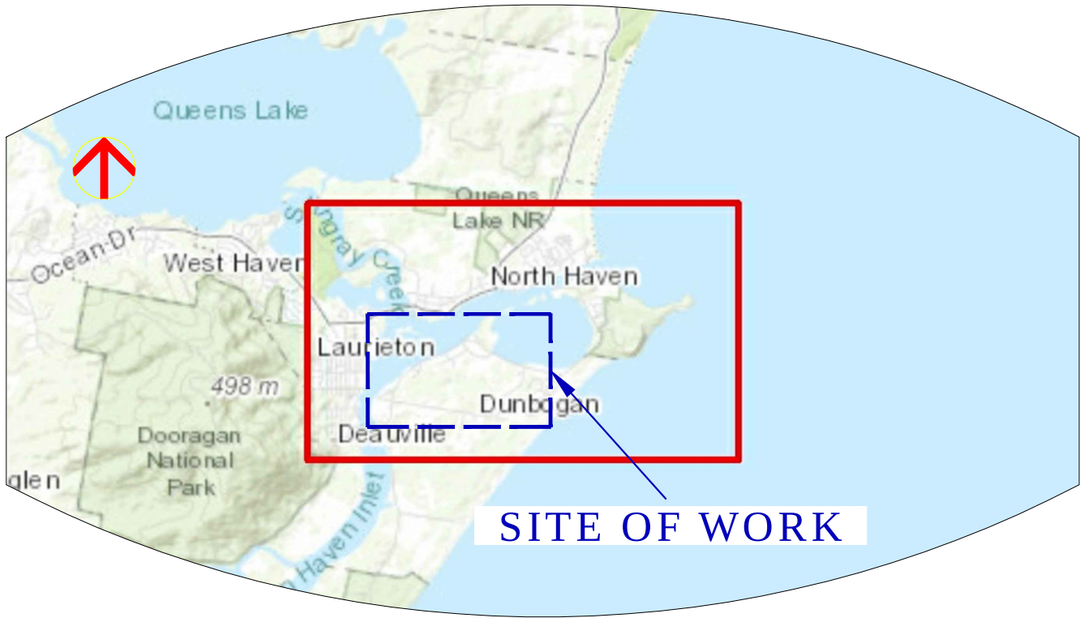
PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

BEACH TO BEACH D5 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
RU-DUN-40-01

KBR

LIST OF DRAWINGS	
DRG.NO	**DRAWING TITLE**
GENERAL	
RU-DUN-40-01	COVER SHEET, LOCALITY MAP AND DRAWING LIST
RU-DUN-40-02	GENERAL NOTES
CIVIL	
RU-DUN-40-20	PLAN
RU-DUN-40-21	PLAN AND SECTION
RU-DUN-40-60	CROSS SECTION
RU-DUN-40-70	TYPICAL DETAILS



LOCALITY PLAN
NOT TO SCALE

SCHEDULE OF SERVICE ALERTS		
SERVICE	**LOCATION**	**DESCRIPTION**

ISSUE No. 1 - REV. B
DATE 03/11/2020

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	B1		B2	
	IN-SITU AND SHOTCRETE	PRECAST**	IN-SITU AND SHOTCRETE	PRECASE**
AGAINST FORMWORK	40	40*	55	45
AGAINST BLINDING	40	---	55	---
AGAINST SOIL	70	---	85	---

* DENOTES ADDITIONAL COVER ADDED TO MEET REQUIREMENTS FOR CARBONATION RESISTANCE.
** DENOTES REQUIREMENT FOR INTENSE COMPACTION CASE IN RIGID FORMWORK.

3. UNLESS NOTED OTHERWISE, THE MINIMUM DEVELOPMENT LENGTHS AND LENGTH OF LAPS SHALL BE AS FOLLOWS:

BAR SIZE	N12	N16	N20
A) HORIZONTAL BARS WITH >300mm OF CONCRETE CAST BELOW THE BAR	400	500	750
B) OTHER BARS	300	400	600

LAPS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION. WHERE MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION, THE LAPS SHOWN IN THE TABLE ABOVE ARE INCREASED BY A FACTOR OF 1.3

4. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE NECESSARY TO CLEAR STEEL DOWELS
5. REINFORCEMENT ABBREVIATIONS FOR PLACEMENT ARE IN ACCORDANCE WITH AS/NZS1100.501 EXCEPT WHERE LV - DENOTES LENGTH VARIES
6. FABRIC SHALL BE LAPPED TWO (2) TRANSVERSE WIRES PLUS 25mm. A MAXIMUM OF THREE (3) SHEETS SHALL BE LAPPED AT ANY ONE POINT
7. ON-SITE CUTTING GALVANISED BARS AND MESH SHALL BE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATION
8. REINFORCEMENT IS NOT TO BE WELDED EXCEPT AS NOTED ON DRAWINGS OR APPROVED BY THE DESIGNER. WELDING TO BE IN ACCORDANCE WITH AS1554.3

SHARED USER PATH

1. MINIMUM SHARED USER PATH WIDTH SHALL BE 2.5m
2. CONCRETE FOOTPATH SURFACE TO HAVE A NON-SLIP BRUSH FINISH. TACTILE GROUND SURFACE INDICATORS ARE TO BE PROVIDED AT ALL KERB RAMPS AND LOCATIONS WHERE FOOTPATHS MEET THE ROADS

PAVEMENTS

1. ALL PAVEMENTS ARE DESIGNED ASSUMING A CBR OF 3 FOR THE SUB-GRADE

SIGNAGE AND LINE MARKING

1. TO ELIMINATE EXCESSIVE GLARE FROM THE SURFACE OF A SIGN, IT SHOULD BE TURNED APPROXIMATELY 5 DEGREES AWAY FROM THE NORMAL TO THE HEADLIGHT BEAM/LINE OF SIGHT
2. ALL SIGNAGE TO BE CLEAR OF ALL VEGETATION AND OBSTRUCTIONS
3. SIGNS TO BE INSTALLED IN ACCORDANCE WITH AS174.2
4. ANY OBSTRUCTIONS ALONG FOOTPATHS SHALL BE DELINEATED WITH YELLOW LINE MARKINGS
5. PEDESTRIAN CROSSING MARKINGS SHALL HAVE A NON-SLIP FINISH

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING SERVICES MUST BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCING WORK. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES AND SUBSEQUENTLY RESOLVED WITH THE DESIGN TEAMS SITE REPRESENTATIVE
2. CONTRACTOR TO ENSURE THE PROPOSED WORKS AND ADOPTED METHOD OF CONSTRUCTION WILL AVOID DAMAGE TO ALL UTILITIES
3. IN ORDER TO AVOID DAMAGE TO THE UTILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORKS ADJACENT TO ANY UTILITY WITH THE RELEVANT UTILITY AUTHORITY IN ACCORDANCE WITH THE AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE RELEVANT UTILITY AUTHORITIES AND THE DESIGN TEAM WITH RESPECT TO ANY TEMPORARY DIVERSIONS NECESSARY FOR CONSTRUCTION STAGING WORKS.
5. PRIOR TO THE START OF EXCAVATION, ALL PROPOSED TEMPORARY EXCAVATIONS FOR UTILITIES NEAR CUT OR FILL BATTERS ARE TO BE ASSESSED ON SITE BY AN EXPERIENCED ENGINEERING GEOLOGIST OR DESIGNERS SITE GEO-TECHNICAL REPRESENTATIVE FOR THEIR POTENTIAL IMPACT ON BATTER STABILITY DURING CONSTRUCTION.

DRAINAGE

1. ALL EXISTING DRAINAGE PITS TO BE RETAINED SHALL BE MODIFIED TO SUIT ANY CHANGES TO FINISHED SURFACE LEVEL
2. ALL DRAINAGE INFRASTRUCTURE MUST BE MANUFACTURED IN ACCORDANCE WITH DESIGN LIFE SPECIFICATIONS OUTLINED IN AS4508, AS/NZS2566 AND AS1597
3. ALL NEW AND EXISTING DRAINAGE THAT CONNECTS TO PROPOSED DRAINAGE IS TO BE CLEANED FREE OF DEBRIS PRIOR TO ASSET HANDOVER
4. ALL REINFORCED CONCRETE PIPES TO BE CLASS 3 WITH RUBBER RING JOINTS AND HS2 SUPPORT UNLESS STATED OTHERWISE
5. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL AND CONSTRUCTIONAL LOADS ACTING ON COMPLETED STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION

SCOUR PROTECTION

1. THICKNESS OF THE RIP-RAP PROTECTION SHALL BE A MINIMUM OF TWICE THE D50 ROCK SIZE SPECIFIED ON THE DRAWINGS. D50 = 250mm U.N.O. THE ROCK SHALL BE REASONABLY WELL GRADED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ROCK SIZE	% PASSING (BY WEIGHT)
2 x D50	100%
D50	40% - 60%
0.3 x D50	10% - 20%

2. ROCK TO BE HARD, DENSE, DURABLE, RESISTANT TO WEATHERING AND ANGULAR IN SHAPE. IT SHALL BE FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER. ROCK THAT IS LAMINATED, FRACTURED, POROUS OR OTHERWISE PHYSICALLY WEAK IS UNACCEPTABLE. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON SLOPES STEEPER THAN 3H:1V.
3. ROCKS AND ROCK BOULDERS SHALL HAVE A RELATIVE DENSITY OF 2.2 TO 2.8
4. THE ROCK SHALL BE REASONABLY WELL GRADED THROUGHOUT THE RIP-RAP LAYER. ROCK SIZES SHALL BE DEPENDANT ON THE D50 VALUE SPECIFIED ON THE DRAWINGS. D10 SHALL BE 0.5xD50 AND D90 SHALL BE 1.35xD50
5. ROCKS SMALLER THAN THE SPECIFIED D10 ARE NOT TO EXCEED 20% BY WEIGHT OF EACH LOAD
6. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON THE SLOPES GREATER THAN 3H:1V

VEGETATED CATCH DRAINS AND SWALES

1. VEGETATED SWALES ARE TO BE GRASSED LINED
2. ALL CHANNELS ARE NOT LINED WITH ROCK OR CONRETE ARE TO BE VEGETATED

REFERENCES

1. AUS-SPEC HASTINGS COUNCIL EDITION 2004

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	02.10.2020			

KBR DRAWING No.
SEC052-0003-CV-GEN-0002

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D5 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
GENERAL NOTES

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: DANIEL TAING
DRAWING No.: RU-DUN-40-02
REVISION: B

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DATE: Tuesday, November 3, 2020 3:00:33 PM
FILE: \\SYDFILE300\DATA$\G&I\CAD\PROJECTS\3EC34 1\03 CAD\CONCEPT DESIGN D5\CIVIL\01 DRAWING\SRU-DUN-40-02.DWG



PLAN - D5 SUP - THE BOULEVARDE (NORTH)

SCALE: 1:1000

LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- PAVED ROAD / SEALED
- GRAVEL ROAD / UNSEALED
- HEADWALL
- Ø600 PIPE WITH DIRECTION OF FLOW
- SEWER
- WATER MAIN
- STORMWATER

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- REST AREA
- HANDRAIL
- EARTHWORKS - BATTER BASED ON DETAILED SURVEY
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-40-02.
2. THE DESIGN HAS REFERENCED DETAIL SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. CONSTRUCT THE BOARDWALK ABOVE HIGH HIGH TIDE.
5. THE BOARDWALK TO BE ALIGNED BETWEEN TREES AS MUCH AS PRACTICAL.

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	02.10.2020			

KBR DRAWING No.
SEC052-0003-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D5 CONCEPT DESIGN
THE BOULEVARDE (NORTH)
PLAN

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

DRAWING No.
RU-DUN-40-20

REVISION
B

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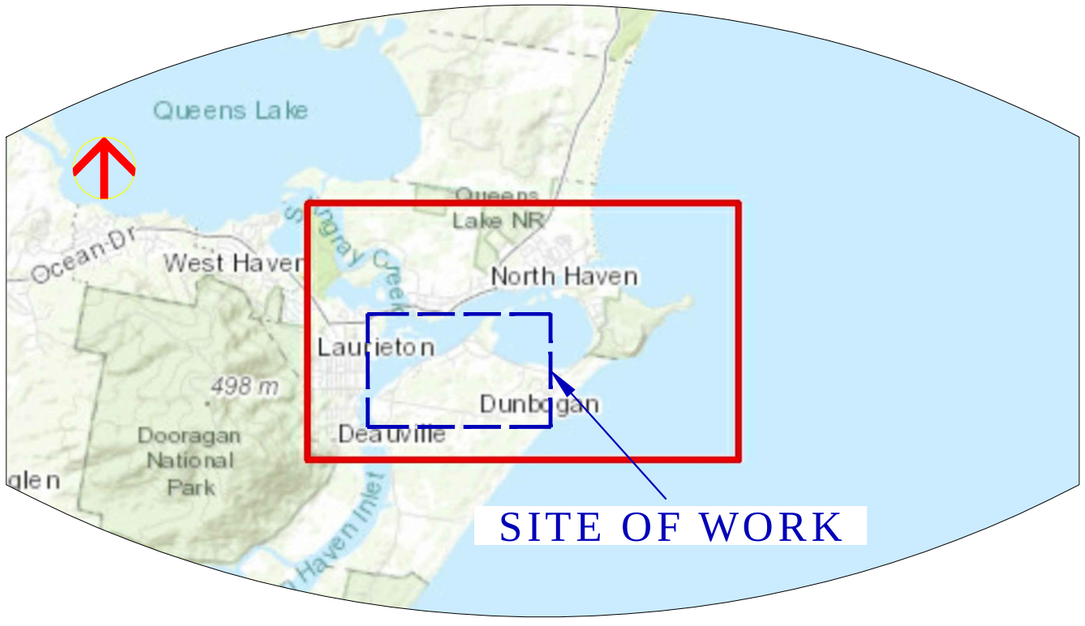
PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

BEACH TO BEACH D8 CONCEPT DESIGN
CAMDEN HEAD ROAD (SOUTH)
RU-DUN-50-01

KBR

LIST OF DRAWINGS	
DRG.NO	**DRAWING TITLE**
GENERAL	
RU-DUN-50-01	COVER SHEET, LOCALITY MAP AND DRAWING LIST
RU-DUN-50-02	GENERAL NOTES
CIVIL	
RU-DUN-50-20	PLAN - SHEET 01
RU-DUN-50-21	PLAN - SHEET 02
RU-DUN-50-22	PLAN AND SECTION - SHEET 01
RU-DUN-50-23	PLAN AND SECTION - SHEET 02
RU-DUN-50-24	PLAN AND SECTION - SHEET 03
RU-DUN-50-60	CROSS SECTION - SHEET 01
RU-DUN-50-61	CROSS SECTION - SHEET 02
RU-DUN-50-62	CROSS SECTION - SHEET 03
RU-DUN-50-70	TYPICAL DETAILS



LOCALITY PLAN
NOT TO SCALE

SCHEDULE OF SERVICE ALERTS		
SERVICE	**LOCATION**	**DESCRIPTION**

ISSUE No. 1 - REV. B
DATE 03/11/2020

GENERAL

1. ALL LEVELS ARE IN METRES REFERENCED TO AUSTRALIAN HEIGHT DATUM (AHD) . ALL COORDINATES ARE IN METRES TO MGA.
2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT PMHC AUSPEC CONSTRUCTION SPECIFICATIONS AVAILABLE ON COUNCILS WEBSITE. WHERE DIFFERENCES EXIST BETWEEN THE PLANS AND THE AUSPEC REQUIREMENTS, THESE PLANS SHALL TAKE PRECEDENCE
3. NO VEGETATION SHALL BE REMOVED WITHOUT PRIOR APPROVAL OF THE SUPERINTENDENT UNLESS NOTED ON THE DRAWINGS OR SCHEDULED IN THE REVIEW OF ENVIRONMENTAL FACTORS
4. THE IMPACT ON THE ENVIRONMENT SHALL BE MINIMISED BY OBSERVING THE FOLLOWING MINIMUM CONSTRUCTION PRACTICES:
* AREAS DISTURBED BY CONSTRUCTION TRAFFIC AND PROCEDURES SHALL BE MINIMISED.
* HYDROMULCHING (OR ALTERNATIVE APPROVED TREATMENT) FOR SLOPE STABILISATION SHALL BE CARRIED OUT SOON AFTER THE COMPLETION OF TOPSOIL PLACEMENT
* FLOW DIVERSION SHALL BE CARRIED OUT BY EARLY INSTALLATION OF DRAINS ALONG TOPS OF BATTERS WITH APPROPRIATE SILTATION CONTROL DEVICES IN ACCORDANCE WITH STANDARD DRAWING ASD602.
* SEDIMENT INTERCEPTION BY THE PLACEMENT OF TEMPORARY SILT FENCING AND GRAVEL FILLED GEOTEXTILE SAUSAGES ACROSS DRAINAGE LINES AND AT INTERCEPTION POINTS FOR BOTH THE CONSTRUCTION AND STOCKPILE AREAS IN ACCORDANCE WITH PHMC STANDARD DRAWING ASD601
* INSTALLATION OF SEDIMENT TRAPS AT GRATED PITS AND KERB INLET PIT IN ACCORDANCE WITH STANDARD DRAWING ASD600
5. SETOUT AND POINT INFORMATION TO BE PROVIDED IN ELECTRONIC FORMAT UPON REQUEST TO THE CONSTRUCTION SURVEYOR AT THE TIME OF CONSTRUCTION.
6. CONTRACTOR TO CONFIRM LEVELS OF EXISTING SERVICES AT ALL CROSSINGS AND IN THE PROXIMITY OF EXCAVATIONS PRIOR TO COMMENCING EXCAVATION.
7. AS CONSTRUCTED DETAILS SHALL BE RECORDED BY BY A REGISTERED SURVEYOR OR APPROVED ENGINEERING SURVEYOR AT THE CONTRACTORS COST. AS CONSTRUCTED DETAILS SHALL BE SUBMITTED TO THE SUPERINTENDENT PRIOR TO PRACTICAL COMPLETION.
8. WORKS SHALL NOT BE UNDERTAKEN WITHOUT CONSIDERATION OF THE EIS.
9. DRAWINGS REFERENCES QUOTED SHOW ONLY THE LAST SIX CHARACTERS FOR SIMPLICITY.
10. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING DESIGN REPORT.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETERES UNLESS SPECIFIED OTHERWISE.

CONCRETE AND DURABILITY

1. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF ALL STRUCTURAL CONCRETE SHALL BE 40MPa AND 20MPa FOR MASS CONCRETE
2. TOP SURFACE OF CONCRETE SHALL BE SLIP RESISTANT
3. EDGES SHALL BE CHAMFERED 20x20 AND RE-ENTRANT ANGLES FILLETED 20x20 UNLESS SPECIFIED OTHERWISE
4. MINIMUM CEMENTITIOUS CONTEXT AND MAX WATER/CEMENT RATIO FOR ALL CONCRETE WORKS SHALL BE AS FOLLOWS:

CLASSIFICATION	MAX W/C RATIO	MIN TOTAL CEMENTITIOUS CONTENT (kg/m3)	TYPE OF BLINDER	SORPTIVITY
B1	0.460	370	MIN. 30% FA/GGBS	25
B2	0.460	370	MIN. 30% FA/GGBS	20

REINFORCEMENT NOTES

1. ALL REINFORCEMENT BARS TO BE GRADE D500N TO AS/NZS4671. ALL MESH TO BE GRADE D500L TO AS/NZS4671.
2. UNLESS NOTED OTHERWISE, NOMINAL COVER TO REINFORCEMENT NEAREST TO ALL CONCRETE SURFACE SHALL BE AS FOLLOWS:

	B1		B2	
	IN-SITU AND SHOTCRETE	PRECAST**	IN-SITU AND SHOTCRETE	PRECASE**
AGAINST FORMWORK	40	40*	55	45
AGAINST BLINDING	40	---	55	---
AGAINST SOIL	70	---	85	---

* DENOTES ADDITIONAL COVER ADDED TO MEET REQUIREMENTS FOR CARBONATION RESISTANCE.
** DENOTES REQUIREMENT FOR INTENSE COMPACTION CASE IN RIGID FORMWORK.

3. UNLESS NOTED OTHERWISE, THE MINIMUM DEVELOPMENT LENGTHS AND LENGTH OF LAPS SHALL BE AS FOLLOWS:

BAR SIZE	N12	N16	N20
A) HORIZONTAL BARS WITH >300mm OF CONCRETE CAST BELOW THE BAR	400	500	750
B) OTHER BARS	300	400	600

LAPS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION. WHERE MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION, THE LAPS SHOWN IN THE TABLE ABOVE ARE INCREASED BY A FACTOR OF 1.3

4. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE NECESSARY TO CLEAR STEEL DOWELS
5. REINFORCEMENT ABBREVIATIONS FOR PLACEMENT ARE IN ACCORDANCE WITH AS/NZS1100.501 EXCEPT WHERE LV - DENOTES LENGTH VARIES
6. FABRIC SHALL BE LAPPED TWO (2) TRANSVERSE WIRES PLUS 25mm. A MAXIMUM OF THREE (3) SHEETS SHALL BE LAPPED AT ANY ONE POINT
7. ON-SITE CUTTING GALVANISED BARS AND MESH SHALL BE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATION
8. REINFORCEMENT IS NOT TO BE WELDED EXCEPT AS NOTED ON DRAWINGS OR APPROVED BY THE DESIGNER. WELDING TO BE IN ACCORDANCE WITH AS1554.3

SHARED USER PATH

1. MINIMUM SHARED USER PATH WIDTH SHALL BE 2.5m
2. CONCRETE FOOTPATH SURFACE TO HAVE A NON-SLIP BRUSH FINISH. TACTILE GROUND SURFACE INDICATORS ARE TO BE PROVIDED AT ALL KERB RAMPS AND LOCATIONS WHERE FOOTPATHS MEET THE ROADS

PAVEMENTS

1. ALL PAVEMENTS ARE DESIGNED ASSUMING A CBR OF 3 FOR THE SUB-GRADE

SIGNAGE AND LINE MARKING

1. TO ELIMINATE EXCESSIVE GLARE FROM THE SURFACE OF A SIGN, IT SHOULD BE TURNED APPROXIMATELY 5 DEGREES AWAY FROM THE NORMAL TO THE HEADLIGHT BEAM/LINE OF SIGHT
2. ALL SIGNAGE TO BE CLEAR OF ALL VEGETATION AND OBSTRUCTIONS
3. SIGNS TO BE INSTALLED IN ACCORDANCE WITH AS174.2
4. ANY OBSTRUCTIONS ALONG FOOTPATHS SHALL BE DELINEATED WITH YELLOW LINE MARKINGS
5. PEDESTRIAN CROSSING MARKINGS SHALL HAVE A NON-SLIP FINISH

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING SERVICES MUST BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCING WORK. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES AND SUBSEQUENTLY RESOLVED WITH THE DESIGN TEAMS SITE REPRESENTATIVE
2. CONTRACTOR TO ENSURE THE PROPOSED WORKS AND ADOPTED METHOD OF CONSTRUCTION WILL AVOID DAMAGE TO ALL UTILITIES
3. IN ORDER TO AVOID DAMAGE TO THE UTILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORKS ADJACENT TO ANY UTILITY WITH THE RELEVANT UTILITY AUTHORITY IN ACCORDANCE WITH THE AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE RELEVANT UTILITY AUTHORITIES AND THE DESIGN TEAM WITH RESPECT TO ANY TEMPORARY DIVERSIONS NECESSARY FOR CONSTRUCTION STAGING WORKS.
5. PRIOR TO THE START OF EXCAVATION, ALL PROPOSED TEMPORARY EXCAVATIONS FOR UTILITIES NEAR CUT OR FILL BATTERS ARE TO BE ASSESSED ON SITE BY AN EXPERIENCED ENGINEERING GEOLOGIST OR DESIGNERS SITE GEO-TECHNICAL REPRESENTATIVE FOR THEIR POTENTIAL IMPACT ON BATTER STABILITY DURING CONSTRUCTION.

DRAINAGE

1. ALL EXISTING DRAINAGE PITS TO BE RETAINED SHALL BE MODIFIED TO SUIT ANY CHANGES TO FINISHED SURFACE LEVEL
2. ALL DRAINAGE INFRASTRUCTURE MUST BE MANUFACTURED IN ACCORDANCE WITH DESIGN LIFE SPECIFICATIONS OUTLINED IN AS4508, AS/NZS2566 AND AS1597
3. ALL NEW AND EXISTING DRAINAGE THAT CONNECTS TO PROPOSED DRAINAGE IS TO BE CLEANED FREE OF DEBRIS PRIOR TO ASSET HANDOVER
4. ALL REINFORCED CONCRETE PIPES TO BE CLASS 3 WITH RUBBER RING JOINTS AND HS2 SUPPORT UNLESS STATED OTHERWISE
5. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL AND CONSTRUCTIONAL LOADS ACTING ON COMPLETED STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION

SCOUR PROTECTION

1. THICKNESS OF THE RIP-RAP PROTECTION SHALL BE A MINIMUM OF TWICE THE D50 ROCK SIZE SPECIFIED ON THE DRAWINGS. D50 = 250mm U.N.O. THE ROCK SHALL BE REASONABLY WELL GRADED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ROCK SIZE	% PASSING (BY WEIGHT)
2 x D50	100%
D50	40% - 60%
0.3 x D50	10% - 20%

2. ROCK TO BE HARD, DENSE, DURABLE, RESISTANT TO WEATHERING AND ANGULAR IN SHAPE. IT SHALL BE FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER. ROCK THAT IS LAMINATED, FRACTURED, POROUS OR OTHERWISE PHYSICALLY WEAK IS UNACCEPTABLE. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON SLOPES STEEPER THAN 3H:1V.
3. ROCKS AND ROCK BOULDERS SHALL HAVE A RELATIVE DENSITY OF 2.2 TO 2.8
4. THE ROCK SHALL BE REASONABLY WELL GRADED THROUGHOUT THE RIP-RAP LAYER. ROCK SIZES SHALL BE DEPENDANT ON THE D50 VALUE SPECIFIED ON THE DRAWINGS. D10 SHALL BE 0.5xD50 AND D90 SHALL BE 1.35xD50
5. ROCKS SMALLER THAN THE SPECIFIED D10 ARE NOT TO EXCEED 20% BY WEIGHT OF EACH LOAD
6. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON THE SLOPES GREATER THAN 3H:1V

VEGETATED CATCH DRAINS AND SWALES

1. VEGETATED SWALES ARE TO BE GRASSED LINED
2. ALL CHANNELS ARE NOT LINED WITH ROCK OR CONRETE ARE TO BE VEGETATED

REFERENCES

1. AUS-SPEC HASTINGS COUNCIL EDITION 2004

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
B	ISSUED FOR CONCEPT DESIGN	03.11.2020
A	ISSUED FOR CONCEPT DESIGN	16.09.2020

POSITION	NAME	SIGNATURE
DRAFTING CHECK	MELANIE WILSON	
ORIGINATE/ DESIGN	SUE YIN	
INDEPENDENT CHECK	NEIL CUMMINGS	
TECHNICAL APPROVAL	LESSON JULY	
PROJECT APPROVAL	DARREN HOLLOWAY	
CLIENT APPROVAL		

KBR DRAWING No.
SEC052-0004-CV-GEN-0002

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D8 CONCEPT DESIGN
CAMDEN HEAD ROAD (SOUTH)
GENERAL NOTES

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAFTER: DANIEL TAING
DRAWING No.: RU-DUN-50-02
REVISION: B

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FILE: \\SYDFILE300\DATA$\G&I\CAD\PROJECTS\3EC34\103 CAD\CONCEPT DESIGN D8\CIVIL\01 DRAWING\SRU-DUN-50-02.DWG



LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- HEADWALL
- PIPE WITH DIRECTION OF FLOW
- SEWER
- WATER MAIN
- STORMWATER
- PICNIC TABLES AND SEATS

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- PICNIC TABLES AND SEATS
- BARRIER FENCE
- EARTHWORKS
- HEADWALL
- STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- KERB LINE
- PARALLEL PARKING BAYS

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG NO. RU-DUN-50-02.
2. MODELED EARTHWORKS BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. DESIGN CONTOURS OMITTED ON THE CONCEPT DRAWINGS.

PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH)

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	16.09.2020			

KBR DRAWING No.
SEC052-0004-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D8 CONCEPT DESIGN
CAMDEN HEAD ROAD (SOUTH)
PLAN - SHEET 01

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

DRAWING No.
RU-DUN-50-20

REVISION
B

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FILE: \\SYDFILE3300\DATA$\G&I\CAD\PROJECTS\3E\C34103 CAD\CONCEPT DESIGN D8\CIVIL\01 DRAWINGS\RU-DUN-50-20.DWG



LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- HEADWALL
- Ø600 PIPE WITH DIRECTION OF FLOW
- SRM SEWER
- WM WATER MAIN
- SW STORMWATER
- PICNIC TABLES AND SEATS

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- SHARED USER PATH - BOARDWALK
- PICNIC TABLES AND SEATS
- BARRIER FENCE
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- KERB LINE
- PARALLEL PARKING BAYS

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG NO. RU-DUN-50-02.
2. MODELED EARTHWORKS BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. DESIGN CONTOURS OMITTED ON THE CONCEPT DRAWINGS.

PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH)

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
B	ISSUED FOR CONCEPT DESIGN	03.11.2020
A	ISSUED FOR CONCEPT DESIGN	16.09.2020

POSITION	NAME	SIGNATURE
DRAFTING CHECK	MELANIE WILSON	
ORIGINATE/ DESIGN	SUE YIN	
INDEPENDENT CHECK	NEIL CUMMINGS	
TECHNICAL APPROVAL	LESSON JULY	
PROJECT APPROVAL	DARREN HOLLOWAY	
CLIENT APPROVAL		

KBR DRAWING No.
SEC052-0004-CV-PLN-0021

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D8 CONCEPT DESIGN
CAMDEN HEAD ROAD (SOUTH)
PLAN - SHEET 02

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

DRAWING No.
RU-DUN-50-21

REVISION
B

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DATE: Tuesday, November 3, 2020 2:53:59 PM
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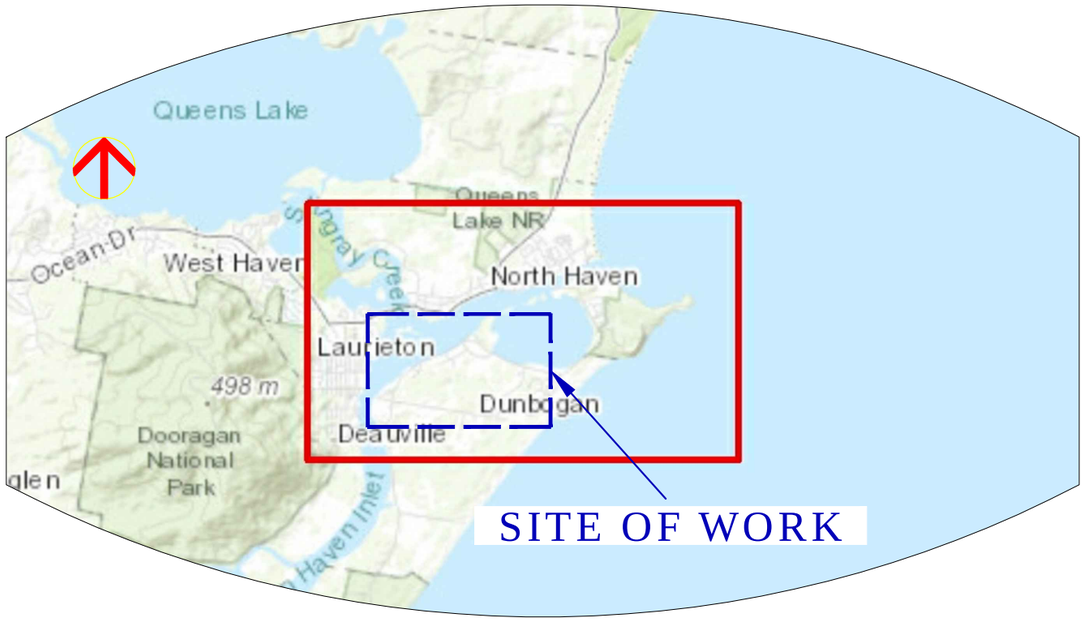
PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

BEACH TO BEACH D10 CONCEPT DESIGN
CAMDEN HEAD ROAD (NORTH)
RU-DUN-60-01

KBR

LIST OF DRAWINGS	
DRG.NO	**DRAWING TITLE**
GENERAL	
RU-DUN-60-01	COVER SHEET, LOCALITY MAP AND DRAWING LIST
RU-DUN-60-02	GENERAL NOTES
CIVIL	
RU-DUN-60-20	PLAN - SHEET 01
RU-DUN-60-21	PLAN - SHEET 02
RU-DUN-60-22	PLAN AND SECTION - SHEET 01
RU-DUN-60-23	PLAN AND SECTION - SHEET 02
RU-DUN-60-24	PLAN AND SECTION - SHEET 03
RU-DUN-60-25	PLAN AND SECTION - SHEET 04
RU-DUN-60-26	PLAN AND SECTION - SHEET 05
RU-DUN-60-60	CROSS SECTION - SHEET 01
RU-DUN-60-61	CROSS SECTION - SHEET 02
RU-DUN-60-62	CROSS SECTION - SHEET 03
RU-DUN-60-63	CROSS SECTION - SHEET 04
RU-DUN-60-64	CROSS SECTION - SHEET 05
RU-DUN-60-70	TYPICAL DETAILS



LOCALITY PLAN
NOT TO SCALE

SCHEDULE OF SERVICE ALERTS		
SERVICE	**LOCATION**	**DESCRIPTION**

ISSUE No. 1 - REV. B
DATE 03/11/2020

GENERAL

1. ALL LEVELS ARE IN METRES REFERENCED TO AUSTRALIAN HEIGHT DATUM (AHD) . ALL COORDINATES ARE IN METRES TO MGA.
2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT PMHC AUSPEC CONSTRUCTION SPECIFICATIONS AVAILABLE ON COUNCILS WEBSITE. WHERE DIFFERENCES EXIST BETWEEN THE PLANS AND THE AUSPEC REQUIREMENTS, THESE PLANS SHALL TAKE PRECEDENCE
3. NO VEGETATION SHALL BE REMOVED WITHOUT PRIOR APPROVAL OF THE SUPERINTENDENT UNLESS NOTED ON THE DRAWINGS OR SCHEDULED IN THE REVIEW OF ENVIRONMENTAL FACTORS
4. THE IMPACT ON THE ENVIRONMENT SHALL BE MINIMISED BY OBSERVING THE FOLLOWING MINIMUM CONSTRUCTION PRACTICES:
* AREAS DISTURBED BY CONSTRUCTION TRAFFIC AND PROCEDURES SHALL BE MINIMISED.
* HYDROMULCHING (OR ALTERNATIVE APPROVED TREATMENT) FOR SLOPE STABILISATION SHALL BE CARRIED OUT SOON AFTER THE COMPLETION OF TOPSOIL PLACEMENT
* FLOW DIVERSION SHALL BE CARRIED OUT BY EARLY INSTALLATION OF DRAINS ALONG TOPS OF BATTERS WITH APPROPRIATE SILTATION CONTROL DEVICES IN ACCORDANCE WITH STANDARD DRAWING ASD602.
* SEDIMENT INTERCEPTION BY THE PLACEMENT OF TEMPORARY SILT FENCING AND GRAVEL FILLED GEOTEXTILE SAUSAGES ACROSS DRAINAGE LINES AND AT INTERCEPTION POINTS FOR BOTH THE CONSTRUCTION AND STOCKPILE AREAS IN ACCORDANCE WITH PHMC STANDARD DRAWING ASD601
* INSTALLATION OF SEDIMENT TRAPS AT GRATED PITS AND KERB INLET PIT IN ACCORDANCE WITH STANDARD DRAWING ASD600
5. SETOUT AND POINT INFORMATION TO BE PROVIDED IN ELECTRONIC FORMAT UPON REQUEST TO THE CONSTRUCTION SURVEYOR AT THE TIME OF CONSTRUCTION.
6. CONTRACTOR TO CONFIRM LEVELS OF EXISTING SERVICES AT ALL CROSSINGS AND IN THE PROXIMITY OF EXCAVATIONS PRIOR TO COMMENCING EXCAVATION.
7. AS CONSTRUCTED DETAILS SHALL BE RECORDED BY BY A REGISTERED SURVEYOR OR APPROVED ENGINEERING SURVEYOR AT THE CONTRACTORS COST. AS CONSTRUCTED DETAILS SHALL BE SUBMITTED TO THE SUPERINTENDENT PRIOR TO PRACTICAL COMPLETION.
8. WORKS SHALL NOT BE UNDERTAKEN WITHOUT CONSIDERATION OF THE EIS.
9. DRAWINGS REFERENCES QUOTED SHOW ONLY THE LAST SIX CHARACTERS FOR SIMPLICITY.
10. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING DESIGN REPORT.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETERES UNLESS SPECIFIED OTHERWISE.

CONCRETE AND DURABILITY

1. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF ALL STRUCTURAL CONCRETE SHALL BE 40MPa AND 20MPa FOR MASS CONCRETE
2. TOP SURFACE OF CONCRETE SHALL BE SLIP RESISTANT
3. EDGES SHALL BE CHAMFERED 20x20 AND RE-ENTRANT ANGLES FILLETED 20x20 UNLESS SPECIFIED OTHERWISE
4. MINIMUM CEMENTITIOUS CONTEXT AND MAX WATER/CEMENT RATIO FOR ALL CONCRETE WORKS SHALL BE AS FOLLOWS:

CLASSIFICATION	MAX W/C RATIO	MIN TOTAL CEMENTITIOUS CONTENT (kg/m3)	TYPE OF BLINDER	SORPTIVITY
B1	0.460	370	MIN. 30% FA/GGBS	25
B2	0.460	370	MIN. 30% FA/GGBS	20

REINFORCEMENT NOTES

1. ALL REINFORCEMENT BARS TO BE GRADE D500N TO AS/NZS4671. ALL MESH TO BE GRADE D500L TO AS/NZS4671.
2. UNLESS NOTED OTHERWISE, NOMINAL COVER TO REINFORCEMENT NEAREST TO ALL CONCRETE SURFACE SHALL BE AS FOLLOWS:

	B1		B2	
	IN-SITU AND SHOTCRETE	PRECAST**	IN-SITU AND SHOTCRETE	PRECASE**
AGAINST FORMWORK	40	40*	55	45
AGAINST BLINDING	40	---	55	---
AGAINST SOIL	70	---	85	---

* DENOTES ADDITIONAL COVER ADDED TO MEET REQUIREMENTS FOR CARBONATION RESISTANCE.
** DENOTES REQUIREMENT FOR INTENSE COMPACTION CASE IN RIGID FORMWORK.

3. UNLESS NOTED OTHERWISE, THE MINIMUM DEVELOPMENT LENGTHS AND LENGTH OF LAPS SHALL BE AS FOLLOWS:

BAR SIZE	N12	N16	N20
A) HORIZONTAL BARS WITH >300mm OF CONCRETE CAST BELOW THE BAR	400	500	750
B) OTHER BARS	300	400	600

LAPS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION. WHERE MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION, THE LAPS SHOWN IN THE TABLE ABOVE ARE INCREASED BY A FACTOR OF 1.3

4. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE NECESSARY TO CLEAR STEEL DOWELS
5. REINFORCEMENT ABBREVIATIONS FOR PLACEMENT ARE IN ACCORDANCE WITH AS/NZS1100.501 EXCEPT WHERE LV - DENOTES LENGTH VARIES
6. FABRIC SHALL BE LAPPED TWO (2) TRANSVERSE WIRES PLUS 25mm. A MAXIMUM OF THREE (3) SHEETS SHALL BE LAPPED AT ANY ONE POINT
7. ON-SITE CUTTING GALVANISED BARS AND MESH SHALL BE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATION
8. REINFORCEMENT IS NOT TO BE WELDED EXCEPT AS NOTED ON DRAWINGS OR APPROVED BY THE DESIGNER. WELDING TO BE IN ACCORDANCE WITH AS1554.3

SHARED USER PATH

1. MINIMUM SHARED USER PATH WIDTH SHALL BE 2.5m
2. CONCRETE FOOTPATH SURFACE TO HAVE A NON-SLIP BRUSH FINISH. TACTILE GROUND SURFACE INDICATORS ARE TO BE PROVIDED AT ALL KERB RAMPS AND LOCATIONS WHERE FOOTPATHS MEET THE ROADS

PAVEMENTS

1. ALL PAVEMENTS ARE DESIGNED ASSUMING A CBR OF 3 FOR THE SUB-GRADE

SIGNAGE AND LINE MARKING

1. TO ELIMINATE EXCESSIVE GLARE FROM THE SURFACE OF A SIGN, IT SHOULD BE TURNED APPROXIMATELY 5 DEGREES AWAY FROM THE NORMAL TO THE HEADLIGHT BEAM/LINE OF SIGHT
2. ALL SIGNAGE TO BE CLEAR OF ALL VEGETATION AND OBSTRUCTIONS
3. SIGNS TO BE INSTALLED IN ACCORDANCE WITH AS174.2
4. ANY OBSTRUCTIONS ALONG FOOTPATHS SHALL BE DELINEATED WITH YELLOW LINE MARKINGS
5. PEDESTRIAN CROSSING MARKINGS SHALL HAVE A NON-SLIP FINISH

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING SERVICES MUST BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCING WORK. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES AND SUBSEQUENTLY RESOLVED WITH THE DESIGN TEAMS SITE REPRESENTATIVE
2. CONTRACTOR TO ENSURE THE PROPOSED WORKS AND ADOPTED METHOD OF CONSTRUCTION WILL AVOID DAMAGE TO ALL UTILITIES
3. IN ORDER TO AVOID DAMAGE TO THE UTILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORKS ADJACENT TO ANY UTILITY WITH THE RELEVANT UTILITY AUTHORITY IN ACCORDANCE WITH THE AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE RELEVANT UTILITY AUTHORITIES AND THE DESIGN TEAM WITH RESPECT TO ANY TEMPORARY DIVERSIONS NECESSARY FOR CONSTRUCTION STAGING WORKS.
5. PRIOR TO THE START OF EXCAVATION, ALL PROPOSED TEMPORARY EXCAVATIONS FOR UTILITIES NEAR CUT OR FILL BATTERS ARE TO BE ASSESSED ON SITE BY AN EXPERIENCED ENGINEERING GEOLOGIST OR DESIGNERS SITE GEO-TECHNICAL REPRESENTATIVE FOR THEIR POTENTIAL IMPACT ON BATTER STABILITY DURING CONSTRUCTION.

DRAINAGE

1. ALL EXISTING DRAINAGE PITS TO BE RETAINED SHALL BE MODIFIED TO SUIT ANY CHANGES TO FINISHED SURFACE LEVEL
2. ALL DRAINAGE INFRASTRUCTURE MUST BE MANUFACTURED IN ACCORDANCE WITH DESIGN LIFE SPECIFICATIONS OUTLINED IN AS4508, AS/NZS2566 AND AS1597
3. ALL NEW AND EXISTING DRAINAGE THAT CONNECTS TO PROPOSED DRAINAGE IS TO BE CLEANED FREE OF DEBRIS PRIOR TO ASSET HANDOVER
4. ALL REINFORCED CONCRETE PIPES TO BE CLASS 3 WITH RUBBER RING JOINTS AND HS2 SUPPORT UNLESS STATED OTHERWISE
5. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL AND CONSTRUCTIONAL LOADS ACTING ON COMPLETED STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION

SCOUR PROTECTION

1. THICKNESS OF THE RIP-RAP PROTECTION SHALL BE A MINIMUM OF TWICE THE D50 ROCK SIZE SPECIFIED ON THE DRAWINGS. D50 = 250mm U.N.O. THE ROCK SHALL BE REASONABLY WELL GRADED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ROCK SIZE	% PASSING (BY WEIGHT)
2 x D50	100%
D50	40% - 60%
0.3 x D50	10% - 20%

2. ROCK TO BE HARD, DENSE, DURABLE, RESISTANT TO WEATHERING AND ANGULAR IN SHAPE. IT SHALL BE FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER. ROCK THAT IS LAMINATED, FRACTURED, POROUS OR OTHERWISE PHYSICALLY WEAK IS UNACCEPTABLE. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON SLOPES STEEPER THAN 3H:1V.
3. ROCKS AND ROCK BOULDERS SHALL HAVE A RELATIVE DENSITY OF 2.2 TO 2.8
4. THE ROCK SHALL BE REASONABLY WELL GRADED THROUGHOUT THE RIP-RAP LAYER. ROCK SIZES SHALL BE DEPENDANT ON THE D50 VALUE SPECIFIED ON THE DRAWINGS. D10 SHALL BE 0.5xD50 AND D90 SHALL BE 1.35xD50
5. ROCKS SMALLER THAN THE SPECIFIED D10 ARE NOT TO EXCEED 20% BY WEIGHT OF EACH LOAD
6. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON THE SLOPES GREATER THAN 3H:1V

VEGETATED CATCH DRAINS AND SWALES

1. VEGETATED SWALES ARE TO BE GRASSED LINED
2. ALL CHANNELS ARE NOT LINED WITH ROCK OR CONRETE ARE TO BE VEGETATED

REFERENCES

1. AUS-SPEC HASTINGS COUNCIL EDITION 2004

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	21.09.2020			

KBR DRAWING No.
SEC052-0005-CV-GEN-0002

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D10 CONCEPT DESIGN
CAMDEN HEAD ROAD (NORTH)
GENERAL NOTES

DRAWING SCALE: NOT TO SCALE
ORIG. SIZE: A1
DRAWING No.: RU-DUN-60-02
REVISION: B
DRAFTER: DANIEL TAING

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DATE: Tuesday, November 3, 2020 3:10:00 PM
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LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- HEADWALL (Ø600)
- PIPE WITH DIRECTION OF FLOW
- SEWER
- WATER MAIN
- STORMWATER
- REST AREA - PICNIC TABLES AND SEATS

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- REST AREA
- BARRIER FENCE
- EARTHWORKS
- HEADWALL (Ø600)
- STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- KERB LINE
- RETAINING WALL / BOARDWALK

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-60-02.
2. MODELED EARTHWORKS ARE BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. INVESTIGATION IS ON-GOING WHETHER TO SUPPORT THE PATH WITH RETAINING WALLS OR BOARDWALKS. FOR DETAILS OF PATH ON BOARDWALK AND RETAINING WALL REFER TO DRG NO. RU-DUN-70-70.

PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH)
SCALE: 1:1000

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	21.09.2020			

KBR DRAWING No.
SEC052-0005-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

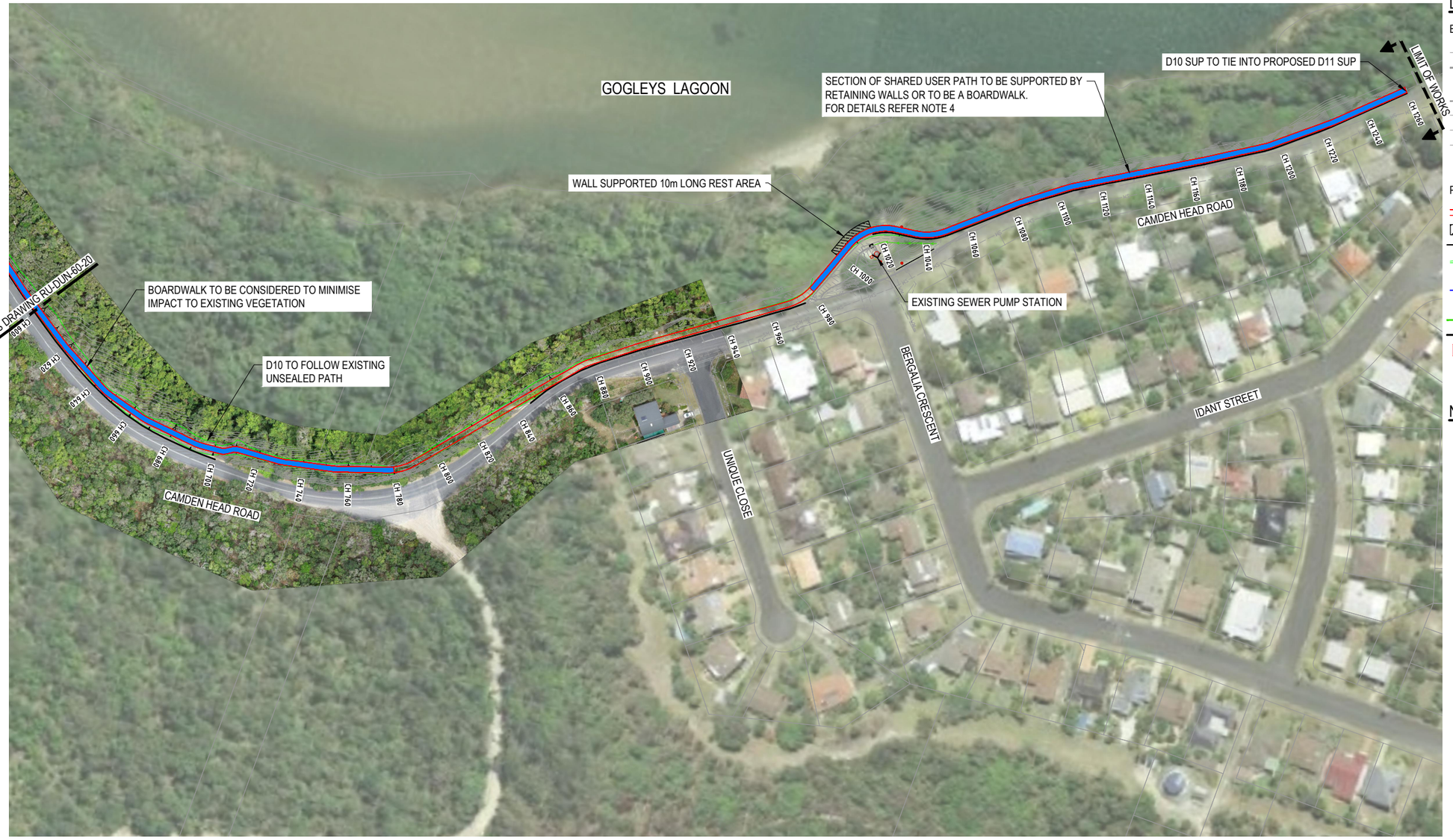
ORIG. SIZE
A1

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D10 CONCEPT DESIGN
CAMDEN HEAD ROAD (NORTH)
PLAN - SHEET 01

DRAWING No.
RU-DUN-60-20

REVISION
B

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LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- HEADWALL
- PIPE WITH DIRECTION OF FLOW (Ø600)
- SEWER
- WATER MAIN
- STORMWATER
- REST AREA - PICNIC TABLES AND SEATS

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- REST AREA
- BARRIER FENCE
- EARTHWORKS
- HEADWALL
- STORMWATER PIPE WITH DIRECTION OF FLOW (Ø600)
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- KERB LINE
- RETAINING WALL / BOARDWALK

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-60-02.
2. MODELED EARTHWORKS ARE BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.
4. INVESTIGATION IS ON-GOING WHETHER TO SUPPORT THE PATH WITH RETAINING WALLS OR BOARDWALKS. FOR DETAILS OF PATH ON BOARDWALK AND RETAINING WALL REFER TO DRG NO. RU-DUN-70-70.

PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH)
SCALE: 1:1000

0 20 40 60 80
SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	21.09.2020			

KBR DRAWING No.
SEC052-0005-CV-PLN-0021

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D10 CONCEPT DESIGN
CAMDEN HEAD ROAD (NORTH)
PLAN - SHEET 02

DRAWING SCALE: SCALE 1:1000
DRAFTER: DANIEL TAING
ORIG. SIZE: A1
DRAWING No.: RU-DUN-60-21
REVISION: B

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DATE: Tuesday, November 3, 2020 3:10:07 PM
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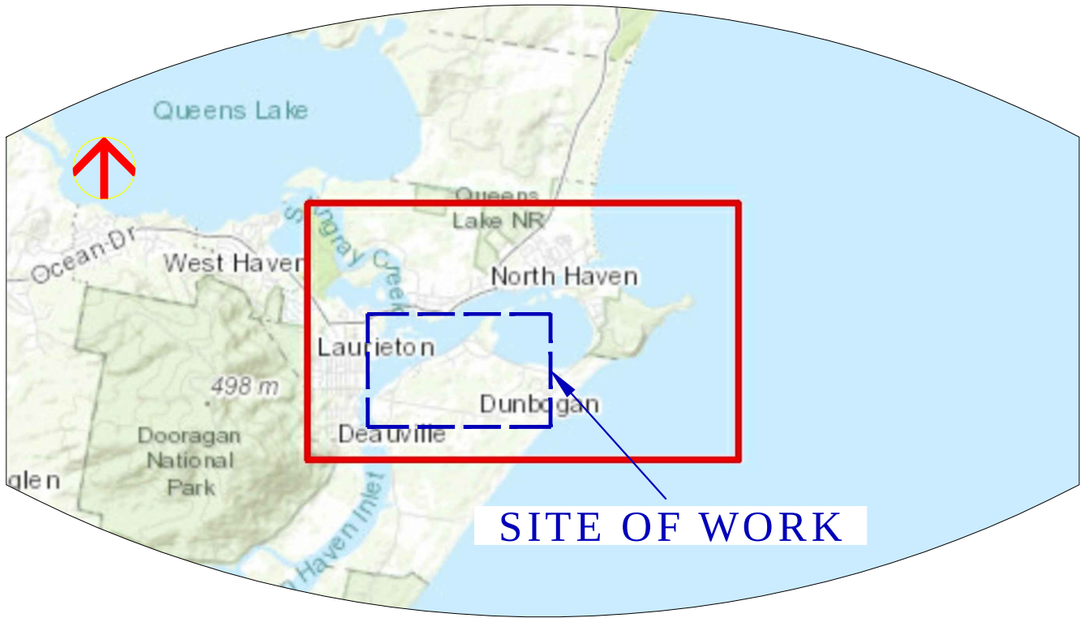
PORT MACQUARIE-HASTINGS COUNCIL

PORT MACQUARIE HASTINGS

BEACH TO BEACH D11 CONCEPT DESIGN
PILOT BEACH ROAD
RU-DUN-70-01

KBR

LIST OF DRAWINGS	
DRG.NO	**DRAWING TITLE**
GENERAL	
RU-DUN-70-01	COVER SHEET, LOCALITY MAP AND DRAWING LIST
RU-DUN-70-02	GENERAL NOTES
CIVIL	
RU-DUN-70-20	PLAN - SHEET 01
RU-DUN-70-21	PLAN AND SECTION - SHEET 01
RU-DUN-70-22	PLAN AND SECTION - SHEET 02
RU-DUN-70-23	PLAN AND SECTION - SHEET 03
RU-DUN-70-60	CROSS SECTION - SHEET 01
RU-DUN-70-61	CROSS SECTION - SHEET 02
RU-DUN-70-62	CROSS SECTION - SHEET 03
RU-DUN-70-70	TYPICAL DETAILS - SHEET 01
RU-DUN-70-71	TYPICAL DETAILS - SHEET 02



LOCALITY PLAN
NOT TO SCALE

SCHEDULE OF SERVICE ALERTS		
SERVICE	**LOCATION**	**DESCRIPTION**

ISSUE No. 1 - REV. B
DATE 03/11/2020

GENERAL

1. ALL LEVELS ARE IN METRES REFERENCED TO AUSTRALIAN HEIGHT DATUM (AHD) . ALL COORDINATES ARE IN METRES TO MGA.
2. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT PMHC AUSPEC CONSTRUCTION SPECIFICATIONS AVAILABLE ON COUNCILS WEBSITE. WHERE DIFFERENCES EXIST BETWEEN THE PLANS AND THE AUSPEC REQUIREMENTS, THESE PLANS SHALL TAKE PRECEDENCE
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* FLOW DIVERSION SHALL BE CARRIED OUT BY EARLY INSTALLATION OF DRAINS ALONG TOPS OF BATTERS WITH APPROPRIATE SILTATION CONTROL DEVICES IN ACCORDANCE WITH STANDARD DRAWING ASD602.
* SEDIMENT INTERCEPTION BY THE PLACEMENT OF TEMPORARY SILT FENCING AND GRAVEL FILLED GEOTEXTILE SAUSAGES ACROSS DRAINAGE LINES AND AT INTERCEPTION POINTS FOR BOTH THE CONSTRUCTION AND STOCKPILE AREAS IN ACCORDANCE WITH PHMC STANDARD DRAWING ASD601
* INSTALLATION OF SEDIMENT TRAPS AT GRATED PITS AND KERB INLET PIT IN ACCORDANCE WITH STANDARD DRAWING ASD600
5. SETOUT AND POINT INFORMATION TO BE PROVIDED IN ELECTRONIC FORMAT UPON REQUEST TO THE CONSTRUCTION SURVEYOR AT THE TIME OF CONSTRUCTION.
6. CONTRACTOR TO CONFIRM LEVELS OF EXISTING SERVICES AT ALL CROSSINGS AND IN THE PROXIMITY OF EXCAVATIONS PRIOR TO COMMENCING EXCAVATION.
7. AS CONSTRUCTED DETAILS SHALL BE RECORDED BY BY A REGISTERED SURVEYOR OR APPROVED ENGINEERING SURVEYOR AT THE CONTRACTORS COST. AS CONSTRUCTED DETAILS SHALL BE SUBMITTED TO THE SUPERINTENDENT PRIOR TO PRACTICAL COMPLETION.
8. WORKS SHALL NOT BE UNDERTAKEN WITHOUT CONSIDERATION OF THE EIS.
9. DRAWINGS REFERENCES QUOTED SHOW ONLY THE LAST SIX CHARACTERS FOR SIMPLICITY.
10. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING DESIGN REPORT.
11. ALL DIMENSIONS ARE SHOWN IN MILLIMETERES UNLESS SPECIFIED OTHERWISE.

CONCRETE AND DURABILITY

1. MINIMUM 28 DAY COMPRESSIVE STRENGTH OF ALL STRUCTURAL CONCRETE SHALL BE 40MPa AND 20MPa FOR MASS CONCRETE
2. TOP SURFACE OF CONCRETE SHALL BE SLIP RESISTANT
3. EDGES SHALL BE CHAMFERED 20x20 AND RE-ENTRANT ANGLES FILLETED 20x20 UNLESS SPECIFIED OTHERWISE
4. MINIMUM CEMENTITIOUS CONTEXT AND MAX WATER/CEMENT RATIO FOR ALL CONCRETE WORKS SHALL BE AS FOLLOWS:

CLASSIFICATION	MAX W/C RATIO	MIN TOTAL CEMENTITIOUS CONTENT (kg/m3)	TYPE OF BLINDER	SORPTIVITY
B1	0.460	370	MIN. 30% FA/GGBS	25
B2	0.460	370	MIN. 30% FA/GGBS	20

REINFORCEMENT NOTES

1. ALL REINFORCEMENT BARS TO BE GRADE D500N TO AS/NZS4671. ALL MESH TO BE GRADE D500L TO AS/NZS4671.
2. UNLESS NOTED OTHERWISE, NOMINAL COVER TO REINFORCEMENT NEAREST TO ALL CONCRETE SURFACE SHALL BE AS FOLLOWS:

	B1		B2	
	IN-SITU AND SHOTCRETE	PRECAST**	IN-SITU AND SHOTCRETE	PRECASE**
AGAINST FORMWORK	40	40*	55	45
AGAINST BLINDING	40	---	55	---
AGAINST SOIL	70	---	85	---

* DENOTES ADDITIONAL COVER ADDED TO MEET REQUIREMENTS FOR CARBONATION RESISTANCE.
** DENOTES REQUIREMENT FOR INTENSE COMPACTION CASE IN RIGID FORMWORK.

3. UNLESS NOTED OTHERWISE, THE MINIMUM DEVELOPMENT LENGTHS AND LENGTH OF LAPS SHALL BE AS FOLLOWS:

BAR SIZE	N12	N16	N20
A) HORIZONTAL BARS WITH >300mm OF CONCRETE CAST BELOW THE BAR	400	500	750
B) OTHER BARS	300	400	600

LAPS SHALL BE STAGGERED SO THAT NO MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION. WHERE MORE THAN 50% OF BARS ARE LAPPED IN ANY ONE CROSS SECTION, THE LAPS SHOWN IN THE TABLE ABOVE ARE INCREASED BY A FACTOR OF 1.3

4. REINFORCEMENT MAY BE DISPLACED SLIGHTLY WHERE NECESSARY TO CLEAR STEEL DOWELS
5. REINFORCEMENT ABBREVIATIONS FOR PLACEMENT ARE IN ACCORDANCE WITH AS/NZS1100.501 EXCEPT WHERE LV - DENOTES LENGTH VARIES
6. FABRIC SHALL BE LAPPED TWO (2) TRANSVERSE WIRES PLUS 25mm. A MAXIMUM OF THREE (3) SHEETS SHALL BE LAPPED AT ANY ONE POINT
7. ON-SITE CUTTING GALVANISED BARS AND MESH SHALL BE TREATED IN ACCORDANCE WITH PROJECT SPECIFICATION
8. REINFORCEMENT IS NOT TO BE WELDED EXCEPT AS NOTED ON DRAWINGS OR APPROVED BY THE DESIGNER. WELDING TO BE IN ACCORDANCE WITH AS1554.3

SHARED USER PATH

1. MINIMUM SHARED USER PATH WIDTH SHALL BE 2.5m
2. CONCRETE FOOTPATH SURFACE TO HAVE A NON-SLIP BRUSH FINISH. TACTILE GROUND SURFACE INDICATORS ARE TO BE PROVIDED AT ALL KERB RAMPS AND LOCATIONS WHERE FOOTPATHS MEET THE ROADS

PAVEMENTS

1. ALL PAVEMENTS ARE DESIGNED ASSUMING A CBR OF 3 FOR THE SUB-GRADE

SIGNAGE AND LINE MARKING

1. TO ELIMINATE EXCESSIVE GLARE FROM THE SURFACE OF A SIGN, IT SHOULD BE TURNED APPROXIMATELY 5 DEGREES AWAY FROM THE NORMAL TO THE HEADLIGHT BEAM/LINE OF SIGHT
2. ALL SIGNAGE TO BE CLEAR OF ALL VEGETATION AND OBSTRUCTIONS
3. SIGNS TO BE INSTALLED IN ACCORDANCE WITH AS174.2
4. ANY OBSTRUCTIONS ALONG FOOTPATHS SHALL BE DELINEATED WITH YELLOW LINE MARKINGS
5. PEDESTRIAN CROSSING MARKINGS SHALL HAVE A NON-SLIP FINISH

UTILITIES

1. LOCATION AND LEVEL OF ALL EXISTING SERVICES MUST BE CONFIRMED BY THE CONTRACTOR PRIOR TO COMMENCING WORK. ALL LEVELS MUST BE CHECKED FOR CONFLICT WITH ANY SERVICES AND SUBSEQUENTLY RESOLVED WITH THE DESIGN TEAMS SITE REPRESENTATIVE
2. CONTRACTOR TO ENSURE THE PROPOSED WORKS AND ADOPTED METHOD OF CONSTRUCTION WILL AVOID DAMAGE TO ALL UTILITIES
3. IN ORDER TO AVOID DAMAGE TO THE UTILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE WORKS ADJACENT TO ANY UTILITY WITH THE RELEVANT UTILITY AUTHORITY IN ACCORDANCE WITH THE AUTHORITY REQUIREMENTS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE RELEVANT UTILITY AUTHORITIES AND THE DESIGN TEAM WITH RESPECT TO ANY TEMPORARY DIVERSIONS NECESSARY FOR CONSTRUCTION STAGING WORKS.
5. PRIOR TO THE START OF EXCAVATION, ALL PROPOSED TEMPORARY EXCAVATIONS FOR UTILITIES NEAR CUT OR FILL BATTERS ARE TO BE ASSESSED ON SITE BY AN EXPERIENCED ENGINEERING GEOLOGIST OR DESIGNERS SITE GEO-TECHNICAL REPRESENTATIVE FOR THEIR POTENTIAL IMPACT ON BATTER STABILITY DURING CONSTRUCTION.

DRAINAGE

1. ALL EXISTING DRAINAGE PITS TO BE RETAINED SHALL BE MODIFIED TO SUIT ANY CHANGES TO FINISHED SURFACE LEVEL
2. ALL DRAINAGE INFRASTRUCTURE MUST BE MANUFACTURED IN ACCORDANCE WITH DESIGN LIFE SPECIFICATIONS OUTLINED IN AS4508, AS/NZS2566 AND AS1597
3. ALL NEW AND EXISTING DRAINAGE THAT CONNECTS TO PROPOSED DRAINAGE IS TO BE CLEANED FREE OF DEBRIS PRIOR TO ASSET HANDOVER
4. ALL REINFORCED CONCRETE PIPES TO BE CLASS 3 WITH RUBBER RING JOINTS AND HS2 SUPPORT UNLESS STATED OTHERWISE
5. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL AND CONSTRUCTIONAL LOADS ACTING ON COMPLETED STRUCTURES. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND PROVISION OF ANY TEMPORARY BRACING, PROPPING, ETC. REQUIRED DURING CONSTRUCTION. STRUCTURES SHALL BE MAINTAINED IN A STABLE CONDITION

SCOUR PROTECTION

1. THICKNESS OF THE RIP-RAP PROTECTION SHALL BE A MINIMUM OF TWICE THE D50 ROCK SIZE SPECIFIED ON THE DRAWINGS. D50 = 250mm U.N.O. THE ROCK SHALL BE REASONABLY WELL GRADED IN ACCORDANCE WITH THE FOLLOWING TABLE:

ROCK SIZE	% PASSING (BY WEIGHT)
2 x D50	100%
D50	40% - 60%
0.3 x D50	10% - 20%

2. ROCK TO BE HARD, DENSE, DURABLE, RESISTANT TO WEATHERING AND ANGULAR IN SHAPE. IT SHALL BE FREE FROM OVERBURDEN, SPOIL, SHALE AND ORGANIC MATTER. ROCK THAT IS LAMINATED, FRACTURED, POROUS OR OTHERWISE PHYSICALLY WEAK IS UNACCEPTABLE. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON SLOPES STEEPER THAN 3H:1V.
3. ROCKS AND ROCK BOULDERS SHALL HAVE A RELATIVE DENSITY OF 2.2 TO 2.8
4. THE ROCK SHALL BE REASONABLY WELL GRADED THROUGHOUT THE RIP-RAP LAYER. ROCK SIZES SHALL BE DEPENDANT ON THE D50 VALUE SPECIFIED ON THE DRAWINGS. D10 SHALL BE 0.5xD50 AND D90 SHALL BE 1.35xD50
5. ROCKS SMALLER THAN THE SPECIFIED D10 ARE NOT TO EXCEED 20% BY WEIGHT OF EACH LOAD
6. AN APPROXIMATE GUIDE TO ROCK SHAPE IS THAT THE BREADTH OR THICKNESS OF A SINGLE ROCK SHOULD BE NOT LESS THAN ONE-THIRD ITS LENGTH. ROUND MATERIAL CAN BE USED AS RIP-RAP PROVIDED IT IS NOT PLACED ON THE SLOPES GREATER THAN 3H:1V

VEGETATED CATCH DRAINS AND SWALES

1. VEGETATED SWALES ARE TO BE GRASSED LINED
2. ALL CHANNELS ARE NOT LINED WITH ROCK OR CONRETE ARE TO BE VEGETATED

REFERENCES

1. AUS-SPEC HASTINGS COUNCIL EDITION 2004

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE
B	ISSUED FOR CONCEPT DESIGN	03.11.2020
A	ISSUED FOR CONCEPT DESIGN	23.09.2020

POSITION	NAME	SIGNATURE
DRAFTING CHECK	MELANIE WILSON	
ORIGINATE/ DESIGN	SUE YIN	
INDEPENDENT CHECK	NEIL CUMMINGS	
TECHNICAL APPROVAL	LESSON JULY	
PROJECT APPROVAL	DARREN HOLLOWAY	
CLIENT APPROVAL		

KBR DRAWING No.
SEC052-0006-CV-GEN-0002

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D11 CONCEPT DESIGN
PILOT BEACH ROAD
GENERAL NOTES

DRAWING SCALE
NOT TO SCALE

ORIG. SIZE
A1

DRAWING No.
RU-DUN-70-02

REVISION
B

DRAFTER: DANIEL TAING

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FILE: \\SYDFILE300\DATA$\G&I\CAD\PROJECTS\3EC34\103 CAD\CONCEPT DESIGN D11\CIVIL\01 DRAWINGS\RU-DUN-70-02.DWG
DATE: Tuesday, November 3, 2020 3:20:56 PM



LEGEND:

EXISTING FEATURES:

- CADASTRAL - PROPERTY BOUNDARIES
- EDGE OF PAVEMENT
- PAVED ROAD / SEALED
- GRAVEL ROAD / UNSEALED
- HEADWALL
- Ø600 PIPE WITH DIRECTION OF FLOW
- SEWER
- WATER MAIN
- STORMWATER
- KERB

PROPOSED FEATURES:

- SHARED USER PATH - PAVEMENT
- REST AREA
- EARTHWORKS
- HEADWALL
- Ø600 STORMWATER PIPE WITH DIRECTION OF FLOW
- SCOUR PROTECTION
- VEGETATED CATCH DRAIN
- KERB LINE
- RETAINING WALL / BOARDWALK

NOTES:

1. FOR ADDITIONAL NOTES REFER TO DRG No. RU-DUN-70-02.
2. MODELED EARTHWORKS BASED ON DETAILED SURVEY.
3. THE PROPOSED SUP ALIGNMENT IS GENERALLY FLAT TO COMPLY WITH DDA LEVEL REQUIREMENTS.

PLAN - D11 SUP - PILOT BEACH ROAD

SCALE: 1:1000

0 20 40 60 80

SCALE 1: 1000 SCALE IN m

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	POSITION	NAME	SIGNATURE
			DRAFTING CHECK	MELANIE WILSON	
			ORIGINATE/ DESIGN	SUE YIN	
			INDEPENDENT CHECK	NEIL CUMMINGS	
			TECHNICAL APPROVAL	LESSON JULY	
			PROJECT APPROVAL	DARREN HOLLOWAY	
B	ISSUED FOR CONCEPT DESIGN	03.11.2020	CLIENT APPROVAL		
A	ISSUED FOR CONCEPT DESIGN	23.09.2020			

KBR DRAWING No.
SEC052-0006-CV-PLN-0020

PORT MACQUARIE HASTINGS

Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317

TITLE
PORT MACQUARIE HASTINGS COUNCIL
BEACH TO BEACH D11 CONCEPT DESIGN
PILOT BEACH ROAD
PLAN

DRAWING SCALE
SCALE 1:1000
DRAFTER: DANIEL TAING

ORIG. SIZE
A1

DRAWING No.
RU-DUN-70-20

REVISION
B

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DATE: Tuesday, November 3, 2020 3:21:00 PM
FILE: \\SYDFILE300\DATA$\G&I\CAD\PROJECTS\SEC34 1\03 CAD\CONCEPT DESIGN D11\CIVIL\01 DRAWINGS\RU-DUN-70-20.DWG

Appendix V Survey Photographs

D3















D5













D8











D10 and D11










Appendix F

Geotechnical Report

Kellogg Brown & Root

Geotechnical Assessment

Proposed Beach to Beach Pathway

Dunbogan Bridge to Pilot Beach, Dunbogan

Report No. RGS20936.2-AC

5 October 2021

REGIONAL GEOTECHNICAL SOLUTIONS

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS20936.2-AC

5 October 2021

Kellogg Brown & Root
201 Kent Street
SYDNEY NSW 2036

Attention: Lesson July

Dear Lesson

RE: Proposed Beach to Beach Pathway – Dunbogan Bridge to Pilot Beach, Dunbogan Geotechnical Assessment

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment of five sections of the proposed Beach to Beach Pathway, from Scarborough Way to Pilot Beach, Dunbogan.

Surface and subsurface conditions at the site and recommendations and advice on foundation conditions and pavement design are presented in the attached report.

If you have any questions regarding this project, please contact the undersigned.

For and on behalf of **Regional Geotechnical Solutions Pty Ltd**

Prepared by



Tim Morris

Associate Engineering Geologist

Regional Geotechnical Solutions Pty Ltd
ABN 51141848820

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Port Macquarie NSW 2444
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Appendices

Appendix A Results of Field Investigations
Appendix B Laboratory Test Result Sheets
Appendix C Pavement Thickness Design Sheets

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd have undertaken a geotechnical assessment of five sections of the proposed Beach to Beach Pathway that will link Laurieton to Pilot Beach, Dunbogan.

There is 2.9km of shared pedestrian pathway to be constructed in the current stage of the project, comprising the following sections:

- D3: Raised boardwalk commencing near Scarborough Way and traversing a low lying inter-tidal estuarine landscape for approximately 120m, on the western side of The Boulevarde. From Bay Street the pathway will be located on the northbound shoulder of The Boulevarde and continue approximately 210m to the existing pathway at D4. The interval within the inter-tidal area was not included within the scope of works;
- D5: Raised boardwalk approximately 160m in length that will be mostly located within the Camden Haven Inlet where it will be subject to tidal flow;
- D8: Proposed footpath approximately 800m in length, that will be located in the nature strip between Camden Head Road and Gogley's Lagoon;
- D10: Proposed footpath approximately 1230m in length that may be constructed on either side of Camden Head Road. Some retaining works may be required if the path is constructed on the western side of Camden Head Road;
- D11: Proposed footpath approximately 200m in length on the western side of Camden Head Road.

The purpose of the assessment was to provide comments and recommendations on the following:

- A geotechnical model of each section that includes general foundation conditions and the depth of the soil profiles;
- Foundation conditions including the presence of fill material or soft soils;
- Recommended foundation types, including bearing capacities, expected settlements, and construction methods;
- Excavation conditions;
- Recommendations as to site preparation to support concentrated loads from pavements;
- Support of cuts and excavations including design parameters for retaining wall design;
- General recommendations on management of construction and drainage at the site from a geotechnical perspective;
- The presence of Acid Sulfate Soils and the need for an Acid Sulfate Soil Management Plan;
- Presence of groundwater; and
- Flexible pavement design for new pavement and pavement extensions.

The work was commissioned by David Tabrett on behalf of Kellogg Brown & Root Pty Ltd and was undertaken in accordance with proposal reference RGS20936.2-AA dated 25 February 2020.

2 METHODOLOGY

Field work for the assessment was undertaken on 01 and 18 July 2021 and was based on the supplied drawings titled "SEC052_04_GIS_001_B2B_Site_Investigation_Rev E (003)". Fieldwork was undertaken by a Geotechnical Engineer from RGS and included:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- 24 boreholes undertaken by either 4WD mounted drilling rig using augering methods or hand auger to depths of between 0.55 and 3.0m;
- Perth Sand Penetrometer (PSP) testing adjacent to selected boreholes; and
- Collection of samples for subsequent laboratory testing.

Engineering logs of the boreholes are attached. Investigation locations are shown on the attached Figure 1 and were obtained by approximate measurements to prominent site features.

3 LABORATORY TESTING

Samples retrieved during fieldwork were returned to the NATA accredited Eurofins Laboratory for the following:

- Acid Sulfate Soil (ASS) screening; and
- Detailed chromium reducible sulphur analysis for Potential ASS.

Test results are summarised and discussed in Section 8. Laboratory test result sheets are presented in Appendix B.

4 SITE CONDITIONS

4.1 Surface Conditions

The subject sections of pathway D3 and D5 are situated on the bank of the Camden Haven River where surface elevations are generally less than 3m AHD. Section D3 commences at Ch 0m near the intersection of The Boulevarde and Scarborough Way and traverses across a low lying inter-tidal estuarine landscape, thickly vegetated with mangroves and then existing the estuary near the intersection between the Boulevarde and Bay Street before continuing approximately 200m within the nature strip adjacent to the east bound lane of The Boulevarde in a residential area. The Boulevarde is constructed on a low fill embankment.

Section D5 at Ch 0m commences opposite No. 33 The Boulevarde, then extends out onto the inter-tidal estuarine flats for approximately 200m, before veering back onto the river bank and terminating in the nature strip adjacent to The Boulevarde. Fibre cement sheeting that may contain asbestos containing material (ACM) was observed in the river bank near Ch 180m.

Section D8 is approximately 840m in length and is situated in the nature strip between the southern bank of Gogley's Lagoon and Camden Head Road. The lagoon river bank has been modified by placement of rock fill, up to approximately 3m in height. Surface elevations are estimated to be less than 3m AHD. Dial Before You Dig and Council plans indicate that underground services including water, sewer and telecommunication are present in the nature strip where the path is proposed. The nature strip narrows down to approximately 1m between the river bank and Camden Head Road in some intervals.

Section D10 is approximately 1230m in length and is mostly situated in the nature strip between the southern bank of Gogley's Lagoon and Camden Head Road. The section traverses across the north to north west facing lower slopes of Pleistocene aged sand dune that rises in elevation towards the east. Camden Head Road is constructed on grade or on a low fill embankment that is up to 1.5m in height.

Section D11 commences at Ch 0m near the intersection with Camden Head Road and Pilot Beach Road and is approximately 340m in length. It is generally situated on the northern nature strip of Pilot Beach Road, and traverses across and around the lower slopes of the north east plunging ridge spur before terminating at Pilot Beach Reserve.

A satellite image that shows the approximate position of the entire length of the proposed routes is reproduced in Plate 1.

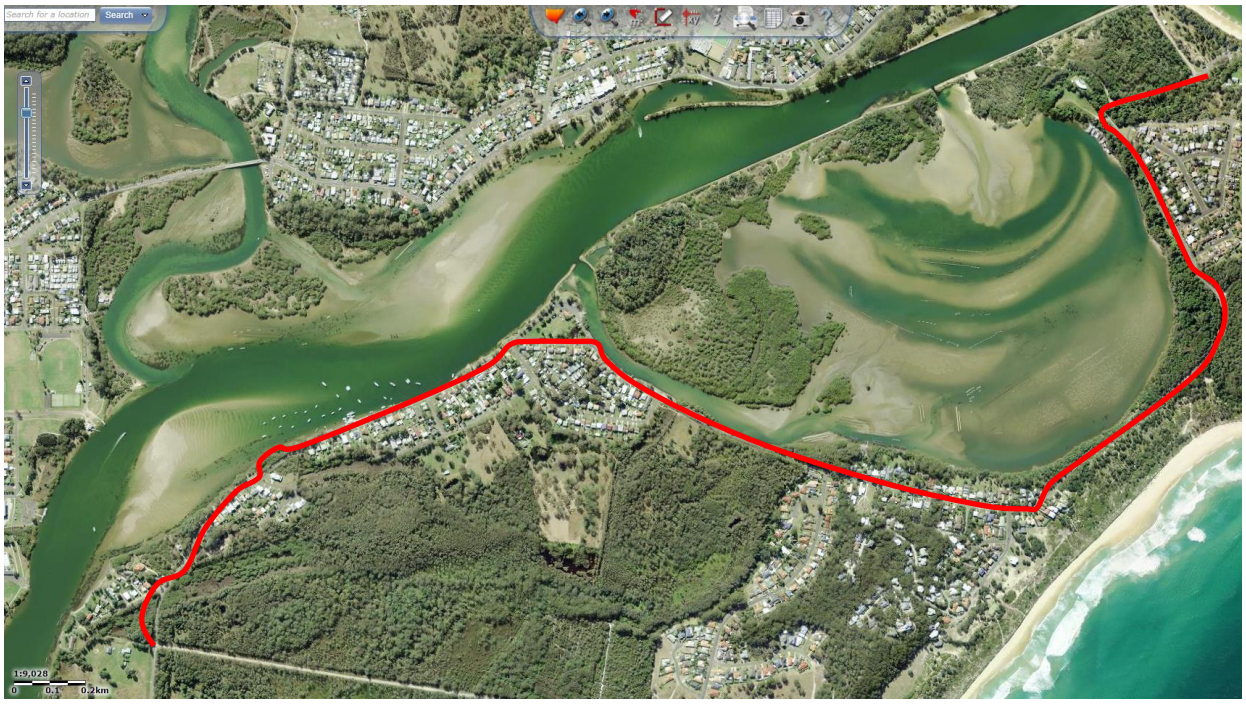


Plate 1: *Satellite image dated 2012 obtained from the NSW Government 'Six Maps' website that illustrates the site location and setting. The approximate extent of the entire length of pathway is outlined in red.*

Typical site photographs are presented below.



D3 Ch0m. Underground services present in raised embankment adjacent to The Boulevarde.



D3 Ch220m looking east. Proposed pathway will be situated in nature strip adjacent to the Boulevarde.



Looking north from D5 Ch0m. A raised boardwalk approximately 160m in length is proposed to extend through the mangroves, and over the sand flats which are inundated at high tide.



Fibre cement sheeting that may contain asbestos near D5, Ch 180m



D10 Ch730m, looking south. Pathway proposed at toe of raised road embankment



Looking north from BH7, D8 Ch260m. Pathway proposed within narrow nature strip.

 *D10 Ch0m proposed to tie-in with the existing D9, Holocene sand dune in the background.*	 *Looking north from D10 Ch850m. Proposed pathway route traverses across sand dune slope. BH18 was undertaken on the south bound shoulder due to existing underground services below the north bound shoulder.*

4.2 Subsurface Conditions

The subject sections of footpath will traverse a wide range of geological terrains including estuarine mangrove swamps, a tidal water body, estuarine flats, back barrier sand plains, sand dunes and residual soils on Camden Head. Reference to the Laurieton Acid Sulfate Soils (ASS) Risk Map (NSW DLWC, 2000) indicates ASS are likely to be encountered within 1m of ground surface in low lying areas.

An excerpt of the Port Macquarie Quaternary geology sheet is reproduced in Plate 2.

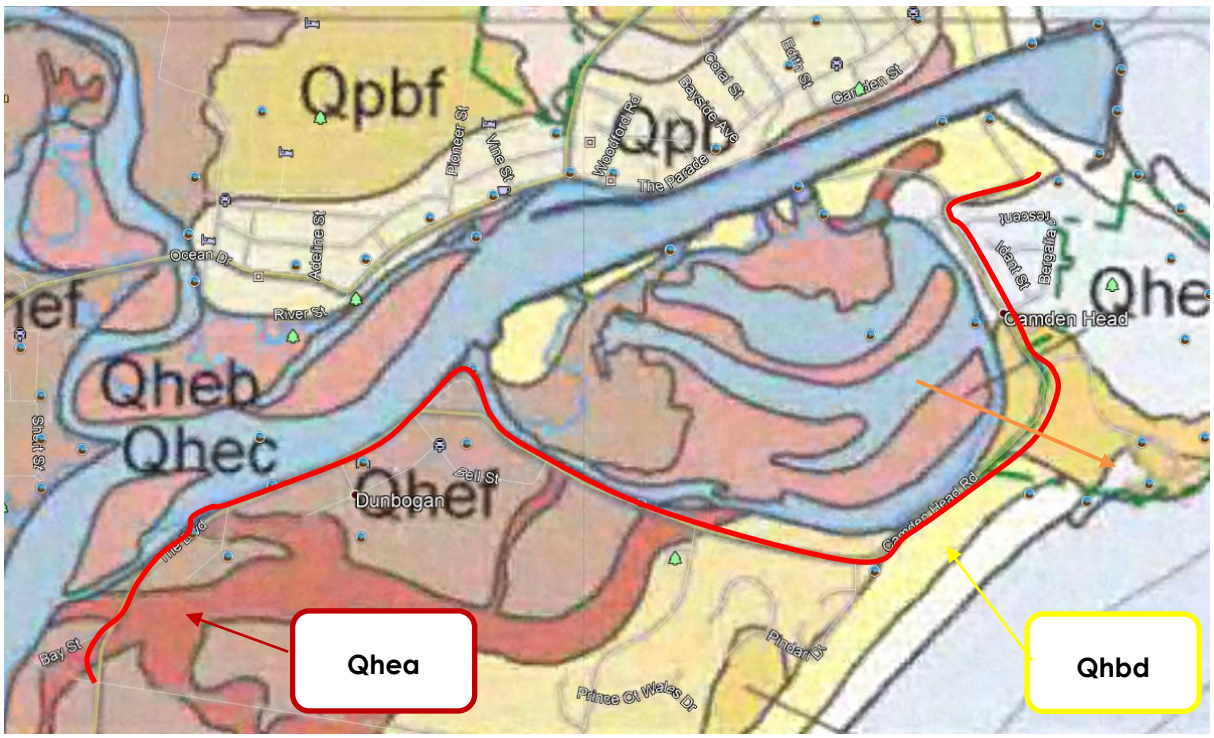


Plate 2: *Google Earth satellite image overlaid with Port Macquarie 1:100,000 Coastal Quaternary Geology Sheet. Approximate route of the pathway shown in red.*

Qhef = Holocene tidal-delta flat – marine sand, silt, clay, shell and gravel

Qhea = Holocene estuarine paleochannel fill – organic mud, peat, clay, silt and marine sand

Qhbd = Holocene dune – marine sand

Qpbdr = Pleistocene bedrock-mantling dune – marine sand, indurated sand

The materials encountered during the investigation are summarised in Table 1 and 2. Further details are presented on the attached engineering logs.

Table 1: Summary of Geotechnical Units

Unit	Material	Material Description
UNIT 1A	TOPSOIL/ FILL	Sandy SILT, low plasticity, dark brown, trace grass roots
UNIT 1B	FILL	Sandy GRAVEL, orange – brown, very dense, or Gravelly Silty CLAY, brown, very stiff
UNIT 2A	Estuarine (Loose)	Silty SAND to Clayey SAND, dark grey, sulfur odour, very loose to loose
UNIT 2B	Estuarine (MD/D)	Clayey SAND, dark grey / orange / pale grey, with shell fragments, medium dense to dense
UNIT 3	Aeolian / Marine SAND	SAND, grey – white, medium dense, trace weakly cemented zones (indurated)

Table 2: Summary of Subsurface Materials

Section	Chainage	Investigation		Depth to Base of Material Layer (m)				
			Unit 1A Fill/Topsoil	Unit 1B Fill	Unit 2A Estuarine SAND (Loose)	Unit 2B Estuarine SAND (Medium Dense)	Unit 3 Aeolian SAND	*Water Inflow (m)*
D3	0	BH11	--	0.0 – 1.6	--	1.6 ≥ 2.0	--	--
D3	60	BH12	Not investigated due to presence of underground services					
D3	210	BH13	0.0 – 0.25	--	0.25 – 0.6	0.6 ≥ 2.0	--	*0.8*
D3	240	BH14	0.0 - 0.1	0.1 – 0.3	0.3 ≥ 2.0		--	*0.85*
D3	390	BH15	--	0.0 – 0.4	--	0.4 ≥ 2.0	--	*0.8*
D5	20	BH1	--	--	0.0 – 1.1	1.0 ≥ 2.0	--	*0.4*
D5	50	BH2	--	--	0 – 1.0	1.0 ≥2.7	--	*0.25m above surface*
D5	140	BH3	--	--	0 – 0.2	1 – 1.8	--	*0.55m above surface*
D5	210	BH4	0.0 – 0.1	--		0.1 ≥ 3.0	--	*0.8*
D8	0	BH5	--	0.0 – 0.8		0.8 ≥ 3.0	--	*1.4*
D8	120	BH6	Not investigated due to narrow road shoulder and presence of underground services					
D8	260	BH7	--	0.0 – 0.2	0.2 – 0.7	0.7 ≥ 1.5	--	--
D8	500	BH8	0.0 – 0.1	--	0.1 – 0.9	0.9 ≥ 1.5	--	*0.5*
D8	800	BH9	0.0 – 0.3	--	--		0.3 ≥ 2.0	--
D10	0	BH10	0.0 – 0.3	--	--		0.3 ≥ 1.5	--
D10	260	BH16	0.0 – 0.1	--	--		0.1 ≥ 1.5	--
D10	730	BH17	0.0 – 0.3	--	--		0.3 ≥ 1.5#	--
D10	850	BH18	0.0 – 0.3	--	--		0.3 ≥ 1.5	--
D10	130	BH19	0.0 – 0.1	0.1 ≥ 0.55*	--		--	--
D11	10	BH20	--	0.0 – 0.7	--		0.7 ≥ 0.8	--
D11	140	BH21	0.0 – 0.25	--	--		0.25 ≥ 0.8	--
D11	200	BH22	0.0 – 0.1	--	--		0.1 ≥ 0.9	--
D11	440	BH23B	--	0.0 – 0.55	--		0.55 ≥ 0.8	--
D11-1	10	BH24	0.0 – 0.3	--	--		0.3 ≥ 0.9	--

Note: ≥ Indicates that base of material layer was not encountered
* Indicates that the test was terminated due to hand auger practical refusal on roots or cobbles
-- Indicates that the material was not encountered at the test location
\# Indicates loose aeolian / marine sand

Groundwater inflow was encountered within boreholes at the levels shown in Table 2. It should be noted that fluctuations in groundwater levels can occur as a result of seasonal variations, temperature, rainfall, tidal influences, and other similar factors, the influence of which may not have been apparent at the time of the assessment.

5 EARTHWORKS

5.1 Site Preparation

The proposed road and pathway alignments are typically vegetated with grass and occasional trees. Proposed pavements should be stripped to remove all topsoil, root affected, uncontrolled fill or other potentially deleterious material which can be retained on site for re-use in landscaping. A geotechnical assessment is recommended following boxing out.

The topsoil and natural sands at the site are considered susceptible to erosion on exposure (i.e. where vegetation is removed) or where exposed to concentrated flows. It is therefore essential that:

- Earthworks should be undertaken progressively, minimising the area and length of time that any part of the site is denuded of vegetation at any one time;
- Re-vegetation or other erosion protection should be undertaken as soon as possible.

Possible asbestos containing materials (ACM) was noted at D5, Ch180m. Further assessment is recommended to assess whether ACM is present. If ACM is present then an Asbestos Management Plan should be prepared by a suitably qualified person in accordance with the NSW WorkCover Code of Practice (*How to Manage and Control Asbestos in the Workplace*), to facilitate the removal of any identified ACM.

5.2 Excavation Conditions

It is anticipated that excavations could be achieved using conventional excavator bucket at least to the depth of excavation indicated on the borehole logs along the route. Cobbles and boulders may be encountered in excavations undertaken adjacent to the riverbanks which have been modified by placement of rock fill.

Sand profiles including estuarine sands (Unit 2) and aeolian sands (Unit 3) are potentially unstable and may require shoring, particularly when the excavations are below the water table. Groundwater levels will fluctuate in response to climatic conditions and may be higher than the levels encountered during fieldwork.

Existing service trenches are present in the vicinity of the proposed pathways along most of the alignment. Excavations can be unstable when they are in close proximity to existing service trenches due to variable compaction of back fill and the tendency for trenches to become water filled. Temporary shoring may therefore be required where excavations are in close proximity to existing service trenches.

The exact location of service trenches adjacent to and/or within this site are not known. It is recommended that all current and previous services should be located prior to commencement of excavation works as service trenches with poorly compacted backfill can form zones of weakness behind proposed excavations.

Entry into unsupported trenches should be avoided and appropriate signage and barricading should be installed around all open excavations. Excavation design should take into account maximum batter angle and setback requirements for vehicle traffic as detailed in the Excavation Work Code of Practice (Safe Work Australia – 2020).

5.3 Reuse of Site Won Materials

Topsoil is not suitable for reuse as engineered fill. This material may be reused for landscaping purposes.

The proposed earthworks from D3, D5 and D8 may encounter estuarine sand soils (Unit 2A and Unit 2B). Potential ASS are present within the estuarine soils (Unit 2A and Unit 2B) from approximately 1m below surface as discussed further in Section 8. An ASS Management Plan will therefore be required for treatment and disposal of excavated Potential ASS material, and/or, lowering of the water table if dewatering is adopted.

The aeolian / marine sands (Unit 3) will be suitable for use as engineering fill provided it is placed in accordance with the recommendations presented in this report.

5.4 Retention

Temporary excavations up to 2.0m high (during construction) in sand can be battered at 1.H:1V above the water table.

Permanent slopes in sand soils shall be battered no steeper than 3H:1V and will require re-vegetation or other erosion protection. Permanent slopes in compacted gravel/clay embankments shall be battered no steeper than 2H:1V and will require re-vegetation or other erosion protection.

Where site constraints preclude the use of such batters, excavations should be supported by temporary shoring or permanent support as appropriate.

Gravity or cantilever retaining walls can be designed on the basis of the parameters presented in Table 3 for walls retaining natural clays or clay fill. Design can be undertaken on the basis of a triangular lateral earth pressure distribution using the characteristic earth pressure coefficients and subsoil parameters provided and should include assessment of the overall stability of the wall.

Table 3: Retention Design Parameters

Material	Unit Weight, γ	Effective Friction Angle	Effective Cohesion, c'	Active Earth Pressure Coefficient, k_a	At Rest Earth Pressure Coefficient, k_o	Passive Earth Pressure Coefficient, k_p
UNIT 1B - FILL	18	30	0 - 2	0.3	0.5	2.5
UNIT 3 Aeolian / Marine SAND	17	30	0	0.33	0.5	3

The earth pressure coefficients detailed in Table 3 have been calculated using Rankine's Theory assuming level backfill. The retaining wall designer should ensure that the use of this method is

appropriate for the individual retaining wall(s). Any surcharge affecting the walls such as adjacent footings, adjacent retaining walls and their backfill, or sloping surfaces, should be allowed for in the design.

5.5 Fill Placement and Compaction Control

All fill placed for the support of structures or pavements should be placed and compacted as outlined below:

- After unsuitable material (including topsoil) has been stripped to design foundation level the exposed subgrade should be assessed by a suitably experienced geotechnical practitioner to assess for the presence of any areas of uncontrolled fill or existing underground service trenches. Particular attention should be paid at the existing service crossings which may need to be relocated deeper in the subgrade profile, or, provided with a different method of treatment such as partial excavation and cover with cement stabilised sand;
- Exposed sand profiles should then be compacted using a vibratory smooth drum roller with the addition of water. A grid of penetrometer tests should then be undertaken across the foundation area to confirm a density index of 65% in the foundation sands to at least 1.5m depth;
- Maximum particle size for general lot fill is 100mm;
- Where surface slopes are more than 7° the existing surface should be benched prior to placement of fill to provide a level surface suitable for compaction;
- Proposed fill material should comprise suitable fill as defined in AS 3798-2007 *Guidelines on Earthworks for Residential and Commercial Developments*. Inspection by a geotechnical authority may be required to confirm suitability of proposed fill material;
- Where filling is required beneath structures, approved fill should be placed in layers not exceeding 250 mm loose thickness and compacted to a minimum dry density ratio of not less than 98% of standard compaction. Clay fill should be placed and maintained at no more than ±2% of standard optimum moisture content; and
- All fill for the support of structures should be placed and compacted in accordance with the recommendations outlined in AS3798-2007 *Guidelines on Earthworks for Residential and Commercial Developments*, under Level 1 supervision. Areas of the site that are filled to support pavements should be filled under Level 2 supervision and testing.

6 FOUNDATIONS

6.1 Foundation Conditions

The profile encountered was variable and included some areas of mixed fill, overlying estuarine or aeolian sand profiles. Within D5 the proposed timber board walk will be situated on an estuarine tidal flat subject to tidal inundation, tidal currents and flooding conditions.

Based on the subsurface conditions encountered during the field investigations and details available of the proposed development, it is considered that piled foundations will be proposed for raised walkways.

6.2 Shallow Foundations

For pad and/or strip footings or stiffened raft footing beams up to 2 m wide, the allowable bearing pressures shown in Table 4 may be adopted, provided site preparation works are undertaken as detailed in Section 5.5. Under applied loads of this order, total settlements are anticipated to not exceed 15 mm.

Table 4: Shallow Foundation Design Parameters

Material / Unit	Allowable Bearing Pressure (kPa)
UNIT 2A Estuarine - Medium Dense (Above water table)	N/A
UNIT 2B Estuarine - Medium Dense (Above water table)	100
UNIT 3 Aeolian / Marine SAND (Above water table)	100

All structural footings should be founded as follows:

- All footings should be founded in natural sands, below all topsoil and any uncontrolled fill materials;
- All footings, edge beams and internal beams should be founded on similar material outside or below the zones of influence resulting from existing or future service trenches, retaining walls or other subsurface structures; and
- Prior to the placement of concrete we recommend that footings be observed and assessed by a suitably experienced geotechnical engineer to assess that the correct founding material has been achieved.

6.3 Piled Foundations

Due to the sand profiles (Unit 2 and 3) and/or shallow groundwater table, open bored piles are not recommended due to the potential for hole collapse. Suitable pile types therefore include cased bored piles, screw piles or grout injected continuous flyte auger (CFA) piles which may be designed based on the design parameters presented in Table 5. Driven piles may also be suitable in areas that are located away from existing structures due to the potential for vibration induced damage.

It is recommended that a geotechnical engineer be on site at least during the initial stages of pile drilling and installations to assess the founding materials encountered and confirm required founding depths.

Table 5: Non-Displacement Pile Design Parameters*

Material Unit	Ultimate End Bearing, f_b (kPa)	Ultimate Skin Friction, f_s (kPa)	Effective Vertical Youngs Modulus (MPa)	Effective Horizontal Youngs Modulus (MPa)
UNIT 2A Estuarine (Loose)	N/A	10	2	1.2
UNIT 2B Estuarine (Medium Dense)	800	15	5	3
UNIT 3 Aeolian / Marine SAND (Medium Dense)	800	15	5	3

Note: * *Values given assume pile spacing >5 times pile diameter and at depth of >4.5 times pile diameter*

The following points are noted in relation to the parameters provided in Table 5:

- Loading a pile to the ultimate capacities provided will incur large settlements, typically of the order of 5% of pile diameter;
- Limit state design requires the piles to be designed for an acceptable level of serviceability, which typically assumes a maximum settlement of not more than 1% of pile diameter. If the structure is more sensitive or less sensitive to settlement than this value assumes, serviceability criteria should be re-assessed;
- It is noted that shaft adhesion and lateral yield should not be included in pile design to the depth where potential scour may occur;
- The parameters provided assume the sides and base of the piles are clean and rough. It will be necessary to clean the sides of open bored piles to remove the layer of softened, smeared, or remoulded material which forms on the walls of the piles, and a pile cleaning bucket will be required for the base;
- Bored piles should either be dewatered prior to pouring concrete or a tremmie mix and tremmie pouring method used. Bored piles founded in sand profiles should not be dewatered due to potential for water inflow through the sand foundation;
- Bored piles will be required to penetrate sands (Unit 2 and 3) which are likely to collapse during bored pile excavation below the water table. An allowance for sacrificial permanent casing should be adopted to line the section of the holes to prevent collapse during construction; and
- It is recommended that a geotechnical engineer be on site at least during the initial stages of pile drilling and installations to assess the founding materials encountered and confirm required founding depths.

In accordance with AS2159-2009 *Piling Design and Installation*, a geotechnical reduction factor (Φ_g) should be applied to the ultimate values shown in Table 4 to derive ultimate geotechnical strengths ($R_{d,g}$) for limit state design. This factor is dependent on assignment of an Average Risk Rating (ARR) which requires some assumptions to be made regarding the design and construction methodology. To derive a geotechnical strength reduction factor for this project the following assumptions are considered reasonable:

- Design of piles and pile groups will be undertaken in accordance with the recommendations presented in this report;



- Investigation comprised boreholes with limited in situ testing;
- Limited geotechnical involvement will occur during pile installation;
- Some performance monitoring of the supported structure during or after construction;
- No static testing of the piles will be undertaken;
- The foundations will be designed by a designer of at least moderate experience in similar geotechnical profiles and pile design; and
- Well established pile design methods will be adopted.

Based on the above and in accordance with AS2159-2009, a Geotechnical Strength Reduction Factor of Φ_g=0.48 would be appropriate for the site.

7 PAVEMENT DESIGN

7.1 Design Parameters

With reference to Port Macquarie Hastings Aus-Spec, options for flexible pavement design considered the following:

- D3 pavement extension on unnamed access road: Access Place design traffic loading = 7 x 10^4 ESA;
- D3 pavement extension on Bay Street: Local Street design traffic loading = 5 x 10^5 ESA;
- D8 new parallel parking lane on Camden Head Road: Local Street design traffic loading = 5 x 10^5 ESA;
- D11 Pilot Beach Road pavement extensions: Local Street design traffic loading = 5 x 10^5 ESA.

7.2 General Road Conditions

The following points are noted about the area of the proposed road alignments:

- Subject intervals will be at or near ongrade;
- New pavement and pavement extensions will tie into existing pavements;
- Kerb and gutter proposed on section D3, D8 and D11;
- Existing pavements have a two coat seal and an AC seal wearing course is not required;
- Proposed pavements are likely to be on existing fill embankments;
- Existing underground services are likely to be present in the proposed alignments; and
- Investigation at BH12 (Access Place, D3) was restricted to multiple underground services. The subject interval of road is constructed on a raised embankment. Previous investigations by RGS on Scarborough Way on the opposite side of the intersection revealed mixed embankment fill of sand and gravel.

7.3 Subgrade

The existing subgrade typically comprised sand profiles, loose to medium dense. Compaction with a smooth drum roller will be required to achieve minimum 70% Density Index. A design CBR of 8% can then be adopted.

Based on the subsurface profile observed, the results of in-situ PSP testing and previous geotechnical assessment of adjoining sections of road embankments a subgrade CBR of 8% was used for design purposes.

7.4 Pavement Design

7.4.1 Local Street

Intervals of Local Street pavements include Bay Street widening (D3), parking bays on Camden Head Road (D8) and extensions of Pilot Beach Road (D11).

AUSTROADS design procedures indicate that for a granular pavement with a traffic loading of 5×10^5 ESA on a CBR 8 subgrade that a minimum effective pavement thickness of 275 mm is required which includes a 120mm minimum thickness of base course. Proposed pavement will comprise:

- Two coat seal
- 120mm basecourse
- 160mm subbase
- Total thickness = 280mm

Pavement thickness design sheets are presented in Appendix C.

7.4.2 Access Place

Intervals of Access Place pavement comprises the extension of the unnamed access road, opposite Scarborough way in D3.

AUSTROADS design procedures indicate that for a granular pavement with a traffic loading of 7×10^4 ESA on a CBR 8 subgrade that an effective pavement thickness of 220 mm is required which includes a 100mm minimum thickness of base course. For constructability purposes a minimum 150mm subbase layer is recommended. This will result in a pavement profile of total thickness 270mm comprising:

- Two coat seal
- 100mm basecourse
- 150mm subbase
- Total thickness = 250mm

Pavement thickness design sheets are presented in Appendix C.

7.5 Construction

Construction recommendations for specific pavement designs are included in the appended Pavement Thickness Design Sheet. In addition, the following general construction advice is given:



- Preparation of areas for pavement construction should involve stripping of all topsoil and tree roots to spoil or stockpile for re-use as landscaping material only;
- Where existing gravels are present they should be stripped to design subgrade level and stockpiled for reuse as Select Fill (CBR>15 and PI<15) where required;
- A geotechnical assessment of the site should be undertaken following boxing out of pavement areas. Particular attention should be paid at the existing service crossings which may need to be relocated deeper in the subgrade profile, or, provided with a different method of treatment such as partial excavation and cover with cement stabilised sand;
- In sand subgrade, strip to design subgrade level by excavator using a mud bucket, with the excavator sitting on the unstripped surface and working away from the stripped surface to form a smooth surface with minimal disturbance;
- The exposed sand subgrade should be compacted to a minimum 70% Density Index before placement of any fill. Sand fill should be placed in layers not exceeding 200mm and compacted to a minimum 70% Density Index with a smooth drum vibratory roller with addition of water to assist compaction;
- On sand subgrade, place subbase (DGS40) on an advancing fill front, with the pavement gravels dumped on the outer edge of the stripped surface and then pushed out by machines trafficking the placed gravels;
- DGS sub-base material should be placed in layers not exceeding 200mm loose thickness and compacted to 95% Modified Compaction;
- DGB base material should be placed and compacted to 98% Modified Compaction;
- Select Fill and pavement gravels should be placed and maintained at 60% to 90% of Optimum Moisture Content;
- Place seal as per Council requirements;
- Where final sealing cannot be undertaken within a few days of completion of the base course, a primer seal should be used to protect the pavement and maintain equilibrium moisture content;
- Should wet weather occur prior to final sealing, the base course should be allowed to dry back to not more than 90% of Optimum Moisture Content prior to sealing. Trapping of excess moisture below the final seal will significantly reduce pavement life;
- Where new construction joins onto existing pavements the existing pavement layers should be benched to avoid a vertical joint extending through the pavements at the interface.

7.6 Drainage

Care will be required to promote subsurface drainage to avoid accumulation of water in the pavement profile. To achieve this, we recommend:

- That subsoil or table drains be constructed to 300mm below base of pavement. In areas of free draining sand subgrade, subsoil drains may not be required, pending geotechnical assessment following boxing out to design subgrade;
- Where pavements are to be widened, the widened section will typically require excavation below existing pavement level. It is critical that granular materials placed in widened areas extend laterally to a table drain that will allow lateral drainage and prevent ponding of water within the pavement edges.

8 ACID SULFATE SOILS

8.1 Presence of ASS

Acid Sulfate Soils (ASS) produce sulphuric acid when exposed to oxygen due to the presence of iron sulphides in the form of pyrite within the soil matrix. These soils form when iron-rich sediments are deposited in saltwater or brackish water environments. Prior to oxidation, these pyritic soils are referred to as Potential ASS. ASS that have produced acid as a result of oxidation are referred to as Actual ASS. They typically occur in natural, low-lying coastal depositional environments below approximately 5m AHD. In the field ASS are generally identified as saline sediments such as alluvial or estuarine soils or bottom sediments in creeks and estuaries.

Refence to the Port Macquarie Acid Sulfate Soil (ASS) Risk Map indicates that the low-lying estuarine and tidal-delta landscapes near D3, D5 and D8 have a high probability of ASS at, or, near the surface.

The aeolian / marine sands encountered in D10 and parts of D11 occur in an area of no known occurrences of ASS.

A portion of the eSpade ASS Risk map is reproduced in Plate 3.

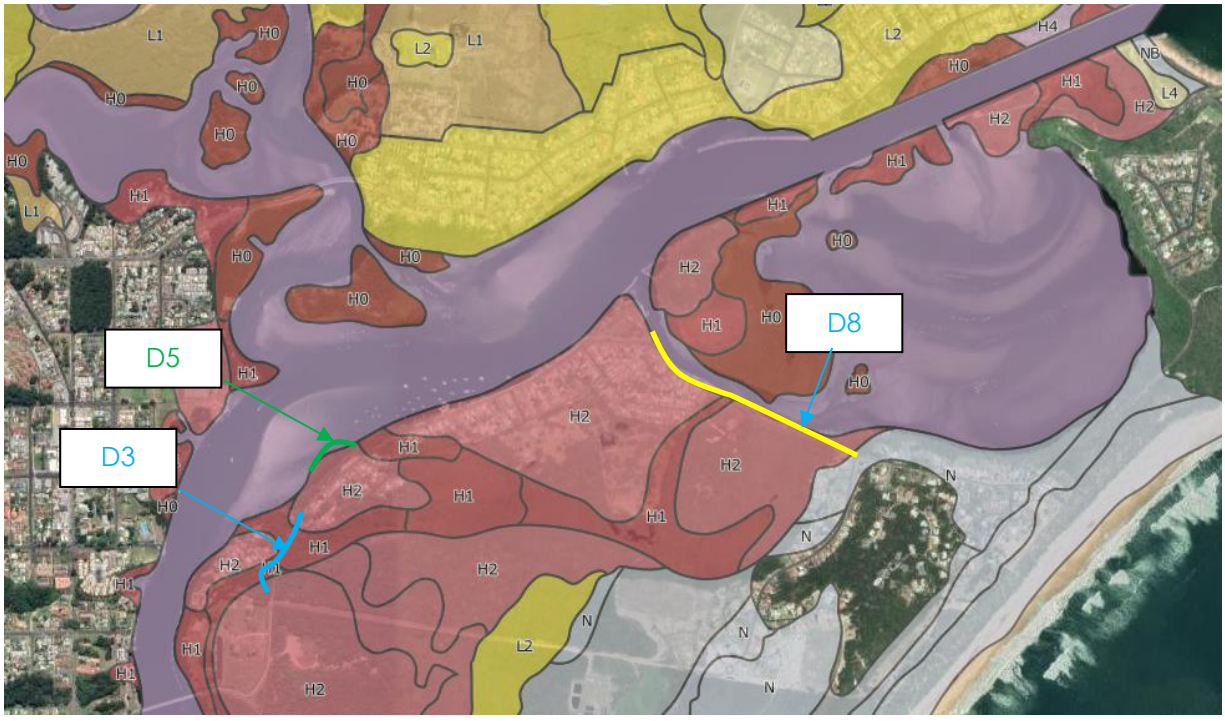


Plate 3: *Excerpt from eSpade website showing there is an area of high probability of ASS at or near ground surface generally correlating with low lying estuarine landscapes in the subject intervals of D3, D5 and D8.*

8.2 Assessment Methodology

Reference to the National Acid Sulfate Soils Guidance (*Water Quality Australia 2018*) provides a summary of general site conditions (Table 2.1) that can be indicative of Potential and Actual ASS. A summary of relevant site conditions is presented below:



- Land elevation of less than 5m AHD can be characteristic of ASS
- Water table less than 3m from surface can be characteristic of ASS
- Well drained sand soils exposed at surface are not considered indicative of ASS
- Vegetation comprises grass and scattered eucalypt trees on the sand plains in the north which are not indicative of ASS
- Estuarine landscapes with mangrove vegetation are indicators of ASS

Sampling and testing were targeted at regular intervals along the proposed alignment. Samples from selected profiles were collected at regular 0.5 m intervals.

8.3 Laboratory Testing

A total of 41 samples obtained from 10 boreholes undertaken in areas of high probability of ASS the investigation were submitted to the NATA accredited Environmental Analysis Laboratory (EAL) and screened for the presence of ASS. The results are presented in Appendix B and indicate the following:

8.3.1 Section D3

- The pH of the samples in distilled water ranged from 7.49 to 5.13. A pH_F value of less than 4 in this test may indicate Actual ASS (National Acid Sulfate Soils Guidelines (NASSG);
- A Low to Volcanic reaction was noted in the samples after addition of hydrogen peroxide. A strong to volcanic reaction may indicate Potential ASS (NASSG); and
- The pH of the samples after oxidation in hydrogen peroxide ranged from 3.5 to 1.8. A pH_{FOX} value of less than 3 in this test is considered indicative of Potential ASS (PASS). pH_{FOX} readings greater than 3 are inconclusive and require further laboratory analysis to confirm the presence of iron sulfides.

8.3.2 Section D5

- The pH of the samples in distilled water ranged from 8.0 to 6.3. A pH_F value of less than 4 in this test may indicate Actual ASS (National Acid Sulfate Soils Guidelines (NASSG);
- A Low to Volcanic reaction was noted in the samples after addition of hydrogen peroxide. A strong to volcanic reaction may indicate Potential ASS (NASSG); and
- The pH of the samples after oxidation in hydrogen peroxide ranged from 4.5 – 1.7. A pH_{FOX} value of less than 3 in this test is considered indicative of Potential ASS (PASS). pH_{FOX} readings greater than 3 are inconclusive and require further laboratory analysis to confirm the presence of iron sulfides.

8.3.3 Section D8

- The pH of the samples in distilled water ranged from 7.7 to 5.9. A pH_F value of less than 4 in this test may indicate Actual ASS (National Acid Sulfate Soils Guidelines (NASSG);
- A Low to Volcanic reaction was noted in the samples after addition of hydrogen peroxide. A strong to volcanic reaction may indicate Potential ASS (NASSG); and
- The pH of the samples after oxidation in hydrogen peroxide ranged from 4.2 to 1.7. A pH_{FOX} value of less than 3 in this test is considered indicative of Potential ASS (PASS). pH_{FOX} readings



greater than 3 are inconclusive and require further laboratory analysis to confirm the presence of iron sulfides.

8.3.4 Section D10

- The pH of the samples in distilled water ranged from 7.9 to 5.1. A pH_F value of less than 4 in this test may indicate Actual ASS (National Acid Sulfate Soils Guidelines (NASSG);
- A Low to Volcanic reaction was noted in the samples after addition of hydrogen peroxide. A strong to volcanic reaction may indicate Potential ASS (NASSG); and
- The pH of the samples after oxidation in hydrogen peroxide ranged from 4.3 to 4.2. A pH_{FOX} value of less than 3 in this test is considered indicative of Potential ASS (PASS). pH_{FOX} readings greater than 3 are inconclusive and require further laboratory analysis to confirm the presence of iron sulfides.

Based on the screening results, ten samples were submitted for detailed chromium reducible sulphur (CrS) and KCl extractable sulfur analysis. The results are presented in Appendix B are summarised in Table 6.

Table 6 - Summary of Detailed ASS Analysis Results

Location	Bore Hole	Sample Depth (m)	Material	Texture	pH_{KCL}	Titratable Actual Acidity, TAA (mol H^+/t)	Chromium Reducible Sulfur, S_{cr} (mol H^+/t)	Net Acidity (mol H^+/t)	Lime kg $CaCO_3$/ tonne
D3 Ch240m	BH14	0.4 – 0.5	Unit 2A	Coarse	4.2	41	<3	**52**	3.9
D5 Ch0m	BH1	1.5 – 1.6	Unit 2B	Coarse	5.1	15	**260**	**280**	21
D5 Ch210m	BH4	2.4 – 2.5	Unit 2B	Coarse	8.5	<2	**42**	**42**	<1
D8 Ch0m	BH5	1.5 – 1.6	Unit 2A	Coarse	5.4	12	**300**	**310**	25
D8 Ch260m	BH7	0.6 – 0.7	Unit 2A	Coarse	5.8	4.0	3.8	<10	<1
D8 Ch900m	BH9	0.4 – 0.5	Unit 3	Coarse	5.9	2.0	<3	<10	<1
D10 Ch0m	BH10	0.4 – 0.5	Unit 3	Coarse	6.1	2.0	<3	<10	<1
Criteria for ASS (Table 4.4 - ASS Manual) Coarse texture (<1,000tonnes of soil) = Net acidity >18 moles H+/tonne									

8.4 ASS Assessment Summary

A review of the test results presented in Table 6 indicates the following:

- The pH_{KCL} ranged from 8.5 to 4.2. A pH_F value of less than 4 in this test may indicate Actual ASS (NASSG). Values >4 or <5.5 are acidic which may be due to limited oxidation of PASS ***or*** other sources of acidity such as organic acids;



- Sample BH14 (D3 Ch240m) contained no reduced inorganic sulfur, however, the net acidity of the sample exceeded the action criteria value for coarse textured materials indicating it may be an Actual ASS. It is noted that the pH_{KCL} is >4 and the acidity present may therefore be due to other sources of acidity such as organic acids which are a feature of coastal sandplain landscapes. Reference to the Laurieton ASS Risk Map indicates that at BH14 there is a high probability of ASS from >1m below the surface, bloe the depth of the sample. Further assessment using sulfur derived acidity analysis is likely to show the origin of the acidity present is not from ASS;
- The reduced inorganic sulfer concentrations of three samples in Unit 2A and 2B ranged exceeded the action criteria value for coarse textured materials. The results indicate the materials **are** Potential ASS. Each of the three sample locations were >1m below surface;
- The reduced inorganic sulfer concentrations of the samples in Unit 3 were less than the action criteria value for coarse textured materials. The results indicate the material is **not** Potential ASS; and
- Sample BH4 (D5 Ch 210m) contains some natural buffering capacity in the form of calcium carbonate (i.e. shell grit) which comprised 0.43% of the sample. The shell can neutralise potential sulphuric acidity and result in reduced net acidity values, however, variable shell size and content can result in only partial neutralisation of the acidity generated and is therefore not included in the Net Acidity result.

The estuarine and tidal delta flat sediments in Unit 2A and Unit 2B, at Sections D3, D5 and D8 are likely to be ASS and an ASS Management Plan will be required where excavations are proposed below elevations of approximately 1m AHD at these locations. Further assessment may be required for where localised excavations are proposed below 1m AHD.

9 LIMITATIONS

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the document. The report should not be used by other parties or for purposes or projects other than those assumed and stated within the report, as it may not contain adequate or appropriate information for applications other than those assumed or advised at the time of its preparation. The contents of the report are for the sole use of the client and no responsibility or liability will be accepted to any third party. The report should not be reproduced either in part or in full, without the express permission of Regional Geotechnical Solutions Pty Ltd.

Geotechnical site investigation is based on data collection, judgment, experience, and opinion. By its nature, it is less exact than other engineering disciplines. The findings presented in this report and used as the basis for the recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

The recommended depth and properties of any soil, rock, groundwater, or other material referred to in this report is an engineering estimate based on the information available at the time of its writing. The estimate is influenced and limited by the fieldwork method and testing carried out in the site investigation, and other relevant information as has been made available. In cases where information has been provided to Regional Geotechnical Solutions for the purposes of preparing this report it has been assumed that the information is accurate and appropriate for such use. No responsibility is accepted by Regional Geotechnical Solutions for inaccuracies within any data supplied by others.

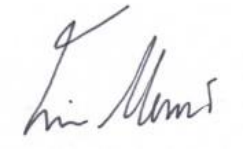
If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of **Regional Geotechnical Solutions Pty Ltd**

Prepared by



Tim Morris

Associate Engineering Geologist

Figures



Based on supplied drawing titled " PLAN - THE BOULEVARD (NORTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
			Scale:	NTS
			Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN - D3	Figure No.	**1**



Legend

Borehole Location

Based on supplied drawing titled " PLAN - D5 SUP - THE BOULEVARD (NORTH) "

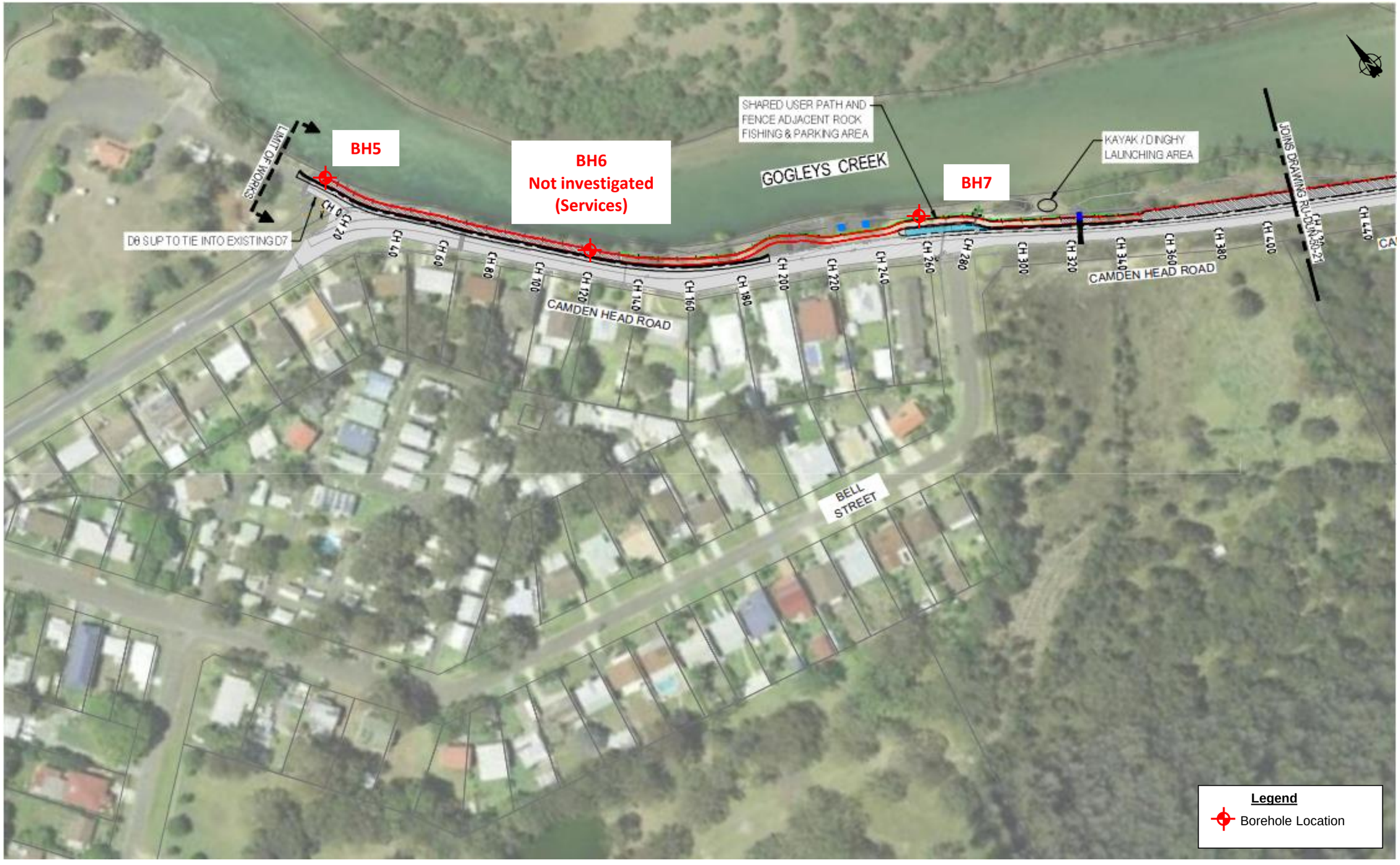
REGIONAL GEOTECHNICAL SOLUTIONS

Client:	KELLOG BROWN & ROOT	Job No.	RGS20936.2
Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
		Scale:	NTS
		Date:	6-Oct-21
Title:	INVESTIGATION LOCATION PLAN - D5	Figure No.	**2**



Based on supplied drawing titled " PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	Client:	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY	Drawn By:	DS
			Scale:	NTS
		DUNBOGAN	Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN D*.1	Figure No.	**4**



Based on supplied drawing titled " PLAN - D8 SUP - CAMDEN HEAD ROAD (SOUTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
			Scale:	NTS
			Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN - D8	Figure No.	**3**



Based on supplied drawing titled " PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
			Scale:	NTS
			Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN - D10	Figure No.	**5**



Based on supplied drawing titled " PLAN - D10 SUP - CAMDEN HEAD ROAD (NORTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	Client:	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
			Scale:	NTS
			Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN - D10.1	Figure No.	**6**



Based on supplied drawing titled " PLAN - D11 SUP - PILOT BEACH ROAD (NORTH) "

REGIONAL GEOTECHNICAL SOLUTIONS	Client:	KELLOG BROWN & ROOT	Job No.	RGS20936.2
	Project:	BRIDGE TO BRIDGE PATHWAY DUNBOGAN	Drawn By:	DS
			Scale:	NTS
			Date:	6-Oct-21
	Title:	INVESTIGATION LOCATION PLAN - D11	Figure No.	7

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH1

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D5: Ch20m
DATE: 1/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 80 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	▽	0.10m ASS 0.20m				SP	0.10m **SAND** fine to coarse grained, with grravel, fine to coarse grained, subrounded.	M			1	ESTUARINE
						SM	**Silty SAND** fine to medium grained, dark grey, trace of roots, sulfur odour.	W	VL	DCP (0-m)	0	
		0.50m ASS 0.60m 0.70m ASS 0.80m 0.90m ASS 1.00m		0.5							0	
											0	
											1	
											0	
											1	
							0.80m				1	
						SC	**Clayey SAND** fine to medium grained, dark grey, clay low plasticity, sulfur odour.				1	
				1.0							1	
		1.20m ASS 1.30m ASS 1.40m 1.50m ASS 1.60m							MD		4	
											3	
											3	
				1.5							4	
											3	
											5	
											6	
											6	
				2.0			2.00m				7	
							Hole Terminated at 2.00 m				6	
											7	
											9	
				2.5							7	
											7	
											8	
				3.0							10	
											11	
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH2

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D5: Ch50m
DATE: 1/6/21

DRILL TYPE: PSP
EASTING:
SURFACE RL:
BOREHOLE DIAMETER:
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
PSP	Not Encountered			0.5 1.0 1.5 2.0 2.5 3.0 3.5						DCP (0-m)	0 0 0 0 1 1 1 1 2 2 3 1 2 4 5 7 7 6 7 10 11	

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH3

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D5: CH140m
DATE: 1/6/21

DRILL TYPE: PSP
EASTING:
SURFACE RL:
BOREHOLE DIAMETER:
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
PSP	Not Encountered			0.5 1.0 1.5 2.0 2.5 3.0 3.5						DCP (0-m)	1 0 2 2 3 4 3 3 3 5 3 4 5 6 5 6 7 10	

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH4

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D5: Ch210m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						SM	0.10m **FILL** Silty SAND, fine to medium grained, grey, with oyster fragments.	D	MD	DCP (0-m)	6	FILL/TOPSOIL - OLD OYSTER LEASE SPOIL
						SP	**SAND** fine to medium grained, grey-brown	M			6	AEOLIAN
							0.25m				3	
						SP	**SAND** fine to medium grained, pale grey/orange, dark brown.				4	ESTUARINE
		0.40m									4	
		ASS 0.50m		0.5							4	
	▽										4	
							0.80m				2	
		0.90m				SC	**Clayey SAND** fine to medium grained, dark grey/orange/pale grey, sulfur odour.	W			3	
		ASS 1.00m		1.0							3	
											5	
											5	
							1.30m				4	
		1.40m				SC	**Clayey SAND** fine to medium grained, dark grey, brown, with shell fragments.		MD - D			PSP FAILURE - RESUME AT 1.4M
		ASS 1.50m		1.5							3	
											5	
											5	
		1.90m									8	
		ASS 2.00m		2.0							7	
											8	
											9	
											9	
											10	
		2.40m									11	
		ASS 2.50m		2.5								
				3.0			3.00m					
							Hole Terminated at 3.00 m					
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density			
	V	Very Loose	Density Index <15%
	L	Loose	Density Index 15 - 35%
	MD	Medium Dense	Density Index 35 - 65%
	D	Dense	Density Index 65 - 85%
	VD	Very Dense	Density Index 85 - 100%

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ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH5
PAGE: 1 of 1
CLIENT: Kellogg Brown and Root Pty Ltd
JOB NO: RGS20936.2
PROJECT NAME: Beach to Beach Walkway
LOGGED BY: DS
SITE LOCATION: Dunbogan NSW
DATE: 1/6/21
TEST LOCATION: D8: Ch0m

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information						Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						GW	0.02m **FILL** Asphaltic concrete aggregate up to 5mm **FILL** Sandy GRAVEL, fine to coarse grained, orange brown, sand fine to coarse grained.	D - M	VD			ROAD SURFACE PAVEMENT
							0.40m					
				0.5		GP	**FILL** Sandy GRAVEL, fine to coarse grained, brown, sand fine to coarse grained, with clay, low plasticity.	M				FILL
							0.80m					
						SC	**Clayey SAND** fine to medium grained, dark grey, trace of silt, low plasticity, sulfur odour.	W	MD	DCP (0.9-m)	4	ESTUARINE
		1.00m ASS 1.10m		1.0							3	
	▽	1.40m ASS 1.50m		1.5							2 2 3 3 3	
		1.90m ASS 2.00m		2.0			2.00m		D		3 5 7 9	
							Hole Terminated at 2.00 m				9 8 9	
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH6

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D8: Ch120m
DATE:

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER:
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
							UNDERLYING ASBESTOS CEMENT WATER MAINS. NOT ABLE TO DETECT VIA RADIO SWEEP Hole Terminated at 0.00 m					

0.5
1.0
1.5
2.0
2.5
3.0
3.5

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH7

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D8: Ch260m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	0.60m ASS 0.70m 0.90m ASS 1.00m		0.5 1.0 1.5		GP	**FILL** Sandy GRAVEL, fine to coarse grained, dark brown, sand fine to coarse grained.	M	D			FILL
							0.20m					
						SC	**Clayey SAND** fine to medium grained, dark brown, calcerous, clay low plasticity, sulfur odour.		MD			ESTUARINE
									D	DCP (0.7-m)	2 3 8 7 9 8 7 9	
								W				
							1.50m Hole Terminated at 1.50 m				9 8 10 10 10	
				2.0 2.5 3.0 3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH8

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D8: Ch500m
DATE: 1/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 80 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.40m ASS 0.50m 0.80m ASS 0.90m 1.40m ASS 1.50m		0.5 1.0 1.5		SM SC	0.10m **Silty SAND** fine to medium grained, dark grey, with rootlets **Clayey SAND** fine to medium grained, dark grey-brown 1.50m Hole Terminated at 1.50 m	M W	MD D	DCP (0-m)	0 1 2 2 2 1 2 1 2 5 6 6 6 6 7 7 8 8 9 9	TOPSOIL MARINE

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH9

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D3: Ch20m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	0.40m ASS 0.50m		0.5		SP	**FILL** Silty SAND, fine to medium grained, grey-brown, with rootlets.	M		DCP (0-m)	4 4 4 5	FILL/TOPSOIL
							0.30m **SAND** fine to medium grained, grey-dark grey		MD		6	AEOLIAN
							0.50m **SAND** fine to medium grained, grey-white				5 5 5 3 4 4 4 3 4 4 5 6 7 10 12	
		0.90m ASS 1.00m		1.0								
		1.40m ASS 1.50m		1.5				W				
		1.90m ASS 2.00m		2.0			2.00m		D			
							Hole Terminated at 2.00 m					
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH10

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D10:Ch 0m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered					SM	**TOPSOIL** Silty SAND, fine to medium grained, grey-brown, with grass roots.	M		DCP (0-m)	2	TOPSOIL
							0.30m				1	
											2	
											2	AEOLIAN
		0.40m				SP	**SAND** fine to medium grained, grey.	W	MD		3	
		ASS 0.50m		0.5							1	
											2	
											3	
		0.90m									3	
		ASS 1.00m		1.0							2	
											3	
											4	
		1.40m									3	
		ASS 1.50m		1.5			1.50m				3	
											4	
							Hole Terminated at 1.50 m				4	
				2.0							4	
											5	
				2.5							8	
											7	
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH11

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D3: Ch20m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered			0.5		GP	**FILL** Sandy GRAVEL, fine to coarse grained, brown.	D	D			FILL
				1.0			1.20m					
		1.40m ASS 1.50m		1.5		CH	**FILL** Gravelly Silty CLAY, high plasticity, brown, sand and gravel, fine to coarse grained.	M ~ w_P	St - VSt			
		1.90m ASS 2.00m		2.0		SC	1.60m **Clayey SAND** fine to medium grained, dark grey, clay low plasticity, sulfur odour. 2.00m	M	MD			ESTUARINE
				2.5			Hole Terminated at 2.00 m					
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH12**

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D3: Ch60m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER:
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
							UNDERLYING ASBESTOS CEMENT WATER MAINS. NOT ABLE TO DETECT VIA RADIO SWEEP Hole Terminated at 0.00 m					

0.5
1.0
1.5
2.0
2.5
3.0
3.5

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH13

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: RW
TEST LOCATION: D3: Ch210m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						SP	**SAND** fine to medium grained, brown, grey, trace of grass roots.	M	L	DCP (0-m)	2	TOPSOIL/FILL
							0.25m				1	
		0.40m				SC	**Clayey SAND** fine to medium grained, dark grey/dark brown, clay low plasticity.				2	ESTUARINE
		ASS 0.50m		0.5							2	
											2	
								W			3	
	▽										5	
							0.80m				3	
		0.90m				SP	**SAND** fine to medium grained, pale grey/grey, trace of fines.		MD		4	
		ASS 1.00m		1.0							4	
											5	
							1.20m				4	
						SP	**SAND** fine to medium grained, grey/dark grey, trace oof fines.				4	
		1.40m									3	
		ASS 1.50m		1.5							4	
											4	
											4	
											4	
		1.90m									4	
		ASS 2.00m		2.0			2.00m				5	
							Hole Terminated at 2.00 m				5	
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH14**

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: RW
TEST LOCATION: D3: Ch240m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						SP	0.10m **FILL/TOPSOIL** SAND, fine to medium grained brown, trace of grass roots.	M	MD			FILL
						SP	**FILL** SAND, fine to medium grained, dark brown with some gravel, fine to coarse grained, and cobbles, trace of silt, low plasticity	D				FILL
						SC	0.30m **Clayey SAND** fine to medium grained, pale brown/grey/pale grey, clay medium plasticity.	M	L	DCP (0.3-m)	4	ESTUARINE
		0.40m ASS 0.50m		0.5							2	
											2	
											2	
											2	
											3	
	▽	0.90m ASS 1.00m		1.0			0.80m				3	
						SP	**SAND** fine to medium grained, pale grey.	W			2	
							1.10m				2	
						SP	**SAND** fine to medium grained, grey/dark grey, trace of fines.				2	
											2	
		1.40m ASS 1.50m		1.5							1	
											1	
											2	
											1	
		1.90m ASS 2.00m		2.0			2.00m				2	
							Hole Terminated at 2.00 m				2	
				2.5							2	
											2	
											2	
											3	
				3.0							4	
											4	
											6	
				3.5							6	

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH15

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: RW
TEST LOCATION: D3: Ch240m
DATE: 1/6/21

DRILL TYPE: Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information						Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						SP	0.10m **FILL/TOPSOIL** SAND, fine to medium grained brown, trace of grass roots.	D	D			FILL-Pavement Gravel
						SP	**FILL** SAND, fine to medium grained, dark brown with some gravel, fine to coarse grained, and cobbles, trace of silt, low plasticity		MD			FILL
		0.40m ASS 0.50m		0.5		SC	0.30m **Clayey SAND** fine to medium grained, pale brown/grey/pale grey, clay medium plasticity.	M > w_P	St	DCP (0.3-m)	4 3 2	ESTUARINE
	▽	0.90m ASS 1.00m		1.0		SP	0.80m **SAND** fine to medium grained, pale grey.	W	MD		3 3 3 3 4	
		1.40m ASS 1.50m		1.5		SP	1.10m **SAND** fine to medium grained, grey/dark grey, trace of fines.		D		4 5 6 7 10	
		1.90m ASS 2.00m		2.0			2.00m				8 10	
				2.5			Hole Terminated at 2.00 m					
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH16

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D10: Ch260m
DATE: 1/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 80 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SM	0.10m **Silty SAND** fine to medium grained, brown-grey.	M	D	DCP (0-m)	1	TOPSOIL
						SC	**SAND** fine to medium grained, pale brown				2	AEOLIAN
				1.0							9	
											3	
											3	
											4	
											6	
											5	
											7	
				1.5			1.50m				5	
							Hole Terminated at 1.50 m				6	
											5	
											4	
											4	
											4	
				2.0							4	
											5	
											4	
											6	
											4	
				2.5							5	
											5	
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH17

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D10: Ch730m
DATE: 1/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 80 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SM	**Silty SAND** fine to medium grained, grey-brown.	M		DCP (0-m)	1 2 2	TOPSOIL
							0.30m					
						SP	**SAND** fine to medium grained, pale brown		VL / L		1 1 1	AEOLIAN
				1.0			0.70m				0 2 1	
						SP	**SAND** fine to medium grained, grey				1 0 1	
				1.5			1.50m				1 1 2	
							Hole Terminated at 1.50 m				2 2 2	
				2.0							1 2 3	
				2.5							3 3 3	
				3.0							3 2	
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH18

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D10: Ch850m
DATE: 1/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 80 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0		SP	**SAND** fine to medium grained, grey, rootlets	M	MD	DCP (0-m)	1	TOPSOIL
											1	
											2	
				0.30m							2	
						SP	**SAND** fine to medium grained, pale grey.				2	AEOLIAN
				0.5							4	
											4	
											4	
											3	
				1.0							4	
											4	
											3	
											3	
											4	
				1.5							4	
				1.50m			Hole Terminated at 1.50 m				4	
											4	
											5	
				2.0							6	
											6	
											6	
				2.5							6	
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH19

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D10: Ch1130m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		ML CI	0.10m **FILL:** Sandy SILT, low plasticity, dark brown, fine to coarse grained sand. **FILL:** Gravelly CLAY, medium plasticity, dark brown, fine to coarse grained gravel with cobble up to 60mm with fine grained sand. 0.55m Practical Refusal on Cobbles Hole Terminated at 0.55 m	$M > W_P$	St - VSt			TOPSOIL/FILL FILL

1.0
1.5
2.0
2.5
3.0
3.5

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH20**

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D11: Ch10m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		Cl	**FILL:** Gravelly CLAY, medium plasticity, brown-grey, fine to coarse grained angular gravel with cobbles to 60mm.	M ~ w_P	VSt			FILL
						SP	0.70m 0.80m **SAND:** fine to medium grained, grey.	M	MD			AEOLIAN
				1.0			Hole Terminated at 0.80 m					
				1.5								
				2.0								
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH21**

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D11: Ch120m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.0		SM	**FILL:** Silty SAND fine to medium grained, dark grey with roots and fine to coarse grained gravel.	M		DCP (0-m)	2 4 3	FILL/TOPSOIL
				0.25m		SP	**SAND:** fine to medium grained, grey.		MD		4 4 8	AEOLIAN
				0.5		SP	**SAND:** fine to medium grained, grey/dark grey with weakly cemented lenses to 70mm, trace of tree roots,				4 3 3	INDURATED SAND
				0.55m 0.80m			Practical Refusal on cobble or tree root at 0.8m, no recovery as on side wall of BH Hole Terminated at 0.80 m					
				1.0								
				1.5								
				2.0								
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

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REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH22**

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D11: Ch220m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SM SP	0.10m **Silty SAND:** fine to medium grained, dark grey with rootlets. **SAND:** fine to medium grained, grey-brown with rootlets. 0.90m	M M	D	DCP (0-m)	2 4 6 6 7 6 7 8	TOPSOIL/AEOLIAN AEOLIAN
				1.0 1.5 2.0 2.5 3.0 3.5			Hole Terminated at 0.90 m					

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH23

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D11: Ch440m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		CI	**FILL:** Gravelly CLAY, medium plasticity, dark grey, fine to coase grained angular gravel with cobbles up to 50mm.	M > w_P	VSt			FILL 1ST ATTEMPT REFUSAL ON COBBLE @ 0.4M
						SP	0.55m **SAND:** fine to medium grained, dark grey with rootlets. 0.80m					AEOLIAN
				1.0			Hole Terminated at 0.80 m					
				1.5								
				2.0								
				2.5								
				3.0								
				3.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH24

CLIENT: Kellogg Brown and Root Pty Ltd
PAGE: 1 of 1
PROJECT NAME: Beach to Beach Walkway
JOB NO: RGS20936.2
SITE LOCATION: Dunbogan NSW
LOGGED BY: DS
TEST LOCATION: D11A: Ch0m
DATE: 18/6/21

DRILL TYPE: Hand Auger
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 120 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered			0.5		SP	**FILL:** SAND, fine to medium grained, dark brown.	M	MD / D	DCP (0-m)	4 6 5	FILL
						SP	0.30m **SAND:** fine to medium grained, brown-grey.				7 6	AEOLIAN
						SP	0.50m **SAND:** fine to medium grained, pale grey.				4 3 3 4	AEOLIAN
				1.0 1.5 2.0 2.5 3.0 3.5			0.90m Hole Terminated at 0.90 m				4	

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

RG LIB 1.05.0.GLB Log RG NON-CORED BOREHOLE - TEST PIT RGS20936.2 LOGS.GPJ <<DrawingFile>> 03/08/2021 11:36 10.02.00.04 Datgel Lab and In Situ Tool

Appendix B

Laboratory Test Result Sheets

Regional Geotechnical Solutions
44 Bent Street
Wingham
NSW 2429

NATA Accredited
Accreditation Number 1261
Site Number 25079

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Attention: **Dan Soffer**

Report **801666-S**
Project name BEACH TO BEACH DUNBOGAN
Project ID RGS20936.2
Received Date Jun 09, 2021

Client Sample ID			**BH1 0.1-0.2**	**BH1 0.5-0.6**	**BH1 0.7-0.8**	**BH1 0.9-1.0**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**N21-Jn17769**	**N21-Jn17770**	**N21-Jn17771**	**N21-Jn17772**
Date Sampled			**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.5	6.3	6.9	6.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.1	1.7	1.9	1.8
Reaction Ratings*[S05]	-	comment	4.0	4.0	4.0	4.0

Client Sample ID			**BH1 1.2-1.3**	**BH1 1.3-1.4**	**BH1 1.5-1.6**	**BH4 0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**N21-Jn17773**	**N21-Jn17774**	**N21-Jn17775**	**N21-Jn17776**
Date Sampled			**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.6	6.7	6.8	7.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.0	2.2	1.9	4.5
Reaction Ratings*[S05]	-	comment	4.0	4.0	4.0	2.0

Client Sample ID			**BH4 0.9-1.0**	**BH4 1.4-1.5**	**BH4 1.9-2.0**	**BH4 2.4-2.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**N21-Jn17777**	**N21-Jn17778**	**N21-Jn17779**	**N21-Jn17780**
Date Sampled			**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.0	9.0	8.6	8.6
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.4	7.7	2.6	2.6
Reaction Ratings*[S05]	-	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH5 1.0-1.1	BH5 1.4-1.5	BH5 1.9-2.0	BH7 0.6-0.7
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17781	N21-Jn17782	N21-Jn17783	N21-Jn17784
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	7.7	7.5	6.3	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.1	2.2	2.1	4.2
Reaction Ratings*[S05]	-	comment	4.0	4.0	4.0	2.0

Client Sample ID			BH7 0.9-1.0	BH7 1.4-1.5	BH8 0.4-0.5	BH8 0.8-0.9
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17785	N21-Jn17786	N21-Jn17787	N21-Jn17788
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.9	4.9	6.3	6.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	1.7	2.0	4.2	3.8
Reaction Ratings*[S05]	-	comment	4.0	4.0	2.0	2.0

Client Sample ID			BH8 1.4-1.5	BH9 0.4-0.5	BH10 0.4-0.5	BH10 0.9-1.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17789	N21-Jn17790	N21-Jn17791	N21-Jn17792
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.0	6.1	6.3	6.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.4	4.1	3.8	4.3
Reaction Ratings*[S05]	-	comment	4.0	2.0	1.0	1.0

Client Sample ID			BH10 1.4-1.5	BH11 1.4-1.5	BH11 1.9-2.0	BH13 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17793	N21-Jn17794	N21-Jn17795	N21-Jn17796
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.1	6.0	5.7	5.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.2	3.8	4.0	3.5
Reaction Ratings*[S05]	-	comment	1.0	4.0	4.0	4.0

Client Sample ID			BH13 0.9-1.0	BH13 1.4-1.5	BH13 1.9-2.0	BH14 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17797	N21-Jn17798	N21-Jn17799	N21-Jn17800
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	4.9	4.7	4.9	5.0
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.9	2.1	2.0	3.2
Reaction Ratings*[S05]	-	comment	2.0	4.0	4.0	2.0

Client Sample ID			BH14 0.9-1.0	BH14 1.4-1.5	BH14 1.9-2.0	BH15 0.4-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17801	N21-Jn17802	N21-Jn17803	N21-Jn17804
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.4	4.7	5.1	5.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.5	2.1	2.3	2.7
Reaction Ratings*[S05]	-	comment	2.0	4.0	4.0	4.0

Client Sample ID			BH15 0.9-1.0	BH15 1.4-1.5	BH15 1.9-2.0	BH4 2.9-3.0
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			N21-Jn17805	N21-Jn17806	N21-Jn17807	N21-Jn17808
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit				
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	6.7	5.7	5.4	7.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	1.8	2.3	2.3	2.6
Reaction Ratings*[S05]	-	comment	4.0	4.0	4.0	4.0

Client Sample ID			BH7 1.9-2.0
Sample Matrix			Soil
Eurofins Sample No.			N21-Jn17809
Date Sampled			Jun 01, 2021
Test/Reference	LOR	Unit	
Acid Sulfate Soils Field pH Test			
pH-F (Field pH test)*	0.1	pH Units	5.3
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	2.1
Reaction Ratings*[S05]	-	comment	4.0

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acid Sulfate Soils Field pH Test	Brisbane	Jun 15, 2021	7 Days

- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests

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43 Detroit Drive
Rolleston, Christchurch 7675
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IANZ # 1290

Company Name:	Regional Geotechnical Solutions	**Order No.:**	
Address:	44 Bent Street Wingham NSW 2429	**Report #:**	801666
		Phone:	(02) 65535641
		Fax:	
Project Name:	BEACH TO BEACH DUNBOGAN		
Project ID:	RGS20936.2		

Received:	Jun 9, 2021 8:30 AM
Due:	Jun 16, 2021
Priority:	5 Day
Contact Name:	Dan Soffer

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
Mayfield Laboratory - NATA Site # 25079						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	BH1 0.1-0.2	Jun 01, 2021		Soil	N21-Jn17769	X
2	BH1 0.5-0.6	Jun 01, 2021		Soil	N21-Jn17770	X
3	BH1 0.7-0.8	Jun 01, 2021		Soil	N21-Jn17771	X
4	BH1 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17772	X
5	BH1 1.2-1.3	Jun 01, 2021		Soil	N21-Jn17773	X
6	BH1 1.3-1.4	Jun 01, 2021		Soil	N21-Jn17774	X
7	BH1 1.5-1.6	Jun 01, 2021		Soil	N21-Jn17775	X
8	BH4 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17776	X
9	BH4 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17777	X

Date Reported:Jun 16, 2021

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Address: 44 Bent Street
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NSW 2429

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Project ID: RGS20936.2

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Fax:

Received: Jun 9, 2021 8:30 AM
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Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
Mayfield Laboratory - NATA Site # 25079						
External Laboratory						
10	BH4 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17778	X
11	BH4 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17779	X
12	BH4 2.4-2.5	Jun 01, 2021		Soil	N21-Jn17780	X
13	BH5 1.0-1.1	Jun 01, 2021		Soil	N21-Jn17781	X
14	BH5 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17782	X
15	BH5 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17783	X
16	BH7 0.6-0.7	Jun 01, 2021		Soil	N21-Jn17784	X
17	BH7 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17785	X
18	BH7 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17786	X
19	BH8 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17787	X
20	BH8 0.8-0.9	Jun 01, 2021		Soil	N21-Jn17788	X

Date Reported:Jun 16, 2021

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Project ID: RGS20936.2

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Received: Jun 9, 2021 8:30 AM
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Contact Name: Dan Soffer

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Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
Mayfield Laboratory - NATA Site # 25079						
External Laboratory						
21	BH8 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17789	X
22	BH9 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17790	X
23	BH10 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17791	X
24	BH10 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17792	X
25	BH10 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17793	X
26	BH11 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17794	X
27	BH11 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17795	X
28	BH13 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17796	X
29	BH13 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17797	X
30	BH13 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17798	X
31	BH13 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17799	X

Date Reported:Jun 16, 2021

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Project ID: RGS20936.2

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Report #: 801666
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Fax:

Received: Jun 9, 2021 8:30 AM
Due: Jun 16, 2021
Priority: 5 Day
Contact Name: Dan Soffer

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acid Sulfate Soils Field pH Test
Melbourne Laboratory - NATA Site # 1254 & 14271						
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						X
Perth Laboratory - NATA Site # 23736						
Mayfield Laboratory - NATA Site # 25079						
External Laboratory						
32	BH14 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17800	X
33	BH14 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17801	X
34	BH14 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17802	X
35	BH14 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17803	X
36	BH15 0.4-0.5	Jun 01, 2021		Soil	N21-Jn17804	X
37	BH15 0.9-1.0	Jun 01, 2021		Soil	N21-Jn17805	X
38	BH15 1.4-1.5	Jun 01, 2021		Soil	N21-Jn17806	X
39	BH15 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17807	X
40	BH4 2.9-3.0	Jun 01, 2021		Soil	N21-Jn17808	X
41	BH7 1.9-2.0	Jun 01, 2021		Soil	N21-Jn17809	X
Test Counts						41

Date Reported:Jun 16, 2021

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	N21-Jn17769	CP	pH Units	6.5	6.5	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	N21-Jn17786	CP	pH Units	4.9	5.0	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	N21-Jn17788	CP	pH Units	6.4	6.5	pass	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	N21-Jn17800	CP	pH Units	5.0	4.9	pass	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Andrew Black	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Regional Geotechnical Solutions
44 Bent Street
Wingham
NSW 2429

NATA Accredited
Accreditation Number 1261
Site Number 20794

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Dan Soffer**

Report **804974-S**
Project name ADDITIONAL: BEACH TO BEACH DUNBOGAN
Project ID RGS20936.2
Received Date Jun 22, 2021

Client Sample ID			**BH1 1.5-1.6**	**BH4 2.4-2.5**	**BH5 1.4-1.5**	**BH7 0.6-0.7**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**B21-Jn44523**	**B21-Jn44524**	**B21-Jn44525**	**B21-Jn44526**
Date Sampled			**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**	**Jun 01, 2021**
Test/Reference	LOR	Unit				
Chromium Suite						
pH-KCL	0.1	pH Units	5.1	8.5	5.4	5.8
Acid trail - Titratable Actual Acidity	2	mol H+/t	15	< 2	12	4.0
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.020	< 0.003	0.020	0.010
Chromium Reducible Sulfur[S04]	0.005	% S	0.42	0.068	0.48	0.006
Chromium Reducible Sulfur -acidity units	3	mol H+/t	260	42	300	3.8
Sulfur - KCl Extractable	0.02	% S	N/A	N/A	N/A	N/A
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur	0.02	% S	N/A	N/A	N/A	N/A
Net Acid soluble sulfur - acidity units	10	mol H+/t	N/A	N/A	N/A	N/A
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	N/A	N/A	N/A	N/A
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	N/A	0.43	N/A	N/A
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	N/A	86	N/A	N/A
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	N/A	0.14	N/A	N/A
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.44	< 0.02	0.50	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	280	< 10	310	< 10
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	21	< 1	23	< 1
Extraneous Material						
<2mm Fraction	0.005	g	33	50	46	62
>2mm Fraction	0.005	g	< 0.005	< 0.005	3.0	< 0.005
Analysed Material	0.1	%	100	100	94	100
Extraneous Material	0.1	%	< 0.1	< 0.1	6.1	< 0.1
% Moisture	1	%	20	11	25	16

Client Sample ID			BH9 0.4-0.5	BH10 0.4-0.5	BH14 0.4-0.5
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			B21-Jn44527	B21-Jn44528	B21-Jn44529
Date Sampled			Jun 01, 2021	Jun 01, 2021	Jun 01, 2021
Test/Reference	LOR	Unit			
Chromium Suite					
pH-KCL	0.1	pH Units	5.9	6.1	4.2
Acid trail - Titratable Actual Acidity	2	mol H+/t	2.0	2.0	41
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	< 0.003	< 0.003	0.070
Chromium Reducible Sulfur[S04]	0.005	% S	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	N/A	N/A	< 0.02
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0
HCl Extractable Sulfur	0.02	% S	N/A	N/A	0.02
Net Acid soluble sulfur	0.02	% S	N/A	N/A	0.02
Net Acid soluble sulfur - acidity units	10	mol H+/t	N/A	N/A	11
Net Acid soluble sulfur - equivalent S% pyrite[S02]	0.02	% S	N/A	N/A	< 0.02
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	N/A	N/A	N/A
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	N/A	N/A	N/A
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)[S03]	0.02	% S	N/A	N/A	N/A
ANC Fineness Factor		factor	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.08
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	52
CRS Suite - Liming Rate[S01]	1	kg CaCO3/t	< 1	< 1	3.9
Extraneous Material					
<2mm Fraction	0.005	g	59	50	41
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1
% Moisture	1	%	7.4	4.8	24

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	Jun 24, 2021	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	Jun 24, 2021	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Brisbane	Jun 24, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

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Project Name: ADDITIONAL: BEACH TO BEACH DUNBOGAN
Project ID: RGS20936.2

Order No.:
Report #: 804974
Phone: (02) 65535641
Fax:

Received: Jun 22, 2021 3:00 PM
Due: Jun 29, 2021
Priority: 5 Day
Contact Name: Dan Soffer

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Chromium Reducible Sulfur Suite	Moisture Set
Melbourne Laboratory - NATA Site # 1254							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 23736							
Mayfield Laboratory - NATA Site # 25079							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	BH1 1.5-1.6	Jun 01, 2021		Soil	B21-Jn44523	X	X
2	BH4 2.4-2.5	Jun 01, 2021		Soil	B21-Jn44524	X	X
3	BH5 1.4-1.5	Jun 01, 2021		Soil	B21-Jn44525	X	X
4	BH7 0.6-0.7	Jun 01, 2021		Soil	B21-Jn44526	X	X
5	BH9 0.4-0.5	Jun 01, 2021		Soil	B21-Jn44527	X	X
6	BH10 0.4-0.5	Jun 01, 2021		Soil	B21-Jn44528	X	X
7	BH14 0.4-0.5	Jun 01, 2021		Soil	B21-Jn44529	X	X
Test Counts						7	7

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Chromium Suite									
pH-KCL			%	99			80-120	Pass	
Acid trail - Titratable Actual Acidity			%	101			80-120	Pass	
Chromium Reducible Sulfur			%	97			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Chromium Suite				Result 1	Result 2	RPD			
pH-KCL	S21-Jn41835	NCP	pH Units	4.4	4.4	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	S21-Jn41835	NCP	mol H+/t	98	99	<1	30%	Pass	
sulfidic - TAA equiv. S% pyrite	S21-Jn41835	NCP	% pyrite S	0.16	0.16	<1	30%	Pass	
Chromium Reducible Sulfur	S21-Jn41835	NCP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	S21-Jn41835	NCP	mol H+/t	< 3	< 3	<1	30%	Pass	
Sulfur - KCl Extractable	S21-Jn41835	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
HCl Extractable Sulfur	S21-Jn41835	NCP	% S	0.03	0.03	2.0	30%	Pass	
Net Acid soluble sulfur	S21-Jn41835	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
Net Acid soluble sulfur - acidity units	S21-Jn41835	NCP	mol H+/t	< 10	< 10	<1	30%	Pass	
Net Acid soluble sulfur - equivalent S% pyrite	S21-Jn41835	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
Acid Neutralising Capacity (ANCbt)	S21-Jn41835	NCP	% CaCO3	N/A	N/A	N/A	30%	Pass	
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	S21-Jn41835	NCP	% S	N/A	N/A	N/A	30%	Pass	
ANC Fineness Factor	S21-Jn41835	NCP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	S21-Jn41835	NCP	% S	0.17	0.17	1.0	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	S21-Jn41835	NCP	mol H+/t	110	110	1.0	30%	Pass	
CRS Suite - Liming Rate	S21-Jn41835	NCP	kg CaCO3/t	7.9	8.0	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B21-Jn40883	NCP	%	9.4	9.6	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

Authorised by:

Andrew Black	Analytical Services Manager
Myles Clark	Senior Analyst-SPOCAS (QLD)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Appendix C

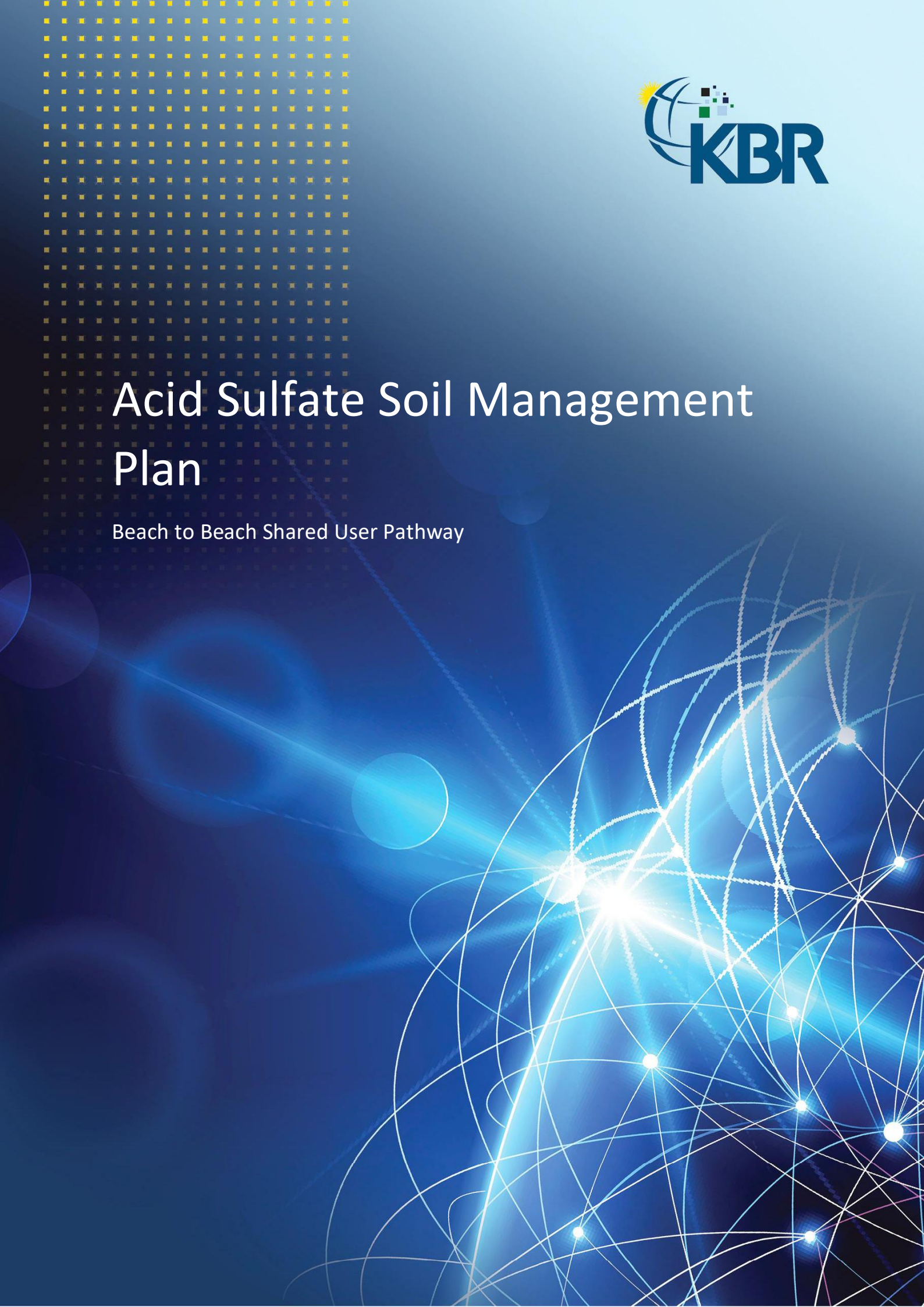
Pavement Thickness Design Sheets

Appendix G

Acid Sulfate Soil Management Plan

Acid Sulfate Soil Management Plan

Beach to Beach Shared User Pathway



Acid Sulfate Soil Management Plan

Beach to Beach Shared User Pathway

Prepared for:
Port Macquarie Hastings Council
Cnr Burrawan Street and Lord Street
Port Macquarie NSW 2444

Prepared by:
Kellogg Brown & Root Pty Ltd
ABN 91 007 660 317
Level 13, 201 Kent Street | Sydney NSW 2000 | Australia

3 November 2021

SEC052-01-TD-EV-REP-0002 Rev 0

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Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to support the Environmental Impact Statement in accordance with the scope of services set out in the contract between KBR and **Port Macquarie-Hastings Council** ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
0	03/11/21	Issued for Use	J Lee	C Sammoun	K Grinlaubs	L July
					2021.11.03 16:58:00 +11'00'	2021.11.03 16:49:56 +11'00'

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List of Abbreviations

ASS	Acid Sulfate Soil
AASS	Actual Acid Sulfate Soil
ASSMAC (1998)	Acid Sulfate Soils Manual 1998
ASSMP	Acid Sulfate Soil Management Plan
$CaCO_3$	Calcium Carbonate
DO	Dissolved Oxygen
KBR	Kellogg Brown & Root
PASS	Potential Acid Sulfate Soil
PMHC	Port Macquarie-Hastings Council
POEO Act	Protection of the Environment Operations Act 1997
NSW	New South Wales
NSW EPA	New South Wales Environment Protection Authority
S_{CR}	Chromium Reducible Sulfur
SUP	Shared User Pathway
sPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulphur
S_{TO}	Total Oxidisable Sulfur
TAA	Titratable Actual Acidity
TPA	Titratable Peroxide Acidity
TSS	Total Suspended Solids

1 Introduction

Kellogg Brown & Root Pty Ltd (KBR) has been commissioned by Port Macquarie Hastings Council (Council) to prepare this Acid Sulfate Soil Management Plan (ASSMP) for the proposed five (5) remaining sections of the Beach to Beach Shared User Pathway (SUP) (described as D3, D5, D8, D10 and D11) between North Haven and Pilot Beaches of Dunbogan in New South Wales (NSW).

A review of the Acid Sulfate Soil Risk Map indicates that the site is located within an area of 'high probability of occurrence of Acid Sulfate Soils'. In such areas there is a severe environmental risk if sediments are disturbed by activities. With due consideration to the geological and soil characteristics of the site (i.e. fine-grained sediments), in addition to historical information, management of development activities is required to consider the potential for disturbance of acid sulfate soil if development activities involve excavation or otherwise oxidation of soils beneath the water table.

Site development activities are largely at grade, however, it is anticipated that works associated with construction of D3 and D5 will require disturbance of sediments within the creek as a result of piling installation activities.

As such an ASSMP is required to document procedures to be implemented to manage the potential environmental risk associated with disturbance of these materials. This ASSMP has been prepared with reference to the Acid Sulfate Soils Manual (ASSMAC, 1998[1]).

1.1 PROPOSAL OVERVIEW

The proposed SUP is a community and Council led development that aims to deliver the remaining 5 sections of the 11 km of un-interrupted footpath/cycleway between North Haven Beach and Camden Haven Breakwall on Pilot Beach in Dunbogan. The objective of the SUP is to provide infrastructure that benefits the community through several positive outcomes. These include:

- A route which provides a safe, uninterrupted 11 km shared pathway which connects the communities of North Haven, Laurieton, Dunbogan and Camden Head
- Encouraging safe pedestrian and bicycle access to community centres, schools and shopping centres
- Promotion of healthy activities, exercise and non-motor vehicle travel within local communities
- Attracting cycle related tourism into the area with flow on benefits for local businesses, Council and community.

Several sections of the Beach to Beach SUP have already been constructed. The works required for the construction of the remaining 2.9 km sections/pathway alignments (D3, D5, D8, D10 and D11) of the 11 km SUP is the subject of this ASSMP (herein referred to as 'the proposal').

1.2 OBJECTIVES

The ASSMP identifies the assessment and appropriate management of acid sulfate soil (ASS) and potential acid sulfate soil (PASS) within areas of ground disturbance for the proposal.

It outlines the management techniques to mitigate the environmental risks associated with the disturbance and exposure of potential ASS to air during sub-surface excavation works, which may render the soils severely acidic.

[1] *Acid Sulfate Soils Manual*, Acid Sulfate Soils Management Advisory Committee, 1998 (ASSMAC, 1998)

The objectives of this ASSMP are to document:

- The known and anticipated sub-surface conditions that will be encountered during excavation/ground disturbance works to support the design and implementation of ASS investigation and management activities
- Monitoring and sampling strategy to be implemented prior to and during the proposed ground disturbance activities so that ASS may be appropriately identified and managed during the excavation works
- Evaluation of ASS management options and constraints to identify the preferred management strategy
- The recommended management procedures for the management and validation of ASS treatment during ground disturbance works in order to minimise the potential for adverse environmental impacts associated with ASS disturbance activities
- Outline the waste disposal requirements for ASS material generated during the proposed works.

The findings of this ASSMP will better inform site management strategies for construction, identify any significant data gaps and provide recommendations for additional studies as required.

1.3 DESCRIPTION OF PATHWAY ALIGNMENTS

The proposal is located in the suburbs of Dunbogan and Camden Head, generally along the estuary of Camden Haven Inlet. The alignment traverses a mix of geological terrain including estuarine mangrove swamps, a tidal water body, estuarine flats, back barrier sand plains, sand dunes and residual soils on Camden Head, residential properties and commercial facilities (recreation reserves, marinas, and shops) scattered across the proposal area.

The five sections of the alignments are presented in Figure 2-1 and description of each section is provided below.

Pathway Section D3

The D3 alignment is directly east of Camden Haven Inlet and runs in approximately south to north direction for approximately 220 m. The alignment commences near Scarborough Way and traverses a low lying inter-tidal estuarine landscape on the western side of The Boulevarde. The alignment exits the low-lying area at Bay Street and continues along the northbound shoulder of The Boulevarde to the existing pathway at D4. The topography of the alignment is relatively flat, and a level pathway and boardwalk will be utilised, allowing the pathway to have minimal change to the existing natural surface.

Pathway Section D5

The D5 alignment runs in a southwest to northeast direction. The alignment is a raised boardwalk of approximately 160 m in length over the estuary (Camden Head Inlet). It starts at the end of the existing D4 pathway on the western side of The Boulevarde just before the intersection of Longworth Road, and ends as it merges into the existing D6 pathway located to the west of The Boulevarde and Longworth Road intersection.

Pathway Section D8

The D8 alignment is located adjacent to Camden Head Road, parallel to Gogleys Creek which flows into Gogleys Lagoon for approximately 800 m. The alignment runs in a northwest to southeast direction and begins at the end of D7 pathway on the eastern side of where the park/boat ramp and Dunbogan Jubilee Hall are located. The pathway crosses the on-way exit road used for accessing the boat ramp and the park, traverses along the northern side of the carriageway

(Camden Head Road) and merges into the existing D9 pathway to the east of Camden Head Road and Scarborough Way intersection.

Pathway Section D10

The D10 alignment comprises sections of pavement and boardwalk in Dunbogan and Camden Head, and traverses along the western side of the carriageway (Camden Head Road) for approximately 1,500 m. The pathway starts at the existing D9, approximately 120 m northeast of the intersection with Seaview Avenue. It runs along the north western side of Camden Head Road and tracks along an existing access track for approximately 145 m until it re-emerges with Camden Head Road and continues until the intersection of Bergalia Crescent. The pathway continues along past an existing sewer pump station and ends just before the Camden Head and Pilot Beach Roads intersection.

Pathway Section D11

The D11 alignment is approximately 700 m. It starts at the end of the new D10 pathway and tracks along the western edge of Pilot Beach Road, crossing an existing unsealed road used to access the Camden Haven Oyster Supply Sheds and a 'second' unsealed access road. The pathway follows Pilot Beach Road along the northern edge of the carriageway, crosses the road leading to Camden Head breakwall path and the breakwall access road. The D11 pathway terminates at Camden Head Breakwall after traversing Pilot Beach Park.

2 Existing Environment

2.1 GEOLOGY AND SOILS

Reference to the 1:250 000 scale Hastings Geological Sheet SH 56-14 (Geological Survey of NSW, 1970[2]) indicates the five sections of the proposal are located on both Quaternary Sandstone (D3, D5, and D8) and Camden Haven Bed Group Sandstone/Shale Conglomerate (D10, D11).

A review of the NSW Department of Environment and Heritage online resource eSPADE2.1 shows no mapped soil landscapes for the proposal sites, however reference to the 1:25,000 Taree Area Coastal Quaternary Geology Map (NSW DPI, 20018[3]) indicates that the proposal is located on several sedimentary landscapes, these being:

- Holocene estuarine palaeochannel fill comprising organic mud, peat, clay, silt, and marine sand
- Holocene sandy beach comprising marine sand, shell, and gravel
- Holocene tidal delta flat comprising marine sand, silt, clay, shell, gravel
- Holocene freshwater swamp comprising organic mud, peat, clay, silt, marine sand
- Holocene estuarine channel comprising marine sand, silt, clay, shell, gravel.

2.2 HYDROGEOLOGY

Details of the closest groundwater bore (with available data) within 500 m of each pathway section alignment and the corresponding recorded standing water level and yield are provided below in Table 2-1.

Table 2-1 Groundwater Bore Data

Pathway Alignment	Groundwater Bore	Approximate Distance from Alignment	Total Depth (m)	Standing Water Level (SWL) (m)	Yield (L/s)
D3	GW073272	200 m, east	6.0	4.8	1.0
D5	GW302405	95 m, south	5.3	3.5	1.0
D8	GW073315	40 m, south	6.5	2.0	0.6
D10	GW070193	245 m, southwest	15.5	3.0	9.5
D11	GW302389	350 m, north	5.0	4.2	0.670

2.3 ACID SULFATE SOILS

A review of the Acid Sulfate Soil Risk Maps via the NSW Department of Planning Industry and Environment online resource eSPADE2.1[4], indicates that the proposal is located within a variety of ASS risk levels.

The ASS risk for each pathway alignment is detailed, as follows:

[2] *Hastings 1:250,000 Geological Sheet SH 56-14*, Geological Survey of NSW 1970 (Geological Survey of NSW, 1970)
[3] *Taree Area 1:25,000 Coastal Quaternary Geology*, NSW Department of Primary Industries 2008 (NSW DPI, 2008)
[4] eSPADE2.1 https://www.environment.nsw.gov.au/eSpade2WebApp NSW Department of Planning Industry and Environment, Accessed 26 October 2020

Pathway Sections D3, D5, and D8:

- H1: High probability <1 m below ground surface
- H2: High probability 1 – 3 m below ground surface

Pathway Section D10:

- N: No known occurrence

Pathway Section D11:

- N: No known occurrence
- H2: High probability 1 – 3 m below ground surface
- NB: No known occurrence, beach

2.3.1 Baseline Assessment and Characterisation

A baseline assessment of the geotechnical and ASS properties materials to be excavated during the proposed development works was reported in Regional Geotechnical Solutions (RGS) Geotechnical Assessment – Proposed Beach to Beach Pathway (No. RGS20936.2-AC, 5 October 2021) (Geotechnical Report). The following investigation was undertaken:

- A total of 24 borehole locations were augered to depths within 0.55 and 3.0 m below ground surface (bgs) within the alignment for geotechnical and ASS sampling and testing. However one borehole location (BH6 within pathway section D8) was not investigated.
- Seven (7) of the total 23 soil samples were screened for ASS and analysed using the Chromium Reducible Sulfur method. The grab samples to depth of 2.5 m were collected in areas of the proposed boardwalk and footpath along the alignment.

The materials encountered during the investigation are summarised in Table 2-2.

Table 2-2 Summary of Geotechnical Units Encountered During Investigation

Unit	Material	Material Description
1A	Topsoil/ FILL	Sandy SILT, low plasticity
1B	FILL	Sandy GRAVEL, orange-brown, very dense, or Gravelly Silty CLAY, brown, very stiff
2A	Estuarine (Loose)	Silty SAND to Clayey SAND, dark grey, sulfur odour, very loose to loose
2B	Estuarine (medium dense/ dense)	Clayey SAND, dark grey/ orange/ pale grey, with shell fragments, medium dense to dense
3	Aeolian/ Marine SAND	SAND, grey – white, medium dense, trace weakly cemented zones (indurated)

The ASS results from the investigation are summarised as follows:

- Geological units 2A and 2B were encountered in the investigation boreholes located within pathway sections D3, D5 and D8.
- Aeolian/ marine sands were encountered in pathway sections D10 and D11, in an area of no known occurrence of ASS.
- Based on the field (pH) screening results, ten selected samples were submitted for detailed chromium reducible sulphur (CrS) and KCl extractable sulphur analysis. Of the samples analysed, four samples (from borehole locations within pathway sections D3, D5 and D8)

exceeded the adopted Action Criteria (in Table 3-1) for 'coarse' texture soil, as presented in Table 2-3.

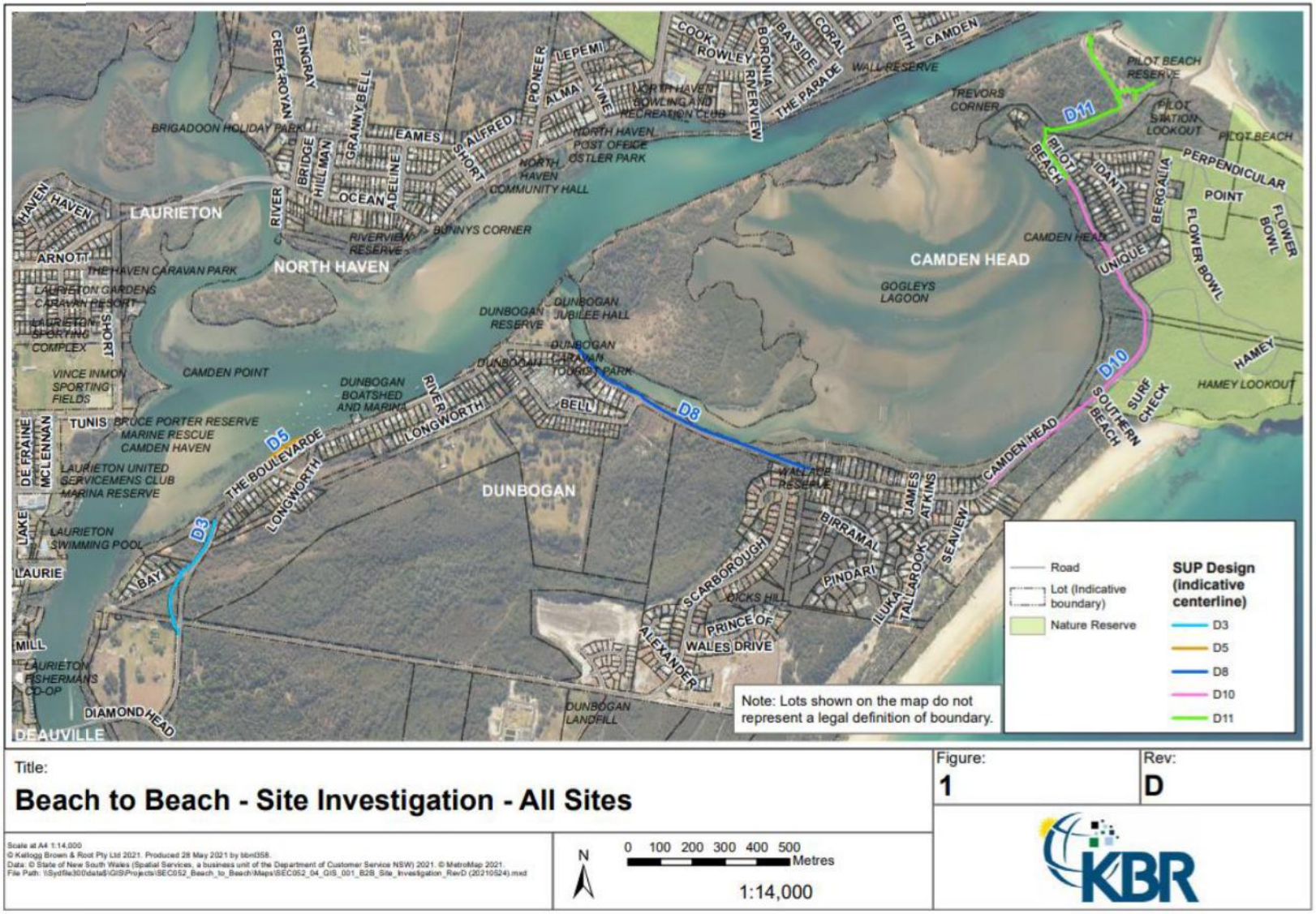
Table 2-3 Summary of Acid Sulfate Soil Analytical Results

Location	Borehole ID	Sample Depth (m)	Geological Unit	Titratable Actual Acidity (TAA) (mol H^+/t)	Chromium Reducible Sulfur (S_{Cr}) (mol H^+/t)	Net Acidity (mol H^+/t)	Lime kg $CaCO_3$/ tonne
D3 Ch240	BH14	0.4-0.5	Unit 2A	41	<3	**52**	3.9
D5 Ch0	BH1	1.5-1.6	Unit 2B	15	**260**	**280**	21
D5 Ch210	BH4	2.4-2.5	Unit 2B	<2	**42**	**42**	<1
D8 Ch0	BH5	1.5-1.6	Unit 2A	12	**300**	**310**	25
D8 Ch260	BH7	0.6-0.7	Unit 2A	4.0	3.8	<10	<1
D8 Ch900	BH9	0.4-0.5	Unit 3	2.0	<3	<10	<1
D10 Ch0	BH10	0.4-0.5	Unit 3	2.0	<3	<10	<1

Where bolded, the analytical result is above Table 4.4 of the Acid Sulfate Soil Manual (ASSMAC, 1998) – adopted Net Acidity for 'coarse' textured soil of 18 mol H^+/t

- Based on the analytical results, proposed earthworks from sections D3, D5 and D8 may encounter estuarine and tidal delta flat sediments (Units 2A and 2B). PASS (refer to Section **Error! Reference source not found.**) are present within the estuarine soils (Units 2A and 2B).
- As recommended in the Geotechnical Report, further assessment may be required for where localized excavations are proposed below 1 m AHD.

Figure 2-1 Locality Plan and Key Features of the Proposal



3 About Acid Sulfate Soils

3.1 BACKGROUND

Acid sulfate soils is a name given to naturally occurring sediments containing iron sulphides such as iron sufide or iron disulphide. ASS are typically found in low-lying coastal and alluvial environments as well as estuarine areas such as creeks, rivers, mangroves, and salt marshes where iron rich sediments deposit in the presence of a sulfate source (e.g. salt water) and organic matter, and through microbial action over time a particular set of environmental conditions is created. Changes to environmental conditions exposes the soil to the atmosphere (via excavation drainage of subsurface soils, or tidal conditions) potentially resulting in the reaction of iron sulphides with oxygen and cause the generation of sulfuric acid. This can result in significant environmental and infrastructure damage (e.g. corrosion of bridge footings) if the resultant sulfuric acid is spread through groundwater or surface water flow.

There are two primary ASS categories:

- Actual ASS (AASS) are soils which have been exposed to oxygen and the constituent iron sulphides have been oxidised, generating sulfuric acid. The produced acid can be neutralised by other soil particles, however excess acid is spread by water movement through the soil.
- Potential ASS are soils which contain iron sulfides, however, have not been oxidised. These soils have been kept from contact with the atmosphere due to waterlogging (located within the water table) or the density of the soils are stable or in equilibrium. In their non-disturbed state, they are generally non-acidic and considered harmless to the environment. Once oxidised through disturbance, PASS have the potential to generate acidic conditions.

The magnitude and duration of effects that may arise from the oxidation and subsequent leaching of PASS are influenced by a range of factors. The critical factors to be considered when interpreting the results of soil analyses are permeability of the soil and the quantity of acid which it would produce on oxidation. Soil permeability (or hydraulic conductivity) is strongly influenced by grain size and the composition of the soil in terms of relative percent of fine materials (i.e. clay).

The potential for a soil to produce acid on oxidation is best quantified by laboratory analysis to determine the percentage of oxidisable sulfur (i.e. pyrite) or the number of moles of acid generated on oxidation. 'Action Criteria' that define levels above which the acid generating potential of a soil is considered to be significant have been published by ASSMAC (1998). The 'Action Criteria' for disturbances of greater than 1,000 tonnes of soil are shown in Table 3-1, and takes into account both the acid generating potential and the texture of a soil.

An acid sulfate soil profile will often comprise both AASS and PASS material due to ongoing chemical reactions in the soil in response to environmental changes such as groundwater fluctuations and seasonal soil moisture variability.

3.2 LABORATORY ASSESSMENT GUIDELINES

The assessment of soils with respect to ASS is undertaken in accordance with the guidelines and values of the ASSMAC (1998). The management of ASS is determined by the Action Criteria defined by three broad soil texture categories (Table 3-1). The Action Criteria is based on the percentage of oxidisable sulfur or equivalent acid trail (i.e. titratable actual acidity-TAA or titratable potential acidity-TPA) results. The scale of disturbance for the proposed works is categorised either as: Small-scale (<1000 tonnes) works based on the texture of the soil material, or Large scale (>1000 tonnes) works where the most sensitive Action Criteria (coarse textured soils) should be adopted.

The proposed development works for the proposal is anticipated to generate less than 1,000 tonnes.

Table 3-1 Action Criteria for a Range of Soil Textures (ASSMAC, 1998)

Type of Material		Action Criteria 1-1,000 tonnes disturbed		Action Criteria, if >1,000 tonnes disturbed	
Texture Class (McDonald et al. 1990)	Approximate Clay Content (<0.0002 mm) (%)	Sulfur Trail oxidisable sulphur %S (oven dry basis) e.g S_{TOS} or S_{POS}	Acid Trail mol H* / tonne (oven dry basis) e.g. TPA or TSA	Sulfur Trail oxidisable sulphur %S (oven dry basis) e.g S_{TOS} or S_{POS}	Acid Trail mol H* / tonne (oven dry basis) e.g. TPA or TSA
Coarse texture (sands to loamy sands)	≤ 5	0.03	18	0.03	18
Medium texture (sandy loams to light clays)	5-40	0.06	36	0.03	18
Fine texture (medium to heavy clays and silty clays)	≥ 40	0.1	62	0.03	18

The exceedance of the Action Criteria (Table 3-1) attributable to the ASS material, triggers the need to prepare a management plan and obtain development consent.

3.3 OTHER REGULATORY GUIDELINES

The Contaminated Land Management Act 1997 (CLM Act), Section 105 states that the Environment Protection Authority (EPA) is able to "make or approve" guidelines for any purpose related to the objects of the Act. As such, in addition to the ASSMAC (1998), this ASSMP has been prepared in reference to the following:

- Waste Classification Guidelines Part 4: Acid Sulfate Soils (NSW EPA 2014a)
- Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA 2014b)
- Contaminated Sites: Guidelines for NSW Site Auditor Scheme, 3rd Edition, October 2017 (NSW EPA 2017)
- Protection of the Environment Operations Act 1997 (POEO Act) and associated regulations.

4 Acid Sulfate Soils Management Strategy

4.1 OBJECTIVES

The ASS management strategies outline the procedures in the identification of ASS/PASS materials and mitigation measures to prevent potential environmental impacts associated the disturbance of ASS/PASS material during the proposed development works. The objectives are to provide:

- A methodology for the identification of materials requiring management;
- Protocols for effective onsite treatment of ASS/PASS materials and associated leachate water (as necessary) during the works;
- Excavation inspection and validation assessment methodologies to be implemented during works that involve the potential to disturb ASS/PASS soils, including stockpiling strategies in order to delineate ASS/PASS material from non-PASS material;
- Water and soil quality targets for the excavation, treatment, and removal of material encountered during the works;
- Effective management of groundwater and any recovered acid affected waters.

Material excavated from the pathway alignment sites would need to be managed in accordance with this ASSMP and 'The Blue Book' (Landcom, 2004[5]).

4.2 SCOPE OF SOIL DISTURBANCE WORKS

The proposed works include:

- Removal of the topsoil, root affected, uncontrolled fill or other deleterious material as part of the site preparation works for the pavement construction.
- Excavation along the pathway alignment. Sand profiles including estuarine sands (Unit 2) and aeolian sands (Unit 3) are potentially unstable and may require shoring, particularly when the excavations are below the water table.
- Pavement on the pathway sections and pavement extensions that will tie-in to existing pavements
- Construction of gravity or cantilever retaining walls in parts of the pathway sections
- Timber boardwalk on estuarine tidal flat (for pathway section D3)
- Piled foundations for raised boardwalk
- Fill placement (and compaction) to support structures and pavement

It is anticipated that upon receipt of development consent for the proposed works, the contractor will consider the nature and extent of ASS/PASS material in development of the proposed construction methodology and the identified minimisation of activities (with the potential to result in disturbance to ASS/PASS) will form part of the proposal's evaluation strategy.

[5] *Soils and Construction: Managing Urban Stormwater*, Volume 1 4th Edition, Landcom 2004 (Landcom, 2004)

4.3 MITIGATION STRATEGIES

Various management strategies for ASS were considered and summarised (in Table 4-1), with an assessment on the applicability of the strategy for the proposed development works.

Table 4-1 Mitigation Strategies

Strategy	Details	Application to Proposed Works
Avoidance	Avoid activity in areas containing ASS	**No** - Given the proposed works surrounding environment and low-lying alluvial setting, excavations are likely to disturb ASS/PASS materials, and with the excavation of soils for boardwalk construction, avoiding ASS/PASS disturbance is not considered a viable option.
Minimisation	Re-design the proposed works to minimise disturbance	**No –** Given the proposed works is mostly along the shoreline of Gogleys Lagoon, excavations for the boardwalk construction may disturb ASS/PASS materials, as such minimising ASS/PASS production is not considered a viable option.
Neutralisation	Neutralisation and removal off-site	**Yes** - Excavated material identified as having the potential to generate acid would be neutralised on-site.
Hydraulic separation	Hydraulic separation	**No** - Other management strategies are more appropriate for the works.
Strategic reburial	Burial below the water table	**No –** Given the proposed works would primarily involve the excavation of boreholes for the installation of foundations for the SUPs (boardwalk), placement of ASS material as backfill below the water table is not considered a viable option.
Neutralisation of water	Neutralise and discharge	**Yes** - If dewatering of ASS impacted water is required.

The management strategy that is most applicable to the manage material with acid generating potential is neutralisation (of soil and water). Details of this management strategy by neutralisation is presented in Section 4.3.1.

Seepage water from exposed excavation faces collected in pits would be appropriately managed, and involve either:

- Discharge to stormwater (assumes discharge criteria is met)
- Discharge to trade waste
- Immediate disposal to a licenced facility by a licensed contractor (via sucker truck or similar).

4.3.1 Neutralisation

The neutralisation of ASS/PASS material can be conducted via the addition of chemicals that react with the produced acid to ensure that it is not released from the treated soil. Neutralisation of ASS/PASS material is conducted to reduce the acidity of the material and should result in a pH of soil, water, and sediments of >6.5. Laboratory analysis is conducted in order to assess the levels of existing and/or actual acidity, which informs the level of neutralising capacity required to react with all potential acidity that may be generated during and following the disturbance of ASS material.

In order to successfully undertake ASS/PASS neutralisation, the proposal should make provisions to allocate suitable treatment area, machinery, budget to purchase the neutralising agent and time to successfully implement the process. The establishment of environmental controls during the treatment process is important in mitigating the potential for acidic leachate production by capture and treating it, and any heavy metals which may be released in solution during oxidation

of ASS material are also appropriately managed. This ASSMP assumes the application of neutralising agent is of a high-quality agricultural lime (aglime) and fine ground (<1 mm) calcium carbonate ($CaCO_3$) or calcite (limestone or marble powder).

Prior to the excavation and disturbance of materials below the water table, a sufficient supply of aglime should be available onsite to address the requirement for ASS/PASS neutralisation. The quantity of the neutralising agent required for the proposal is based on the volume of ASS/PASS to be treated. All dockets, receipts, and other field records should be retained on file, and show the storage locations of all chemicals and neutralising agents onsite.

ASS/PASS management by neutralisation for the proposal is considered a viable management option as:

- Excavation of small volumes of natural material are anticipated for the drilling and excavation of boreholes to install boardwalk and footpath foundations
- There is sufficient space that can be made available within the site for a suitable treatment area, which can be hydraulically separated from the rest of the site
- Appropriate machinery will be onsite to achieve mixing of the soil and neutralisation chemicals, can be supplied by the civil works contractors
- Following successful neutralisation of ASS/PASS material, the treated soils are no longer considered ASS material and can be either disposed offsite as waste or reused as engineered fill material (if required).

Neutralisation of Water

Surface drainage and groundwater that comes into contact with ASS/PASS material has the potential to become acidic and contaminated with heavy metals leached from the acidified soil. The sources of water include ground drainage associated with rainfall or dewatering products during excavation works, leachate from the treatment of ASS/PASS soils and groundwater flow into excavations. Any water sourced from the treatment area is required to be contained, assessed and treated (as necessary) prior to its discharge from the site. Once the water has been assessed for pH and contaminant concentrations, and considered suitable for discharge, the water may be discharged from site and into the stormwater system.

If the water is assessed to be acidic, it will be neutralised via the addition of lime in a separate bunded area, treatment tank or lined detention basin. Lime is to be added incrementally and thoroughly mixed until the process results in the water being within the pH range of 6.5 to 8.5.

4.4 SITE MANAGEMENT STRATEGY

The site management strategy to be implemented during development works which may disturb ASS/PASS material will provide:

- Adequate treatment of ASS/PASS material so that the acid neutralising capacity is sufficient for the material, and no net acidity is generated following treatment (measured through field testing and laboratory validation)
- Any water discharged from areas of excavation and treatment of ASS (including run-off and water from dewatering and leachate) is neutralised and discharged to stormwater once it meets the site assessment criteria as outlined in this ASSMP
- Implementation of assessment protocols during excavation works in order to effectively treat and manage any drained, disturbed or excavated ASS.

The management actions pertaining to neutralisation/liming, treatment and management of ASS stockpiles and waters are included in Table 4-2.

Table 4-2 Acid Sulfate Soil Management Measures

Construction Activity	ASS Management Principle	Management Actions
Excavation of boreholes for foundations	Neutralisation and reuse/ dispose	Test excavated soil from excavated materials at a rate of one sample per 50m^3 of material. Neutralise with lime at rate specified by the laboratory test (ensure safety factor of 1.5 is used in calculations). See below for further details.
Dewatering of excavations	Treatment of water (if required)	A field measurement for pH should be conducted to ascertain if the water is neutral, and discharged to stormwater once it has been shown to meet the criteria specified in this ASSMP or removed/ disposed offsite as liquid waste.
Stockpiling of soils	Oxidation prevention Minimise potential for cross contamination Minimise sediment loss	If stockpile is suspected of ASS or PASS prior to treatment or disposal (is required), provision should be made to safely store the material in site settings that ensure minimal environmental impact from any acidic leachate produced. The design of stockpile(s) should: • Establish leachate collection and treatment systems including an impervious pad (i.e. geomembrane liner) on which to place the stockpile • Minimise the surface area exposed to oxidation by considering some form of artificial capping (i.e. builder's plastic), which also reduces the potential for sediment loss through water/wind erosion • The artificial capping will also minimise the amount of infiltration of water • Establish diversion banks upslope to prevent run-on water • Establish sediment control structure to ensure sulfidic material is not eroded by using some form of capping. Leachate generated from stockpiles should be field tested for pH levels and assessed for other contaminants to meet discharge or disposal requirements.

4.4.1 Acid Sulfate Soil Identification

Prior to construction works the distribution and extent of AASS and PASS should be determined, as well as the potential of any ASS to release acid upon disturbance prior to treatment in accordance with ASSMAC (1998).

Analysis by a registered laboratory for percentage of oxidisable sulfur (S%) by an approved method such as Chromium Reducible Sulfur (S_{CR}) or Suspension Peroxide Oxidation Combined Acidity and Sulfur (sPOCAS) should be undertaken on all excavated materials, inspected and examined for the following ASS indicators:

- pH<4.5 in adjacent water bodies, drains or groundwater
- Unusually clear or milky blue-green water
- Yellow jarositic precipitate on soil surfaces

- Iron stains on drain surfaces, pond surfaces, concrete walls or pipes
- Iron stained water and soil
- "Rotten egg" gas/sulfurous odour.

4.4.2 Lime Treatment, Validation and Monitoring

The following management protocols would be followed and are based on Section 8 of Dear *et al*, 2002:

- Soils selected for this method of treatment would be treated with lime or neutralising agent to neutralise their equivalent TPA or equivalent oxidisable sulfur
- Lime (fine agricultural lime or suitable and approved alternative) application rate would include a safety factor for mixing of 1.5, unless it can be demonstrated that this factor can be reduced and still satisfy neutralisation requirements
- The soil must be managed to achieve a consistency that would allow for thorough mixing. This may entail drying, mechanical turning and breaking up of the soil (with associated management of any acid resulting). Drying should not be undertaken during foreseeable wet weather due to the increased risk of flushing acid out of AASS and into waters. A lime pad must always be pre-positioned prior to spreading soils for drying. Sufficient mixing may be difficult to achieve for firm/stiff clays, and layering of soils and lime using an ASS treatment pad may achieve neutralisation objectives. Effective mixing may also be achieved and well controlled if conducted within a temporary container onsite lined with lime
- Neutralising agents to be stored under conditions that would prevent the deterioration of their effectiveness
- Neutralising agents used on the site (for example along drainage lines and at the base of treatment areas) must be replenished and or replaced regularly to remain effective against loss by wind or water erosion
- Stockpiles of lime would be covered or "dampened down" to minimise dust emission. Care is to be taken to ensure leachate is prevented/controlled
- Utilisation of safe handling and storage procedures for alkaline treatment substances, including training of project staff in health and safety procedures relating to their use
- Bunded treatment areas would be provided with a surface treatment of lime placed at a minimum rate of 5kg/m^2/metre depth of material (or part thereof) to be placed. This is to provide a layer of neutralising treatment for any acidic runoff or leachate from the treatment areas
- Receipts, dockets or other records showing all acquisitions of neutralising agents must be kept along with records of how and where this neutralising agent was used on site.

Table 4-3 Lime Treatment, Validation and Monitoring

Issue	Procedure
Implementation Strategy/ Mitigation Measures	Assessment and management of ASS material will be conducted in accordance with ASSMAC (1998), industry best practice and will incorporate the following procedures: • Soils within a site designated for acid sulfate soils will be tested for acid sulfate potential and classified • If neutralising treatment is required, then a sufficient quantity of finely ground neutralising agent must be applied to treat total sulfidic acidity (TSA) and total actual acidity (TAA), e.g. percentage of oxidisable sulfur (%S) + TAA in equivalent units of %S contained in the soil

Issue	Procedure
	• Calculation of liming rate, using a safety factor of at least 1.5 to compensate for impurities in the neutralising agent, and bulk densities of the material to be treated is to be considered • Exposure of PASS material within an excavated trench site will be minimised to reduce the potential for oxidation and acid leachate generation. Precautionary liming within the trench is to be used for high risk zones • Excavation for construction will be done under dry conditions • Lowering of the water table will be minimised • Identified PASS material will be separated in the excavation operation and buried beneath the permanent water table (where possible) to minimise acid leachate generation or treated lime at a pre-determined rate • Non-PASS material will be used as fill wherever possible • Excavated fill will be monitored for colour and leachate quality • Stockpiling of PASS material will be minimised, where possible. No untreated PASS material will be placed and left at surface for more than 24 hours • Stockpiled material will be monitored for colour and leachate quality • Excavation, handling, placement, treatment and monitoring of PASS material will be supervised by the proposal's *Environmental Consultant*.
Monitoring/ Validation Sampling of Liming Rates	• Treated material will be monitored regularly for success using field-based tests and lab tests. TPA or equivalent on representative samples of material being treated at a rate of one sample per 1,000 m^3 • No sample to have a soil pH >5.5 • No sample to have a pH <6.5 after peroxide oxidation • Any leachate generated within the site will be collected and treated within a bunded area of high acidities persist; the collected leachate will be treated using alkaline additives to pH of 6.5. Records will be kept of lime dosing rates and monitoring results.
Auditing	Management to ensure assessment and treatment procedures according to ASSMAC (1998) prior to final placement of treated soils (if required) during construction.
Reporting	Records always kept onsite during construction phase and available for inspection.
Corrective action	Incorrect segregation of soils based on visual observations will require the neutralizing procedure (adjust liming rates) to be repeated in order to achieve neutralisation.

4.4.3 Stockpile Management of Excavated Materials

Stockpiles of excavated material are expected to be placed beside the open trenched sections on limed treatment areas prior to reburial which is to occur within 24 hours of excavation. Excavated spoil is not to be mixed such that material showing signs of acid generating potential would come into contact with material with no significant acid generating potential.

Stockpile management of excavated materials (for over 24 hours) will be required to reduce the impacts of erosion and ensure sediment is not mobilised into the receiving environment (refer to Table 4-4 and Table 4-5).

Note: Any temporary drainage measures required are to be managed in accordance with The Blue Book. - Managing Urban Stormwater: Soils and Construction (Landcom, 2004).

Table 4-4 Stockpile Management Activities

Activity	Management Action	Timing
Placement of soils with acid generating potential (for soils to be reburied within 24 hours of excavation)	Ensure that material is returned to the excavation within 24 hours within the time which acidic soils are not expected to be generated and therefore underlying treatment liners may not be necessary provided the material is scraped clean for reburial.	During Construction
	Excavated materials should be segregated based on soil types/texture.	During Construction
Stockpiling of soils for periods greater than 24 hours	A dedicated stockpile facility would be required to be designated and would require constructed bunding around the stockpile in order to reduce the transport of sediment attributed to any stormwater runoff or overland flow	As required
	Any temporary drainage devices to control soil and water movement around the site are to be constructed and managed in accordance with *The Blue Book - Managing Urban Stormwater: Soils and Construction*	At all times
	The stockpiles are to be kept suitably moist (to the extent that leachate is not produced) to reduce sediment transport from wind erosion. Additionally, the stockpiles can be covered by plastic to further reduce the likelihood of impacting nearby sensitive receptors.	As required
	The bunded area should be designed to minimise potential for impact on nearby receptors. Any leachate generated from the stockpile should be contained within the bunded area and treated using the same principles identified for extracted groundwater/seepage water	As required
	All stormwater inlets in close proximity to stockpiled material and the excavations are to be appropriately protected from sediment inflows in accordance with *The Blue Book*.	At all times
General operations	Bunding should act as a general clearance area, and personnel should be advised not to enter the area without adhering to specific safety guidelines.	At all times

Table 4-5 Sediment and Erosion Control

Issue	Procedure
Performance Criteria	Turbidity of <25 NTU and Suspended Solids of <50mg/L
Implementation Strategy/ Mitigation Measures	Sediment control measures would be placed across all drainage paths in areas to be disturbed before commencing construction. Where possible, surface run-off shall be directed to sediment ponds or enclosed excavated areas. All surface drainage from soil stockpile and treatment areas shall be directed to sediment ponds or enclosed excavated areas. Access ways for construction equipment shall be maintained to reduce dust and sediment run-off. The area disturbed by construction activities at any time shall be minimised to allow management of erosion and sediment generation by onsite personnel at all times. PASS and ASSS material shall be stockpiled in areas bunded by non-PASS material. The surface of soil stockpiles shall be sealed or compacted to reduce erosion and infiltration. The height of stockpiles and bunding shall be dictated

Issue	Procedure
	by the surrounding topography and catchment area to reduce erosion and dust generation. Drainage from each stockpile shall be directed to a sump or pond located in the bunded area for testing prior to discharge.
Monitoring/ Validation Sampling of Liming Rates	The *Site Environmental Consultant* would conduct daily visual monitoring and after storm events (>25 mm in 24 hours) to ensure adequate sediment and erosion measures are in place to suit construction activities and that sediment and erosion control structures have sufficient freeboard. Monitoring of suspended solids and turbidity shall be undertaken. Daily inspection for the generation of jarosite within soil stockpiles.
Auditing	The Contractor's management practices for sediment and erosion control would be audited by the Contract Superintendent or their representative. The audit results would be available to Council at all times upon request.
Reporting	All details of site inspection and auditing would be recorded, and records would be maintained by the *Site (Construction) Manager*.
Corrective action	Repair or upgrade sediment control measures where non-compliance is identified. Cover soil stockpiles with geofabric where erosion or jarosite is identified. Cease construction activities works during rainfall where sediments are being tracked outside the immediate excavation area.

4.4.4 Treatment and Management of Water/Leachate

Treatment and management of water and leachate from areas containing ASS to prevent leaching of acidic waters and metal contaminants into the environment is required to maintain the existing surface water quality (wherever practicably possible) and to ensure criteria of receivers of wastewater are met. The management procedures to be utilised for treatment of waters affected by acid sulfate affected soils would include:

- Minimise the time the excavation remains open
- Any surplus water to be disposed off-site is to be measured for parameters and treated (if required) according to the procedures in Table 4-6
- All external drainage would be directed away from the excavated site to minimise the volume of water within the site that may require treatment
- Where leachate is generated in close proximity (within ~100 m of an open water body), monitoring of surface water conditions would be conducted to detect temporary failures (e.g. water quality testing results not meeting discharge criteria; refer Table 4-6)
- Records on flow rates within the trench for the length of the alignment. Chainages should be included.

Table 4-6 Treatment and Management of Waters/ Leachate

Issue	Procedure
Performance Criteria	Discharge to a facility licenced to accept the wastewater or under a trade waste agreement. Water shall be tested for the parameters as required by the facility accepting the waste under their licence or as per the trade waste licence. All water discharged from site to stormwater is to comply with criteria as outlined in the ANZG Water Quality Guidelines 2018.
Implementation Strategy/ Mitigation Measures	Ponded water within the site would be minimised wherever possible, unless part of the treatment process. Excavations should proceed in dry weather and not during wet weather events.

Issue	Procedure
	Physical separation of external watercourses from the excavation through bunding and diversion would be undertaken. Monitoring would be undertaken during flood and storm events (>25 mm in 24 hours) where possible to allow for water quality comparisons to be made. Stormwater control would rely on the maintenance of directed drains to the excavations or a centralised settlement pond for dedicated stockpiles. Outside the excavation area, existing surface water conditions shall be maintained wherever possible. Where sediment problems are identified, settling in the excavations shall be aided by dosing with flocculation agents such as Magnafloc. During disturbance of the site surface, water runoff shall be directed to the excavations or a centralised settlement pond. If increasing acidity is encountered, the waters within the excavations would be treated until a minimum pH of 6.5 has been achieved prior to discharge.
Monitoring/ Validation Sampling of Liming Rates	Monitoring/measurements of ponded water in open trenches to be conducted prior to discharge. For excavations adjacent to open water bodies (within ~100 m of an open water body), monitoring would be undertaken using a handheld pH and EC meter during construction. Laboratory analyses at a NATA registered laboratory Analysis of settlement pond water for SO_4, Cl, Alkalinity and Acidity, Total Suspended Solids (TSS) and Dissolved Oxygen (DO) prior to discharge. During flood events, samples of stormwater runoff would be collected and monitored for colour, TSS where safely accessible. Visual inspection would be undertaken following each rainfall event and on a regular basis during dry periods to determine the presence or absence of oil, grease and iron floc/precipitate.
Auditing	Management to ensure assessment and treatment procedures are in accordance to the performance criteria prior to discharge of surface water from the site.
Reporting	Water quality monitoring data of nearby water bodies would be submitted to Council on a monthly basis and would be available upon request.
Identification of Incident or Failure to Comply	Fail in surface water quality as per water quality criteria, at the environmental monitoring points to below background level.
Corrective action	Identify reason for deterioration in surface water quality and determine if it is linked to the construction operations. Review of construction operation. Review and upgrade neutralisation treatment procedure, as required.

5 Responsibilities and Management

Management activities related to ASS are the responsibility of the construction contractor. The implementation of ASS management measures on-site would be undertaken by a competent contractor responsible for monitoring, record keeping and ensuring compliances are achieved.

Note: All works undertaken by the Contractor are to comply with the ASSMP and performed in accordance with the Protection of the Environment Operations Act 1997.

5.1 RESPONSIBILITIES

The responsibilities to manage, document and report on ASS issues for the proposal are, as follows:

The *Site Manager* is responsible for ensuring that all requirements of the ASSMP are met during the proposal.

The *Site Foreman* is responsible for ensuring the strategies and procedures prescribed in the ASSMP are implemented at the site in accordance with the specified performance criteria.

The *Site Environmental Consultant* (or Contractor) is responsible for the supervision of excavation, handling, placement, treatment and monitoring of PASS material.

The *Environmental Manager* is responsible for reviewing compliance with the ASSMP and development of actions to address non-conformance, including maintaining a "concerns register" to address concerns or complaints raised by the community (or other parties) as described in Section 5.5.

5.2 NON-CONFORMANCE AND CORRECTIVE ACTION

Any non-conformance to the ASSMP must be addressed as soon as is practical. The personnel responsible for the non-conformance must be notified immediately for purposes of issuing rectification instructions. The corrective action includes the review and adjustment (as required) practices to meet the performance criteria.

Incident and non-conformance reporting shall be undertaken to ensure:

- Environmental incidents and non-conformance regarding the management of ASS are identified, investigated and action is taken to mitigate any adverse impact caused
- Corrective and preventative actions are initiated and completed
- Identified non-conformances lead to improvements in systems and/or processes.

5.3 AUDITING

The *Environmental Manager* will be responsible for ensuring that an auditing program is implemented for the construction and treatment works. The audit program shall aim to ensure compliance with the ASSMP and relevant statutory requirements.

The *Environmental Manager* shall appoint an experienced ASS practitioner to conduct regular auditing of activities and ASS management measures. Given the expected construction period, an agreed (weekly or monthly) auditing schedule is recommended. The frequency of these audits may gradually decrease if a high level of compliance with the ASSMP is evident.

The audit shall take the form of a visual inspection of the works and treatment sites (if applicable), and associated control measures and a review of monitoring data. A written record of auditing undertaken shall be maintained, including details on the date of the audit, activities undertaken, observations and any non-conformances identified. A copy of the audit report shall be forwarded to the *Environmental Manager* within 2 days (or as agreed) of the audit.

5.4 TRAINING

All equipment operators, supervisors and subcontractors engaged in the Project (alignment) works shall participate in the induction training for ASS. This training will include basic recognition and identification of ASS and an outline of the requirements of the ASSMP. The *Site Foreman* shall verify attendance at induction training prior to commencement of site works.

5.5 COMMUNITY RELATIONS

Concerns or complaints raised by the community (or other parties) in relation to ASS will be directed to the *Environmental Manager* for action.

The *Environmental Manager* shall maintain a "concerns register" to record the following information:

- Details: Name, address and phone number of the party raising the concern.
- Nature of concern: Detail of issue, date of incident, people involved, and location.
- Action taken or required: Any action proposed or undertake to address the concern, including time and date.
- Response to action: Was the complainant satisfied with the outcome of the actions taken, if not, what else needs to be done, or is it outside the scope of the development works.
- Prevention or re-occurrence: What action has been taken by the nominated responsible person to ensure the problem will not re-occur.

6 Conclusion

As a result, the likelihood of this risk occurring is considered probable, with the consequence if it did occur moderate as environmental impacts would be localised to the site and immediate surrounding area.

Site characterisation assessment data available for subsurface conditions across the site has identified the occurrence of PASS material, primarily consisting of estuarine and tidal delta sediments in Units 2A and 2B overlying the land portion of proposed pathway sections D3, D5 and D8. Where existing and future assessment data identifies the presence of ASS/PASS materials that may be disturbed during construction activities, the measures identified in this acid sulfate soil management plan (ASSMP) provide appropriate procedures to manage the risks associated with the proposed activities. If successfully implemented, these measures will minimise the environmental risks associated with disturbance of the PASS materials.

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Appendix H

Flood Risk Assessment

Beach to Beach Camden Haven

Flood Risk Assessment



Beach to Beach Camden Haven

Flood Risk Assessment

Prepared for:
PORT MACQUARIE HASTINGS COUNCIL
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3 November 2021

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Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
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			Neil Luzano 2021.11.03 17:00:13 +11'00'		2021.11.03 17:03:13 +11'00'	2021.11.03 16:54:17 +11'00'

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1 Introduction

The purpose of this report is to address the risk of flooding to the proposed Beach to Beach Shared Pathway (herein referred to as the Pathway), specifically the remaining 2.9 km section that includes the following:

- D3 (360m) – Raised boardwalk commencing near Scarborough Way and traversing a low lying intertidal estuarine landscape for approximately 120m, on the western side of The Boulevarde and continuing approximately 210m to the existing pathway at D4.
- D5 (160m) – Raised boardwalk approximately 160m in length that will be mostly located within Camden Haven Inlet where it will be subject to tidal flow.
- D8 (800m) – Proposed footpath approximately 800m in length that will be located in the nature strip between Camden Head Road and Gogley Lagoon.
- D10 (1500m) – Proposed footpath approximately 1500m in length that may be constructed on either side of Camden Head Road. Some retaining works may be required if the path is constructed on the western side of Camden Head Road.
- D11c (700m) – Proposed footpath approximately 200m in length on the western side of Camden head Road, extending approximately 500m in length adjacent to the Pilot Beach access road.

The Beach to Beach project aims to deliver an un-interrupted shared pathway connecting North Haven and Pilot Beach in Dunbogan that provides safety and accessibility to pedestrians and cyclists, as well as recreation that attracts tourism in the area. The five pathway alignments traverse road reserves, Crown land and sensitive environments.

Flood mapping as part of the Caden Haven River and Lakes System Flood Study undertaken by Worley Parsons in 2013 for Port Macquarie-Hastings Council identified the proposed Beach to Beach Pathway as potentially flood affected. The existing mapping has been used to define the flood risks associated with the design.

The NSW Department of Planning and Environment issued a Secretary's Environmental Assessment Requirements (SEARS) which requires tidal inundation, flood affectation and the potential impact of climate change be assessed as part of the Environmental Impact Statement (EIS).

The study area is located at the downstream end of the Camden Haven River, which has a catchment area of 650 km^2 extending from North Haven to Mount Comboyne some 25 km to the west. The catchment drains to the Pacific Ocean at North Haven.

The study area overlaid with the proposed shared pathway and 1% AEP (Annual Exceedance Probability) peak flood depths is presented in Figure 1-1.



LEGEND

- Proposed Shared Pathway
- Peak Water Level (m AHD)

1% AEP Peak Flood Depth (m)

- 0
- 0.5
- 1
- 2
- 4

Title:

LOCATION MAP

Figure: 1-1

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KBR

2 Review of Previous Studies and Models

Several studies have previously been undertaken in the vicinity of the Pathway that are relevant to this flood assessment. Council has provided these relevant flood studies and flood model outputs. KBR has used these existing studies/model outputs to define the flood risks associated with the Pathway.

The following data have been provided by Council or sourced from the Port Macquarie Hastings Council Website:

- Beach to Beach Shared Pathway Alignment Study and Environmental Approvals Pathway (GHD, 2019)

  The report has been prepared by GHD Pty Ltd (GHD) on behalf of Port Macquarie Hastings Council (Council) to:

  - Determine draft design alignment for the Pathway
  - Identify the environmental constraints and propose a planning approval pathway for segments D3, D5, D8, D10, and D11a, b and c
  - Assess previous designs to ensure they meet the current project objectives
  - Assess civil and structural systems to ensure the design considers, CAPEX, maintenance, environment, and functionality
  - Assess alternative alignments along segment D3 and D11
  - Document consultation and investigations on the design development to ensure comments are required and tracked
  - Estimate construction costs for the project to allow Council to develop funding submission(s)

  GHD considered a wide range of users with varying requirements in defining the project's Design Criteria. The users considered were the elderly, low mobility pedestrians, families, recreational walkers and runners, recreational riders, and tourist walkers and riders. Consequently, GHD adopted several standards and guidelines to meet user requirements and ensure accessibility to the proposed pathway including Austroads, Australian Standards, and Council Guidelines.

  GHD reviewed available information and identified several key environmental constraints arising from the proposed pathway, which include local heritage items, coastal wetlands, littoral rainforests, habitat for threatened species, bushfire prone land, Aboriginal midden sites and land claims, nature reserves, Crown Reserves and Crown Waterway.

  Options assessment for the design of the Pathway was undertaken which considered different materials and arrangements for the different segments of the Pathway. Cost, durability and maintenance, constructability, sustainability, user functionality and attractiveness were

included in the general criteria of the assessment.

GHD provided recommendations and findings that included guidance on which relevant policies affect the different segments of the Pathway. Direction on required approvals and studies to be undertaken were provided as well as recommendation on suitable materials in terms of the overall criteria defined in the study.

- Camden Haven and Lakes System Flood Study (Worley Parsons, 2013)

  Council initiated the process of formulating a flood risk management plan for the Camden Haven River by commissioning Worley Parson to undertake a flood study in 2013.

  The aim of the study was to produce information on flood flows, velocities, levels and flood extents, for a range of flood events under existing floodplain and catchment conditions, and to highlight those areas where the greatest flood damage is likely to occur. This data was compared against the flood characteristics associated with potential flood damage reduction options and future floodplain risk management decisions, thereby providing a tangible measure of potential impacts.

  The study considered available information at the time including previously completed flood studies, streamflow gauge records, rainfall records, topographic maps, hydrographic surveys, bridge crossing details, historical flood information, and on-site observation of the study area.

  A hydrologic model of the catchment that includes Camden Haven River, Stewarts River and Herons Creek was developed using XP-RAFTS to investigate and quantify flood characteristics for the Camden Haven River and Lakes System. The model was used to determine flood discharge hydrographs for both historical and design events. Calibration was undertaken using available daily read rainfall and pluviometer data, as well as streamflow data recorded by a stream gauge located at Logans Crossing near Kendall.

  Peak flow hydrographs were determined from the hydrologic model, which showed that the Camden Haven River contributes to over half of the total inflow to the lower Camden Haven during the design 1% AEP flood event. Results of the modelling were compared to the previously developed 1989 XP-RAFTS hydrologic model, which showed that the two models were generally varying no more than 10%.

  A two-dimensional hydraulic model of the floodplain was also developed using the RMA-2 software. The hydraulic model covers the reach of the Camden Haven River from three kilometres upstream from the Logans Crossing Road Bridge, downstream along the Stewarts River from 600 metres upstream from the Pacific Highway Bridge and downstream along Herons and Stingray Creeks from the Pacific Highway Bridge.

  The flood model was used to simulate historical and design floods, and generate the design flood levels referenced in this report. The simulated historical event flood levels matched at least half of all recorded flood levels within 130 mm, demonstrating a reasonable model calibration. Water surface profiles were generated from modelling the range of design floods in accordance with Australian Rainfall & Runoff (ARR) 1987 for Camden Haven River and its tributaries. Predicted peak flood levels, water surface profiles, flood extents for the range of modelled design events were provided in the report and have been used as the basis of the current flood assessment for the Pathway.

- Camden Haven and Lakes System Flood Study (Worley Parson, 2013) RMA Modelling Results

  Council provided the RMA model results in the form of 3 m ASCII grids from the Camden Haven

and Lakes System Flood Study undertaken by Worley Parsons in 2013. These results were used by KBR in assessing the flood risks associated with the proposed pathway. The following are included in the results provided to KBR:

- 20% AEP depths, hazards, levels, velocities
- 1% AEP depths, hazards, levels, velocities
- 0.5% AEP depths, hazards, levels, velocities

3 Overview of Flood Risks

The design of the pathway including the horizontal alignment and vertical profile has been prepared by KBR at the time of this report. This design has been assessed against the RMA hydraulic model results provided by Council to assess the flood risk along the Pathway. It should be noted that no additional flood modelling and no modifications to the provided model results have been undertaken by KBR. Figure 3-1 to Figure 3-9 present the study area with the proposed Pathway, peak flood depths, peak water levels, peak velocities, and flood hazards for the 20%, 1%, and 0.5% AEP storm events. Additional information would be required to define the accurate flood immunity of the entire Pathway alignment. Commentary is provided below in the context of the flood affectation of the Pathway during the 20%, 1%, and 0.5% AEP storm events.

Comparison of the proposed vertical profiles of the Pathway against the provided RMA results show that segment D3 is inundated by a maximum of 400 mm and D5 by 450 mm during the 20% AEP storm. Segments D8, D10, and D11 remain flood free during the 20% AEP storm.

During the 1% AEP event, segments D3, D5 and D8 are inundated to a maximum depth of 2.1 m, 2.2 m and 1.9 m respectively. Segment D10 remains flood free. Segment D11 is predominantly flood free with the exception of a 180 m reach starting from Chainage 210 m that is inundated to a maximum depth of 0.6 m.

The results demonstrate that the peak water levels increase by an average of 2 m between the 20% and 0.5% AEP storm events. During the 0.5% AEP event, segments D3, D5 and D8 are inundated to a maximum depth of 2.4 m, 2.5 m and 2.2 m respectively. Segment D10 remains flood free. Segment D11 is predominantly flood free with the exception of a 250 m reach starting from chainage 172 m that is inundated to a maximum depth of 0.9 m.

The Camden Haven and Lakes System Flood Study (WorleyParsons, 2013) adopted a hazard criteria based on the hazard categorisation provided by NSW Floodplain Development Manual. The adopted criteria, as presented in Table 3-1 was used to undertake provisional hazard mapping of the study area.

Table 3-1 Adopted Flood Hazard Categorisation (WorleyParsons, 2013)

Hazard Category	Criteria	Practical Application
Low	Depth (d) < 0.4, velocity (v) < 0.5 m/s	Suitable for cars
Medium	Exceeding Low criteria, and d ≤ 0.8 m, v ≤ 2.0 m/s, vd ≤ 0.5	Suitable for heavy vehicles and wading by able bodied adults
High	Exceeding Medium criteria, and d ≤ 1.8 m, v ≤ 2.0 m/s, vd ≤ 1.5	Suitable for light construction, timber frame, brick veneer, etc.
Very High	Exceeding High criteria and 0.5 m/s < v < 4 m/s, vd ≤ 2.5	Suitable for heavy construction, steel frame, concrete, etc.
Extreme	Exceeding Very High criteria and v > 4 m/s	Unsuitable for development – indicates significant conveyance of flow or floodway

As shown in Figure 3-3, during a 20% AEP storm Segment D3 crosses a zone of medium hazard, D5 crosses a zone of high hazard, while D8, D10, and D11 remain flood free (i.e. no flood hazard). It is recommended to incorporate suitable safety measures, such as signages, to inform pedestrians of the hazard within Segment D5. Provision of handrails along segment D5 is also recommended.

As shown in Figure 3-6 and Figure 3-9, the majority of the floodplain local to the pathway is categorised as high to very high hazard during the 1% AEP and 0.5% AEP events, including the location of Segments D3, D5, and D8. Installation of additional signages through the entire Pathway alignment (with the exception of segment D10) should be considered to inform pedestrians of flood hazard during major storms. The Pathway design/construction should also account for the flood hazard categorisation as noted in Table 3-1.

The Camden Haven and Lakes System Flood Study (WorleyParsons, 2013) included a 1% AEP climate change assessment for 4 different scenarios that considered varying sea level rise and increased rainfall intensity and volume (refer to Table 3-2). A fifth scenario was also included that is based on the Probable Maximum Flood with sea level rise. Considering the 1% AEP climate change assessments, the study provided predicted flood levels along the Camden Haven River (as presented in Table 3-3, which provide for an average increase in levels of 0.4 m across the study area. Therefore, it is predicted that due to climate change (900 mm sea level rise) the 1% AEP storm will generate a maximum flood depth of 2.4 m along Segment D3, 2.6 m along Segment D5, 2.1 m along Segment D8, and 1.0 m along Segment D11.

Table 3-2 WorleyParsons' Climate Change Scenarios

Scenario	Description
Scenario 1	1% AEP catchment event with 900 mm Sea Level Rise (SLR) plus 10% increase in rainfall intensity and volume
Scenario 2	1% AEP catchment event with 900 mm SLR
Scenario 3	1% AEP catchment event with 400 mm SLR plus 10% increase in rainfall intensity and volume
Scenario 4	1% AEP catchment event with 400 mm SLR
Scenario 5	Probable Maximum Flood (PMF) event with 900 mm SLR

Table 3-3 WorleyParsons' Predicted Flood Levels (m AHD) due to Climate Change

Location	1% AEP Base Case	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Logans	8.2	8.5 (+0.3)	8.2	8.5 (+0.3)	8.2
Kendall	6.2	6.5 (+0.3)	6.2	6.5 (+0.3)	6.2
Pacific	4.3	4.8 (+0.5)	4.6 (+0.3)	4.7 (+0.4)	4.5 (+0.2)
Watson-Taylors	3.5	4.2 (+0.7)	4.0 (+0.5)	3.9 (+0.4)	3.7 (+0.2)
Watson-Taylors	3.5	4.1 (+0.6)	4.0 (+0.5)	3.9 (+0.4)	3.7 (+0.2)
Dunbogan	3.0	3.8 (+0.8)	3.7 (+0.7)	3.5 (+0.5)	3.3 (+0.3)
Confluence	2.9	3.7 (+0.8)	3.6 (+0.7)	3.4 (+0.5)	3.2 (+0.3)
Gogley's	2.9	3.5 (+0.6)	3.4 (+0.5)	3.1 (+0.2)	3.0 (+0.1)
Breakwater	2.4	3.3 (+0.9)	3.3 (+0.9)	2.8 (+0.4)	2.8 (+0.4)



LEGEND

- Proposed Shared Pathway
- Peak Water Level (m AHD)

20% AEP Peak Flood Depth (m)

- 0
- 0.5
- 1
- 2
- 4

20% AEP Peak Flood Depth

Figure: 3-1

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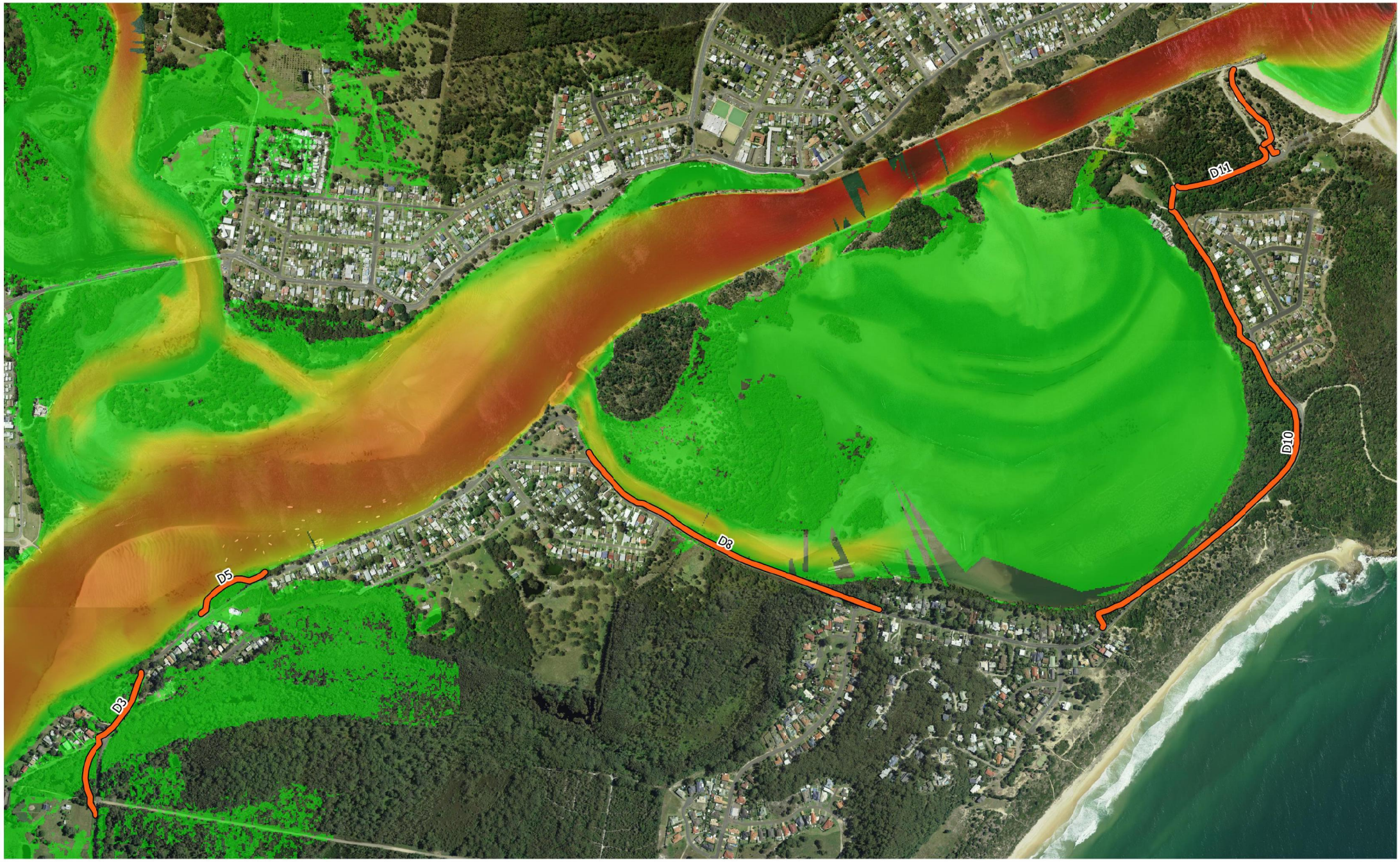
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KBR



LEGEND

- Proposed Shared Pathway
- 20% AEP Peak Velocity (m/s)
  - 0.25
  - 0.5
  - 1
  - 2
  - 4

Title:

20% AEP Peak Velocity

Figure: 3-2

Rev: 0

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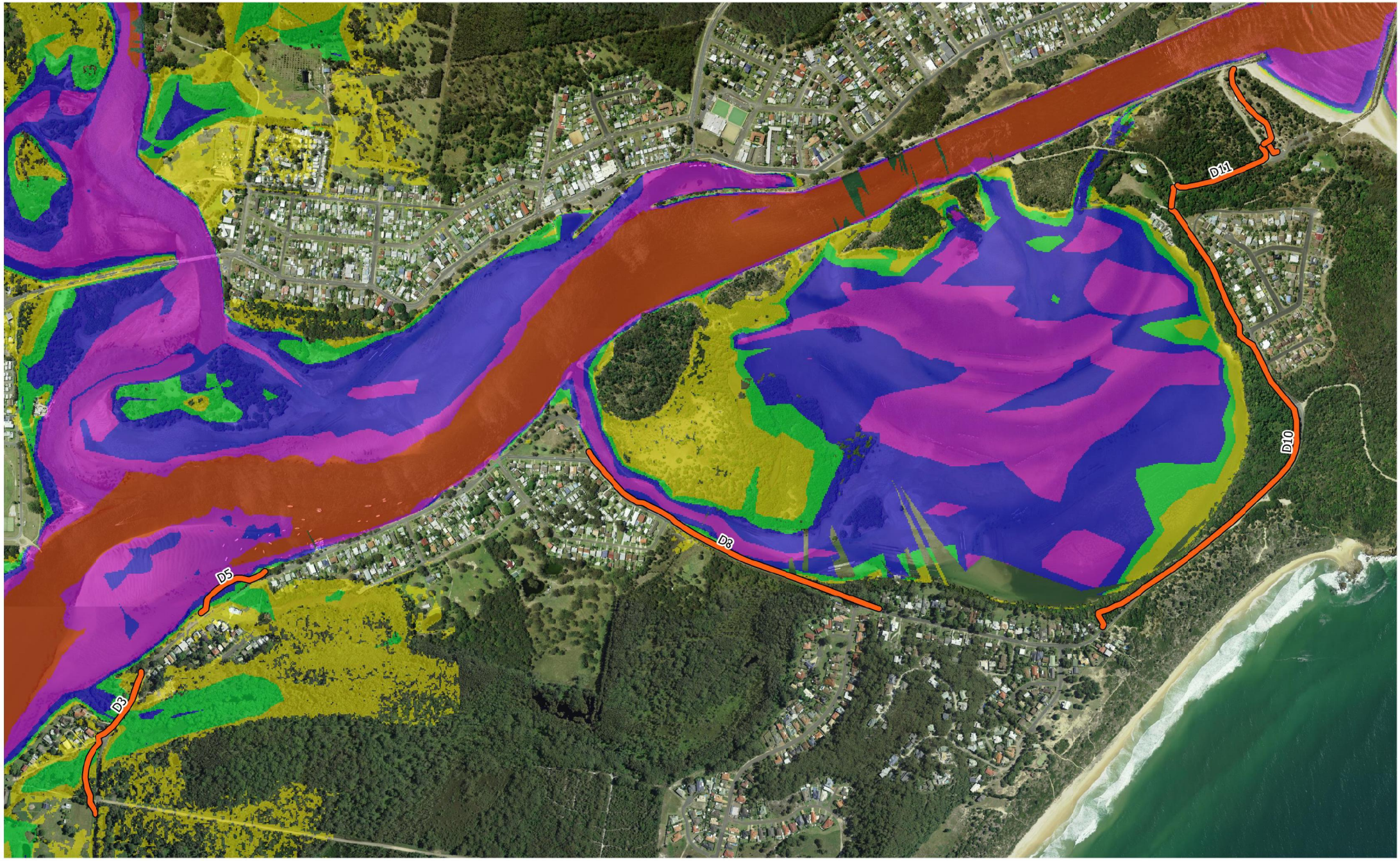
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LEGEND

- Proposed Shared Pathway
- 20% AEP Flood Hazard
  - Low
  - Medium
  - High
  - Very High
  - Extreme

Title:
20% AEP Flood Hazard

Figure: 3-3

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N

0 100 200 300 m

KBR



LEGEND

- Proposed Shared Pathway
- Peak Water Level (m AHD)

1% AEP Peak Flood Depth (m)

- 0
- 0.5
- 1
- 2
- 4

Title:

1% AEP Peak Flood Depth

Figure: 3-4

Rev: 0

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LEGEND

- Proposed Shared Pathway
- 1% AEP Peak Velocity (m/s)
  - 0.25
  - 0.5
  - 1
  - 2
  - 4

Title:

1% AEP Peak Velocity

Figure: 3-5

Rev: 0

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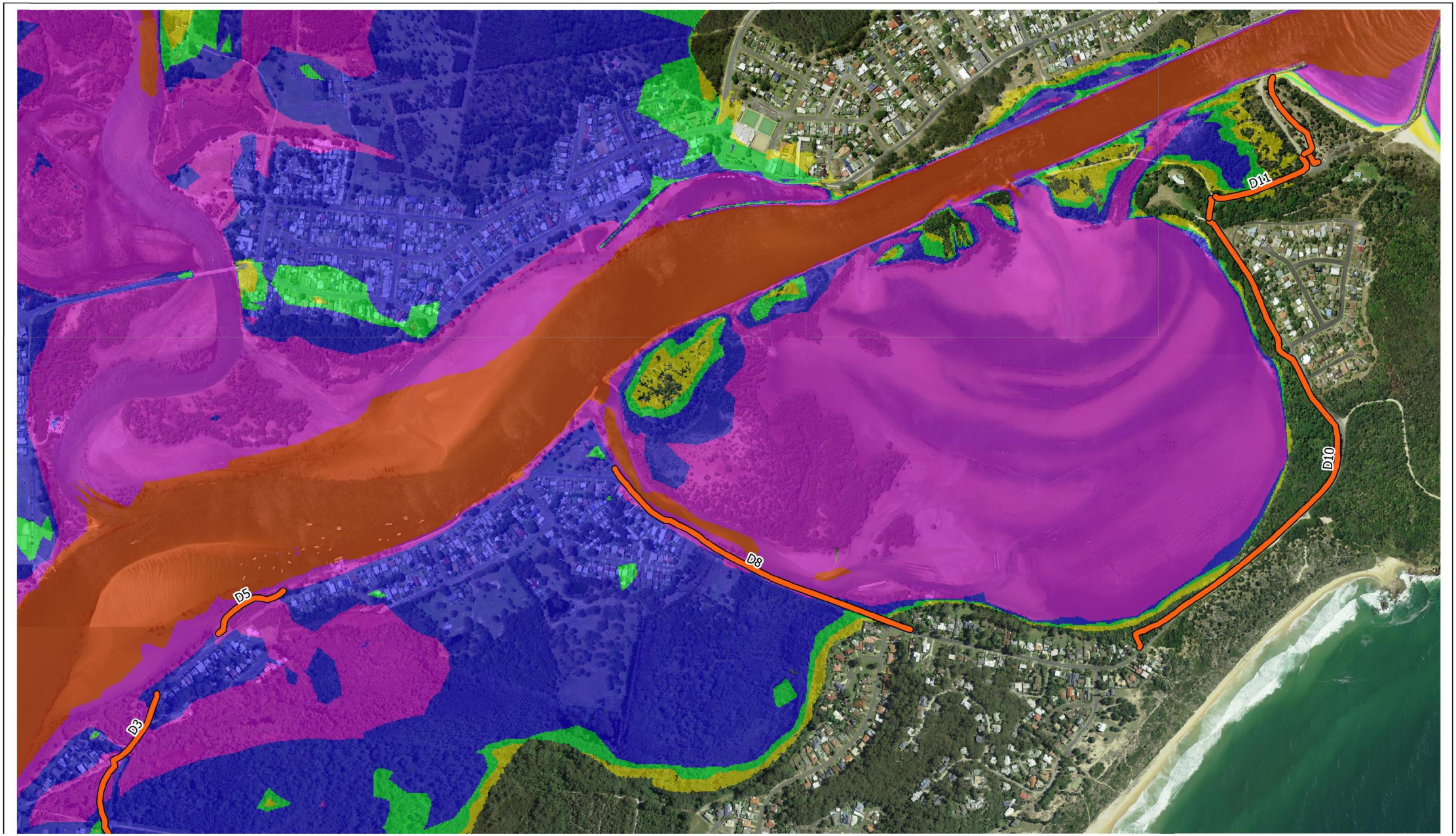
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KBR


D11
D10
D8
D5
D3



LEGEND

- Proposed Shared Pathway
- Peak Water Level (m AHD)

0.5% AEP Peak Flood Depth (m)

- 0
- 0.5
- 1
- 2
- 4

Title:

0.5% AEP Peak Flood Depth

Figure: 3-7

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KBR



LEGEND

- Proposed Shared Pathway
- 0.5% AEP Peak Velocity (m/s)
  - 0.25
  - 0.5
  - 1
  - 2
  - 4

Title:

0.5% AEP Peak Velocity

Figure: 3-8

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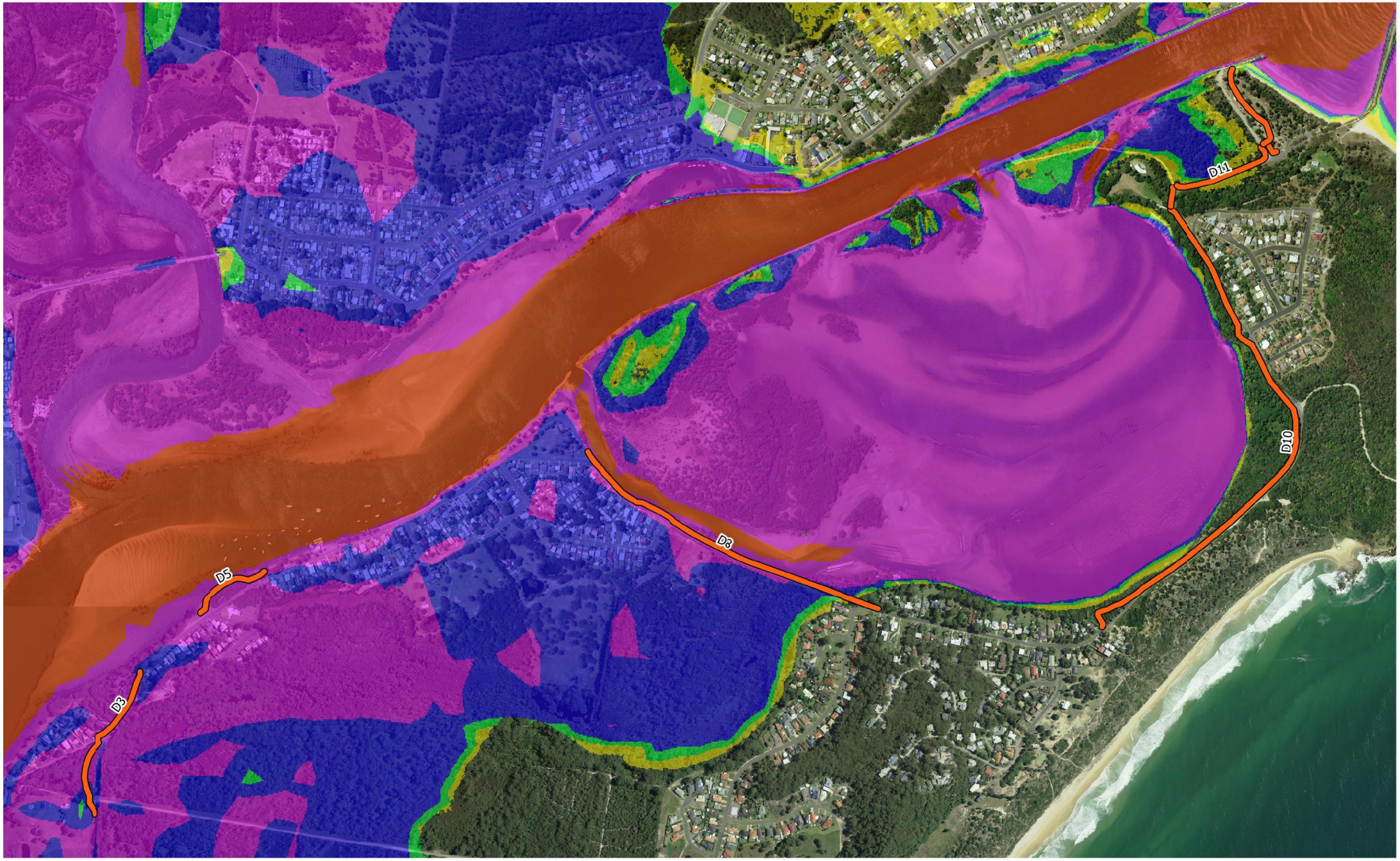
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LEGEND

- Proposed Shared Pathway
- 0.5% AEP Flood Hazard
  - Low
  - Medium
  - High
  - Very High
  - Extreme

Title:

0.5% AEP Flood Hazard

Figure: 3-9

Rev: 0

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4 Outcomes and Recommendations

Flooding along the Pathway is driven by the Camden Haven Inlet and the construction of the Pathway is not expected to significantly affect the flooding condition in the area. The flood risk assessment undertaken using the available 20%, 1%, and 0.5% AEP RMA hydraulic model results showed that the Pathway is flood affected as presented in Table 4-1 and Table 4-2 below.

Table 4-1 Summary of Flood Depths

Segment	20% AEP		1% AEP		0.5% AEP	
	Max Flood Depth (m)	Flood Impact	Max Flood Depth (m)	Flood Impact	Max Flood Depth (m)	Flood Impact
D3	0.40	Ch 83 to Ch 395	2.10	Entire Alignment	2.40	Entire Alignment
D5	0.45	Ch 0 to Ch 179	2.20	Entire Alignment	2.50	Entire Alignment
D8	-	-	1.90	Ch 0 to Ch 760	2.20	Ch 0 to Ch 774
D10	-	-	-	-	-	-
D11	-	-	0.60	Ch 210 to Ch 390	0.90	Ch 172 to Ch 422

Table 4-2 Summary of Flood Hazard

Segment	20% AEP	1% AEP	0.5% AEP
D3	Medium	Very High	Very High
D5	High	Very High	Very High
D8	-	Very High	Very High
D10	-	-	-
D11	-	Low	Low

Provision of safety measures such as signages and handrails along the Pathway should be considered to inform pedestrians of flood hazards in the area as well as ensure safety during storm events. To accurately define the flood immunity of the Pathway, additional modelling for more frequent storm events is required.

5 References

Beach to Beach Detailed Design & EIS – Concept Options Report, SEC052-001-CD-REP-001-REV A (KBR, 2020)

Beach to Beach Shared Pathway Alignment Study and Environmental Approvals Pathway (GHD, 2019)

Camden Haven and Lakes System Flood Study (Worley Parsons, 2013)

Guide to Road Design Part 5A (AUSTROADS, 2013)

Appendix I

Construction Noise and Vibration Assessment

RAPT CONSULTING

Construction Noise and Vibration Assessment - Beach to Beach Shared Pathways Project

Prepared for
KBR

October 2021

Relationships Attention Professional Trust

Document Details

Construction Noise and Vibration Assessment – Beach to Beach Shared Pathway Project

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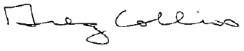
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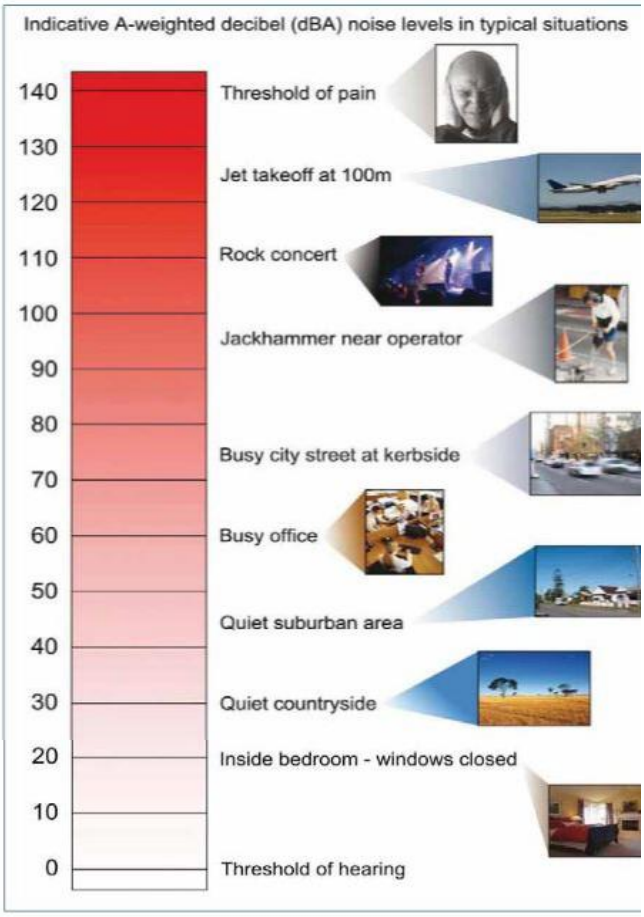
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Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources. 
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.

Noise sensitive receiver	◗ An area or place potentially affected by noise which includes: ◗ A residential dwelling. ◗ An educational institution, library, childcare centre or kindergarten. ◗ A hospital, surgery or other medical institution. ◗ An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. ◗ Commercial or industrial premises. ◗ A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: ◗ Noise impacts ◗ Noise mitigation benefits ◗ Cost effectiveness of noise mitigation ◗ Community views.
Sound power level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).

1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake a construction noise and vibration impact assessment (CNVIA) for KBR as part of an Environmental Impact Statement (EIS) for the Construction of a proposed public shared pathway between North Haven Beach and Pilot Beach in Dunbogan NSW.

This project seeks to deliver the remaining sections of the Beach to Beach Shared Path between North Haven and Pilot Beach in Dunbogan. The path will follow the banks of the local river system, creating an 11km scenic route of uninterrupted shared pathway.

The Beach to Beach Pathway is a community driven project that aims to deliver approximately 11km of un-interrupted shared pathway between North Haven Beach and Pilot Beach in Dunbogan. To date the section from North Haven Beach to Dunbogan Beach is complete as well as a number of sections between Dunbogan Bridge and Pilot Beach as shown in Figure 1.1. Currently, stages N1 (hot mix) N2, N3, N4, N5, L1, L2, L3, L4, D1 (under construction), D2, D4, D6, D7 and D9 are completed. Approximately 2.9km remains to be constructed, these sections include D3, D5, D8, D10 and D11.

The project site and surrounding area is provided in Figure 1.1.



Figure 1-1Project Site and Surrounding Area

1.2 SEAR's and Where Addressed

The Secretary Environmental Assessment Requirements (SEAR's) for noise and vibration for the EIS are provided in Figure 1.2.

Noise and Vibration – including:

- a description of all potential noise and vibration sources during construction, including hours of construction; and
- assessment of the likely noise impacts on nearby sensitive receivers during construction in accordance with the *Interim Construction Noise Guideline* (DECC, 2009).

Figure 1-2 SEAR's Requirements for Noise and Vibration

In preparing this CNVIA, the Secretary's Environmental Assessment Requirements (SEARs), issued for the project SEAR Number 1391 on 11 August 2019, have been addressed. The key matters raised by the SEARs for consideration in the CNVIA and where this report addresses these matters are outlined in Table 1.1

Table 1-1 SEAR's and where Addressed

Requirement	Where addressed
Noise and Vibration – Including: • A description of all potential noise and vibration sources during construction, including hours of construction; and • assessment of the likely noise impacts on nearby sensitive receivers during construction in accordance with the *Interim Construction Noise Guideline* (DECC, 2009),	• Section 4 • Section 4

1.3 Assessment Objectives

This CNVIA assesses the potential impacts from the construction of the Beach to Beach Shared Pathways Project. The purpose of this CNVIA is to assess potential noise and vibration from its construction and to recommend mitigation measures where required.

The outcomes of this assessment include recommendations for potential noise and vibration mitigation and management measures designed to achieve an acceptable noise amenity for residential (dwelling) occupants and other potentially sensitive receivers surrounding the study area.

1.4 Scope

The CNVIA scope of work included

- Initial desk top review to identify key environmental noise catchment areas and noise sensitive receptors from aerial photography
- Undertake a series of attended noise measurements along the proposed pathway in the vicinity of potentially sensitive receivers
- Establish project noise and vibration goals for the construction of the project
- Identify the likely principal noise sources during construction and their potential impacts on noise receptors
- assessment of potential noise, vibration impacts associated with construction, of the project

- provide recommendations for feasible and reasonable noise and vibration mitigation and management measures, where noise or vibration objectives may be exceeded

1.5 Relevant Guidelines

The relevant policies and guidelines for noise and vibration assessments in NSW that have been considered during the preparation of this NVIA include:

- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change, 2009
- Assessing Vibration: A Technical Guideline, Department of Environment and Conservation (DEC), 2006
- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration 1993
- DIN 4150: Part 3-1999 Structural vibration – Effects of vibration on structures 1999
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority (EPA), 2017.

1.6 Limitations

The purpose of this report is to provide an independent noise and vibration assessment for the project.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

To establish background noise levels, attended measurements to collect background and ambient noise levels were conducted at Sections D3, D5, D8, D10 and D11 on 10 February 2021 to quantify the acoustic environment. The locations selected were considered indicative of the local ambient noise environment.

Measurements were conducted using a RION NL-42 Sound Level Meter with Type 2 Precision. 15-minute measurements were undertaken for the Daytime time Periods as it is understood the construction will be undertaken during standard construction hours. The attended noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, "Acoustics – Description and Measurement of Environmental Noise" and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

During site visits it was noted that existing road traffic, distant road traffic, and natural wildlife primarily described the ambient noise environment and is indicative of a sub-urban noise environment. The attended measurements were undertaken during calm conditions.

The following figures show the attended monitoring locations.



Figure 2-1 D3 Monitoring Location 27 Bay Street



Figure 2-2 D5 Monitoring Location 34 The Boulevard



Figure 2-3 D8 Monitoring Location Corner of Bell Street and Camden Head Road



Figure 2-4 D10 Monitoring Location Northern End of Camden Head Road

The LA90 descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 per cent of the time over a relevant period of measurement. The LA90 descriptor is used to establish the Rating Background Noise Level (RBL). The RBL has been calculated, according to the procedures described in the EPA's NPfI and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures." The LAeq is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Logged data was reviewed and filtered to exclude any extraneous data results during the monitoring period. The Rating Background Levels (RBL) and ambient levels (LAeq) are provided in Table 2.1.

Table 2-1 Noise Monitoring Results

Location	Noise Period	Noise Level		Noise Sources
		L_{Aeq}	L_{A90}	
D3	10/02/2021 2:10pm – 2:25pm	62	40	Steady road traffic, wildlife noise
D5	10/02/2021 1:45pm – 2:00pm	54	38	road traffic, wildlife noise
D8	10/02/2021 12:10pm – 2:25pm	68	44	Steady road traffic, wildlife noise
D10/11	10/02/2021 12:40pm – 12:55pm	55	36	road traffic, wildlife noise

During site inspections the D10 monitoring location was considered representative of the D11 area. Additionally, D11 consists of commercial receptors and no residential receptors.

3. Noise and Vibration Objectives

3.1 Construction Noise

Construction noise is assessed with consideration to DECCW *Interim Construction Noise Guidelines* (ICNG) (July 2009). The INCG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 2.

Table 3-1 ICNG Recommended Construction Hours

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 3.3.

Table 3-2 ICNG Noise Guidelines at Receivers

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
industrial premises (external)	75 dB(A)

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences).
- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

It is understood construction is planned for standard hours. Based on the above and the RBL's determined from site monitoring, construction noise management levels have been derived, as shown in Table 3.3.

Table 3-3 ICNG Noise Trigger Levels Leq(15min) dB(A)

Receiver	Within Recommended Standard Hours
D3 Residential	50
D5 Residential	48
D8 Residential	54
D10 Residential	46

3.2 Road Noise

The NSW Road Noise Policy (RNP) recommends various criteria for different road developments and uses. Based on the definitions in the RNP, Camden Head Road is considered a local road. Table 3 of the RNP provides guidance for establishing road traffic noise assessment criteria for residential land uses.

Road noise goals based on Table 3 of the NSW Road Noise Policy are provided in Table 3.4 below.

Table 3-4 Road Noise Goals

Situation	Day 7 am to 10 pm	Night 10 pm to 7 am
Land use development with potential to create additional traffic on Local Roads (external)	55 $L_{Aeq(1\ hour)}$	50 $L_{Aeq\ (1\ hour)}$

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by construction activities and or land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'. Site construction traffic will have blended in with local traffic by the time it goes past the nearest sensitive receivers. To increase noise levels by 2dB(A) one would have to increase the cumulative traffic volume by 60%. The amount of additional construction traffic on the road network is negligible and will not increase overall traffic noise levels on the surrounding road network. Therefore, compliance is expected and not considered further in this report.

3.3 Vibration Guidelines

3.3.1 Human Exposure

Vibration goals the were sourced from the DECCW's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472–1992, *Evaluation of human exposure to vibration in buildings (1–80 Hz).*

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

The preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 3.5 for the applicable receivers.

Table 3-5 Preferred and Maximum Levels for Human Comfort

Location	Assessment Period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14

Note 1 Daytime is 7:00am to 10:00pm and Night-time is 10:00pm to 7:00am

The acceptable vibration dose values (VDV) for intermittent vibration are defined in Table 2.4 of the guideline and are reproduced in Table 7 for the applicable receiver type.

Table 3-6 Acceptable Vibration Dose Values for Intermittent Vibration (m/s1.75)

Location	Daytime [2]		Night-time [2]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas [3]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Note 2 Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00: and
Note 3 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be needed to assess intermittent values against the continuous or impulsive criteria for critical areas.

3.3.2 Building Damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to the following International Standards and Guidelines:

- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration
- German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: *Effects of vibration on structures*.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any damage may occur are presented in Table 3.7 for DIN 4150-3: 1999-02 and Table 3.8 for BS7385.2 – 1993.

Table 3-7 DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz*	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20-40	40-50	40
Dwellings and buildings of similar design and/or occupancy	5	5-15	15-20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 4 At frequencies above 100Hz, the values given in this column may be used as minimum values

Table 3-8 BS7385.2 Transient Vibration Guideline Values for Potential building - Cosmetic Damage

Building Type[6]	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz[5]	15 Hz and above[5]
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 5 Values referred to are at the base of the building: and
Note 6 For transient vibration effecting unreinforced or light framed structures at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from vibration on the broader community is not typically expected. Vibration during works is considered an intermittent source associated with two main types of impact: disturbance at

receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

4. Assessment of Potential Impacts

4.1 Construction Noise

Construction can occur in the vicinity of residences or other sensitive land uses and be variable in times of occurrence. These aspects of construction can exacerbate noise levels and their effects. Construction noise by its nature is temporary, may not be amenable to purpose-built noise control measures applied to industrial processes, and may move as construction progresses. With these constraints in mind, The ICNG was developed to focus on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to protect much of residences and other sensitive land uses from noise pollution most of the time.

Noise Generating Equipment

It is understood any construction activities would be undertaken during standard hours. Plant and equipment needed for the proposal would be determined during the construction planning phase. Likely equipment including typical sound levels are summarised in Table 4.1. Noise level data has been obtained from AS2436, the RMS Construction Noise Estimator and RAPT Consulting internal database. Other equipment may be used however it is anticipated that they would produce similar noise emissions.

Table 4-1 Typical Construction Item Sound Power Levels

Plant and Equipment	Estimated % of use in 15 minutes[1]	Typical Sound Power Level dB(A)
Construction Compounds		
Light Vehicle	50	108
Power Generator	100	103
Compressor	50	109
Welding Equipment	50	105
Construction Operations		
Excavator	50	110
Front End Loader	50	112
Light Vehicles	50	108
Smooth Drum Roller	50	107
Backhoe	50	111
Compactor	50	106
Dump Truck	50	110
Asphalt Truck	50	103

Note 7 The sound power levels for the individual plant items are worst-case levels representative of the equipment operating at maximum capacity. In practice, not all plant items would operate at maximum capacity at the same time and therefore the estimated usage has been adjusted to reflect this. This adjustment is consistent with RAPT Consulting experience on similar projects.

Construction Operations

Acoustic modelling was undertaken using Bruel and Kjaer's "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Construction noise levels have been predicted based on the potential construction noise levels provided in Table 4.1. These noise levels represent different equipment noise levels and give an idea how noise levels may change across the proposal area with different activities being undertaken.

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

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

In addition, construction machinery would likely move about the study area, variously altering the directivity of the noise source with respect to individual receivers and their distances. Noise levels at sensitive receivers can be significantly lower than the worst-case scenario when the construction works move to a more distant location in the work area. An example of this is shown in Figure 4.1.

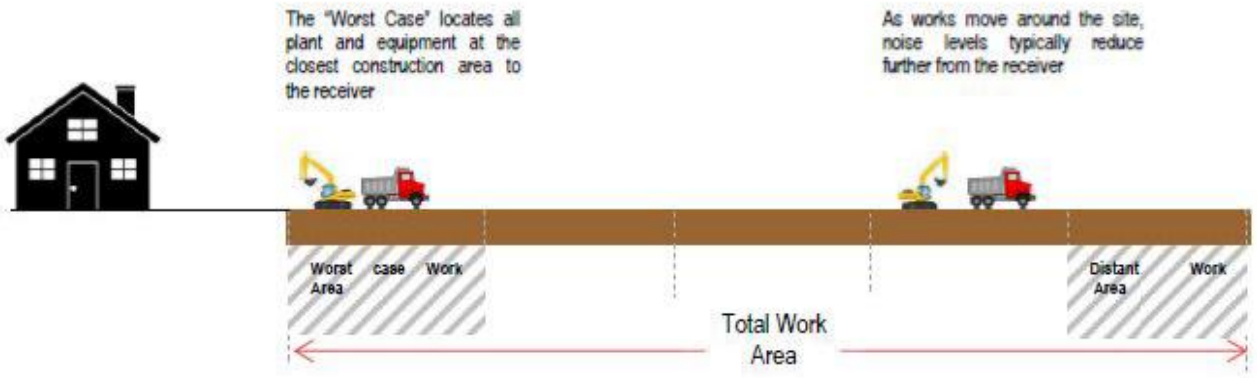


Figure 4-1 Example of Differing Work Areas

During any given period, the machinery items to be used in the study 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. Therefore, the modelled construction noise results are considered to represent a worst-case scenario. Four scenarios were assessed, D3, D5, D8 and D10/11. These scenarios also demonstrate how received noise levels can change due to location of construction activity.

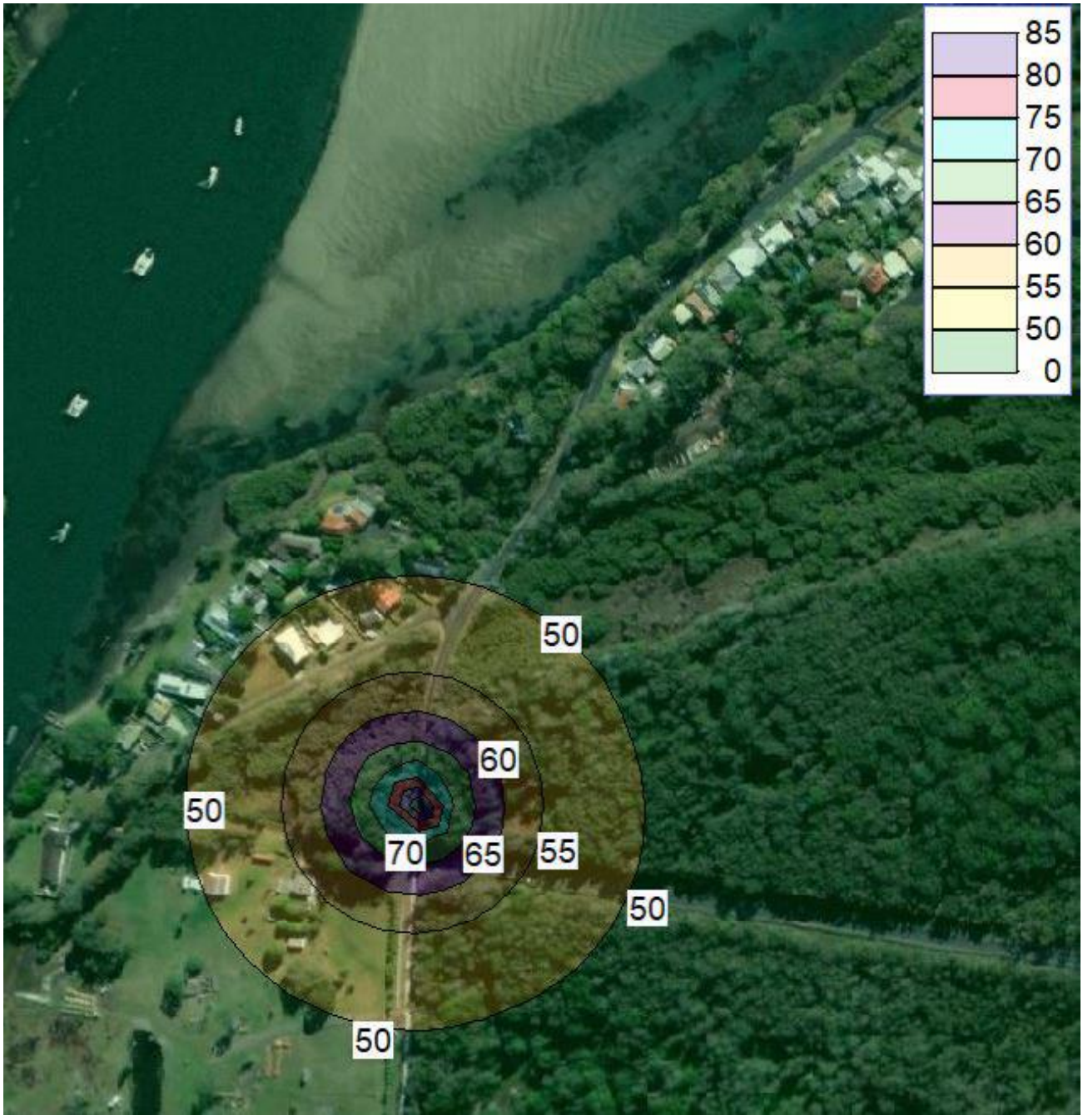


Figure 4-2 D3 Scenario 1 dB(A) Leq(15min)

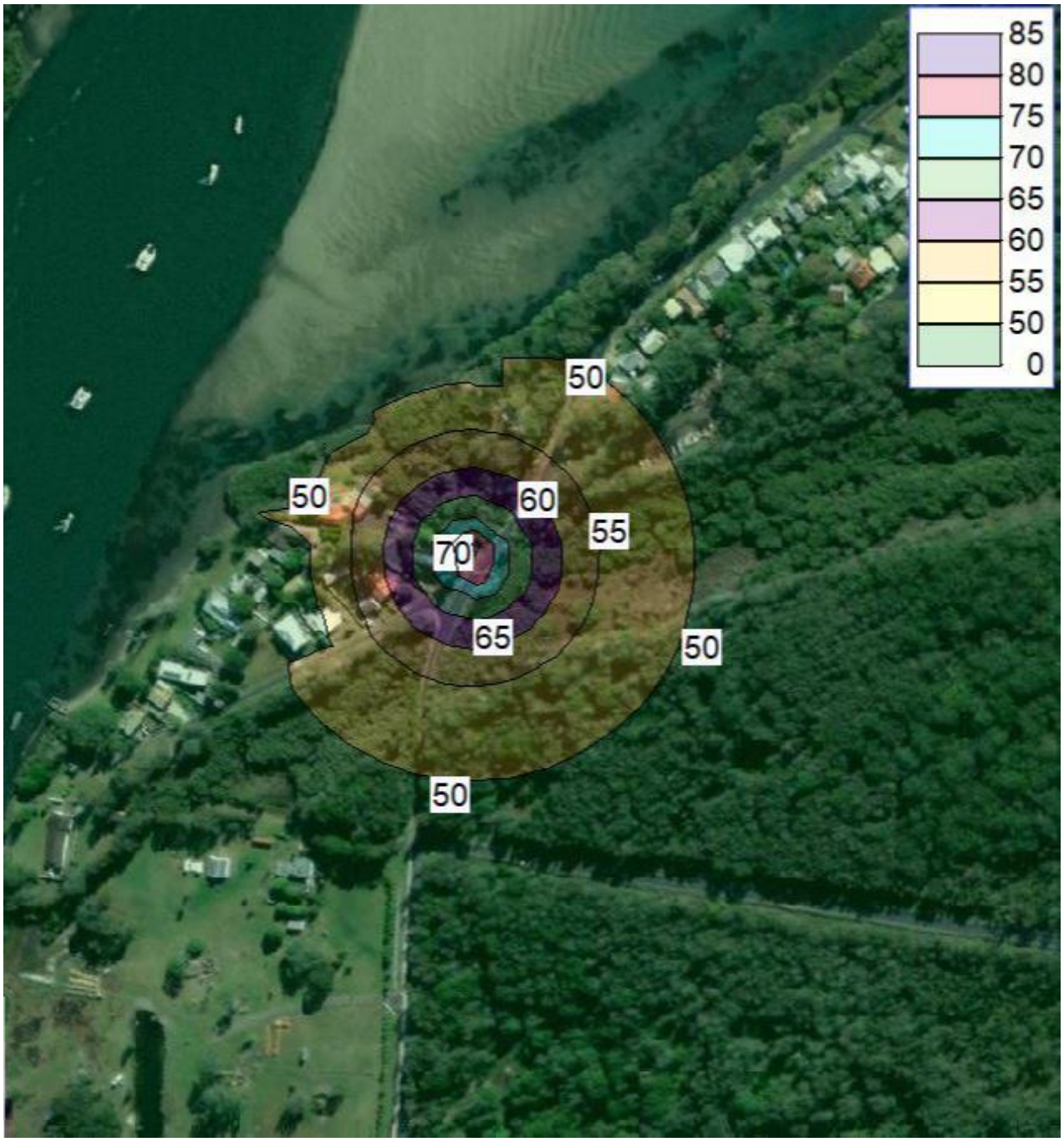


Figure 4-3 D3 Scenario 2 dB(A) Leq(15min)

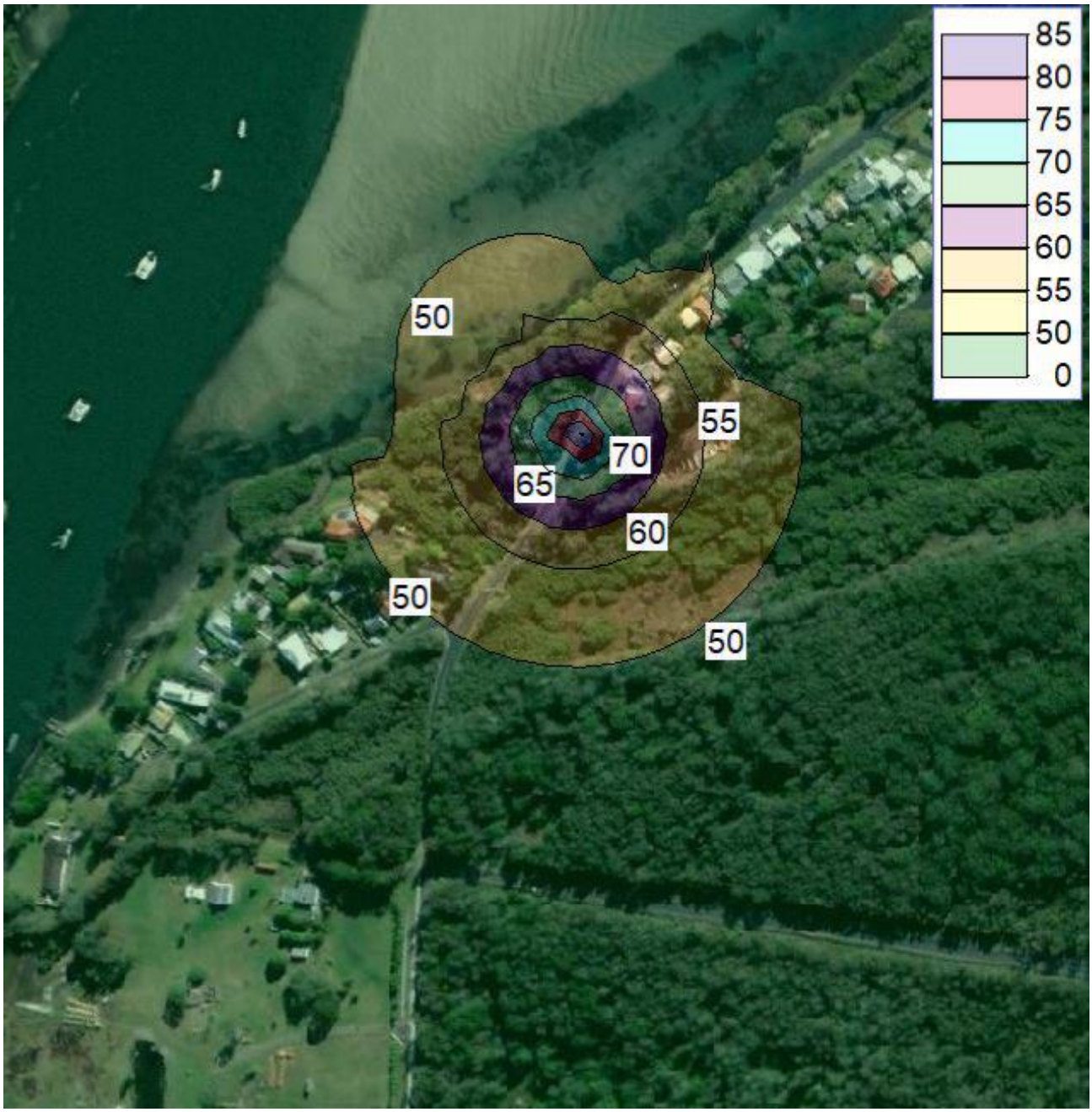


Figure 4-4 D3 Scenario 3 dB(A) Leq(15min)



Figure 4-5 D5 Scenario 1 dB(A) Leq(15min)



Figure 4-6 D5 Scenario 2 dB(A) Leq(15min)

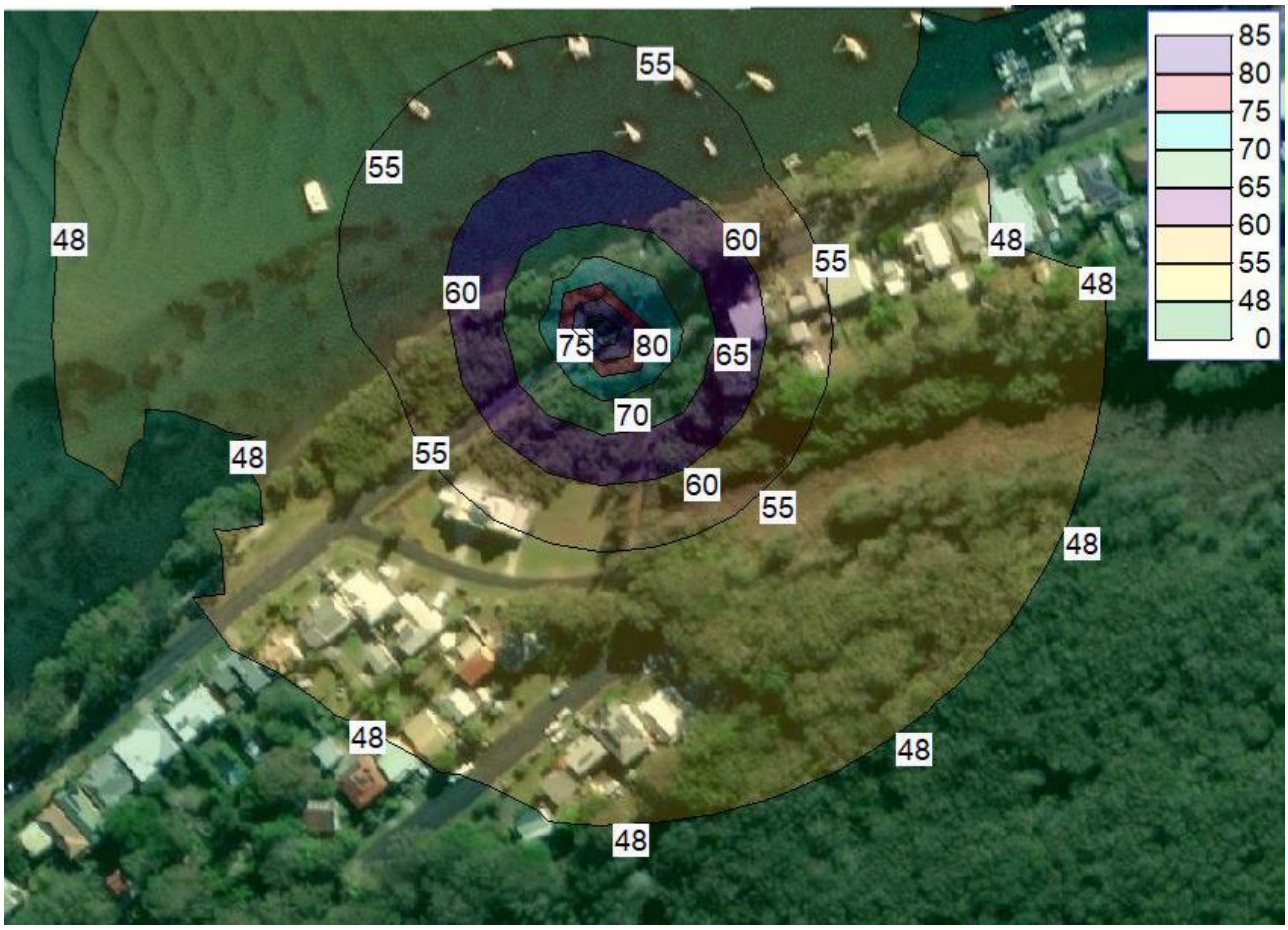


Figure 4-7 D5 Scenario 3 dB(A) Leq(15min)



Figure 4-8 D8 Scenario 1 dB(A) Leq(15min)



Figure 4-9 D8 Scenario 2 dB(A) Leq(15min)



Figure 4-10 D8 Scenario 3 dB(A) Leq(15min)

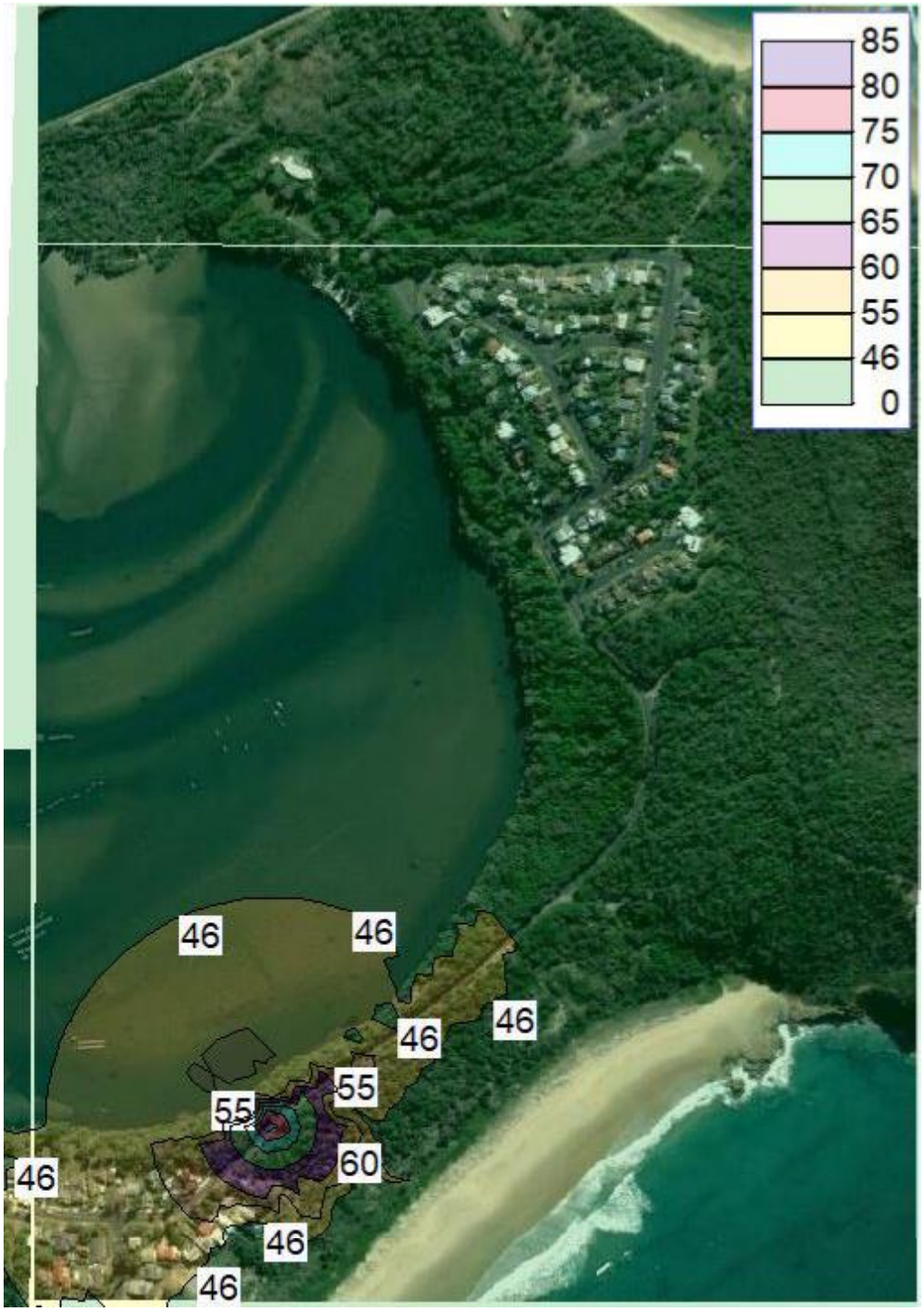


Figure 4-11 D10_11 Scenario 1 dB(A) Leq(15min)

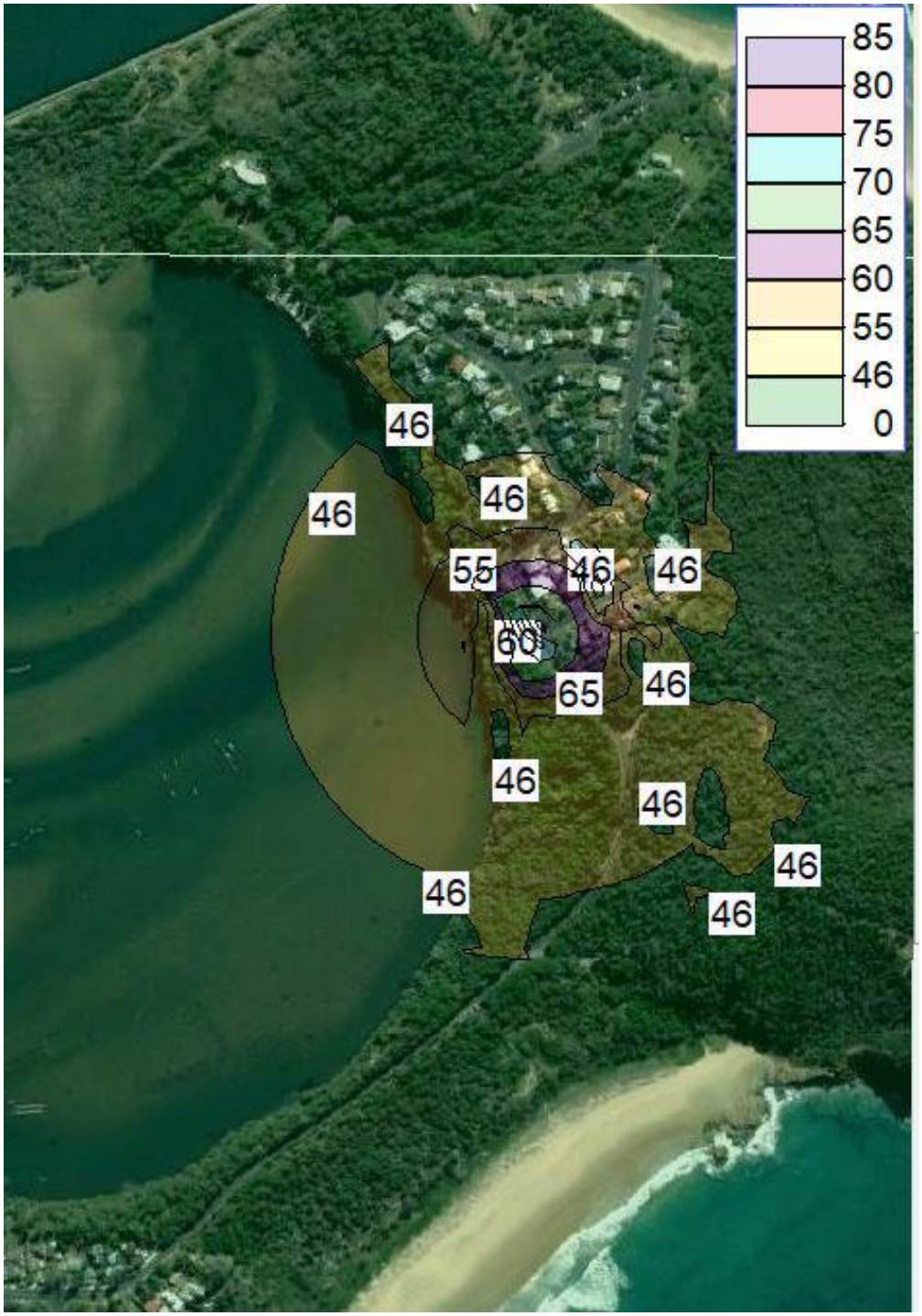


Figure 4-12 D10_11 Scenario 2 dB(A) Leq(15min)

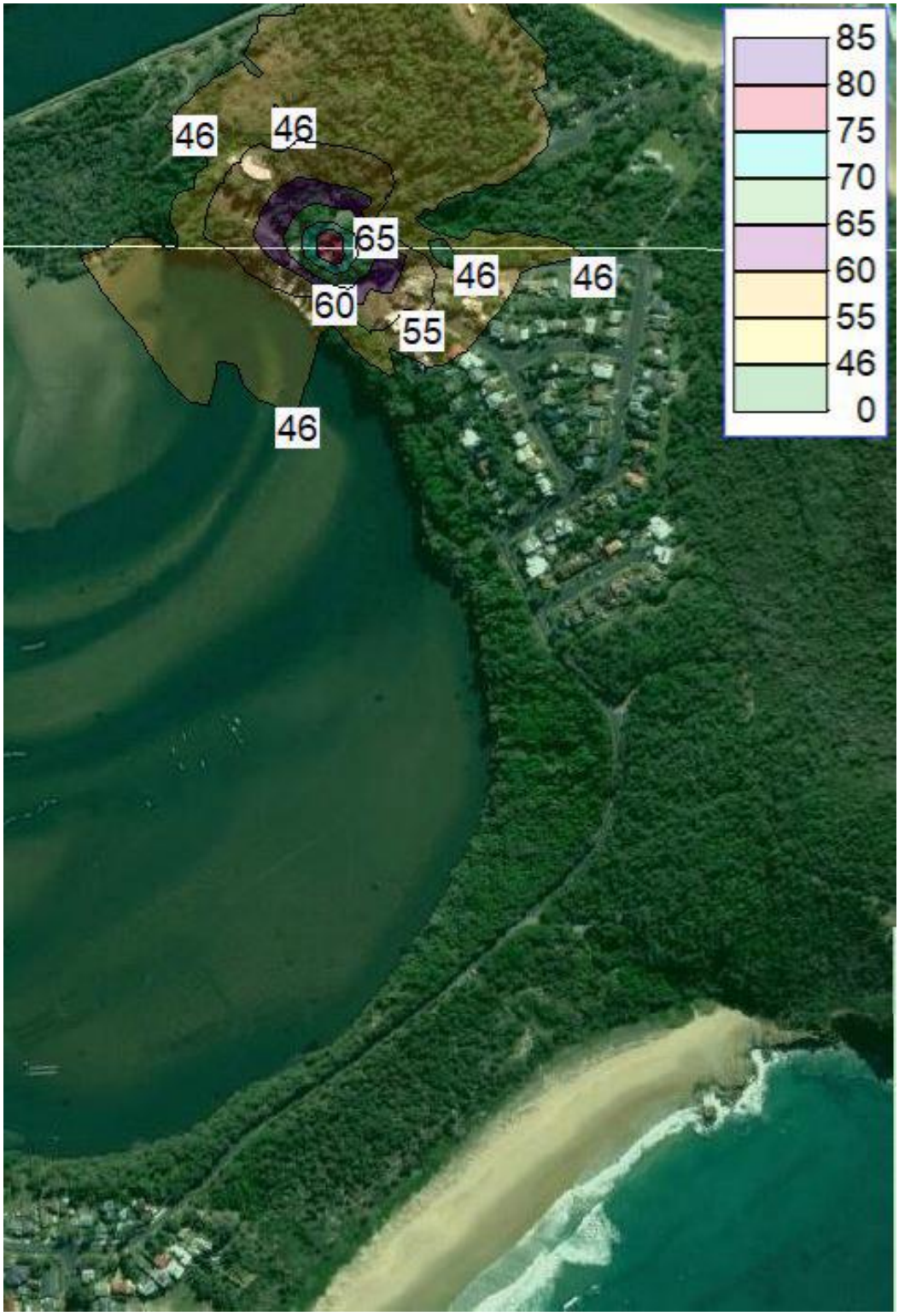


Figure 4-13 D10_11 Scenario 3 dB(A) Leq(15min)

The proposed construction compound locations are shown in Figure 4-14.



Figure 4-14 Proposed Construction Compound Locations (Source: KBR)

Construction compound modelled results are shown in Figures 4-15 – 4-18.



Figure 4-15 Compound 1 Results dB(A) Leq(15min)



Figure 4-16 Compound 2 Results dB(A) Leq(15min)

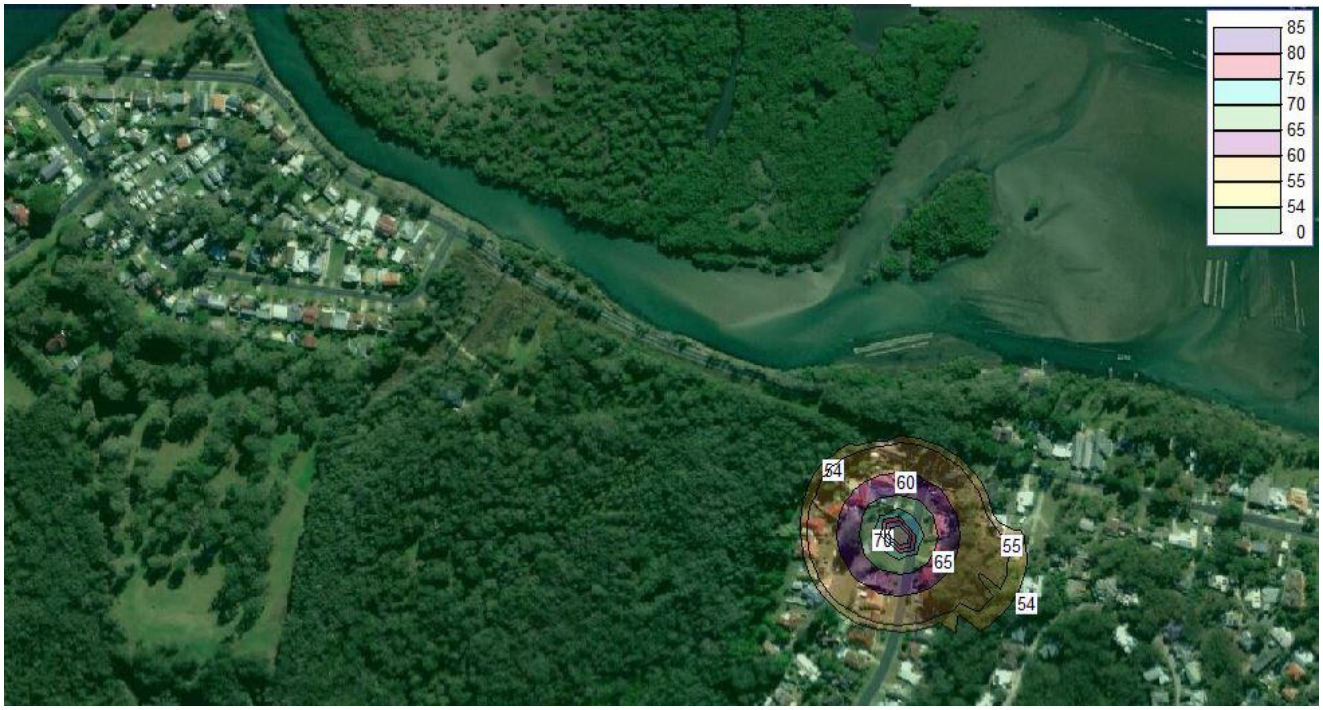


Figure 4-17 Compound 3 Results dB(A) Leq(15min)



Figure 4-18 Compoud 4 Results dB(A) Leq(15min)

The results of the construction assessment indicate NML's can be met in most situations however, there is the potential to be exceeded particularly for when construction activities are taking place in close proximity to residences. However, the highly affected noise level is expected to be complied with. Additionally, NML's for offices and retail outlets and other industries is expected to be complied with. While NML's can be achieved in most cases for residential, office and retail outlets, and industrial receivers, there is a risk for NML's to be exceeded depending on work activities and locations. With this in mind it is recommended a construction noise and vibration management plan be implemented as part of the proposal to minimise the risk of adverse noise emanating upon the community.

4.2 Construction Vibration

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design

(e.g. dimensions, materials, type and quality of construction and footing conditions). The intensity, duration, frequency content and number of occurrences of vibration, are all important aspects in both the annoyances caused and the strains induced in structures.

Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive, reciprocating, rolling or rotating equipment).
- The Frequency content.
- The impact medium stiffness.
- The type of wave (surface or body).
- The ground type and topography.

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data.

Based on information provided, piling or hammering is not expected. However, if this is to occur, it is recommended this activity does not exceed the small hydraulic hammer specification. Additionally, vibratory rolling is recommended to not exceed the <50 kN (1-2 tonne) specification when in close proximity to the nearest residences. .

Ground Vibration – Minimum Working Distances from Sensitive Receivers

The Transport for NSW CNVS provides guidance for minimum working distances. As a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant are listed in Table 4-2. The minimum distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer DECC’s Assessing Vibration - a technical guideline). DIN 4150 has criteria of particular reference for heritage structures. The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

Table 4-2 Recommended Minimum Safe Working Distances for Vibration Intensive Plant from Sensitive Receiver

Plant Item	Rating / Description	Minimum Distance Cosmetic Damage		Minimum Distance Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1-2 tonne)	5m	11m	15m to 20m
	<100 kN (2-4 tonne)	6m	13m	20m
	<200 kN (4-6 tonne)	12m	15m	40m
	<300kN (7-13 tonne)	15m	31m	100m
	>300kN (13-18 tonne)	20m	40m	100m
	>300kN (>18 tonne)	25m	50m	100m
Small Hydraulic Hammer	300kg (5 to 12 t excavator)	2m	5m	7m
Medium Hydraulic Hammer	900kg (12 to 18 t excavator)	7m	15m	23m
Large Hydraulic Hammer	1600kg (18 to 34 t excavator)	22m	44m	73m
Vibratory Pile Driver	Sheet Piles	2m to 20m	5m to 40m	20m
Pile Boring	≤ 800mm	2m (nominal)	5m	4m
Jack Hammer	Hand Held	1m (nominal)	3m	2m

Given the proximity of nearest residential receptors from the proposal, where vibratory rollers are proposed it is recommended <50 kN (1-2 tonne) be utilised. Additionally, if hydraulic hammering were to occur, it is recommended no larger than small 300kg (5 to 12t excavator) be utilised.

4.3 Construction Noise and Vibration Management Plan

A Construction Noise and Vibration Management Plan (CNVMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The CNVMP would provide the framework for the management of all

potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.3.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures should be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least 1 week prior to the commencement of works.
- Consultation and communication between the site and neighbours to the site would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.
- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.
- High noise generating activities such as jack hammering should only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
- Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.
- Equipment which is used intermittently should be shut down when not in use.

- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- To minimise heavy equipment handling noise, material stockpiles should be located as far as possible from the nearest receptors
- Loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

Complaints handling

Noise and vibration monitoring should be undertaken upon receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.

- If valid noise and/or vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.
- Any noise and/or vibration monitoring should be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and/or vibration monitoring should be undertaken upon receipt of a noise and/or vibration complaint. Monitoring should be undertaken and reported within a timely manner (say 3 to 5 working days). If exceedance is detected, the situation should be reviewed to identify means to reduce the impact to acceptable levels.

5. Conclusion

This CNVIA assessment has been undertaken by RAPT Consulting for KBR as part of an Environmental Impact Statement (EIS) for the Construction of a proposed public shared pathway between North Haven Beach and Pilot Beach in Dunbogan NSW.

Given the distance to nearest receptors, the assumptions made in the assessment and the nature of the construction works, it is expected that construction noise can comply with adopted noise NML's in most situations. However, there are circumstances where NML's have the potential to be exceeded. Therefore, a standard set of construction noise management measures has been provided to deal with the unlikely event of any noise issues. It is believed through the implementation of a CNVMP unlikely noise issues can be managed and mitigated to ensure construction noise is minimised to achieve noise management levels for the proposal.

Appendix J

Visual Impact Assessment

Beach to Beach

Visual Impact Assessment



Beach to Beach

Visual Impact Assessment

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Acknowledgments

KBR acknowledges the Traditional Custodians throughout Australia and their continuing connection to land, water, culture, and community, and pays respect to their Elders past, and present.

Limitations Statement

The sole purpose of this report and the associated services performed by Kellogg Brown & Root Pty Ltd (KBR) is to **provide a visual impact assessment** in accordance with the scope of services set out in the contract between KBR and **Port Macquarie-Hastings Council** ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

This assessment report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the provisions of the agreement between KBR and the Client. KBR accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Revision History

Revision	Date	Comment	Signatures			
			Originated by	Checked by	Technical Approval	Project Approval
0	03/11/21	Issued for Use	J Lee	C Sammoun	K Grinlaubs	L July
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Term	Definition
CEMP	Construction Environment Management Plan
EAR	Environment Assessment Report
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
ER	Environment Report
EPBC Act	Environment Protection and Biodiversity Act 1999
ESD	Ecological Sustainable Development
KBR	Kellogg Brown & Root Pty Ltd
MNES	Matters of National Environmental Significance

1 Introduction

1.1 SITE AND CONTEXT

The proposal is a community and Council led development creating an 11km shared user pathway (SUP). The SUP is designed for pedestrian and cyclists. The proposal site is located within the boundaries of Port Macquarie Hastings Council Local Government Area and is approximately 30 km south of Port Macquarie township in the suburbs of connect North Haven, Camden Haven, Laurieton and Dunbogan.

The proposal consists of the completion of the remaining five pathway alignment sections which make up a total of 2.9km of the 11km SUP. The five sections are outlined as follows:

Pathway Section D3

The 360m alignment is located in Dunbogan, directly east of Camden Haven Inlet and runs in an almost south to north direction. The alignment begins adjacent to the south of The Boulevarde and Scarborough Way intersection, traverses the unsealed Scarborough Way and curves into a low-lying inter-tidal estuarine landscape on the western side of The Boulevarde. The alignment exits the low-lying area at Bay Street and continues along the northbound shoulder of The Boulevarde for approximately 220 m to the existing pathway at D4. The topography of the alignment is relatively flat, and level and a boardwalk will be utilised, allowing the SUP to have minimal change to the existing natural surface.



Figure 1-1 Pathway Section D3

Pathway Section D5

The 160m alignment is located in Dunbogan and runs in a southwest to northeast direction. The alignment is a raised boardwalk and viewing platform over the estuary (Camden Head Inlet). The large water body of Camden Head Inlet hosts a range of recreational activities by local residents and tourists, which pathway section D5 traverses. It starts at the end of D4 SUP on the western side of The Boulevarde just before the intersection of Longworth Road. The proposed alignment merges into an existing D6 SUP located to the west of The Boulevarde and Longworth Road intersection. The boardwalk is proposed to increase views of the Camden Haven Inlet and aesthetics of the pathway along the route.



Figure 1-2 Pathway Section D5

Pathway Section D8

The 800m alignment is located along Camden Head Road, parallel to Gogleys Creek which flows into Gogleys Lagoon. The alignment runs in a northwest to southeast direction and begins at the end of D7 SUP on the eastern side of the park/boat ramp area where Dunbogan Jubilee Hall is located. The pathway crosses the one-way exit road used for accessing the boat ramp and the park, traverses along the northern side of the carriageway (Camden Head Road) and merges into the existing (D8-D9 tie-in) pathway to the east of Camden Head Road and Scarborough Way intersection.



Figure 1-3 Pathway Section D8 (ch0 – ch380)



Figure 1-4 Pathway Section D8 (ch390 – ch843)

Pathway Section D10

The 1,500m alignment comprises sections of pavement and boardwalk in Dunbogan and Camden Head, and traverses along the western side of the carriageway (Camden Head Road). The SUP starts at the end of the existing D9, approximately 120m northeast of the intersection with Seaview Avenue. The SUP runs along the north western side of Camden Head Road and tracks along an existing unsealed access track for approximately 145 metres until it re-emerges with Camden Head Road and continues until the intersection with Bergalia Crescent. The pathway continues along past an existing sewer pump station and ends just before the Camden Head and Pilot Beach Roads intersection.

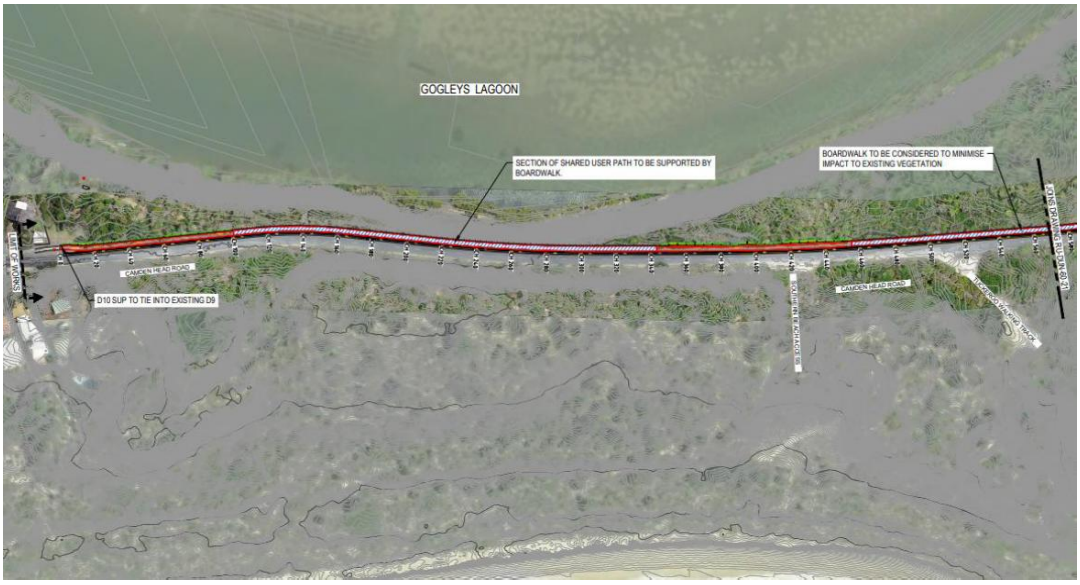


Figure 1-5 Pathway Section D10 (ch0 – ch580)

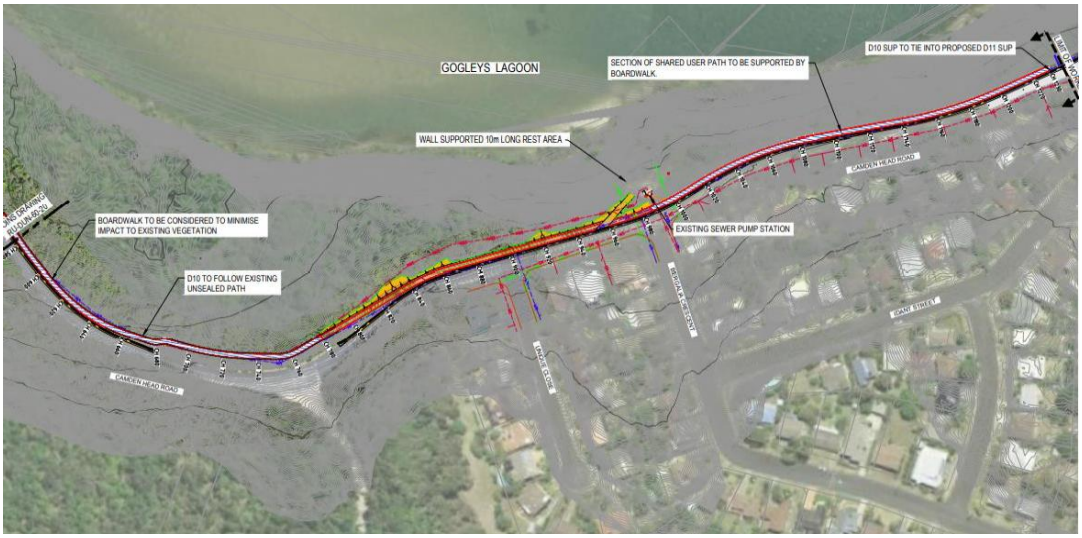


Figure 1-6 Pathway Section D10 (ch580 – ch1230)

Pathway Section D11

The 700m alignment is located in Camden Head, starting at the end of the new D10 and tracks along the western edge of Pilot Beach Road, crossing an existing unsealed road used to access the Camden Haven Oyster Supply Sheds and a 'second' unsealed access road. The SUP follows Pilot Beach Road along the northern edge of the carriageway, and crosses the road leading to Camden Head breakwall path and the breakwall access road. The SUP terminates at the breakwall.



Figure 1-7 Pathway Section D11

1.2 SUMMARY OF DEVELOPMENT

The proposal is a community-based project that aims to deliver an 11 kms of un-interrupted footpath/cycleway (SUP) between North Haven and Camden Haven (Pilot Beach). The overall project has been driven by community groups and Council commencing in 2013 and is currently at the final stages of the development. These final five sections (D3, D5, D8 D10, D11) are set to connect the previously developed sections of the overall project. The goals of the development are to:

- Create a shared pathway for all to enjoy.
- Encourage safe pedestrian and bicycle access around the community.
- Promote healthy lifestyles.
- Attract cycle related tourism.

As noted above the proposal pertains to SUP sections: D3, D5, D8, D10 and D11. The development is generally located along the edge of the existing roads. The proposal is to be constructed at-grade and a range of designs including pavements and built boardwalks, thus allowing the SUP to have minimal change to the existing natural edge surface and suitable grade for users.

At D5, the proposed development comprises a boardwalk connecting existing sections (D4 and D6 tie-ins) and viewing platform/rest area over the estuary (Camden Haven Inlet). An emphasis on the visual impact of pathway section D5 (in this report) is based on the location of which pathway section D5 traverses and the proposed boardwalk is a man-made recreational space (structure) that will be utilised as part of a coastal walkway in the natural environment.

2 Landscape Character and Visual Environment

This section describes the landscape characteristics and visual environment of the SUP sections. Section D5 is discussed separately in Section 0 based on the high visual sensitivity observed – the pathway section is most visible from urban and rural residences and recreational areas.

2.1 EXISTING LANDSCAPE CHARACTER

The four main categories listed (below) summarises the dominant characteristics of the respective SUP section(s) landscape.

2.1.1 Sections D3, D8, D10 and D11 – Overview

Built form

- D3 – Northern portion of the site comprised a row of residential properties (from the intersection of Bay Street and along The Boulevarde).
- D8 – In the first half of the pathway section, Dunbogan Jubilee Hall and residential properties are located to the west, and along Camden Head Road to the south of the site, respectively. Residential properties are observed towards the end of the (close to the intersection of Camden Head Road and Scarborough Way).
- D10 – Residential properties (houses) to the south and along Camden Head Road in the second half of the SUP section
- D11 - No buildings observed except for a few sheds and public toilets adjacent to the east of Camden Head Breakwall Access Road.

Natural topography

- D3 - The natural topography of the land is relatively flat and low-lying.
- D8 – The natural topography of the land is relatively flat and low-lying.
- D10 – The land is relatively flat in the first half and gradually increases in elevation (along Camden Head Road) in the second half of the SUP section. The elevation increases as it moves from the shore heading east (towards the residential areas). Residents from this increased elevation have greater views of the water but are still compromised by the vegetation on the shoreline.
- D11 – The natural topography of the land is hilly and steep.

Vegetation

- D3 – The SUP section traverses coastal wetland surrounded by remnant trees before crossing Bay Street.

- D8 – From the end of D7 the SUP section (between Camden Haven Inlet and Camden Head Road) runs adjacent to remnant native vegetation and trees, followed by a section of coastal saltmarsh and estuarine mangrove forest. The SUP section closer to the start of D9 traverses along the edge of a forest (vegetation and tall trees).
- D10 – Around the SUP section are segments of dense vegetation described as coastal sand tea-tree, rainforest and estuarine mangrove forests.
- D11 – The SUP section continues from the end of the D10 SUP in surrounded by rainforest and swamp oak forests to the corner of Camden Head Road and the breakwall access road. Remnant trees are observed on the eastern portion of the access road.

Waterway

- D3 – The SUP section is located to the east of the water body (Camden Haven Inlet).
- D8 – The SUP section is generally along the shoreline of Gogleys Lagoon.
- D10 – The SUP section is generally along the shoreline of Gogleys Lagoon.
- D11 – The SUP traverses inland (wetland) along Camden Head Road, and ends in Pilot Beach.

2.2 EXISTING VISUAL ENVIRONMENT

This section shows the existing environment of respective pathway section(s) landscape.

2.2.1 Sections D3, D8, D10 and D11

A site visit was undertaken on 22 January 2021 and Table 2-1 is a photograph log of pathway sections D3, D8, D10 and D11. Visual assessment of the respective pathway sections is discussed, as follows:

Section D3

The visual impact for this view is considered low. The view of the boardwalk in the low-lying inter-tidal estuarine area will not be visible from The Boulevarde. The pathway continues from Bay Street and along the northbound shoulder of The Boulevarde is anticipated to have a low visual impact to occur, and the D3-D4 pathway (tie-in) is obstructed by the mature vegetation, thus will not be visible from the carriageway.

During construction, the visual impact will include construction fencing and materials on the site. Construction vehicles will use Scarborough Way and Bay Street to park and unload materials. This will obstruct some existing views of the vegetation along the carriageway.

Post construction there will be minor changes made to the existing space. The vegetation in the low-lying inter-tidal estuarine area will block any views of the boardwalk, and connecting concrete pavement and boardwalk will be seen along The Boulevarde to the D3-D4 pathway (tie-in).

The sensitivity of this view is low. This is due to the minimal or no change being made to this existing views. The receptors of this view will be motor vehicles, pedestrians and residents. These views will be frequent and brief.

Section D8

The visual impact for this view is considered low. The view of the boardwalk and connecting concrete pavement with barrier fence along the verge of Camden Head Road is anticipated to have a low visual impact to occur. Disruption to the area (road verge) will only occur through the construction phase. Minimal tree/ vegetation removal is anticipated, therefore leaving the natural view in the same state post development. No significant permanent changes visible from the

carriageway at the D7-D8 pathway (tie-in) on the eastern side of the park/boat ramp area where Dunbogan Jubilee Hall, and D8-D9 pathway (tie-in).

During construction, the visual impact will include construction fencing and materials on the site. Construction vehicles will use the shoulder of Camden Head Road to park and unload materials. This will obstruct some existing views of the vegetation along the carriageway.

Post construction there will be minor changes made to the existing space. The boardwalk and connecting concrete pavement of the pathway will be seen along Camden Head Road to the D8-D9 pathway (tie-in).

The sensitivity of this view is low. This is due to the minimal change being made to the existing view. The receptor of this view will be motor vehicles, pedestrians and residents. This viewing will be short but frequent from the town's main road (Camden Head Road). The magnitude is low also due to the low visibility of the project.

Section D10

The visual impact for this view is considered low. The view of the boardwalk and connecting concrete pavement with barrier fence along the verge of Camden Head Road is anticipated to have a low visual impact to occur. Disruption to the area (road verge) will only occur through the construction phase. Minimal tree/ vegetation removal is anticipated, therefore leaving the natural view in the same state post development. No significant permanent changes visible from the carriageway at the D9-D10 pathway (tie-in), similarly at the new D10-D11 pathway (tie-in).

During construction, the visual impact will include construction fencing and materials on the site. Construction vehicles will use the shoulder of Camden Head Road to park and unload materials. This will obstruct some existing views of the vegetation along the carriageway.

Post construction there will be minor changes made to the existing space. The boardwalk and connecting concrete pavement of the pathway will be seen along Camden Head Road to the new D10-D11 pathway (tie-in), except between ch670 to ch820 where the vegetation will block views of the boardwalk.

The sensitivity of this view is low. This is due to the minimal change being made to the existing view. The receptor of this view will be motor vehicles, pedestrians and residents. This viewing will be short but frequent from the town's main road (Camden Head Road). The magnitude is low also due to the low visibility of the project.

Section D11

The visual impact for this view is considered low. The view of the boardwalk and connecting concrete pavement with barrier fence along the verge of Camden Head Road/Pilot Beach Road and Breakwall Access Road is anticipated to have a low visual impact to occur. Disruption to the area (road verge) will only occur through the construction phase. Minimal tree/ vegetation removal is anticipated, therefore leaving the natural view in the same state post development. No significant permanent changes visible from the carriageway at the new D10-D11 pathway (tie-in) to the end of the alignment on Breakwall Access Road.

During construction, the visual impact will include construction fencing and materials on the site. Construction vehicles will use the shoulder of Pilot Beach Road, Breakwall Access Road and visitors' park area to park and unload materials. This will obstruct some existing views of the vegetation along Pilot Beach Road.

Post construction there will be minor changes made to the existing space. The boardwalk and connecting concrete pavement of the pathway will be seen on Pilot Beach Road along the northern edge of the carriageway, which crosses the road leading to Camden Head breakwall path and the breakwall access road.

The sensitivity of this view is low. This is due to the minimal change being made to the existing view. The receptor of this view will be motor vehicles, pedestrians and residents. This viewing will be short but frequent from the town's main road (Camden Head Road). The magnitude is low also due to the low visibility of the project.

Table 2-1 Photos of Sections D3, D8, D10 and D11

<table>
<tr>
<td> 
Section D3 – Views down Bay Street where the proposed pathway will cross</td>
<td> 
Section D3 – View into the vegetation where the pathway will exit the low-lying vegetation area onto Bay Street</td>
</tr>
<tr>
<td> 
Section D3 – View along The Boulevarde towards Bay Street</td>
<td> 
Section D8 – Typical view of the environment along the D8 alignment</td>
</tr>
</table>



Section D8 – Narrower verge area of the D8 alignment



Section D8 – Area of the D8 alignment showing existing street furniture and trees. All trees to remain and street furniture to be relocated.



Section D10 - Typical view of the environment along the D10 alignment.



Section D10 – Narrower verge area of the D10 alignment



Section D10 – Narrower verge area of the D10 alignment near the existing sewer pump station



Section D11 – Narrow initial corner and verge near the area of the oyster sheds access road on the D11 alignment



Section D11 – Narrower verge area of the D11 alignment



Section D11 – View along the breakwater access road where the pathway will run along the edge within the existing park

2.3 EXISTING LANDSCAPE AND VISUAL CHARACTER – D5

The four main categories listed have been expanded as the D5 landscape environment dominated by water and mangrove vegetation is in contrast with the dominant characteristics of the pathway sections D3, D8, D10 and D11.

2.3.1 D5 overview

This section describes the existing pathway section D5. This SUP section is located on the estuary of Camden Head Inlet, which is subject to tidal influences. The shoreline comprised of mangrove vegetation. Table 2-2 presents Viewpoints 2, 3 and 4 of section D5.

Built form

To the east of the SUP section and across The Boulevarde carriageway is a large residential property. To the south of the large residential dwelling is a residential area along The Boulevarde and Longworth Road comprising of single and double storey houses. The town of Laurieton (open space recreational facility and residential properties) can be seen from across the water body of Camden Haven Inlet.

Natural topography

The natural topography of the land is relatively flat. There are small increases and decreases in the ground elevation along The Boulevard. The ground elevation increases from the shoreline towards the residential area to the south of the SUP section. Residents on higher grounds have greater views of the water but are still compromised by the vegetation on the shoreline.

Vegetation

The SUP section is on the estuarine side of the mangrove forest, which sprawls along the coastline. The dense vegetation screens the water views along the western side of The Boulevard. Larger areas of dense vegetation are observed further south of the site.

Waterway

The SUP section is proposed on the estuary of Camden Haven Inlet water body. The waters of Queens Lake, Watson Taylors Lake, Stingray Creek, creeks, and upstream tributaries connect to the waters of Camden Haven Inlet. Gogleys Creek and Gogleys Lagoon are located further east of the site.

Landmarks

A yacht club is located approximately 200m northeast of the pathway section. The nearby areas host recreational water activity. Further east there is a public park, shopping facilities, and residential areas.

Water Views

The Camden Haven Inlet accounts for the main views in both private and public space. Recreational water users experience open views to the site at water level. From water level there are views of dense vegetation extending across the shoreline which becomes scarce opening views of residential properties.

Distant and Filtered Views

The topography of the area around is relatively flat with further area increasing in elevation. Elevation that increases around the site slightly alters surrounding views, however the vegetation remains a screen for the site. Across the water body there are recreational and residential areas.

Visual Barriers

Barriers to views from residential areas

- Residential properties with potential views of the site are already screened by existing vegetation.
- Views of dwellings built on elevation are still screened by the vegetation on the site.

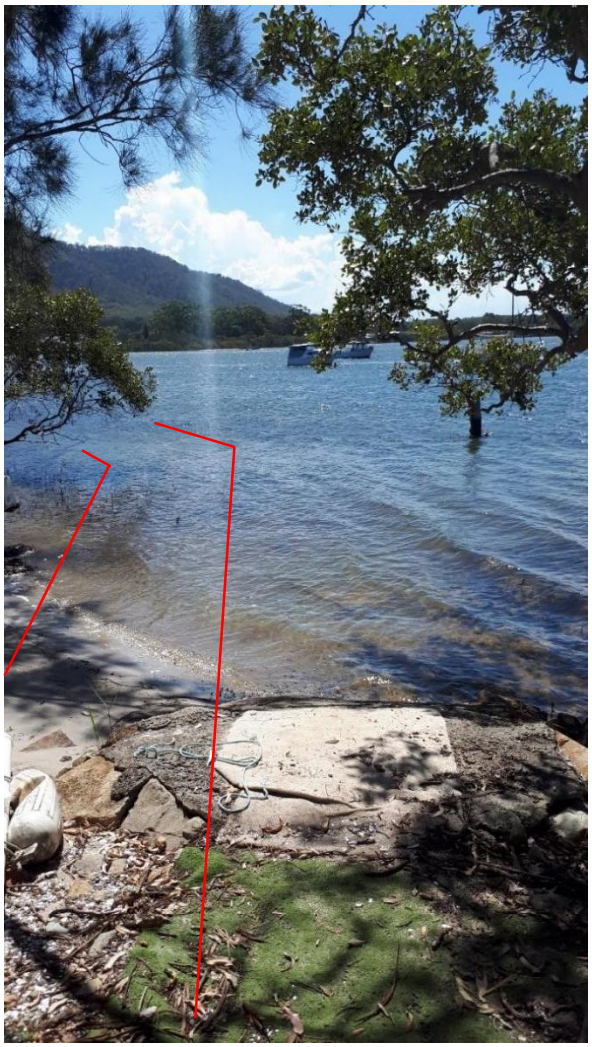
Barriers to the views from the boat shed/yacht club

- The contour of the land screens the view of the development from the boat shed
- Vegetation again provides screening to the development

Table 2-2 Photos of Landscape and Visual Character of Pathway Section D5



Viewpoint 2 – Entry point



Viewpoint 3 – Exit point of Section D5



Viewpoint 4 – View from across Camden Head Inlet (red line boardwalk location of Section D5)

3 Visual Impact Assessment

The assessment has been conducted to identify potential visual impacts from a range of sites. Views selected cover several varied viewpoints such as roads, public parks and recreation spaces, water views, close and distant views. This range of viewpoints allows for a greater analysis of potential impacts of the development due to the varied range of locations and the people that may be using them. To complete the assessment of impact on these views, methodology from Transport for NSW (TfNSW) *EIA-N04 Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment* has been drawn upon.

3.1 PLANNING PRINCIPLES

The planning principles related to VIA (derived from two key cases) was developed by the commissioners of the NSW Land and Environmental Court and will guide this assessment. This VIA will draw on planning policies derived from the cases surrounding private and public domain views, summarised as follows:

- Tenacity Consulting v Warringah Council (2004) NSWLEC 140

  The planning policy derivative of this case is to the extent and appropriateness of view impacts from private property. The planning policy is to guide the design and be practical and reasonable in the consideration of existing views. The following steps need to be taken to ensure this consideration of planning policies takes place:

  – Assess to the views to be affected
  – Consider from what part of the property the views were obtained
  – Assess the extent of the impact
  – Assess the reasonableness of the proposal that is causing the impact.

- Rose Bay Marina Pty Limited v Woollahra Municipal Council and Anor [2013] NSWLEC 1046

  The planning policies from this case refers to public domain views. A two-stages process was involved for this case.

  The first stage being the identification of the nature and scope of the view, including:

  – the nature and extent of any existing obstruction of the view;
  – relevant elements of the view;
  – what might not be in the view;
  – whether the change permanent or temporary; and
  – what might be the curtilages of important elements within the view.

  The second stage involves consideration of the court articulated (relevant) factors, including;

  – a high value is to be placed on 'iconic views';
  – a completely unobstructed view has value;

- whether any significance attached to the view is likely to be altered, and if so, who or what organisation has attributed that significance and why they have done so;
- whether the present view is regarded as desirable, and whether the change makes it less so and why;
- whether any change to whether the view is a static or dynamic, one should be regarded as positive or negative and why;
- if the view attracts the public to specific locations, why and how that attraction is likely to be impacted;
- whether any present obstruction of the view is so extensive as to render preservation of the existing view merely tokenistic;
- if the present obstruction of the view is extensive, whether the remainder warrants preservation; and
- does the insertion of some new element into the view by the proposed development alter the nature of the present view?

This report investigates the sensitivity and magnitude of the development at pathway section D5 to assess the visual impact.

- *Sensitivity* refers to the qualities of an area, the number and type of receivers and how sensitive the existing character of the setting is to the proposed nature of change.
- *Magnitude* refers to the physical scale of the project, how distant it is and the contrast it presents to the existing condition.

The matrix in Table 3-1 was referenced in this assessment to appropriately determine the visual impact from each view. Along with the rating developed, a description of influential sensitivity and magnitude factors will be provided.

Table 3-1 Landscape Character and Visual Impact Rating Matrix (TfNSW, 2020)

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Source: TfNSW (2020) EIA-N04 Environmental Impact Assessment Practice Note: Guideline for Landscape Character and Visual Impact Assessment.

3.2 VISUAL ASSESSMENT

In consideration of the high visibility of D5 landscape environment as discussed in Section 2.3, a specific visual impact assessment of the pathway section was undertaken at five (viewpoint) sites (as depicted on Figure 3-1) and at the nearby Yacht Club. These views are in both high and low traffic areas and aim to account for all possible views, specifically:

- from the public domain
- from pedestrian
- close and direct
- distant and filtered

Descriptions of the aspects for each of the viewpoints identified on Figure 3-1 are summarised below.

Figure 3-1 Viewpoints (view sites) 1 to 5

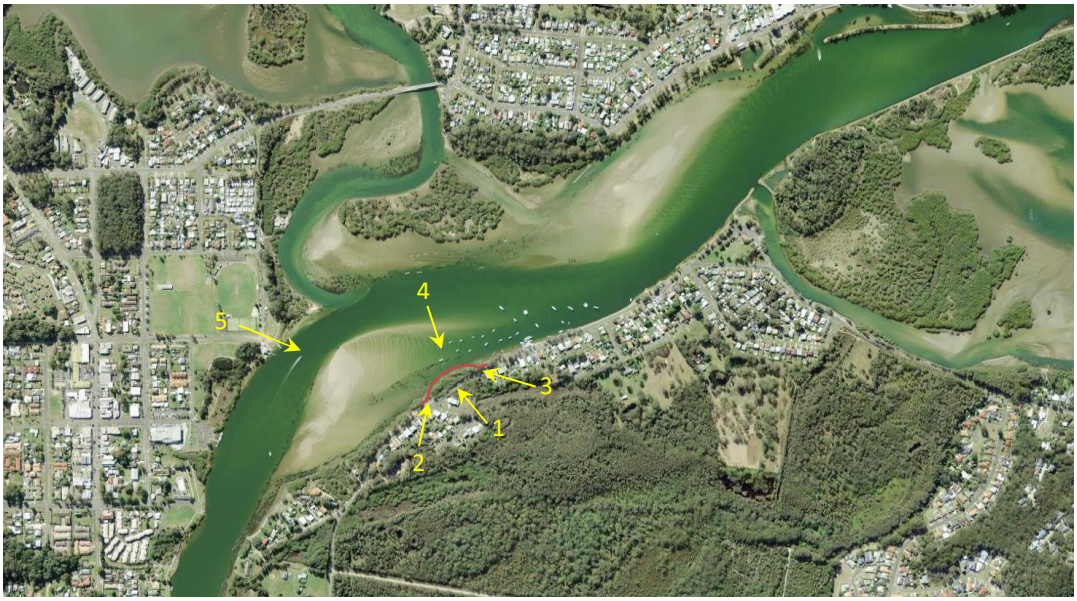


Table 3-2 Viewpoint 1

Aspect	Description
Location	The Boulevarde (road view)
Receptors	Residents, pedestrians and road users
Distance	20m
No. of Viewers	Low
Existing View	Vegetation covering the shoreline stretching back to the roadside. The vegetation is substantially tall and wide, blocking any potential water views.
Sensitivity	Low
Magnitude	Negligible
Visual Impact	Negligible
	Due to the highly obstructed view of the site because of mature vegetation, it is anticipated that a negligible visual impact will occur. During construction there will be minimal disturbance to the view of the existing vegetation. The site works will take place on the water side of the vegetation. Construction materials and vehicles will be seen to the left and right sides of this view at the entry and exit points to the boardwalk. The vegetation will however screen most of the construction site. Post construction there will be a negligible impact due to the existing vegetation that will screen the view of the structure from this location. This dense vegetation will continue to screen views of the water and the boardwalk structure. This has allowed the magnitude rating to remain low as the contrast of the boardwalk and the natural vegetation will not be seen. The sensitivity of this view is low. This is due to the minimal or no change being made to this existing views. The receptors of this view will be motor vehicles pedestrians and residents. These views will be infrequent and brief.

Table 3-3 Viewpoint 2

Aspect	Description
Location	Entrance to boardwalk (west) road view
Receptors	Motor vehicles, pedestrians, and residents
Distance	20m
No. of Viewers	Low
Existing View	The existing view from this point is vegetation along the shoreline. There are small gaps in the vegetation that allow views of the Camden Haven Inlet to be seen. Foreground views include an open grassed area.
Sensitivity	Low
Magnitude	Low
Visual Impact	Low
	The visual impact for this view is considered low. From this view the boardwalk will not be visible. No significant permanent changes will be made to the open grassed area, and disruption to this area will only occur through the construction phase. Minimal tree/vegetation removal is anticipated, therefore leaving the natural view in the same state post development. During construction the visual impact will include construction fencing, amenity blocks and materials. Construction vehicles will also use this grassed area to park and unload materials. This will obstruct existing views of the vegetation and any view of the water. Post construction there will be minor changes made to the existing space. From this view the vegetation will block any views of the boardwalk and only the connecting concrete pavement will be seen. Sensitivity of this view is low. There are no major changes being made to the area however there is a high viewing from this point. These viewings will be short but frequent from the town's main road (The Boulevarde). The magnitude is low also due to low visibility of the project even from the close viewing range.

Table 3-4 Viewpoint 3

Aspect	Description
Location	Exit from boardwalk (east) road view
Receptors	Motor vehicles, pedestrians, and residents
Distance	20m
No. of Viewers	Low
Existing View	The existing view from this point is vegetation. This vegetation is extended from the shoreline back to the roadside. Water views can be seen briefly between vegetation.
Sensitivity	Low
Magnitude	Low
Visual Impact	Low
	The visual impact for this view is considered low. From this view minimal views of boardwalk will be seen, however, the D5-D6 (pathway) tie-in will be seen. The view of the continuous pathway will be more visible with the removal of some trees.

Aspect	Description
	During construction the visual impact will include construction fencing and materials on the site. This will obstruct existing views of the vegetation and any view of the water. Post construction there will be minor visual changes to the area. Removal of vegetation is needed to connect the pathways. Removal or pruning of vegetation will increase the water views from this point however reduce the vegetation views. From this view, the boardwalk connecting the concrete pavement will be seen. Sensitivity of this view is low. There are no major changes being made to the area, however, there is a high viewing from this point. These viewings will be short but frequent from the town's main road (The Boulevarde). The magnitude is low due to low visibility of the project even from the close viewing range.

Table 3-5 Viewpoint 4

Location	Description
Location	Inlet
Receptors	Water users
Distance	70m
No. of Viewers	High
Existing View	The existing view from this point is both the water and land. The water is a distinct feature that can be seen to take up the primary of the foreground. Shoreline vegetation is also seen from this view as well as small sights of residential dwellings between vegetation gaps.
Sensitivity	High
Magnitude	High
Visual Impact	High The visual impact from this view is considered highly significant. This is associated with the development of the boardwalk structure in an open space. The boardwalk will not be obstructed by any vegetation and will not be screened, thus allowing a direct view of the structure. This view gives a clear view of the boardwalk (and viewing platform) including the associated piers and rails. During construction there would be disruptions to the view. This will include construction site works, temporary fencing, and scaffolds. Minimal vehicles and stored materials would be they would be positioned on the opposite side of the vegetation. There will be a high contrast between the natural environment and the introduction of a man-made structure. As this view is close to the shoreline, the other man-made structures in the area (residential dwellings) cannot be seen. This means the boardwalk will be the only man-made structure to be seen from this view, creating a high contrast to the existing landscape. Receptors from this view will be recreational water users. Water activities are seasonal which will lower the viewing frequency in the off season. Viewing will heighten in peak times with the water body being a large area of activity. This increases the sensitivity, and the magnitude of the development is high due to the extent of the structure from a close view.

Table 3-6 Viewpoint 5

Aspect	Description
Location	Bruce Porter Reserve / Camden Point (in Laurieton)
Receptors	Pedestrians

Aspect	Description
Distance	450m
No. of Viewers	Low
Existing View	The current view from this location is the shoreline of Laurieton. This includes the vegetation, proposed site, the boat shed and residential properties.
Sensitivity	Low
Magnitude	Negligible
Visual Impact	Negligible
	From this view, the extent of the shoreline (Dunbogan) can be seen which includes other man-made structures and the natural environment. This decreases the significance of the boardwalk within the environment regardless of the surrounding vegetation. During construction there would be disruptions to the view. This will include construction site works. Minimal vehicles and materials would be they would be positioned on the opposite side of the vegetation. Post construction, the completed boardwalk would be of little significance from this view. The viewing range from this point contains several existing man-made structures, thus reduces the visual significance of the SUP in contrast to the existing natural environment. The conditions of the viewpoint have resulted in the low sensitivity rating, due to the distance, the scale of the boardwalk in comparison to surrounding environment. As a result, the magnitude is rated as negligible.

Table 3-7 Viewpoint Yacht Club

Aspect	Description
Location	Boat shed at the Yacht Club
Receptors	Boat users
Distance	250m
No. of Viewers	Moderate
Existing View	The water body takes over most of the view from this location. The vegetation that lines the shores can also be seen and identified as a distinct feature of the landscape view.
Sensitivity	Low
Magnitude	Low
Visual Impact	Low
	The visual impact from this view is considered low. This has resulted from the small scale of the boardwalk in comparison to the dominating landscape of water and vegetation. The contour of the land increases the views of the vegetation that obstructs the proposed development. During construction there will be little change. Site works may be seen including the use of temporary fencing and scaffolding. The vegetation will however screen most of this construction work. Post construction there will be no major changes to the view. This view will remain dominated by the large water body and screening vegetation. Due to the position of the boat shed on the shoreline, there will be no clear vision of the structure. Sensitivity of this project remains low attributable to the infrequent viewing from this point. Due to the low visibility the sensitivity can remain at this low rating. The magnitude of this project is considered low due to the distance of the view

Aspect	Description
	and the minimal contrast the boardwalk presents to existing environment from this angle.

The visual impact results from the 6 viewpoints are summarised Table 3-8.

Table 3-8 Visual Impact Results

Visual Impact	No. of Viewpoints
Negligible	2
Low	3
Moderate	0
High	1

The views from most viewpoints will be temporally disrupted throughout the construction of the boardwalk. As these works are temporary, they pose no great impacts to the views in the public and private space. Construction disturbance views can be eased by construction personnel following guidelines for safe, clean, and fast construction of the boardwalk.

4 Mitigation Options

4.1 BACKGROUND

There are four mitigation options used to assess the development of D5 in relation to the visual impact outcomes. These mitigation options are:

- Avoidance - this approach is used where mitigation cannot be undertaken by any of the following measures, resulting in locational change or not proceeding with the proposal on the site at all.
- Reduction - This approach is to reduce the degree or magnitude of the action and its implementation.
- Alleviation - this approach refers to design refinements to mitigate visual impact. This could include specific selection for built form articulation, choice of material and colours and/or planting design.
- Offsite compensation - this approach is used when none of the above measures will provide adequate visual impact mitigation. This approach entails offsite works on the land from which the viewpoint is experienced.

4.2 VISUAL IMPACT OUTCOMES

Avoidance

Due to the nature of the proposed development and low visual impact from many of the views, there is no need to avoid development. It is considered that avoidance is not an appropriate mitigation action for this project.

Reduction

The plan details a 11km alignment (scenic route) beginning in North Haven and ending opposite to the starting point (in Camden Head); with a reduction in size the extent of the pathway will either remain incomplete or will not be fit for use. From this it can be considered that the option of reduction is not an appropriate action for this project.

Alleviation

The high visual impact seen from the waterside can be further alleviated through design controls. This includes using natural materials to better fit in with the surrounding vegetation and background landscape. This could follow through to colours used being subtle and muted to blend in with the surrounding environment.

Offsite compensation

A small number of trees will be removed to connect the entrance/exit of the boardwalk to the existing pathway (D6). The boardwalk will avoid the mangrove vegetation on the shoreline. Some vegetation will need to be pruned and lopped to create the pathway. Due to the impact on the vegetation, offsite compensation can be considered appropriate mitigation for this project.

5 Conclusion

A comprehensive Visual Impact Assessment of the Beach-to-Beach project site has been conducted. This assessment has identified potential impacts the project at this site could have visually from a range of views. These views consider pedestrian, water users and vehicle traffic in this area.

The visual impact results from the six viewpoints are summarised Table 5-1.

Table 5-1 Visual Impact Results

Visual Impact	No. of Viewpoints
Negligible	2
Low	3
Moderate	0
High	1

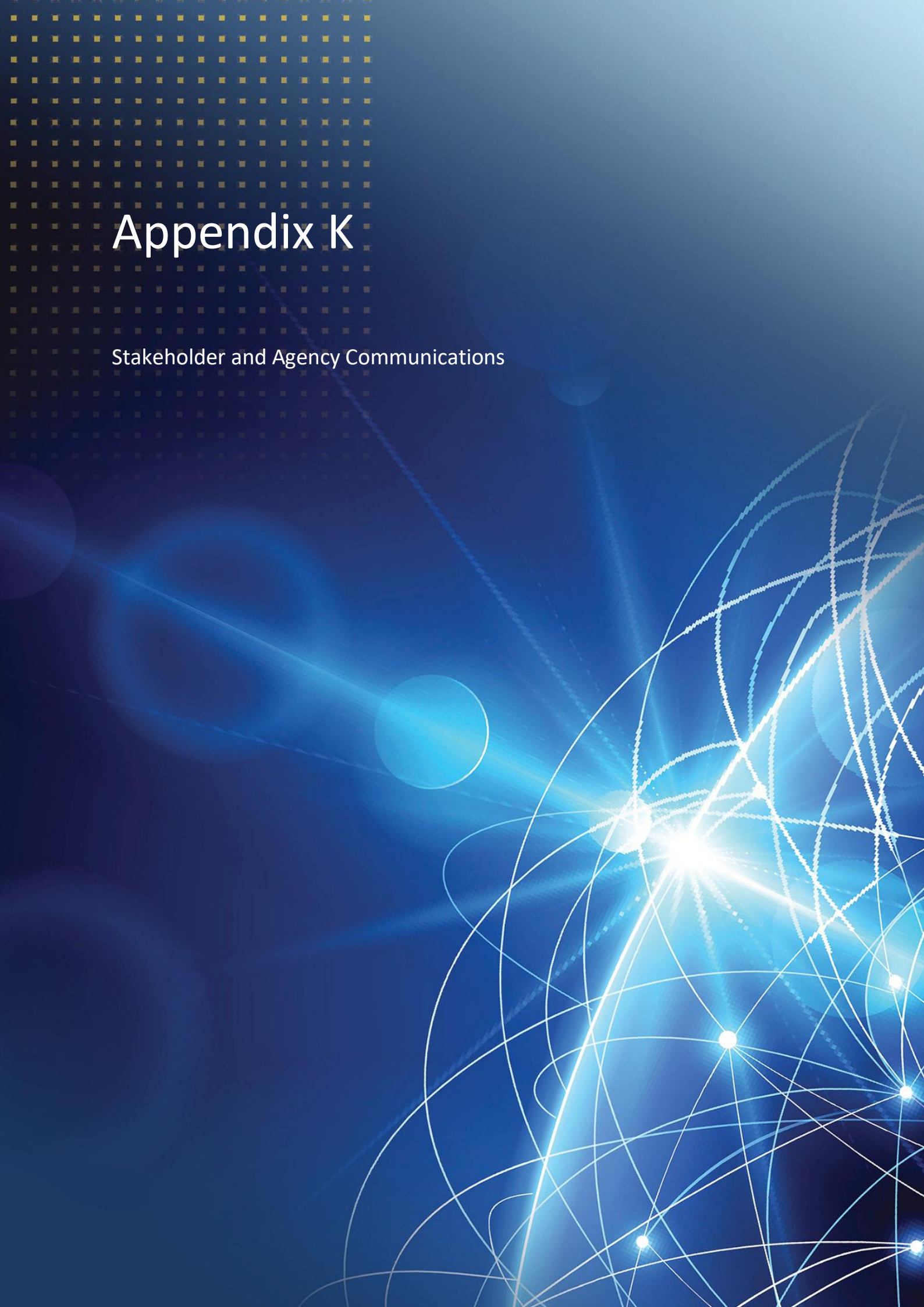
The views from most viewpoints will be temporally disrupted throughout the construction of the boardwalk. As these works are temporary, they pose no great impacts to the views in the public and private space. Construction disturbance views can be eased by construction personnel following guidelines for safe, clean, and fast construction of the boardwalk.

Post construction there will be visual changes for some views in the community. However, these views are seen only in the public domain leaving the private views from residential space unchanged. Recreational water users will be exposed to the structure due to the openness of the vegetation from the view. With appropriate mitigation actions as suggested above could reduce the visual impact from these views.

It is the professional opinions of the authors of this assessment that this project presents no highly concerning impacts to the public and private views of the community. Although changes will be made to these views, they remain insignificant, and continuation of the proposed design should occur.

Appendix K

Stakeholder and Agency Communications



Planning, Industry & Environment

Our Ref: DOC19/857001
Your Ref: E-mail datedf 01/10/19

Team Leader Transport Assessments
Department of Planning, Industry and Environment
PO Box 39
Sydney NSW 2000

Attention: Mr John Doubleday

Dear Mr Scott

Re: Request for Biodiversity and Conservation Division's Environmental Impact Statement Environmental Assessment Requirements – Camden Head Shared Pathway SEPP (Coastal Management)

Thank you for your email dated 1 October 2019 about the proposed shared pathway at Camden Haven seeking Environmental Assessment Requirements (EARs) from the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment. I appreciate the opportunity to provide input.

The BCD was formerly part of the Office of Environment and Heritage, but now forms part of the new Environment, Energy and Science Group in the Department (see https://www.dpie.nsw.gov.au).

We note that the project will impact land mapped under the State Environmental Planning Policy (Coastal Management) so it will be assessed in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). However, the proponent intends to assess the remaining parts of the project as an activity under Part 5 of the EP&A Act.

In our opinion, the entire project should be subject to the EIS and we request that advice be sought from the proponent to demonstrate how the EP&A Act enables the project to be assessed under two parts of the Act, when the bulk of the project is subject to Part 4 Act.

The Environmental Impact Statement (EIS) EARs provided by the BCD are limited to Aboriginal cultural heritage, biodiversity, NPWS estate, acid sulphate soils, flooding, stormwater and coastal erosion.

The proponent should ensure that the EIS will be sufficiently comprehensive to enable unambiguous assessment of all direct and indirect impacts of the proposal. We consider that this information is necessary for a comprehensive EIS for the proposal.

In particular, the EIS should:

1. include measures to avoid harm to Aboriginal objects and intangible Aboriginal heritage and consultation with Aboriginal knowledge holders

2. consider and seek to avoid and mitigate potential impacts on biodiversity, including threatened species and endangered ecological communities

3. assess the likely impacts (both direct and indirect) on any adjoining and/or nearby NPWS estate reserved under the *National Parks and Wildlife Act 1974* with reference to the *Guidelines for developments adjoining land managed by the Office of Environment and Heritage* (OEH, 2013), available at: http://www.environment.nsw.gov.au/resources/protectedareas/development-land-adjoining-130122.pdf

4. assess the potential to expose acid sulphate soils and document appropriate acid sulphate soils management strategies

5. include measures to mitigate impacts on coastal processes and wetlands,

6. include measures to avoid and mitigate erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

The full list of our requirements that need to be addressed in the EIS is provided in **Attachment 1**. In preparing the EIS, the proponent should refer to the relevant guidance material listed in **Attachment 2.**

If you have any questions about this advice, please do not hesitate to contact me at dimitri.young@environment.nsw.gov.au or 6659 8272.

Yours sincerely

Dimitri Young 2 October 2019

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Biodiversity and Conservation

Enclosures:
Attachment 1 - BCD Recommended EARs – EIS – Camden Head Shared Pathway - SEPP (Coastal Management)
Attachment 2 - EIS Guidance Material

Attachment 1

Biodiversity and Conservation Division's Recommended Secretary's Environmental Assessment Requirements (SEARs) for Preparation of an Environmental Impact Statement

for the

Camden Head Shared Pathway

SEPP (Coastal Management)

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A. The Proposal

The Environmental Impact Statement (EIS) should identify the environmental objectives for the proposal and clearly describe the proposal. These environmental objectives will guide decisions on environmental controls and management throughout the life of the proposal.

The objectives of the proposal should be clearly stated and refer to:

1. the size and type of the proposal and its operation;
2. all anticipated environment impacts, both direct and indirect, including level of vegetation / habitat clearing
3. the anticipated level of performance in meeting required environmental standards;
4. threatened species, populations, ecological communities and their habitats impacted upon;
5. the staging and timing of the proposal; and
6. the proposal's relationship to any other proposal.

The EIS should fully identify all of the processes and activities intended for the site and during the life of the proposal, including details of:

7. the location of the proposal and details of the surrounding environment;
8. the proposed layout of the site;
9. appropriate land use zoning;
10. ownership details of any residence and/or land likely to be affected by the proposal;
11. maps/diagrams showing the location of residences and properties likely to be affected and other industrial developments, conservation areas, wetlands, etc. in the locality that may be affected by the proposal;
12. all equipment proposed for use at the site;
13. chemicals, including fuel, used on the site and proposed methods for the transportation, storage, use and emergency management;
14. waste generation, storage and disposal;
15. a plan showing the distribution of any threatened flora or fauna species and the vegetation communities on or adjacent to the subject site, and the extent of vegetation proposed to be cleared should be provided; and
16. methods to mitigate any expected environmental impacts of the proposal.

B. Environmental Impacts of the Proposal

Impacts related to the following environmental issues need to be assessed, quantified and reported on:

- Aboriginal cultural heritage
- Biodiversity
- NPWS Estate (land reserved or acquired under the *National Parks and Wildlife Act 1974*)
- Acid Sulfate Soils
- Flooding, Stormwater and Coastal Erosion
- Cumulative Impacts

The EIS should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment 2**.

C. Aboriginal Cultural Heritage

The EIS should contain:

1. A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposal.

2. A description of the cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposal, and the significance of these values for the Aboriginal people who have a cultural association with the land.

3. A description of any consultation with Aboriginal people regarding the proposal and the significance of any Aboriginal cultural heritage values identified through that consultation. The Biodiversity and Conservation Division advises that the proponent may utilise the former OEH's *Aboriginal Consultation Requirements for Proponents 2010* as best practice guidelines for such consultation (these requirements for consultation must be followed if the proposal requires an Aboriginal Heritage Impact Permit or the Aboriginal heritage assessment requires archaeological testing).

4. The views of those Aboriginal people regarding the likely impact of the proposal on their cultural heritage. If any submissions have been received as a part of the consultation requirements, then the report must include a copy of each submission and your response.

5. A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposal, with reference to the cultural heritage values identified.

6. A description of any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places.

7. A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm.

In addressing these requirements, the proponent may refer to the following documents:

a. *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (OEH, 2010) - www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf. These guidelines identify a process that could be used to prepare Aboriginal cultural heritage assessments for development proposals assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*.

b. *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (OEH, 2010) - www.environment.nsw.gov.au/licences/consultation.htm. This document further explains the consultation requirements that are set out in clause 80C of the *National Parks and Wildlife Regulation 2009*. The process set out in this document must be followed and documented in the EIS if the proposal requires an Aboriginal Heritage Impact Permit or the Aboriginal heritage assessment requires archaeological testing.

c. *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (OEH, 2010) - www.environment.nsw.gov.au/licences/archinvestigations.htm. The process described in this Code should be followed and documented where the assessment of Aboriginal cultural heritage requires archaeological testing to be undertaken.

Notes:

- An Aboriginal Site Impact Recording Form (http://www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm) must be completed and submitted to the Aboriginal Heritage Information Management System (AHIMS) Registrar, for each AHIMS site that is harmed through archaeological investigations required or permitted through these environmental assessment requirements.

- Under section 89A of the *National Parks and Wildlife Act* 1974, it is an offence for a person not to notify the Biodiversity and Conservation Division of the location of any Aboriginal object the person becomes aware of, not already recorded on the Aboriginal Heritage Information Management System (AHIMS). An AHIMS Site Recording Form should be completed and submitted to the AHIMS Registrar (http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm), for each Aboriginal site found during investigations.

D. Biodiversity

1. The EIS must assess the impacts of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act) as follows:

   A. The EIS must demonstrate whether or not the proposed development is to be carried out in a declared area of outstanding biodiversity value.

   B. If the proposed development is not carried out in a declared area of outstanding biodiversity value, then the EIS must demonstrate and document how the proposed development exceeds, or does not exceed, the biodiversity offset scheme threshold, as set out in section 7.4 of the BC Act and clause 7.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation) by determining whether the proposed development involves:

      I. The clearing of native vegetation of an area declared by clause 7.23 of the BC Regulation as exceeding the threshold, or

      II. The clearing of native vegetation, or other action prescribed by clause 6.1 of the BC Regulation, on land included on the Biodiversity Values Map published under clause 7.3 of the BC Regulation.

   C. If the biodiversity offset scheme threshold is not exceeded, then the EIS must document *the test for determining whether proposed development is likely to significantly affect threatened species or ecological communities* as outlined in Section 7.3 of the BC Act, by preparing an ecological assessment that includes:

      I. A field survey of the site conducted and documented in accordance with relevant guidelines, including:

         a. the *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna -Amphibians* (DECCW, 2009), http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf

         b. *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004), http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf

         c. Field survey methods and assessment information on the website: http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/surveys-and-assessments

      If a proposed survey methodology is likely to vary significantly from the above methods, the proponent should discuss the proposed methodology with the Biodiversity and Conservation Division prior to undertaking the EIS, to determine whether the Biodiversity and Conservation Division considers that it is appropriate.

      Recent (less than five years old) surveys and assessments may be used. However, previous surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or

- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species,

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the surveys. If a previous survey is used, surveys for any additional entities listed under the BC Act since the previous survey took place, must be undertaken and documented.

Determining the list of potential threatened species for the site should be done in accordance with the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004) and the *Guidelines for Threatened Species Assessment* (Department of Planning, July 2005). The following internet resources:

- Bionet Atlas http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx and
- Threatened species profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/
- Bionet Vegetation Classification http://www.environment.nsw.gov.au/research/Visclassification.htm
- Other data sources (e.g. PlantNET, Online Zoological Collections of Australian Museums (http://www.ozcam.org/), previous or nearby surveys etc.) may also be used to compile the list.

II. The following information as a minimum:

a. The requirements set out in the *Guidelines for Threatened Species Assessment* (Department of Planning, July 2005

b. A description and geo-referenced mapping of study area (and spatial data files), e.g. overlays on topographic maps, satellite images and /or aerial photos, including details of map datum, projection and zone, all survey locations, vegetation communities in accordance with the BioNet Vegetation Classification (http://www.environment.nsw.gov.au/research/Visclassification.htm), key habitat features and reported locations of threatened species and ecological communities present in the subject site and study area.

c. A description of survey methodologies used, including timing, location and weather conditions.

d. Details, including qualifications and experience of all staff undertaking the surveys, mapping and assessment of impacts as part of the EIS.

e. Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status.

f. A description of the likely impacts of the proposal on biodiversity and wildlife corridors, including direct and indirect and construction and operation

impacts. Wherever possible, quantify these impacts such as the amount of each vegetation community or species habitat to be cleared or impacted, or any fragmentation of a wildlife corridor.

g. Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposal to avoid or minimise impacts, including details about alternative options considered and how long-term management arrangements will be guaranteed.

h. A description of the residual impacts of the proposal. If the proposal cannot adequately avoid or mitigate impacts on biodiversity, then a biodiversity offset package is expected (see the requirements for this at point 4 below).

III. The *'test for determining whether proposed development is likely to significantly affect threatened species or ecological communities, or their habitats'* as outlined in Section 7.3 of the BC Act.

2. If the EIS determines under Section 7.2 of the BC Act as set out in 1 above that the proposed development is likely to significantly affect threatened species, then in accordance with Section 7.7 of the BC Act the EIS must be accompanied by a Biodiversity Development Assessment Report prepared in accordance with Part 6 of the BC Act.

Note:

For the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999,* the EIS should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.

E. NPWS Estate

The EIS should address the following with respect to land reserved under the *National Parks and Wildlife Act 1974*.

1. Where appropriate, likely impacts (both direct and indirect) on any adjoining and/or nearby NPWS estate reserved under the *National Parks and Wildlife Act 1974* should be considered. Refer to the *Guidelines for developments adjoining land managed by the Office of Environment and Heritage* (OEH, 2013). The guideline is available at:

   http://www.environment.nsw.gov.au/resources/protectedareas/development-land-adjoining-130122.pdf

Note: Proposals which may impact marine protected areas should be referred to the Regions, Industry, Agriculture and Resources Group in the Department of Planning, Industry and Environment to determine the assessment and approval requirements.

F. Acid Sulfate Soils

The EIS should address the following:

1. The potential impacts of the proposal on acid sulfate soils must be assessed in accordance with the relevant guidelines in the Acid Sulfate Soils Manual (Stone et al. 1998) and the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004).

2. Describe mitigation and management options that will be used to prevent, control, abate or minimise potential impacts from the disturbance of acid sulfate soils associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

G. Flooding, Stormwater and Coastal Erosion

The EIS should include an assessment of the following referring to the relevant guidelines in Attachment 2:

1. The potential effect of coastal processes and coastal hazards including potential impacts of sea level rise:
    a. on the proposal; and
    b. arising from the proposal.
2. Whether the proposal is consistent with any coastal zone management plans.
3. Whether the proposal is consistent with any floodplain risk management plans.
4. Whether the proposal is compatible with the flood hazard of the land.
5. Whether the proposal will significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.
6. Whether the proposal will significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
7. Whether the proposal incorporates appropriate measures to manage risk to life from flood.
8. Whether the proposal is likely to result in unsustainable social and economic costs to the community as a consequence of flooding.
9. The implications of flooding over the full range of potential flooding, including the probable maximum flood, should be considered as set out in the NSW Government Floodplain Development Manual. This should include the provision of:
    a. Full details of the flood assessment and modelling undertaken in determining any design flood levels (if applicable), including the 1 in 100 year flood levels.
    b. A sensitivity assessment of the potential impacts of an increase in rainfall intensity and runoff (10%, 20% and 30%) and sea level rise on the flood behaviour for the 1 in 100 year design flood if applicable.
10. All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposal should be detailed.

H. Cumulative Impacts

The EIS should include an assessment of the following:

1. The cumulative impacts, including both construction and operational impacts, from all clearing activities and operations, associated edge effects and other indirect impacts on cultural heritage, biodiversity and NPWS Estate in accordance with the *Environmental Planning and Assessment Act 1979*.

2. The cumulative impacts, including both construction and operational impacts, of the proponent's existing and proposed development and associated infrastructure (such as access tracks etc.) as well as the cumulative impact of the development in the context of other developments located in the vicinity.

Attachment 2 – EIS Guidance Material

Title	Web address
Relevant Legislation	
Coastal Protection Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+13+1979+cd+0+N
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Floodplain Development Manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
Marine Parks Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+64+1997+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Biodiversity Conservation Act 2016	https://www.legislation.nsw.gov.au/~/view/act/2016/63
Biodiversity Conservation Regulation 2017	https://www.legislation.nsw.gov.au/~/view/regulation/2017/432
Biodiversity Conservation (Savings and Transitional) Regulation 2017	https://www.legislation.nsw.gov.au/~/view/regulation/2017/433
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Aboriginal Cultural Heritage	
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	http://www.environment.nsw.gov.au/licences/consultation.htm
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	http://www.environment.nsw.gov.au/licences/archinvestigations.htm
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm
Aboriginal Heritage Information Management System (AHIMS) Registrar	http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm

Biodiversity

Biodiversity Assessment Method (OEH 2017)	http://www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf
Biodiversity Assessment Calculator	https://www.lmbc.nsw.gov.au/bamcalc
Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna -Amphibians (DECCW, 2009)	http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf
Species credit threatened bats and their habitat – NSW survey guide for the Biodiversity Assessment Method (OEH 2018).	https://www.environment.nsw.gov.au/research-and-publications/publications-search/species-credit-threatened-bats-nsw-survey-guide-for-biodiversity-assessment-method
NSW Guide to Surveying Threatened Plants (OEH 2016)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-guide-to-surveying-threatened-plants
Field Survey Methods	http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/surveys-and-assessments/field-survey-methods
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC, 2004)	http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf
Threatened Species website	http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species
Atlas of NSW Wildlife	http://www.environment.nsw.gov.au/wildlifeatlas/about.htm
BioNet Vegetation Classification (NSW Vegetation Classification System)	http://www.environment.nsw.gov.au/research/Visclassification.htm
PlantNET	http://plantnet.rbgsyd.nsw.gov.au/
Online Zoological Collections of Australian Museums	http://www.ozcam.org/
Threatened Species Assessment Guidelines: the Assessment of Significance (DECC 2007)	http://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-species-assessment-guidelines
Principles for the use of biodiversity offsets in NSW	http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm

NPWS Estate

Land reserved or acquired under the NPW Act

List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx

NPWS Revocation of Land Policy	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/protectedareas/10509devadjdeccw.pdf

Water and Soils

Acid sulphate soils

Acid Sulfate Soils Planning Maps	http://canri.nsw.gov.au/download/
Acid Sulfate Soils Manual (Stone et al. 1998)	Manual available for purchase from: http://www.landcom.com.au/whats-new/the-blue-book.aspx Chapters 1 and 2 are on DPI's Guidelines Register at: Chapter 1 Acid Sulfate Soils Planning Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Planning%20Guidelines.pdf Chapter 2 Acid Sulfate Soils Assessment Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Assessment%20Guidelines.pdf
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	http://www.derm.qld.gov.au/land/ass/pdfs/lmg.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.

Flooding and Coastal Erosion

Reforms to coastal erosion management	http://www.environment.nsw.gov.au/coasts/coastalerosionmgmt.htm
Floodplain development manual	http://www.dnr.nsw.gov.au/floodplains/manual.shtml
Guidelines for Preparing Coastal Zone Management Plans	http://www.environment.nsw.gov.au/resources/coasts/130224CZMPGuide.pdf
Climate Change Impacts and Risk Management	http://www.environment.gov.au/climate-change

Water

Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

Our Ref: DOC21/157491
Your Ref: SEC052-01-C2-S00008/09/10

Kellogg Brown and Root Pty Ltd
2 Portside Crescent
Maryville NSW 2293

Attention: Mr Konrad Grinlaubs

Dear Mr Grinlaubs

Re: Request for Biodiversity and Conservation Division's Environmental Impact Statement Environmental Assessment Requirements – Beach to Beach Shared Pathway

Thank you for your letter dated 2 March 2021 about the Beach to Beach Shared Pathway Project in the Port Macquarie Hastings local government area at North Haven, seeking Environmental Assessment Requirements (EARs) from the Biodiversity and Conservation Division (BCD) in the Biodiversity, Conservation and Science Directorate of the Environment, Energy and Science Group in the Department of Planning, Industry and Environment. I appreciate the opportunity to provide input.

The BCD was formerly part of the Office of Environment and Heritage, but now forms part of a Group that has responsibilities relating to biodiversity (including threatened species and ecological communities, or their habitats), National Parks and Wildlife Service estate, climate change, sustainability, flooding, coastal and estuary matters.

On 1 July 2020 Aboriginal cultural heritage (ACH) functions were transferred from the BCD to Heritage NSW in the Department of Premier and Cabinet. For ACH advice, please contact Heritage NSW at heritagemailbox@environment.nsw.gov.au.

We note that the project will be assessed in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Environmental Impact Statement (EIS) EARs provided by the Biodiversity and Conservation Division are limited to biodiversity, NPWS estate, acid sulphate soils, flooding, stormwater and coastal erosion. These SEARs, as they relate to biodiversity, have been issued with respect to the *Biodiversity Conservation Act 2016* (BC Act).

The proponent should ensure that the EIS will be sufficiently comprehensive to enable unambiguous assessment of all direct and indirect impacts of the proposed development.

The BCD notes the presence of several threatened fauna species records adjacent to the proposed development route including Koala (*Phascolarctos cinereus*), Squirrel glider (*Petaurus norfolcensis*), Little Bent Wing Bat (*Miniopterus australis)* and Grey Headed Flying-fox (*Pteropus poliocephalus*).

We also note the proposed development is adjacent to or intersects land mapped as Coastal Wetland and/or Littoral Rainforest under the State Environmental Management Policy (SEPP) (Coastal Management) 2018. Moreover, this development also intersects or is adjacent to land mapped as land containing threatened species or threatened ecological communities identified as potential serious and irreversible impacts (SAII) under the BC Act.

The EIS should assess the impacts of the proposal on these threatened species, ecological communities, or their habitats, on mapped coastal wetlands and/or littoral rainforests and on SAII entities.

The full list of our requirements that may need to be addressed in the EIS is provided in **Attachment 1.** In preparing the EIS, the proponent should refer to the relevant guidance material listed in **Attachment 2.**

If you have any questions about this advice, please do not hesitate to contact Ms Paul Houlder, Project Officer, Data Support, at paul.houlder@environment.nsw.gov.au or 6670 8679.

Yours sincerely



12 March 2021

DIMITRI YOUNG
Senior Team Leader Planning, North East Branch
Biodiversity and Conservation

Enclosures:
Attachment 1 - BCD Recommended EARs – EIS – Beach to Beach Shared Pathway Project Port Macquarie Hastings LGA
Attachment 2 - EIS Guidance Material

Attachment 1

Biodiversity and Conservation Division's Recommended Secretary's Environmental Assessment Requirements (SEARs) for Preparation of an Environmental Impact Statement

for the

Beach to Beach Shared Pathway Project Port Macquarie Hastings LGA

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A. The Proposed Development

The Environmental Impact Statement (EIS) should fully and clearly describe the proposed development, including any environmental impact mitigation measures, and identify all the processes and activities intended for the site during the life of the proposed development.

The description of the proposed development in the EIS should, where relevant, include:

1. the location of the proposal and details of the surrounding environment;
2. appropriate land use zoning;
3. the size and type of the proposal and its operation;
4. the proposed layout of the site;
5. the staging and timing of the proposal;
6. the proposal's relationship to any other proposal.
7. all equipment proposed for use at the site;
8. chemicals, including fuel, used on the site and proposed methods for the transportation, storage, use and emergency management;
9. waste generation, storage and disposal;
10. the anticipated environment impacts of the proposal, both direct and indirect,
11. a plan showing the distribution of any threatened flora or fauna species and the vegetation communities on or adjacent to the subject site, and the extent of vegetation proposed to be cleared; and
12. ownership details of any residence and/or land likely to be affected by the proposal;
13. maps/diagrams showing the location of residences and properties likely to be affected and other industrial developments, conservation areas, wetlands, etc. in the locality that may be affected by the proposal;
14. methods to mitigate any expected environmental impacts of the proposal; and
15. the anticipated level of performance in meeting required environmental standards.

B. Environmental Impacts of the Proposed Development

Impacts related to the following environmental issues should be assessed, quantified and reported on:

- Biodiversity
- NPWS Estate (land reserved or acquired under the *National Parks and Wildlife Act 1974*)
- Acid Sulfate Soils
- Flooding, Stormwater and Coastal Erosion
- Cumulative Impacts

The EIS should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines is at **Attachment 2.**

C. Biodiversity

1. The EIS must assess the impacts of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the *Biodiversity Conservation Act 2016* (BC Act) as follows:

   A. The EIS must demonstrate whether the proposed development is to be carried out in a declared area of outstanding biodiversity value.

   B. If the proposed development is not carried out in a declared area of outstanding biodiversity value, then the EIS must demonstrate and document whether the proposed development exceeds the biodiversity offset scheme threshold, as set out in section 7.4 of the BC Act and clause 7.1 of the *Biodiversity Conservation Regulation 2017* (BC Regulation), by determining whether the proposed development involves:

      I. The clearing of native vegetation of an area declared by clause 7.23 of the BC Regulation as exceeding the threshold, or

      II. The clearing of native vegetation, or other action prescribed by clause 6.1 of the BC Regulation, on land included on the Biodiversity Values Map published under clause 7.3 of the BC Regulation.

   C. If the biodiversity offset scheme threshold is not exceeded, then the EIS must document *the test for determining whether proposed development is likely to significantly affect threatened species or ecological communities* as outlined in Section 7.3 of the BC Act, by preparing an ecological assessment that should include:

      I. A field survey of the site conducted and documented in accordance with relevant guidelines, including:

         a. *Field survey methods for environmental consultants and surveyors when assessing proposed developments or other activities on sites containing threatened species* https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/field-survey-method-guidelines.pdf

         b. *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna -Amphibians* (DECC, 2009) http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf

         c. *NSW Guide to Surveying Threatened Plants* (OEH 2016) https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/guide-surveying-threatened-plants-160129.pdf

         d. *"Species credit' threatened bats and their habitats https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/species-credit-threatened-bats-survey-guide-180466.pdf*

e. *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004), https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/draft-threatened-biodiversity-survey-guide.pdf

If a proposed field survey methodology is likely to vary significantly from the methods in the guidelines above, then the proponent should discuss the proposed methodology with the Biodiversity and Conservation Division prior to undertaking surveys for the EIS, to determine whether the Biodiversity and Conservation Division considers the proposed methodology appropriate.

The results of recent (less than five years old) field surveys may be used. However, the results of previous field surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the subject species are unlikely to be detected or present, or
- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate for detecting the target subject species,

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the field surveys.

If the results of previous field surveys are used, then field surveys for any additional threatened entities listed under the BC Act since the previous field surveys took place, must be undertaken and documented.

The list of potential threatened species, populations, ecological communities, or their habitats for the site should be determined in accordance with:

- the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft* (DEC, 2004), and
- the Department's Threatened Species website http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species ,and
- the *Bionet Atlas of NSW* http://www.environment.nsw.gov.au/wildlifeatlas/about.htm , and
- the Vegetation Information System (BioNet Vegetation Classification) http://www.environment.nsw.gov.au/research/Visclassification.htm , and
- other data sources (e.g. PlantNET, Online Zoological Collections of Australian Museums (http://www.ozcam.org/), previous or nearby surveys etc.) may also be used to compile the list.

II. The following information as a minimum:

a. A description, spatial data files, and geo-referenced mapping of the study area, (overlays on topographic maps, satellite images and /or aerial photos, including details of map datum, projection and zone), showing all field survey locations, vegetation communities classified in accordance with the BioNet Vegetation Classification (http://www.environment.nsw.gov.au/research/Visclassification.htm), key

habitat features and reported locations of threatened species and ecological communities present in the subject site and study area.

b. A description of survey methodologies used, including timing, location and weather conditions.

c. Details, including qualifications and experience, of all staff undertaking the surveys, mapping and assessment of impacts as part of the EIS.

d. Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status.

e. A description of the likely impacts of the proposed development on biodiversity values, including direct and indirect impacts and construction and operation impacts, with impacts quantified, wherever possible, such as the amount of each vegetation community or species habitat to be cleared or impacted, and/or the degree of fragmentation of a habitat connectivity.

f. Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposed development to avoid or minimise biodiversity impacts, including details about alternative options considered and how long-term management arrangements will be guaranteed.

g. A description of the residual impacts of the proposed development.

III. The '*test for determining whether proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats'* as outlined in Section 7.3 of the BC Act undertaken in accordance with the gazetted *Threatened Species Test of Significance Guidelines* (OEH 2018) available at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf

2. If the EIS determines under 1 above that the proposed development is likely to significantly affect threatened species, then in accordance with Section 7.7 of the BC Act the EIS must be accompanied by a Biodiversity Development Assessment Report prepared in accordance with Part 6, Division 3 of the BC Act.

3. If the EIS determines under 1 above that the proposed development is unlikely to significantly affect threatened species, then the proposed development should:

   a. be designed to avoid and minimise impacts on biodiversity values to the fullest extent possible, and

   b. include a biodiversity offset package to offset remaining direct and indirect impacts on biodiversity values, prepared in accordance with the Department's 13 offsetting principles available at http://www.environment.nsw.gov.au/biodivoffsets/oehoffsetprincip.htm:

Note:

For the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999,* the EIS should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action.

D. NPWS Estate

The EIS should address the following with respect to land reserved under the *National Parks and Wildlife Act 1974*.

1. Where appropriate, likely impacts (both direct and indirect) of the proposed development on any adjoining and/or nearby NPWS estate reserved under the National Parks and Wildlife Act 1974 should be considered, with reference to the *Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities (DPIE 2020)* available at:

   https://www.environment.nsw.gov.au/research-and-publications/publications-search/developments-adjacent-to-national-parks-and-wildlife-service-lands

Note: Proposed development which may impact marine protected areas should be referred to the Regions, Industry, Agriculture and Resources Group in the Department of Planning, Industry and Environment to determine the assessment and approval requirements.

E. Acid Sulfate Soils

The EIS should address the following:

1. The potential impacts of the proposed development on acid sulfate soils must be assessed in accordance with the relevant guidelines in the Acid Sulfate Soils Manual (Stone et al. 1998) and the Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004).

2. The mitigation and management options that will be used to prevent, control, abate or minimise potential impacts from the disturbance of acid sulfate soils associated with the proposed development and to reduce risks to human health and prevent the degradation of the environment must be described, including include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

F. Flooding, Stormwater and Coastal Erosion

The EIS should include an assessment of the following referring to the relevant guidelines in Attachment 2:

1. The potential effect of coastal processes and coastal hazards including potential impacts of sea level rise:

    a. on the proposed development; and

    b. arising from the proposed development.

2. Whether the proposed development is consistent with any coastal zone management plans.

3. Whether the proposed development is consistent with any floodplain risk management plans.

4. Whether the proposed development is compatible with the flood hazard of the land.

5. Whether the proposed development will significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.

6. Whether the proposed development will significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

7. Whether the proposed development incorporates appropriate measures to manage risk to life from flood.

8. Whether the proposed development is likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

9. The implications of flooding over the full range of potential flooding, including the probable maximum flood, should be considered as set out in the NSW Government Floodplain Development Manual. This should include the provision of:

    a. Full details of the flood assessment and modelling undertaken in determining any design flood levels (if applicable), including the 1 in 100 year flood levels.

    b. A sensitivity assessment of the potential impacts of an increase in rainfall intensity and runoff (10%, 20% and 30%) and sea level rise on the flood behaviour for the 1 in 100 year design flood if applicable.

10. All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposed development should be detailed.

G. Cumulative Impacts

The EIS should include an assessment of the following:

1. The cumulative impacts, including both construction and operational impacts, from all clearing activities and operations, associated edge effects and other indirect impacts on cultural heritage, biodiversity and NPWS Estate in accordance with the *Environmental Planning and Assessment Act 1979*.

2. The cumulative impacts, including both construction and operational impacts, of the proponent's existing proposals and other proposals and associated infrastructure (such as access tracks etc.) as well as the cumulative impact of the proposed development in the context of other proposals located in the vicinity.

Attachment 2 – EIS Guidance Material

Title	Web address
Relevant Legislation	
Biodiversity Conservation *Act 2016*	https://www.legislation.nsw.gov.au/#/view/act/2016/63/full
Coastal Management Act 2016	https://www.legislation.nsw.gov.au/#/view/act/2016/20/full
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
Fisheries Management Act 1994	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
Marine Parks Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+64+1997+cd+0+N
National Parks and Wildlife Act 1974	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
Water Management Act 2000	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
Wilderness Act 1987	http://www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
Biodiversity	
Biodiversity Assessment Method (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf
Biodiversity Development Assessment Report	https://www.legislation.nsw.gov.au/#/view/act/2016/63/part6/div3/sec6.12
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	http://www.environment.nsw.gov.au/resources/bcact/guidance-decision-makers-determine-serious-irreversible-impact-170204.pdf
Accreditation Scheme for Application of the Biodiversity Assessment Method Order 2017	https://www.legislation.nsw.gov.au/regulations/2017-471.pdf

Title	Web address
Biodiversity conservation actions	www.environment.nsw.gov.au/resources/bcact/ancillary-rules-biodiversity-actions-170496.pdf
Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	www.environment.nsw.gov.au/resources/bcact/ancillary-rules-reasonable-steps-170498.pdf
Threatened Species Website	www.environment.nsw.gov.au/threatenedspecies/
NSW BioNet (Atlas of NSW Wildlife)	www.bionet.nsw.gov.au/
NSW guide to surveying threatened plants (OEH 2016)	www.environment.nsw.gov.au/resources/threatenedspecies/160129-threatened-plants-survey-guide.pdf
Threatened species survey and assessment guideline information	www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm
BioNet Vegetation Classification - NSW Plant Community Type (PCT) database	www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm
Data Portal (access to online spatial data)	http://data.environment.nsw.gov.au/
Fisheries NSW policies and guidelines	http://www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Revocation, recategorisation and road adjustment policy (OEH, 2012)	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities (DPIE 2020)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Development-guidelines/developments-adjacent-npws-lands-200362.pdf
Water and Soils	
Acid sulphate soils	
Acid Sulfate Soils Planning Maps via Data.NSW	http://data.nsw.gov.au/data/
Acid Sulfate Soils Manual (Stone et al. 1998)	http://www.environment.nsw.gov.au/resources/epa/Acid-Sulfate-Manual-1998.pdf

Title	Web address
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	http://www.environment.nsw.gov.au/resources/soils/acid-sulfate-soils-laboratory-methods-guidelines.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.
Flooding and Coastal Erosion	
Reforms to coastal erosion management	http://www.environment.nsw.gov.au/coasts/coastalerosionmgmt.htm
Floodplain development manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Guidelines for Preparing Coastal Zone Management Plans	http://www.environment.nsw.gov.au/resources/coasts/130224CZMPGuide.pdf
NSW Climate Impact Profile	http://climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

NSW STATE EMERGENCY SERVICE

Our Ref: ID 1346
Your Ref: SEC052-01-C2-S00012

12th March 2021

Mr Konrad Grinlaubs
Kellogg Brown & Root Pty Ltd
2 Portside Crescent
Maryville (Newcastle) NSW 2293

Via email: Konrad.Grinlaubs@kbr.com

Dear Mr Grinlaubs,

Notification under clause 15AA of the State Environmental Planning Policy (Infrastructure) 2007 in relation to the proposed Beach to Beach shared pathway - Port Macquarie Hastings Upgrade

Thank you for the notification under clause 15AA of the *State Environmental Planning Policy (Infrastructure) 2007* in relation to the proposed upgrade of the Beach to Beach shared pathway - Port Macquarie Hastings, North Haven to Dunbogan.

The NSW State Emergency Service (NSW SES) has reviewed the proposed upgrade using the information provided with the proposal and the flood risk information (e.g. local flood Plan, flood studies etc.) available to the NSW SES. Based on this review the proposed works appear to have minimal risk to NSW SES response operations.

Please feel free to contact me on 0458 737 188 or via email at maria.frazer1@one.ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence.

Yours sincerely,

Maria Frazer
Coordinator Planning
NSW State Emergency Service

NSW GOVERNMENT

STATE HEADQUARTERS
6-8 Regent Street, Wollongong NSW 2500
PO Box 6126, Wollongong DC NSW 2500
P (02) 4251 6111
F (02) 4251 6190
www.ses.nsw.gov.au
ABN: 88 712 649 015

25 March 2021

File No: NTH21/00060/01
Your Ref: SEC052-01-C2-500002

Environmental Assessment and Planning, NSW
Kellogg Brown & Root Pty Ltd
2 Portside Crescent
MARYVILLE NSW 2293

Attention: Konrad Grinlaubs – Senior Environmental Planner

Dear Sir / Madam,

RE: Planning Proposal – Beach to Beach Shared Pathway, Port Macquarie Hastings LGA

I refer to your letter of 2 March 2021 requesting comment from Transport for NSW (TfNSW) in relation to the abovementioned planning proposal.

Transport for NSW - NSW Maritime (TfNSW) advises that the proposal as per the supplied documentation has been assessed as having minimal impact on the safety of navigation under the *Marine Safety Act 1998*.

The documentation has been reviewed. TfNSW is supportive of the proposed Beach to Beach Shared Pathway Project between North Haven Beach and Pilot Beach in Dunbogan NSW and has no objections to the proposed works subject to the below conditions;

1. All work vessels associated with the project must comply with the relevant NSW Marine Legislation.
2. All work vessels and crew associated with the project must comply with the *Marine Safety (Domestic Commercial Vessels) National Law Act 2012*.
3. Any submerged hazards, cables, wires, silt curtains etc must be marked with yellow aqua buoys (sign written "Warning – Submerged Hazard"). These aqua buoys must be lit with a yellow flashing light if hazards are present before sunrise and after sunset.
4. Notification is to be given to NSW Maritime, a minimum of 21 days prior to works commencing, providing a full scope of works relating to on-water operations. A Marine Notice may be required to be published on the Maritime website and/or local newspaper.

Should you require any further information or if you wish to discuss the works please email navigationadvicenorth@transport.nsw.gov.au.

Yours faithfully,



for Matt Adams
Team Leader, Development Services
Community and Place | Region North
Regional & Outer Metropolitan
Transport for NSW

Natural Resources Access Regulator

Contact: Natural Resources Access Regulator
Phone: 1800 633 362
Email: nrar.enquiries@nrar.nsw.gov.au

Our Ref: V15/2812-5#82
SEARs Ref: SEAR 1391

1 June 2021

Konrad Grinlaubs
KBR
2 Portsite Crescent
Maryville NSW 2293

Emailed: Konrad.Grinlaubs@kbr.com, cc'd: June.Lee@kbr.com

Dear Sir/Madam

Re: Request for Environmental Assessment Requirements - V15/2812-5#82
Reference Number: SEAR 1391
Description: Beach to Beach Shared Pathway
Location: Port Macquarie-Hastings LGA

Thank you for your email on the 29th of April 2021 seeking input into the Secretary's Environmental Assessment Requirements (SEARs) for the above development. The Natural Resources Access Regulator (NRAR) has reviewed the supporting documentation accompanying the request for SEARs and recommends the Environmental Impact Statement (EIS) be required to include the following;

- Identification and impact assessment of all works/activities that may intercept, extract, use, divert or receive water.
- The identification of all water take for the project. Include details of water sources that water will be taken from where water entitlements need to be acquired to account for the water take.
- Details of Water Access Licences (WALs) held to account for any take of water, or demonstration that WALs can be obtained prior to take of water occurring.
- Assessment of the project's compliance with any exemptions or exclusions to requiring approvals or licenses under the *Water Management Act 2000*.
- Identification and impact assessment of all works located on waterfront land associated with the wetland including consideration of the NRAR Guidelines for Controlled Activities on Waterfront Land (2018).

Any questions regarding this correspondence should be directed to nrar.servicedesk@dpie.nsw.gov.au

Yours Sincerely



For

Alison Collaros
Manager Licensing & Approvals
Water Regulatory Operations
Natural Resources Access Regulator

PORT MACQUARIE HASTINGS COUNCIL

Organisational Project Delivery

MEMO

To:	Patrick Galbraith-Robertson, development assessment planning Coordinator		
From	Josh Bennie - Acting Senior Project Manager		
Date:	Date 16/5/2022	Refers :	DA2021 - 1001 - Shared User Path - Beach to Beach project -Dunbogan
Subject:	P2018.154 - Beach to Beach Shared Path Alignment Investigation DA2021 - 1001 - Shared User Path - Beach to Beach project - Dunbogan		

Dear Pat,

This Memo provides a covering letter in response to the DA additional information request regarding DPI Fisheries' comments (letter IDA21/147 dated 6 December 2021) for the Beach to Beach Shared Path project.

The PMHC project team and Consultant KBR have revised the EIS & BDAR to include additional commentary of the proposed impacts to fish habitat and the design process of the proposed route to address DPI Fisheries comments.

Please see the attached Excel comments register however a list of the changes are included below:

- Updated commentary and FM Act Offset and Monitoring Strategy (EIS section 6.1.2 - page 65)
- Biodiversity offsets and credits required (EIS Section 6.1.5 - page 77)
- PMHC covering memo to commit to funding offsetting impacts to seagrass (memo dated 16.5.22) at a ratio of 2:1 for Type 1-3 habitat currently being $113.50/m^2$
- Provision of a long term monitoring program developed prior to construction (and
    - Construction methodology (EIS section 2.4.2 - page 13)
- Updated Aquatic Habitat Assessment (Appendix D - BDAR - Section 4 page 53)
- Pathway options analysis and selection (Appendix D - BDAR - Section 6 Page 85)

I trust the satisfies the requirements of the additional information requested from DPI Fisheries.

Regards,



Josh Bennie
Acting Senior Project Manager

PORT MACQUARIE HASTINGS COUNCIL

Organisational Project Delivery

MEMO

To:	Patrick Galbraith-Robertson, development assessment planning Coordinator		
From	Josh Bennie - Acting Senior Project Manager		
Date:	Date 17/5/2022	Refers :	DA2021 - 1001 - Shared User Path - Beach to Beach project - Dunbogan
Subject:	P2018.154 - Beach to Beach Shared Path Alignment Investigation DA2021 - 1001 - Shared User Path - Beach to Beach project - Dunbogan		

Dear Pat,

This Memo provides a response to the DA additional information request regarding payment of a monetary bond for potential indirect impacts associated with shading and construction impacts for the Beach to Beach shared path project.

It is intended as part of the future construction staging that the required monetary bond offsets, equating to $113.50 per metre squared, will be paid as part of the construction phase of the project. Refer to the Beach to beach EIS Section 6.1.2 (page 65).

As noted by DPI Fisheries through the DA assessment (letter IDA21/147 dated 6 December 2021) a long term three years monitoring program will be developed prior to construction start that will quantify the extent of actual indirect impacts to seagrass.

I trust the satisfies the requirements of the additional information requested.

Regards,

Josh Bennie
Acting Senior Project Manager

Approvals

Gary Randall *Group Manager, Organisational Project Delivery*	Gary Randall (May 19, 2022 13:40 GMT+10)
Blayne West *Group Manager, Community Infrastructure Planning & Design*	Blayne West Blayne West (May 21, 2022 12:23 GMT+10)
Glenn Lacey *Acting Director Community Infrastructure*	G lacey G lacey (May 23, 2022 17:07 GMT+10)

Memo - B2B Fisheries Seagrass Response

Final Audit Report 2022-05-23

Created:	2022-05-16
By:	Josh Bennie (josh.bennie@pmhc.nsw.gov.au)
Status:	Signed
Transaction ID:	CBJCHBCAABAAcWJdm5sBhbl0zGIDP5S5FW1hWfyixMY9

"Memo - B2B Fisheries Seagrass Response" History

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Signature Date: 2022-05-23 - 7:07:08 AM GMT - Time Source: server- IP address: 203.219.48.100

Agreement completed.
2022-05-23 - 7:07:08 AM GMT

Adobe Acrobat Sign

Appendix L

Correspondence with Crown Land



Gabriella Horton

From: Konrad Grinlaubs
Sent: Monday, 19 April 2021 5:27 PM
To: Leen June Lee
Subject: FW: Beach to Beach Project Approvals Responses
Attachments: licence-new-licence-application-form (5).pdf; Roads-Crown-road-transfer-application-form.pdf; Beach to beach analysis_.doc

Categories: Important / Urgent

FYI

Konrad Grinlaubs
KBR | Team Lead Environment, NSW
2 Portside Crescent | Maryville (Newcastle) NSW 2293 | Australia
Phone: +61 2 8284 2093 | Mobile: +61 (0)431 818 392
Konrad.Grinlaubs@kbr.com

KBR acknowledges the Traditional Custodians throughout Australia and their continuing connection to land, water, culture and community, and pays respect to their Elders past, present and future.

From: Shannon Powell <shannon.powell@crownland.nsw.gov.au>
Sent: Wednesday, March 24, 2021 1:49 PM
To: Alexandra Cooke <Alexandra.Cooke@kbr.com>; Sam Mackie <Sam.Mackie@pmhc.nsw.gov.au>
Cc: Konrad Grinlaubs <Konrad.Grinlaubs@kbr.com>; Silas Sutherland <silas.sutherland@crownland.nsw.gov.au>
Subject: [External] RE: Beach to Beach Project Approvals Responses

Hi Alexandra and Sam

Thank you for your patience and understating for my delayed response.

Please find attached summary of preliminary status and actions for each section of the D3 to D11. It is preliminary and reflects our previous discussion.

Formal status will be completed once the licence application is submitted. You may wish to include a map of the each section with the extent of the effected crown land highlighted (footprint of the walkway) to make creation of the licence document streamlined and accurate.

When completing the licence application please include :

- REF for the proposed constructed sections for our review
- Letter of concurrence from the NSWALC for the structures to be built

A licence will be needed for the already constructed sections that are on Crown land that Council is not he manager of.

2 tenures may be suitable, given one tenure will authorise a boardwalk (proposed D3-D11) while the other will potentially authorise encroachments (already constructed).

Construction on Crown land for the D3-D11 must not commence until Council holds a tenure from Crown lands.

Attached is the Crown road transfer request that is required for a few section of crown road that will be required to transfer and this link will direct Council to the Compulsory acquisition process for the Council roads constructed on Crown land https://www.industry.nsw.gov.au/lands/access/compulsory-acquisition

Should you have any questions, please do not hesitate to contact me.

Shannon Powell
Group Leader Property Management

Regional Services – North Coast
Crown Lands | Department of Planning, Industry and Environment
T: 1300 886 235 **M**: 0428600193
E: shannon.powell@crownland.nsw.gov.au
www.dpie.nsw.gov.au
Level 3, 49-51 Victoria Street, Grafton NSW 2460
PO Box 2185, Dangar NSW 2309

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Alexandra Cooke <Alexandra.Cooke@kbr.com>
Sent: Thursday, 4 March 2021 1:39 PM
To: Shannon Powell <shannon.powell@crownland.nsw.gov.au>
Cc: Konrad Grinlaubs <Konrad.Grinlaubs@kbr.com>
Subject: Beach to Beach Project Approvals Responses

Hi Shannon,

I hope you are well?

I'm following up to see if it is possible to forward the responses from our meeting on the 17th February, regarding the Beach to Beach Shared Pathway project?

I'm heading away for a week from tomorrow. I have left a message on your phone however, if you could please forward the responses to Konrad (cc'd in this email), it would be much appreciated.

Please let us know if you require anything further.
Many thanks,
Allie

Alexandra Cooke
KBR | Environmental Planner, Infrastructure
13/201 Kent St | Sydney, NSW, 2000 | Australia
Office: +61 (0)2 8284 2000
Mobile: +61 (0)431 965 077
Alexandra.cooke@kbr.com



KBR acknowledges the Traditional Custodians throughout Australia and their continuing connection to land, water, culture and community, and pays respect to their Elders past, present and future.

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