



# **Wagonga Inlet Water and Sewer Trenchless Crossings Review of Environmental Factors**

Eurobodalla Shire Council

16 September 2022

→ **The Power of Commitment**




**GHD Pty Ltd | ABN 39 008 488 373**

GHD Tower, Level 3, 24 Honeysuckle Drive  
Newcastle, New South Wales 2300, Australia

**T** +61 2 4979 9999 | **F** +61 2 9475 0725 | **E** ntlmail@ghd.com | **ghd.com**

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# Executive summary

The two existing Wagonga Inlet pipelines, a DN375 MS water main and DN375 MS sewer rising main were installed in 1978. Eurobodalla Shire Council (Council) are looking to replace the existing crossing with two new underbored pipelines to provide reliability to both water and sewer systems.

Council engaged GHD Pty Ltd (GHD) to undertake optioneering investigations, preliminary environmental investigations and concept design for the works associated to the preferred alignment of the new pipelines.

The new pipelines will cross Wagonga Inlet with a horizontal bore distance of approximately 430m, between the Mill Bay Boat Ramp Carpark on the northern side, to Ken Rose Park on the southern end. The preliminary environmental investigations determined that a Review of Environmental Factors (REF) was required for the proposal. Council engaged GHD to prepare a concept design and REF for the new Wagonga Inlet crossing water and sewer mains (Narooma mains), in the suburbs of Narooma and North Narooma, NSW (the proposal).

The works are development permissible without consent in accordance with Clause 106 and Clause 125 of State Environmental Planning Policy (Infrastructure) (ISEPP). This REF has been prepared in accordance with the requirements of Clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Biodiversity Conservation Act 2016*, the *Fisheries Management Act 1994* and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. Council would be the proponent and determining authority for the REF.

In preparation of this REF, potential environmental impacts relating to the proposal have been identified and assessed and consideration of the relevant planning requirements and legislation has been undertaken.

Where applicable, mitigation measures have been identified in order to avoid or minimise potential impacts. The overall environmental impact assessment process has been established that the proposal can be undertaken without major adverse impacts upon the environment. Prior to the commencement of the proposed works within the project area there must be an application for an Aboriginal Heritage Impact Permit (AHIP) to complete a test excavation of the northern entry site and the Boat Shed Midden/ Wagonga Inlet (AHIMS ID# 62-7-0165) if this site cannot be avoided by the proposed works.

For all environmental aspects, the proposal would not result in a significant environmental impact and therefore an environmental impact statement is not required to be prepared.

This report is subject to, and must be read in conjunction with, the limitations, assumptions and qualifications contained throughout the report.

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# 1. Introduction

Eurobodalla Shire Council (Council) have engaged GHD Pty Ltd (GHD) to prepare a concept design and a Review of Environmental Factors (REF) for the installation of two new underbored pipelines to provide reliability to both water and sewer systems in Narooma, New South Wales (NSW) (the 'proposal', see Figure 3.1).

The two existing pipelines, a DN375 MS water main and a DN375 MS sewer rising main were installed in 1978 and Council are looking to replace the existing crossings with two new underbored pipelines to provide reliability to both water and sewer systems.

## 1.1 Proposal identification

The proposed trenchless crossing will connect to the existing water and sewer mains near the proposed entry (launch) and exit (receiving) pits in the Mill Bay Boat Ramp Carpark on the northern side of the Inlet and the Ken Rose Park on the southern side of the Inlet.

The proposal would require works on both the northern and southern sides of Wagonga Inlet within Crown reserve, on land owned by Department of Planning, Industry and Environment (DPIE) – Crown Land. However, it is noted these areas are likely under the general management of Council and would require consultation with Council's Crown land manager and DPIE – Crown Land.

With the exception of the construction of the entry and exit pits, and the short connecting sections to the existing mains, all works would otherwise be completed using trenchless methods to avoid direct disturbance to the Wagonga Inlet. The entry pit would be located within Mill Bay Boat Ramp Carpark and requires a total area of 30 square meters and a length of between 10 - 15 m for the construction activities. The exit pit would be located at Ken Rose Park and requires a minimum area of approximately 15 square meters with the maximum allowance of 30 square meters. The depth of the entry and exit pits will be shallow (1.2 m – 2.5 m), which is in line with the requirements of Horizontal Directional Drilling (HDD).

The proposal would be undertaken by Council, a public authority. The proposal is considered development permissible without consent under Clauses 106 and 125 of *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) and is therefore assessed under Part 5, Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

For the purposes of this assessment, the following definitions are employed:

- The 'proposal' refers to the proposed construction and operation of the two new underbored pipelines to provide reliability to both water and sewer systems in Wagonga, NSW. The location of the proposal is shown in Figure 3.1. The 'proposal site' refers to the areas that would be directly impacted by the proposal.
- The 'study area' encompasses the current design, immediate surrounds, and areas that may be directly or indirectly impacted by the proposal. The location of the study area is shown in Figure 3.1.

## 1.2 Purpose of the report

The potential environmental impacts of the proposal have been assessed in this document in accordance with Council's responsibilities as both a public authority and determining authority under the EP&A Act, particularly section 5.5 which requires determining authorities "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity".

In keeping with the requirements of Part 5, Division 5.1 of the EP&A, the factors listed under Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) have been taken into consideration in determining the likely impacts of the proposal (this is further discussed in Section 7.1).

This REF includes a description of the context for planning approvals and a description of the proposal. It includes an assessment of the potential environmental impacts and proposes mitigation measures that would be applied to avoid or minimise environmental impact.



## 2. Proposal need and justification

### 2.1 Objectives of the proposal

The existing pipelines were constructed in 1978 and Council are looking to replace the existing crossings with two new underbored pipelines to provide reliability to both water and sewer systems. The proposal will involve a dual trenchless crossing comprising of a OD450 water main and a OD450 sewer rising main used to replace the existing mains. The primary objectives of the proposal are to ensure:

- A reliable water supply is provided to the local communities of Narooma, Central Tilba, and Mystery Bay.
- A reliable sewage service is provided to Narooma.
- Impacts to the environment that could occur as a result of damage to the aged pipeline are minimised.
- Reduced potential for system redundancy.
- Reliability of the required transfer capacity into the future.
- The potential conflict with the proposed wharf upgrades by Marine Rescue NSW is eliminated or minimised.

### 2.2 Existing infrastructure

The two existing Wagonga Inlet pipelines, a DN375 MS water main and DN375 MS sewer rising main, were constructed in 1978. Owing to the age of these pipelines, Council is seeking to replace these pipelines to improve reliability and longevity in both the water and sewer systems. The new water main and sewer rising main will be connected to the existing water and sewer mains at either side of the Wagonga Inlet.

### 2.3 Options considered

#### 2.3.1 Alignment option

Three options were considered for the proposal. These are outlined below:

##### **Option 1 (Western alignment) – preferred route**

The location of the Option 1 alignment is from within Mill Bay Boat Ramp Carpark to the western side of the existing mains. This location is proposed as the closest to the water and sewer connection points and be drilled across the Wagonga Inlet over the shortest distance, whilst maintaining clearance from existing utilities and running to the west of the proposed new wharf by Marine Rescue NSW. The underbore is approximately 430 m in length and exits at the rear foot path to the south of the existing valves in Ken Rose Park, Narooma.

The close proximity of the entry and exit pits to the existing water and sewer mains may impact on the setup location and pipeline depth. The proposed alignment should consider the existing utilities to not be impacted by the drilling.

This option achieves the objective of providing reliability to the existing water and sewer systems.

##### **Option 2 (Eastern alignment)**

Option 2 alignment is also from within Mill Bay Boat Ramp Carpark, proposed to be installed on the eastern side of the current dual crossing. This alignment is proposed to cross the Wagonga Inlet over approximately 500 m and is further away from the proposed new wharf.

Option 2 is also further away from the proposed connections to water and sewer in both entry and exit. The exit point is proposed to be located near the carpark at Ken Rose Park to utilise the available space and allow for pipeline installation.

Although this option is further away from all assets on Mill Bay Boat Ramp side, it may have potential for impact on the water main near the carpark in Ken Rose Park due to the proximity to the connection point.

This option achieves the objective of providing reliability to the existing water and sewer systems.

### **Option 3 (Do nothing)**

This option would result in the existing water and sewer pipelines continuing to function in its current state. There would be no improvement in reliability in both the water and sewage systems. This option will not satisfy the objectives of the proposal and is not suitable as a result.

## **2.3.2 Trenchless method option**

The underbore options feasibility desktop review assessed four trenchless methods:

### **Horizontal directional drilling (HDD)**

- Surface launched
- Shallow entry and exit pits required
- Produces a shallow arc
- Steer-able
- Suitable in most ground conditions
- Requires area for laying out product pipe
- Uses positive downhole pressure to support the borehole
- Not always suitable when incorporating a casing

### **Microtunnelling**

- Pit launched
- Straight bore (very accurate, Laser Guided)
- Requires pits below installation depth (6 m x 3 m)
- Can be limited, depending on ground conditions
- Installs casing/ pipe directly behind drilling unit
- Excellent, for maintaining borehole stability
- Larger the bore, the longer its achievability
- May be limited contractor base

### **Auger boring**

- Pit launched.
- Straight bore (may not be as accurate as Microtunnel)
- May incorporate Pilot Tube for greater accuracy
- May be limited in drive length
- Requires large pits down below installation depth (11 m x 3 m)
- Can be limited depending on ground conditions. Can install steel casing directly behind drilling unit
- Limited contractors
- Due to auger cutting action can cause ground destabilization in unsuitable ground conditions

### **Pipe ramming**

- Pit launched, straight bore
- Requires pits down below installation depth (10 m x 3 m)
- Suitable in soft/poor ground conditions
- Limited contractors, relatively short distances (20 m - 30 m)
- Installs open pipe(casing) directly into the ground by a ramming technique

## 2.4 Preferred option justification

Following completion of the Options Report (GHD, 2021a), an Options Workshop was held to discuss the key findings from the optioneering stage and seek for Council's endorsement on the preferred option. Option 1 was selected as the preferred route since it will be the most suitable to reduce impacts on users, be closest to the connection points to the existing pipelines and is situated in a better location for the angle of pipe installation.

Upon assessment of the proposal, horizontal directional drilling (HDD) trenchless methodology has been deemed to be the safest and most feasible option. The proposed option is 430 m in length with a large vertical curve using a 500 m bend radius with 17 m – 27 m of cover. Each underbore would have a minimum of 10 m of cover below the Inlet's base.

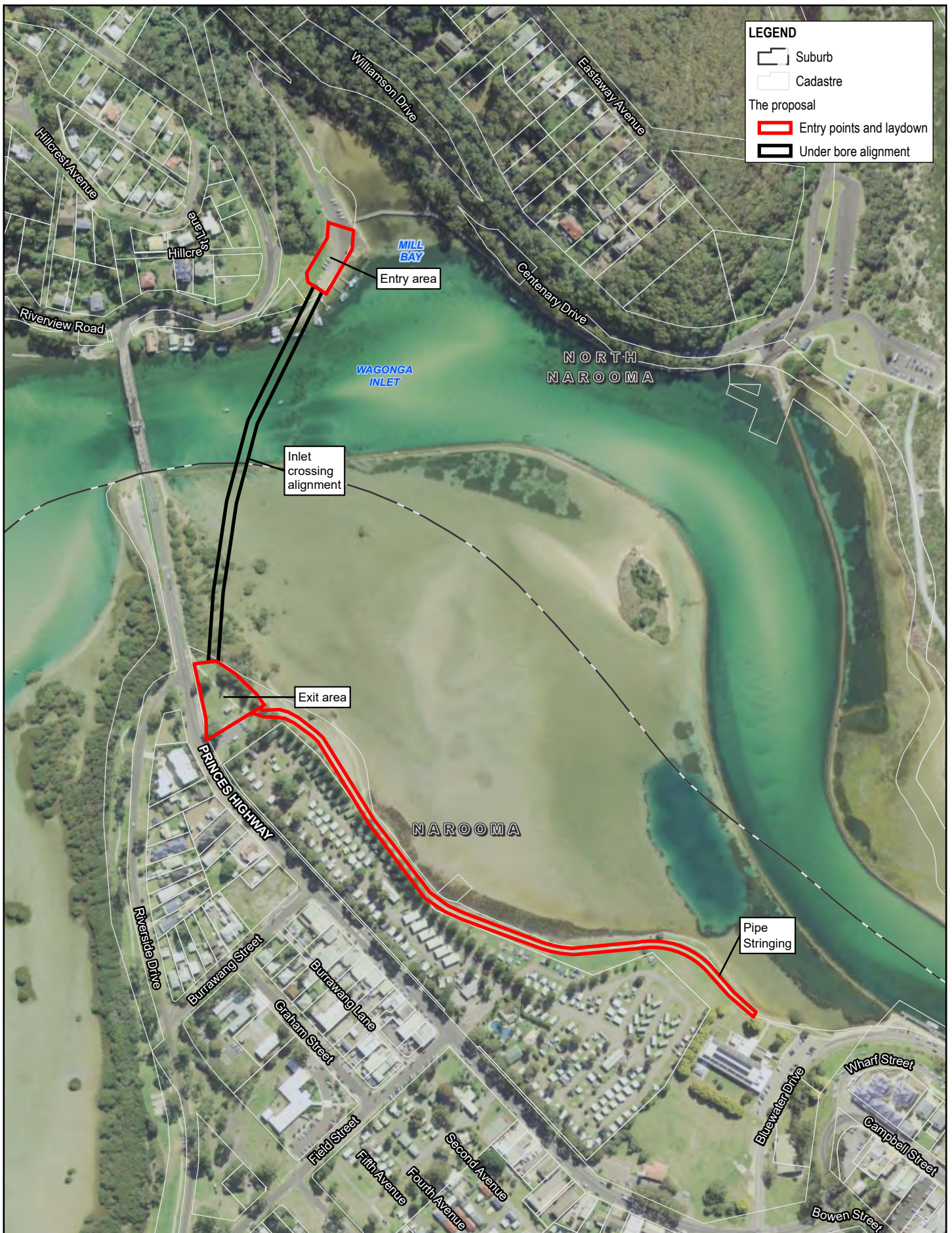
Through the design workshops and the completion of this REF, minor revisions to the proposed construction were completed, including the requirement to avoid impact to registered AHIMS sites at the northern side of the inlet and the pipe string out location. Further details are discussed in Section 3.

## **3. Description of the proposal**

### **3.1 Proposal overview**

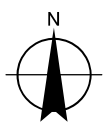
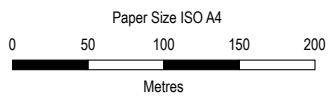
An overview of the proposal is shown in Figure 3.1 with the concept design included in Appendix A. The proposal includes replacement of the existing Wagonga Inlet transfer crossings with a new water main and sewer main, connecting Narooma and North Narooma to the south and north respectively.

With the exception of the construction of the entry and exit pits, and the 15 -20 metres trenched connecting sections to the existing mains, all works would otherwise be completed using trenchless methods to avoid direct disturbance to Wagonga Inlet Crossing. The entry pit would be located within Mill Bay Boat Ramp Carpark, with a total area of 900 m<sup>2</sup>. The exit pit would be located at Ken Rose Park, with a minimum area of 225 m<sup>2</sup>. The specifics of construction activities for the proposal are provided in section 3.3.



**LEGEND**

- Suburb
- Cadastral
- The proposal
  - Entry points and laydown
  - Under bore alignment



**Eurobodalla Shire Council**  
**Wagonga Inlet Crossing –**  
**Water and Sewer Trenchless Crossings**  
**Review of Environmental Factors**

Project No. 12563160  
 Revision No. 0  
 Date 16 Sep 2022

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56

**The proposal**

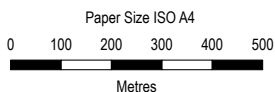
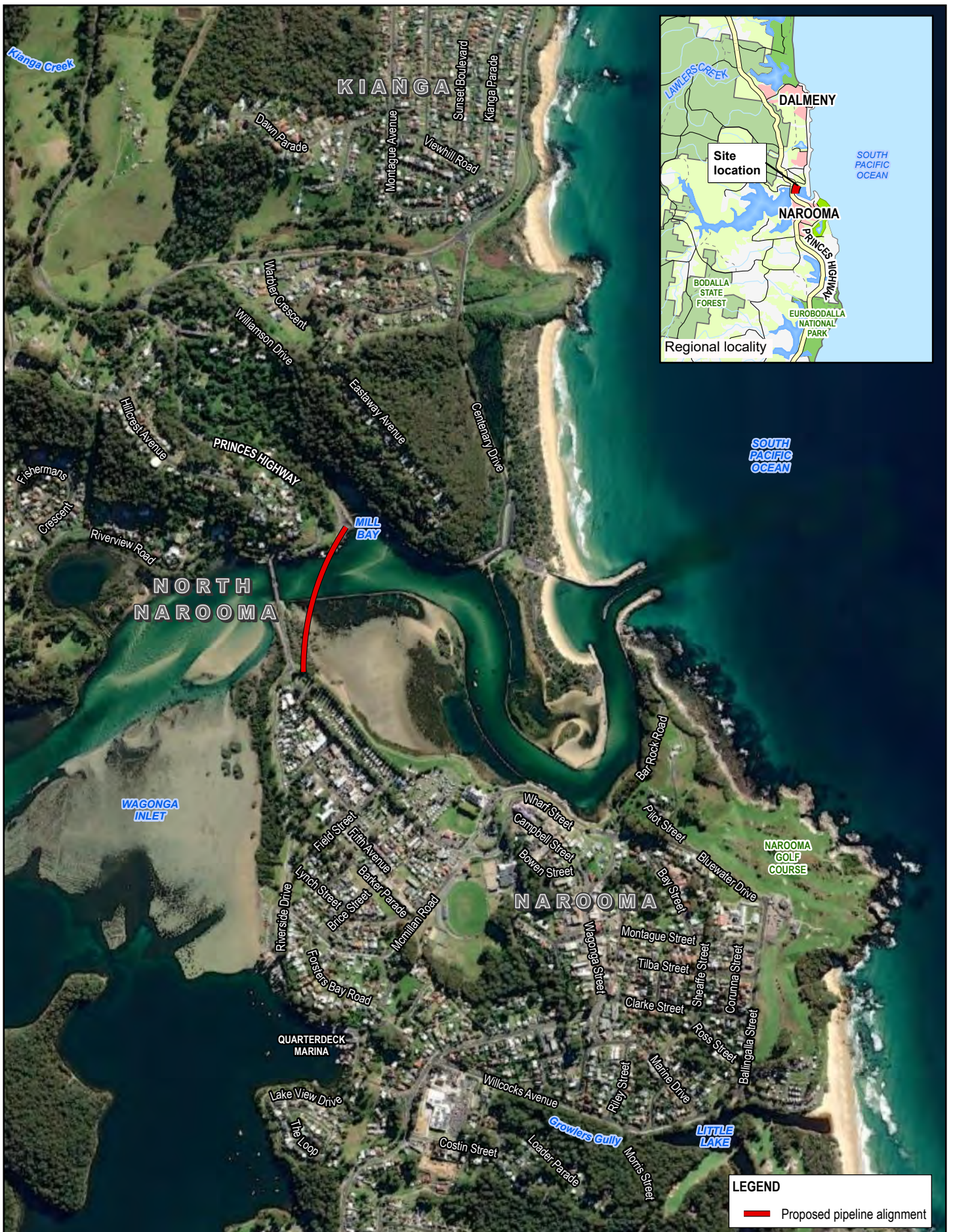
**FIGURE 3-1**

## 3.2 Proposal location

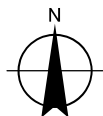
The proposal would be constructed in the suburbs of Narooma and North Narooma, NSW (Figure 3.2). The entirety of the proposal occurs within the Eurobodalla Shire LGA.

The proposal would require works on both the northern and southern sides of Wagonga Inlet within Crown reserve, on land owned by Department of Planning, Industry and Environment (DPIE) – Crown Land. However, it is noted these areas are likely under the general management of Council and would require consultation with Council's Crown land manager and DPIE – Crown Land.

GHD submitted an Options Report on 16 November 2021 to the Council which recommended a launch site location from within Mill Bay Boat Ramp Carpark to the western side of the existing mains. This location is proposed to be closest to the water and sewer connection points and be drilled across the Wagonga Inlet over the shortest distance, whilst maintaining clearance from existing utilities and running to the west of the proposed upgrade works of the wharf by Marine Rescue NSW.



Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56



Eurobodalla Shire Council  
 Wagonga Inlet Crossing –  
 Water and Sewer Trenchless Crossings  
 Review of Environmental Factors

Proposed locality

Project No. 12563160  
 Revision No. 0  
 Date 16 Sep 2022

**FIGURE 3-2**

## 3.3 Construction of the proposal

### 3.3.1 Construction activities

The following minimum pipes cover and gradients are preliminary recommendations only and are to be confirmed during detailed design:

- Minimum cover will be maintained for the trenchless under bore of 10 m below the base of the inlet. Below the banks of the inlet, a minimum cover of 4 m will be maintained.
- Minimum vertical clearance to services to be 500 mm for gravity sewer and 300 mm for all other services unless noted otherwise by specific utility requirements.
- Minimum gradient to be 0.2% (or 1 in 500) to allow air pockets to travel towards air valves.
- Maximum gradient to be 20%. Where vertical grades exceed 10% bulkheads are to be installed.

The entry pit is located within Mill Bay Boat Ramp Carpark to the western side due to the sufficient space available for set up. The total area required at the entry pit is expected to be 900 m<sup>2</sup>. This includes the entry pit itself and any indirect impacts from the ancillary equipment, HDD rig and compound sites.

The exit pit site is located on the southern side of Wagonga Inlet at Ken Rose Park. The total minimum area required at the exit site is 225 m<sup>2</sup> with the maximum allowance of 900 m<sup>2</sup>. The exit pit will include an excavator, vacuum tanker, work vehicles, pipe fusion welding gear, pipe and a fluid delivery system.

In addition to the entry pit, ancillary activities include pipe-stringing in a laydown area. Due to limited stringing out space behind the entry and exit sites, the proposed laydown area is the path along the inlet at Narooma. It is noted that an Aboriginal Heritage item is located in the vicinity of the pipeline string out location and impacts to this item will be avoided via the measures identified in Section 6.7.4.

Construction stages include:

- Planning and mobilisation
- Construction
- Pipe connections
- Decommission
- Rehabilitation works

Construction would be using trenchless methods as described further below. Key stages are as follows:

#### Planning and mobilisation

The construction contractor would establish the site compound and ancillary equipment at the entry pit including any fencing and controls. Access to the entry and exit pit locations is via publicly accessible roadways. Should the construction compound occur outside the REF assessment area, further impact assessment and approval from Council would be required. Basic ancillary equipment for the underbore would include a Fluid Recycling System, Excavator, Vacuum Tanker, Pumps, Generators, Utes and a site office. As space is limited on both the northern and southern sides of the inlet, planning will be crucial. The minimum setup area would need be 900 m<sup>2</sup> for the Mill Bay Boat Ramp Carpark and 225 m<sup>2</sup> at Ken Rose Park.

The ancillary equipment will be setup near the HDD rig and will include recycling units, pumps and generators. Plant and equipment storage would generally be undertaken within the entry pit area with connected sections of pipeline lying on previously disturbed areas of grassland adjoining the entry pit. Where this is not practicable, further assessment would be required to determine associated impacts (Section 6.3.3).



## Construction

The entry and exit pits would be built using an excavator. In order to attain a safe depth of cover prior to entering the Inlet, the angle of entry will be between 10%-15%. When drilling in softer soils, an additional depth of cover of surface casing may be required in order to limit the risk of frac-out and/or collapse depending on the cohesive nature of the soils.

Laydown area and welding of the pipeline will most likely occur from the Ken Rose Park end due to the sufficient space as well as the laydown area along the side of the inlet (see Figure 3.1). The pipes may be filled with water to reduce buoyancy before they are installed. The two pipes will be completed simultaneously. One will be used as a mud return line in order to keep the borehole open and reduce time needed to transport drilling fluids for cleaning and reuse. This will form a circulatory system. Confirmation of pipe selection will be included in the detailed design. The pipes will be installed with the assistance of a vacuum tanker to assist in the management of spoil.

Open trench construction is proposed for the final connection points of the mains to the existing water and sewer mains. This comprises approximately 15-20 m of open trench at each end for each main, where concrete thrust blocks and isolating valves are going to be installed.

Prior to commissioning, the pipelines will be flushed with chlorinated water and connected to the existing mains.

## Decommissioning

The construction contractor would remove waste from the site. Entry and exit pits, connection area and valves installation will be reinstated to pre-construction condition. The contractor will complete landscaping necessary to return the site to its previous condition. All machinery and equipment as well as the site compound will be removed from the site.

Further information regarding timing and staging is discussed under 3.3.6.

### 3.3.2 Vegetation removal

The trenchless nature of the pipeline means that there is minimal disruption to groundcover. The only points at which groundcover will need to be removed are the entry and the exit pit sites and the pipe connections via open trench methodology. The entry and exit sites are anticipated to require approximately 900 m<sup>2</sup> and 225 m<sup>2</sup> respectively, the pipe connections and the open trench sections are anticipated to require approximately 150 m<sup>2</sup> on each end. The pipe connection Ken Rose Park is grass covered (Figure 3.6), meaning that vegetation removal would apply to this grass. Further discussion on vegetation removal is included in Section 6.3.

### 3.3.3 Plant and equipment

The construction works would require the use of a variety of construction plant and equipment. Examples of the main plant and equipment that are expected to be used are:

- Excavator or similar earthmoving equipment for entry/ exit pit construction
- Medium to large size Horizontal directional drilling (HDD) rig
- Light vehicles
- Pipe fusion welding gear
- Pipe
- Fluid recycling system
- Vacuum tanker
- Delivery vehicles including trucks
- Workers transport vehicles
- Chainsaw
- Compressor
- Drill rig HPU
- Gas cutter
- Hand power tools
- HDD rig

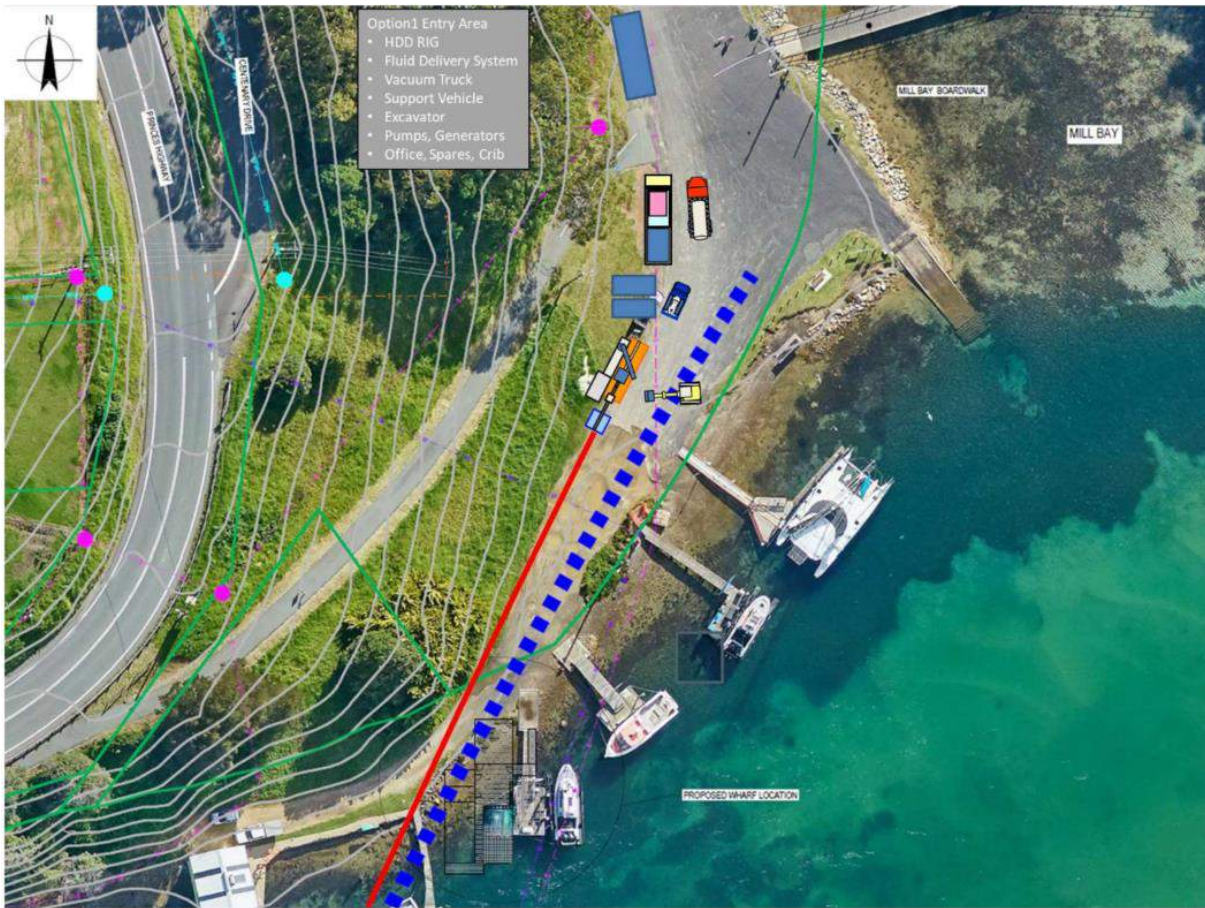
- Mud cleaner
- Mud pump
- Power generator
- Shaker
- Sheet piling rig
- Truck (medium rigid)
- Tub grinder/mulcher
- Vacuum truck
- Welder generator

### 3.3.4 Ancillary facilities

This REF has included assessment of two proposed locations for a temporary construction site compound (refer to Figure 3.1). The compound area would be 30 m x 30 m, with offices and equipment housed slightly further away to limit the space taken within carpark to allow potential access to boats or fit in with the lay of the land (see Figure 3.3 and Figure 3.5). The pipe will be strung and welded to the southern side of the exit pit at Narooma (see Figure 3.4). The proposal site would be fenced to ensure the proposal site is excluded from the public.

The compound area and ancillary facilities would include the following:

- Site office
- Parking
- Equipment laydown areas
- Waste receptacles
- Spoil (sub and topsoil) stockpile areas
- Storage areas for construction materials (could include some hazardous materials such as fuels and chemicals).



**Figure 3.3** Entry site (Mill Bay Boat Ramp Carpark) showing proposed locations of ancillary facilities



**Figure 3.4** Exit site (Ken Rose Park) showing proposed locations of ancillary facilities



**Figure 3.5** View of Wagonga Inlet from northern side of Inlet (Mill Bay Boat Ramp Carpark, facing south-west), showing the carpark in a heavily disturbed environment



**Figure 3.6** View of Wagonga Inlet from southern side of Inlet (Ken Rose Park, facing north-east), showing the maintained lawn and community facilities at the park

### 3.3.5 Movements and access

Construction traffic during the temporary construction period of the proposal includes:

- Approximately 10 light vehicle movements per day for construction workers over the construction period.
- Approximately 5 heavy vehicle movements per day for earthmoving and pipe deliveries over the construction period.

Access for construction of the proposal would be undertaken from Centenary Drive on the northern side of the inlet to Mill Bay Boat Ramp. Access from the southern side of the inlet would occur via Princes Highway directly into Ken Rose Park. The site will be utilising the existing Ken Rose Park Carpark. To access the exit pit, the site will require some modifications the existing carpark to remove wooden bollards.

### 3.3.6 Timing and staging

#### Proposal timing

Based on standard construction hours and a standard drilling rate, it is projected that the HDD operation would take 8 weeks in total (4 weeks per pipeline).

Additional 6 weeks are anticipated for planning and mobilisation, pipe connections, decommissioning and rehabilitation works.

#### Construction hours

Working hours for all construction activities would be during standard construction hours:

- Monday to Friday 7:00 a.m. to 5:00 pm
- Saturday 8:00 a.m. to 1:00 pm
- No work on Sundays or public holidays

There is potential for the requirement of operating outside of these hours during pipe pull activities. This would be temporary and would span for no longer than one week. Approval would be sought for any changes to the approved and extended work hours.

## 3.4 Operational requirements

Once operational, the proposal is expected to operate in a similar manner to the current Wagonga Inlet crossing water and sewer mains. Some ongoing maintenance will be required to ensure the pipeline remains in good working order. Maintenance would include monitoring valve performance. Maintenance activities would be consistent with Council maintenance of the existing assets.

### 3.4.1 Operational access

Access during operation would be one light vehicle per inspection and would be via Centenary Drive at North Narooma and Princes Highway at Narooma.

## 4. Statutory framework

### 4.1.1 Eurobodalla Local Environmental Plan 2012

The proposal is located within the Eurobodalla Shire local government area (LGA) and the relevant planning instrument is the *Eurobodalla Local Environmental Plan 2012* (Eurobodalla LEP).

Land zoning maps indicate that the proposal would be constructed on land zoned:

- RE1 – Public Recreation
- W1 – Natural Waterways
- W2 – Recreational Waterways

As the proposal is permitted without consent under the ISEPP, the consent provisions of the Eurobodalla LEP do not apply to the proposal and are therefore not considered further in this REF.

Environmental heritage is listed under Schedule 5 of the Eurobodalla LEP. The closest listed local heritage item to the proposal is the Old Ferry Approaches and Crossing located 300 m from Mill Bay Boat Ramp Carpark in North Narooma. On the southern side of the inlet, there is also an Old Ferry Approaches and Crossing located 150 m southwest of Ken Rose Park.

## 4.2 Environmental Planning and Assessment Act 1979

The EP&A Act is the principal planning legislation in NSW. Planning instruments are made under Part 3 of the EP&A Act and define the approval pathway for proposals based on a number of factors such as development location, capital investment value, type of development etc. The most applicable planning instruments for the proposal are discussed below.

### 4.2.1 State Environmental Planning Policy (Transport and Infrastructure) 2021 (T& ISEPP)

T& ISEPP aims to facilitate the effective delivery of infrastructure and the provision of services across the state through increased regulatory certainty and improved efficiency and flexibility in the location of infrastructure and service facilities, while providing for adequate stakeholder consultation.

T& ISEPP relates primarily to public infrastructure proposals and service facilities developed for or on behalf of public authorities.

Council is defined as a public authority.

Controls relating to water supply systems are provided in Division 24 of T& ISEPP.

The Standard Instrument – Principal Environmental Plan defines a water reticulation system as:

*a building or place used for the transport of water, including pipes, tunnels, canals, pumping stations, related electricity infrastructure and dosing facilities.*

In accordance with Section 2.158, development for the purpose of water reticulation systems may be carried out by or on behalf of a public authority without consent on any land.

The proposal would be classified as works for a water reticulation system.

This proposal is proposed to be carried out by or on behalf of a public authority, and therefore would be carried out in the prescribed circumstances.

Controls relating to sewerage systems are provided in Division 18 of T& ISEPP.

The Standard Instrument – Principal Environmental Plan defines a sewerage reticulation system as:

*sewerage reticulation system means a building or place used for the collection and transfer of sewage to a sewerage treatment plant or water recycling facility for treatment, or transfer of the treated waste for use or disposal, including associated—*

- a) *pipelines and tunnels, and*
- b) *pumping stations, and*
- c) *dosing facilities, and*
- d) *odour control works, and*
- e) *sewerage overflow structures, and*
- f) *vent stacks.*

In accordance with Section 2.1.25 (1), development for the purpose of sewerage reticulation systems may be carried out by or on behalf of a public authority without consent on any land.

The proposal would be classified as works for a sewerage reticulation system.

This proposal is proposed to be carried out by or on behalf of a public authority, and therefore would be carried out in the prescribed circumstances.

Development permissible without consent is assessed in accordance with Part 5 of the EP&A Act through the preparation of a REF. For the purposes of the REF, Council is the proponent and determining authority under Division 5.1 of the EP&A Act.

## 4.2.2 State Environmental Planning Policy (Resilience and Hazards) 2021

The southern end of the proposal site is located on land mapped by the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) as a proximity area for coastal wetlands. However, proposal site is heavily disturbed and has negligible environmental value (further discussed in Section 6.3).

## 4.3 Other NSW legislation

### 4.3.1 Roads Act 1993

The *Roads Act 1993* (Roads Act) sets out the requirements for the management and use of public roads. Section 138 of the Roads Act requires that a person obtain the consent of the appropriate roads authority for the erection of a structure, or the carrying out of a work in, on or over a public road, or the digging up or disturbance of the surface of a public road.

While works will be undertaken within the Mill Bay boat ramp/ carpark area, this area is understood not to be part of the road reserve.

### 4.3.2 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Conservation Act 2016* (BC Act) is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future. The BC Act lists threatened species, populations and ecological communities as well as critical habitat and key threatening processes that must be considered when assessing the effects of an activity.

The BC Act outlines the factors to be considered when making an assessment. If a significant impact is deemed likely following this assessment, a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) may be required. The proposal would not result in a significant impact to biodiversity, hence preparation of an SIS or BDAR is not required. Further detail is provided in Section 6.3.

### 4.3.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) lists the threatened species, populations and ecological communities that must be considered when assessing the effects of an activity as described in Clause 5.5 of the EP&A Act. Section 220ZZ of the FM Act (and Section 1.7 of the EP&A Act) outlines the factors to be considered when making an assessment. A Species Impact Statement is required if there is likely to be a significant impact on a threatened species, population or ecological community or its habitat.

The proposal will cross under Wagonga Inlet. No dredging and reclamation, obstruction of fish passage is expected to be required for the proposal. The proposal is not expected to harm to a threatened species, population or ecological community, damage to critical habitat, or damage to the habitat of a threatened species, population or ecological community. Further detail is provided in Section 6.3.

### 4.3.4 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) aims to conserve nature, objects, places or features (including biological diversity) of cultural value within the landscape. The NPW Act also aims to foster public appreciation, understanding and enjoyment of nature and cultural heritage, and provides for the preservation and management of national parks, historic sites and certain other areas identified under the NPW Act. There have been one non-Aboriginal heritage item and two Aboriginal heritage items identified within the vicinity.

The preparation of a full Aboriginal Cultural Heritage Assessment (ACHA), in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) has been completed. Potential impacts to Aboriginal heritage are discussed in Section 6.7.3.

### 4.3.5 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to ensure that the heritage of NSW is adequately identified and conserved. The Heritage Act provides protection to items such as places, buildings, works, relics, moveable objects, precincts or land that have been identified, assessed and listed on the State Heritage Register.

There is one Heritage item, listed on the State Heritage Inventory which is the Light from Montague Island Lighthouse shown in the vicinity of works in Ken Rose Park. However, the light is located inside the Narooma visitor centre and will not be impacted by the works.

The nearest heritage item to the proposal listed on the State Heritage Inventory is the Old Ferry Approaches and Crossing located 300 m from Mill Bay Boat Ramp Carpark in North Narooma. On the southern side of the inlet, there is also an Old Ferry Approaches and Crossing located approximately 150 m southwest of Ken Rose Park. The Narooma Memorial School of Arts is located approximately 1 km away from Ken Rose Park which is on the southern side of the proposal. Potential impacts to non-Aboriginal heritage are assessed in Section 6.6.2.

### 4.3.6 Aboriginal Land Rights Act 1993

The *Land Rights Act 1993* provides land rights for Aboriginal person in NSW via a process of land claim and establish land councils to acquire, manage and represent claims and claimants.

There are no known land claims that directly relate to the proposal.

### 4.3.7 Crown Land Management Act 2016

The object of the *Crown Land Management Act 2016* is to provide direction in regard to the ownership, use and management of Crown Land of NSW. This includes considering environmental, social, cultural heritage and economic issues in regard to Crown Land management, with the intent of providing consistent, efficient, fair and transparent management of Crown land for the benefit of the people of NSW, including the use and co-management by Aboriginal people.

The proposal is located on Crown land. Therefore, consultation with Council's Crown Land Manager and DPIE – Crown Lands will be required to confirm the need for an approval under the *Crown Land Management Act 2016*.



### 4.3.8 Water Management Act 2000

The *Water Act 1912* (Water Act) has historically been the main legislation for managing water resources in NSW, however, is currently being progressively phased out and replaced by water sharing plans (WSPs) under the Water Management Act 2000 (WM Act). Once a WSP commences, existing licences under the Water Act are converted to Water Access Licences (WALs) and to water supply works and use approvals under the WM Act.

The WSP relevant to the proposal is the Water Sharing Plan for the Wandella Creek Water Source 2003. Water access licences are also issued under the WM Act with some still issued under the *Water Act 1912*. Licences are required to take water, undertake water management works, carry out some activities on waterfront land or where aquifers are impacted. Section 56 of the WM Act establishes access licences for the taking of water within a water management area.

Controlled activity approvals are required for certain types of activities which are carried out on waterfront land or defined as a controlled activity in the WM Act. However, exemptions for controlled activity approvals apply for activities carried out by public authorities.

There are no existing WALs associated with the proposal and no additional WALs are required as a result of the proposal. Impacts to water will be minimal and is expected during construction, however, the proposal will achieve the Water Act objective as it will contribute to the sustainable and efficient use of water. Potential impacts to hydrology, flooding and water quality are assessed in Section 6.2.

### 4.3.9 Rural Fires Act 1997

For certain development on bush fire prone land, approval is required under the *Rural Fires Act 1997* (Rural Fires Act) and the EP&A Act.

Narooma is located within a designated bush fire prone area. The proposal is surrounded by areas of bush fire prone land. However, approval is only required under the Rural Fires Act for subdivision, special fire protection purposes or habitable dwellings. Therefore, approval for the proposed works under this Act is not required.

### 4.3.10 Waste Avoidance and Resource Recovery Act 2000

The *Waste Avoidance and Resource Recovery Act 2000* provides a framework to identify and implement the most efficient use of resources in order to reduce the potential for environmental harm arising from the generation of waste.

The construction contractor is required to conform to the provisions of the Act in relation to waste management by adopting the resource management hierarchy principals (in order of priority) of avoidance, resource recovery and disposal. More detail on the waste avoidance and resource recovery approach is further addressed in Section 6.11.

### 4.3.11 Contaminated Land Management Act 1997

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating and (where appropriate) remediating land that is considered to be contaminated.

Section 59(2) of the Act requires notification of contaminated sites.

Section 60 of the Act requires landowners to report any contamination that represents a significant risk of harm to human health or the environment to the NSW Environment Protection Authority (EPA).

A search of contaminated land record of notices and sites notified to the EPA identified no contaminated sites within proximity to the proposal site. Site contamination is further addressed in Section 6.1.

### 4.3.12 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) establishes a licensing regime for pollution generating activities in NSW. Under Section 48 of the Act, an environmental protection licence relating to air, water and noise pollution or waste management is required for scheduled activities as listed under Schedule 1 of the POEO Act.

The proposal does not meet the definition of a scheduled activity under Schedule 1. Therefore, an EPL under the POEO Act would not be required.

### 4.3.13 Coal Mine Subsidence Compensation Act 2017

The object of the *Coal Mine Subsidence Compensation Act 2017* is to provide a fair, efficient and sustainable compensation framework for dealing with the impacts of coal mine subsidence.

Review of the mine subsidence board mapping indicates the proposal site is outside of any mine subsidence districts and therefore the *Coal Mine Subsidence Compensation Act 2017* is not applicable.

### 4.3.14 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) provides for modern, flexible tools and powers that allow effective, risk-based management of biosecurity in NSW. It provides a streamlined statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds. The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Any priority weeds identified under the Act must be treated as prescribed if encountered.

Seven flora species are listed as priority weeds within the Eurobodalla Shire LGA have previously been recorded within the locality. Given the manicured nature of the proposal site, these species are unlikely to be present, however may have the potential to occur in the proposal site following disturbance. Therefore, mitigation measures to control the spread of priority weeds are discussed in Section 6.3.4.

## 4.4 Commonwealth legislation

### 4.4.1 Environmental Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government Department of Agriculture, Water and the Environment (DAWE) for proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land.

A search for matters of national environmental significance (NES) was completed for the proposal site (10 km search) on 03 December 2021 (Appendix B). This search identified one Commonwealth Marine Area, six listed threatened ecological communities, 75 listed threatened species and 57 listed migratory species.

The proposal is unlikely to have a significant impact on matters of NES or the environment of Commonwealth land. Accordingly, the proposal has not been referred to DAWE. Potential impacts from the proposal on matters of national environmental significance are discussed further in Section 6.3.

## 4.4.2 Native Title Act 1993

The *Native Title Act 1993* (Native Title Act) recognises and protects native title and provides that native title cannot be extinguished contrary to the Act. Essentially, the Act covers actions affecting native title and the process for determining whether native title exists and compensation for actions affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register.

## 4.5 Confirmation of statutory position

The review of relevant legislation undertaken in the preceding sections confirms that the proposal would be development permissible without consent in accordance with Clause 125(1) of ISEPP. This REF is required to be in accordance with the requirements of Clause 228 of the EP&A Regulation, the BC Act, the FM Act and the EPBC Act. Council is both the proponent and the determining authority.

Additional licences and permits required prior to the commencement of construction of the proposal include:

- Preparation of a full ACHA, including archaeological test excavations in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a). This would require:
  - Full Aboriginal consultation, in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010b).
  - If Aboriginal objects are located during survey or testing, it will be necessary to apply for an AHIP. This may or may not include a requirement for further archaeological salvage.
- Consultation with Council's Crown Land Manager and DPIE – Crown Lands will be required to confirm the need for an approval under the *Crown Land Management Act 2016*.

## 5. Stakeholder and community consultation

### 5.1 Community consultation

Residents and the local community would be advised of proposal works prior to construction commencing. This would likely be undertaken by Council via direct mail. Alternative options would include social media posts, a media release and web news story.

Access and acquisition of land would be agreed with all impacted landowners prior to construction commencing.

### 5.2 ISEPP consultation

Consultation requirements for infrastructure projects in NSW, such as the proposal, is provided in Clauses 13 to 16 of ISEPP. Clauses 13, 14 and 15 outline the circumstances under which consultation with the local council is required, while Clause 16 outlines the requirements of when to consult with other public authorities.

As the works are being carried out by Council, in accordance with Clause 17(1), Clauses 13, 14 and 15 do not apply. A checklist of Clause 16 is provided in Table 5.1, which found that ISEPP consultation is not required for the proposal.

Table 5.1 ISEPP consultation

Is consultation with other agencies required under clause 16 of the Infrastructure SEPP?		
Are the works adjacent to a national park, nature reserve or other area reserved under the National Parks and Wildlife Act 1974?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on land zoned E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Do the works involve the installation of a fixed or floating structure in or over navigable waters?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Are the works on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

## 6. Environmental assessment

### 6.1 Soils and geology

#### 6.1.1 Existing environment

##### Geology and soils

Review of DPIE's eSPADE (v2.1) tool indicates the proposal site is located in the Wapengo Lake soil landscape. These soils are generally located on deep clayey sand prone to permanently high water tables, severe flood hazard, water (wave) erosion hazard, groundwater pollution hazard, and engineering hazard.

Geotechnical investigations were conducted by GHD (2021), with the following identified:

- **South of the inlet** soils encountered comprised of alluvial sand.
- **North of the inlet** soils encountered were generally:
  - Alluvial soil to 9.3 m depth in borehole BH03, in turn overlying residual clay to the limit of investigation at 10.0 m depth.
  - Residual soil to 4.0 m depth in borehole BH04, in turn overlying weathered chert bedrock.
- A Holocene aged estuarine plain system south of the Wagonga Inlet. This primarily comprises an estuarine in-channel bar and beach (Qheb). However, the southern end of the alignment (near the proposed entry/exit pit) lies close to the geological contact with the tidal-delta flat unit (Qhef). Each of these units typically comprise marine sand, silt, clay, shell and gravel.
- A subaqueous Holocene aged estuarine channel (Qhec) associated with the Wagonga Inlet, typically comprising marine sand, silt, clay, shell and gravel.
- Ordovician aged sedimentary and volcanic rocks (Ow) on the northern shore of the Wagonga Inlet, but close to a Holocene aged estuarine in-channel bar and beach (Qheb).

##### Acid sulfate soils

The results of the geotechnical investigations were conducted by GHD (2022) for the proposal indicate:

- The estuarine bottom sediments of Wagonga Inlet are mapped with a high probability of occurrence of ASS materials.
- South of the Inlet, the proposed alignment is mapped within an estuarine plain and sandplain landform with a low probability of occurrence of ASS materials at or within 1 m of the ground surface.
- There are no known occurrences of ASS mapped within the proposed alignment on the northern shore. However, a mapped area of estuarine intertidal flat (coinciding with the Holocene aged estuarine in-channel bar and beach mapped above) with a low probability of occurrence of ASS materials encroaches the northern end of the proposed pipeline.

##### Contamination

A desktop assessment including a search of the EPA contaminated land register was conducted by GHD on 31 January 2022 (Appendix B). Based on this assessment the following potential contamination sources as potentially occurring within the study area:

- Throughout the study area – use of herbicides, pesticides and fertilisers.
- Princes Highway, Centenary Drive and other local roads – fill from road construction, run off from accumulated fuel and oil residues, dumped rubbish.

Table 6.1 summarises the potential areas of environmental concern based on the results of the desktop review.

**Table 6.1** Potential areas of environmental concern

Description	Rationale/detail	Potential contamination
Urban land uses	Use of pesticides or herbicides on the site for weed or insect control. Use of fertilisers.	Arsenic, organochlorine pesticides (OCPs), organophosphates (OPPs), ammonia, nitrogen and phosphorus.
Storage and use of chemicals	Storage of oils, fuels, grease, herbicides and pesticides.	Total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylenes (BTEX), Polycyclic aromatic hydrocarbons (PAHs), phenols, heavy metals, OCPs and OPPs.
Princes Highway, Centenary Drive and other local roads	Run off of accumulated vehicle residues to adjacent roadside drains and fields.	Heavy Metals, TPH, BTEX, PAHs.
Contaminated fill	Potential use of fill on site, buried materials and storage of building wastes in stockpiles.	Heavy Metals, TPH, BTEX, PAHs, polychlorinated biphenyl (PCBs), OCPs, OPPs and asbestos.

A search of contaminated land record of notices and sites notified to the EPA undertaken on 20 November 2021 indicates there are no contaminated sites within the proposal site. However, there is potential for spills from the boat ramps on the northern side from the launching and un-launching of watercraft.

Based on the results of the desktop assessment and geotechnical investigation, the overall likelihood for significant chemical contamination to be present within the proposal site is considered to be low.

## 6.1.2 Impact assessment

### Construction

#### Exposure of soil to erosion

The proposal would require earthworks and stockpiling of soil material and movement of trucks and machinery across the ground surface. This would expose and disturb soil that is currently vegetated or the compacted within the boat ramp / car park area. Soil erosion could cause downstream impacts, including siltation of watercourses and water storages and reduction in the water quality of waterways.

The pipelines would be constructed using trenchless construction. Soil disturbance would be minimised through the use of entry and exit pits. Revegetation would minimise the amount of soil exposed.

The pipelines cross Wagonga Inlet. Working near waterways has the potential to cause erosion of the banks and subsequent sedimentation issues and cause unnatural alteration of bed and bank stability. However, since the proposal will be installed using trenchless construction, the areas of soil disturbance will be limited to the entry and exit pits.

Open trench construction is proposed for the final connection points of the mains to the existing water and sewer mains. This comprises approximately 15-20 m of open trench at each end for each main, where concrete thrust blocks and valves are going to be installed. Stabilisation and rehabilitation of entry and exit pits would be undertaken as soon as practical following completion of works to protect the nearby Wagonga Inlet.

There would be the potential for erosion to occur from incorrectly managed stockpiles. Measures to mitigate and avoid soil erosion impacts from this are critical and are provided in Section 6.1.3.

#### Acid sulphate soils

The entry and exit pits are to be between 1.2 – 2.5 metres deep. Therefore, as soils on the south side are likely to be ASS below 1.5 m depth and the natural soils beneath filled areas on the north side are considered to be ASS, the proposal would likely intersect ASS. An ASS Management Plan will be required for the proposal as trench excavation would cause disturbance to ASS.

## Accidental contamination

During construction there is potential for construction of the pipelines via trenchless methods to result in frac-out. Frac-outs occur when water and/or other lubricants (e.g. drilling fluids) used in the boring process escape from the confines of the borehole. To manage the potential risk of this occurring, a fracture management plan would be prepared prior to the commencement of construction and include measures to manage this risk including maintaining depth of cover, providing bunding / silt fencing around the pits.

In addition, during construction, there would be a requirement for a number of fuel-powered vehicles and equipment as well as some chemicals and lubricants. There is potential for accidental spillage or leaks of hydrocarbon or chemicals during works or from any stored hazardous materials. While this would present a negative impact, the volumes of potential spillages would be relatively minor so would not be anticipated to result in a significant impact. However, mitigation measures including the preparation of an incident emergency spill plan would be developed and implemented before any construction commences.

## Unexpected discovery of contaminated soils

A potential exists for unexpected contaminated soils or wastes to be identified during excavations for pipeline installations. The key risk would be the accidental spreading or mobilisation of unexpected contaminated soils. As such, in the event of discovering any unexpected contamination, further investigation would be undertaken prior to continuing with works to determine the impacts and mitigation measures required.

## Soil structure

Construction activities such as stockpile of materials and heavy vehicle traffic have the potential to cause soil compaction. This can be exacerbated when these activities are undertaken when soils are wet and more susceptible to compaction. Soil compaction can cause damage to the soil structure, which determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity.

## Operation

The proposal would not result in any impacts to soil and geology during operation.

## 6.1.3 Mitigation measures

Mitigation measures provided in Table 6.2 would be implemented to minimise potential impacts on soils and geology.

*Table 6.2 Proposed mitigation measures – soils and geology*

Impact	Mitigation measure	Timing	Responsibility
Unexpected discovery of contaminated soils	Preparation of an unexpected finds/contaminated soils procedure as part of the CEMP. The procedure would include details of excavation, segregation, stockpiling, remediation, validation and disposal requirements for any contaminated matter.	Pre-construction, Construction	Contractor
Fracture management plan	Prepare a fracture management plan and include measures to manage this risk including maintaining depth of cover, providing bunding/silt fencing around the pits.	Pre-construction, Construction	Contractor
ASSMP	An ASSMP would be prepared for the proposal in accordance with prepared in accordance with the NSW ASS Manual (ASSMAC, 1998a) and ASS Assessment Guidelines (ASSMAC, 1998b).	Pre-construction, Construction	Contractor

Impact	Mitigation measure	Timing	Responsibility
Exposure of soil to erosion	<p>Prepare an erosion and sediment control plan (ESCP) in accordance with Blue Book - Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and Volume 2A: Installation of Services, which must include the following:</p> <ul style="list-style-type: none"> <li>– Identification of materials including potentially contaminated material.</li> <li>– Stockpiling and tracking of all materials throughout construction.</li> <li>– Validation and certification of material stockpiles prior to re-use.</li> <li>– Tracking of materials incoming and outgoing from site.</li> <li>– Establish all erosion and sediment control measures before ground disturbance work commences and these are to remain in place until all surfaces have been fully restored and stabilised.</li> <li>– Inspect and maintain controls regularly to ensure effectiveness over the entire duration of the proposal and clean out before 30% capacity is remaining.</li> <li>– Provide a clean water diversion around disturbed areas.</li> <li>– Stockpiles would be located outside of drainage lines and the dripline of trees and would have appropriate controls installed to prevent erosion, control runoff and prevent sedimentation.</li> <li>– All excavations are to be progressively backfilled and stabilised within ten working days during the course of construction works to minimise the potential for erosion.</li> <li>– Final rehabilitation works would be undertaken within 10 days of the completion of works, and in consultation with the relevant landowner.</li> <li>– Stabilise stockpiles against erosion and flood management in instances where they would be in place for greater than twenty working days.</li> <li>– Revise the ESCP throughout the proposed works covering all stages.</li> </ul>	Pre-construction, Construction	Contractor
Accidental contamination from leaks or spills of fuels/chemicals etc.	<p>Prepare an incident emergency spill plan as part of the CEMP to include procedures for the storage and handling of hazardous materials including fuel and chemicals as follows:</p> <ul style="list-style-type: none"> <li>– No refuelling to occur on-site unless appropriate bunded hardstand and spill protection/spill plan is prepared.</li> <li>– Storage of hazardous materials on-site to be kept to a minimum and would be in accordance with national guidelines and the safety data sheets relating to bunding, coverage, storage of incompatible materials, etc.</li> <li>– A 'spill kit' would be kept on site at all times for potential chemical or fuel spills.</li> <li>– Construction contractors will be trained in the correct use of the spill kit.</li> </ul>	Pre-construction	Contractor
Rehabilitation	Minimise disturbance areas during construction and progressively stabilise and rehabilitate disturbed areas following completion of construction activities.	Construction	Contractor
	Disturbed soils shall be stabilised and revegetated with pavement or turf.	Construction	Contractor
	Monitor, inspect and maintain rehabilitated areas on a regular basis.	Post Construction	Council



## 6.2 Hydrology, flooding and water quality

### 6.2.1 Existing environment

#### Surface water

The proposal site is located across Wagonga Inlet, a wave dominated estuary that transverses North Narooma and Narooma.

#### Flooding

Review of Council flooding maps indicate the proposal site is located within a flood planning area.

#### Groundwater

During geotechnical investigations, groundwater was generally encountered at depths between 1.0 m to 1.5 m in Wagonga Inlet.

No long-term monitoring of the groundwater levels was undertaken and the boreholes were backfilled at completion.

### 6.2.2 Impact assessment

#### Construction

##### Surface water

Construction of the proposal has the potential to temporarily increase sediment and erosion runoff to Wagonga Inlet due to the works resulting in exposed disturbed soils, required for the entry and exit pits.

Pipe installation will require a minimum depth of 10 m-12 m below the inlet tolerance to limit the risk of fracout or avoid unsuitable soils. Impacts are expected to be minimal and manageable with the implementation of appropriate mitigation and management measures.

Construction of the proposal has the potential to impact surface water within the study area due to leakage or spillage of hydrocarbon products from vehicles, wash down areas and workshops and refuelling bays and fuel, oil and grease storages.

The proposed process of commissioning of the pipeline includes the flushing of the pipe with chlorinated water. It is proposed that the chlorinated water will be discharged to Wagonga Inlet on completion subject to installation of appropriate controls.

The proposal would not result in any significant impacts on surrounding water quality if appropriate erosion and sediment controls are implemented (refer to Section 6.2.3).

##### Flooding

Construction of the pipelines are unlikely to alter the existing flood potential for the area, there will be no elevation changes to local topography as a result of the proposal.

While the potential for impacts from construction of the proposal is considered minor, excavations would be avoided during periods of heavy rainfall.

## Groundwater

Construction of the proposal would require excavations for the entry and exit pits, pipe connections of the last 20m, as well as underground boring. There is a potential for groundwater intersection, however, it will be unlikely.

There is potential for wet and soft soils in at the proposal site. Such soils may require additional measures to allow for construction of the proposal. These soils may provide poor trafficability for construction equipment. Any dewatering of groundwater can result in a localised lowering of the groundwater table, with the following worst-case impacts:

- Potential reduction of a negligible quantity of water.
- Land subsidence due to a loss of support below ground.
- Deterioration of water quality from potential saltwater intrusion.

Less than 3ML of water is likely to be removed as part of any dewatering required for the site.

## Operation

The proposal is not anticipated to impact on surface water, flooding or groundwater during operation.

## 6.2.3 Mitigation measures

Mitigation measures provided in Table 6.3 would be implemented to minimise potential impacts on hydrology, flooding and water quality.

*Table 6.3 Proposed mitigation measures – hydrology and flooding*

Impact	Mitigation measure	Timing	Responsibility
Groundwater dewatering	A dewatering system would be implemented to manage groundwater inflow into excavations.	Construction	Contractor
	The potential for dewatering to result in settlement of loose sand would be considered in the design of a dewatering system, as there is potential for exposure of ASS as a result of lowering the groundwater around the excavation. Shoring of excavations will reduce inflow of loose sand and groundwater.	Pre-construction, Construction	Contractor
Excavations	Keep all excavations free of water, where possible.	Construction	Contractor
	Excavations would be minimised where possible.	Construction	Contractor
Flood contingency plan	Where possible stockpiles, machinery, equipment etc. are located outside the 5% AEP flood level or can be easily relocatable out of the 5% AEP in the event of heavy rainfall.	Pre-construction, Construction	Contractor
Sedimentation of waterways	Implement erosion and sediment control measures described in Section 6.1.3 particularly concerning placement of stockpiles and soil treatment areas as far away from drainage lines and waterways as possible.	Construction	Contractor
	Any material removed from the waterway that is to be temporarily deposited or stockpiles on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.	Construction	Construction Contractor
	Vehicle wash down and/or cement truck washout would occur in a designated bunded area or offsite.	Construction	Contractor
	Disturbed soils shall be stabilised and revegetated with pavement or turf.	Construction	Contractor
	Rehabilitation would be undertaken along the length of the construction areas subject to ground disturbance, including ground	Construction	Contractor

Impact	Mitigation measure	Timing	Responsibility
	stabilisation and establishment of vegetative groundcover in all disturbed areas. Sediment and erosion controls would be maintained until vegetation cover is suitable.		
Discharge of water	Pre commissioning pipeline cleaning water will be managed in accordance with a pipeline commissioning procedure. Measures will include: Hyper chlorinated water to be treated such that no water is released to the environment with elevated chlorine levels. Monitoring requirements for potential contaminants. Installation of appropriate erosion and sediment controls such as; discharge sump, boom/silt curtains. Inspection/maintenance as required. Trigger action response plan.	Construction	Contractor
Discharge of water	Consultation with Marine Parks will be conducted in relation to the discharge of water into the inlet.	Pre-construction	Council

## 6.3 Biodiversity

### 6.3.1 Methodology

#### Desktop review

A desktop review of background information was undertaken prior to the site inspection to identify biodiversity values that may be affected by the proposal. Searches were undertaken for the locality (defined as a 10-kilometre radius of the proposal site) and included the following databases:

- DPIE BioNet Atlas for records of threatened species listed under the BC Act and EPBC Act which have been recorded within the locality (DPIE, 2021a, report generated 3 December 2021)
- Australian Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool for Matter of National Environmental Significance (MNES) listed under the EPBC Act which may occur in the study area (DAWE, 2021a, report created 3 December 2021)
- NSW threatened biodiversity data collection (DPIE, 2021b) and Commonwealth Species Profile and Threats Database (DAWE, 2021b) for descriptions of the ecology, distribution and habitat requirements of threatened biota
- NSW BioNet Vegetation Classification (VIS 2.1) – Community Identification (DPIE, 2021c)
- Wagonga Inlet Crossing –Water and Sewer Trenchless Crossings Wagonga Inlet Crossing Options Review (GHD, 2021)
- Bureau of Meteorology’s Atlas of Groundwater Dependent Ecosystems (BOM, 2021)
- NSW Department of Primary Industry (DPI, 2019) Fisheries NSW Spatial Data Portal for Key Fish Habitat under the FM Act mapped in the study area
- Existing vegetation mapping of the locality presented in Southeast NSW Native Vegetation Classification and Mapping (DPIE 2010)
- Historical aerial photographs of the study area accessed via SIXmaps (NSW Government, 2021)
- Priority weed declarations for the Eurobodalla LGA (DPI, 2021)
- Aerial photography of the study area

## Limitations

Given the small area of impact and generally disturbed nature of the proposal area, an assessment of the proposal area was conducted through a desktop review only and has not been ground-truthed.

The desktop review is aimed at providing an overall assessment of the ecological values of the proposal area, with particular emphasis on threatened and migratory species to allow an assessment of the potential impacts of the proposal and to provide suitable mitigation measures to minimise impacts on adjacent biodiversity values. An assessment of the likelihood of occurrence was undertaken for threatened biota listed under the BC Act, FM Act and EPBC Act that have potential to occur in the locality. This assessment was based on the assumptions of known habitat requirements for the threatened species.

## 6.3.2 Existing environment

### Vegetation

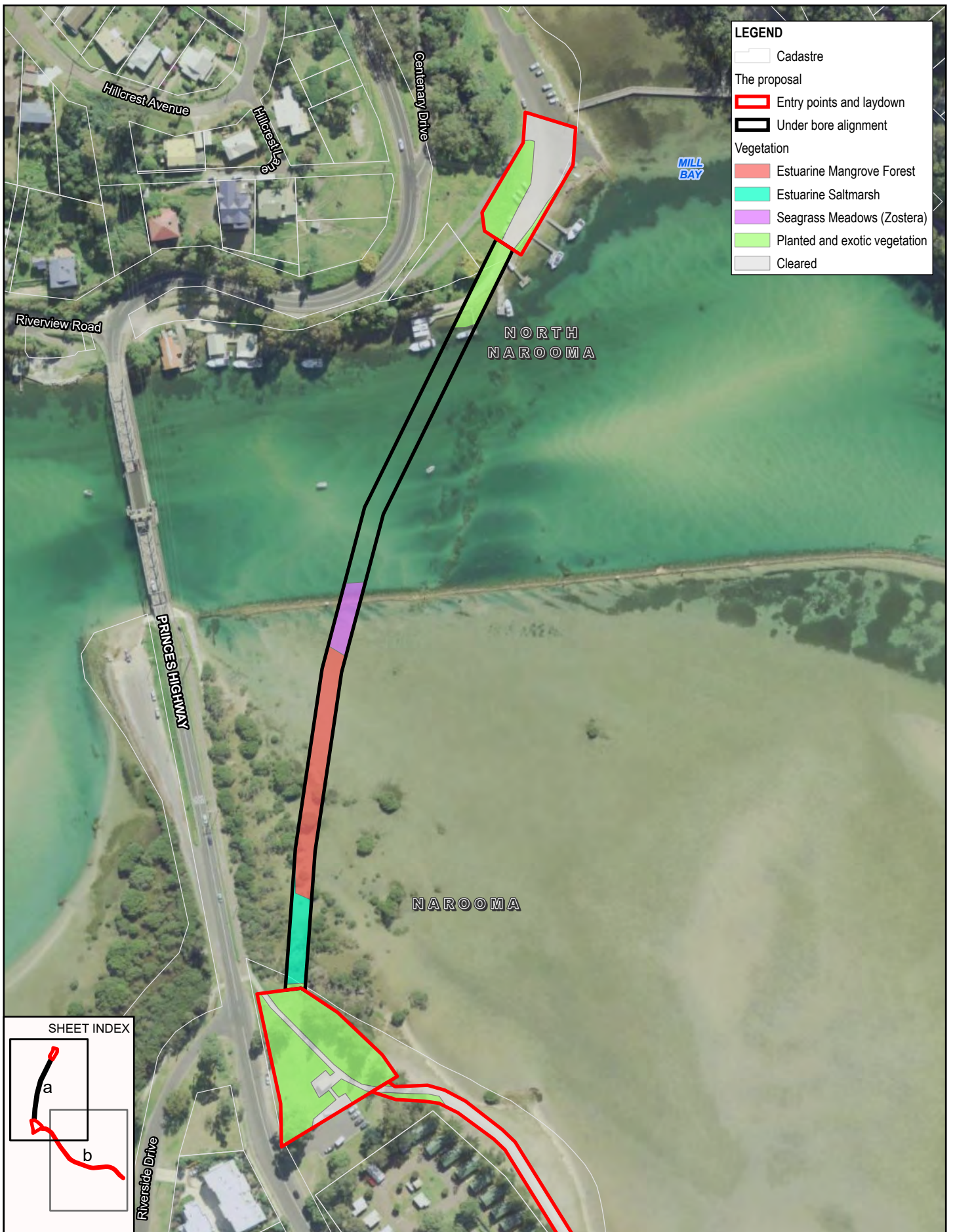
Vegetation within the proposal site is heavily modified. The study area (Figure 6.1) has been subject to substantial modification including land clearing, landscaping and residential development.

Ken Rose Park on the southern side of the inlet and the Mill Bay Boat Ramp carpark area on the northern side of the inlet are mapped as cleared (see Figure 6.2 to Figure 6.4). The vegetation type identified in the proposal site is 'landscaped area' and does not conform to any native plant community type (PCT). The vegetation consists of planted native and exotic species, including Spotted Gums (*Corymbia maculata*) and Norfolk Pines (*Araucaria heterophylla*) which are growing over a ground layer of regularly mown grass and other exotic species. Three native PCTs occur in the study area but would not be directly impacted by the proposal. The conservation significance and location of PCTs are provided in Table 6.4.

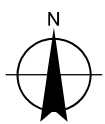
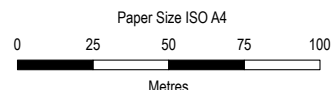
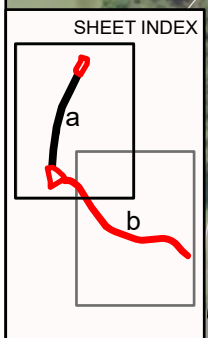
The proposal site is highly modified and disturbed and is therefore unlikely to support any of the threatened flora species.

Table 6.4 Plant community types in the study area

Name	PCT	FM Act	BC Act status	EPBC Act status	Location
Planted and exotic vegetation	NA	NA	NA	NA	Proposal area at Mill Bay Boat Ramp and Ken Rose Park
Estuarine Saltmarsh	PCT 1126: Saltmarsh in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Protected marine vegetation	Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions (Endangered ecological community)	Subtropical and Temperate Coastal Saltmarsh (Vulnerable ecological community)	Mapped to the south of Ken Rose Park and within Wagonga Inlet (DPI 2007)
Estuarine Mangrove Forest	PCT 920: Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion	Protected marine vegetation	Not listed	Not listed	Located adjacent to Ken Rose Park
Seagrass Meadows	PCT 1913 Seagrass meadows of the estuaries and lagoons of the New South Wales coast	Protected marine vegetation Not listed (outside the distribution of the listed population)	Not listed	Not listed (outside the distribution of the listed community)	<i>Posidonia australis</i> is mapped within Wagonga Inlet, including east of Mill Bay Boat Ramp (DPI 2007)



LEGEND	
	Cadastre
The proposal	
	Entry points and laydown
	Under bore alignment
Vegetation	
	Estuarine Mangrove Forest
	Estuarine Saltmarsh
	Seagrass Meadows (Zostera)
	Planted and exotic vegetation
	Cleared



Eurobodalla Shire Council  
 Wagonga Inlet Crossing –  
 Water and Sewer Trenchless Crossings  
 Review of Environmental Factors

Project No. 12563160  
 Revision No. 0  
 Date 16 Sep 2022

**Vegetation types**  
 sheet 1 of 2

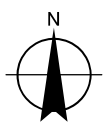
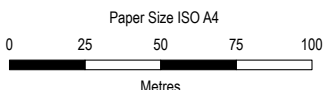
**FIGURE 4-1a**



**LEGEND**

- Cadastre
- The proposal**
- Entry points and laydown
- Under bore alignment
- Vegetation**
- Cleared

**SHEET INDEX**



**Eurobodalla Shire Council**  
**Wagonga Inlet Crossing –**  
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 Date 16 Sep 2022

**Vegetation types**  
**sheet 2 of 2**

**FIGURE 4-1b**



Figure 6.2 Ken Rose Park on the southern side of the inlet



Figure 6.3 Ken Rose Park on the southern side of the inlet



Figure 6.4 Mill Bay Boat Ramp carpark area on the northern side of the inlet



Figure 6.5 Mill Bay Boat Ramp carpark area on the northern side of the inlet

## Priority weeds

Seven flora species listed as priority weeds within the Eurobodalla LGA under the *Biosecurity Act* have previously been recorded within the locality (DPIE, 2021a):

- African Lovegrass (*Eragrostis curvula*)
- Bridal Creeper (*Asparagus asparagoides*)
- Climbing Asparagus Fern (*Asparagus plumosus*)
- Fireweed (*Senecio madagascariensis*)
- Lantana (*Lantana camara*)
- Madeira Vine (*Anredera cordifolia*)
- Sea Spurge (*Euphorbia paralias*)

Given the manicured nature of the proposal area, these species are unlikely to be present, however may have the potential to occur in the proposal site following disturbance.

## Fauna and fauna habitats

The parkland vegetation would provide foraging resources for relatively mobile common native fauna species. Landscape plantings in Mill Bay Boat Ramp carpark and Ken Rose Park have very limited potential to provide habitat for fauna species.

Wagonga Inlet and the riparian zone potentially provide habitat for aquatic species such as aquatic macroinvertebrates, fish, birds, microbats, reptiles and amphibians. Wagonga Inlet classified as Key Fish Habitat under the DPI Key Fish Habitat Mapping (DPI 2019). The proposed surface disturbance area within the proposal site does not contain any defined watercourses or waterbodies that could provide suitable habitat for threatened fish species under the FM Act.

The proposal works include a trenchless method of installation for the water main pipe Wagonga Inlet. A depth of at least 10 metres below the base of the inlet would be used to limit the chance of settlement, frac-out and impacts on existing utilities. Due to the proposed works occurring at this depth, it not likely that the aquatic habitat within Wagonga Inlet would be impacted. For this reason, aquatic species and their habitat have not been further assessed.

## Threatened and migratory biota

### Threatened ecological communities

The desktop literature review identified six threatened ecological communities (TECs) that are likely to occur or may occur within the study area. The study area is highly modified and there are no TECs present within the proposal site.

### Threatened flora species

The desktop literature review identified 11 flora species listed as threatened under the BC Act and/or EPBC Act have been previously recorded or are predicted to occur in the locality. Marginal habitat for Square Raspwort (*Haloragis exalata subsp. exalata*) and Australian Saltgrass (*Distichlis distichophylla*) is present within saltmarsh along Wagonga Inlet within the study area, however habitat within the proposal site is severely modified and is therefore unlikely to support any threatened flora species.

### Threatened and migratory fauna species

The desktop review indicates that 111 threatened and/or migratory fauna species listed under the BC Act and/or EPBC Act and/or FM Act have been recorded in the locality or are predicted to occur in the locality.

The proposal site is unlikely to provide suitable habitat for most threatened fauna species given the highly modified nature of the landscape. Evidence of regular mowing of the proposal site was identified from site photographs. Habitat resources including rocks, tree hollows and woody debris are absent from the proposal area, as such the proposal area provides limited breeding habitat for native fauna. Planted trees may provide occasional foraging resources for mobile threatened species such as microbats and the Grey-headed Flying-fox (*Pteropus poliocephalus*). Most of the threatened fauna recorded in the locality would not occur in the proposal site given their specific habitat requirements, preference for larger tracts of native vegetation, and a general absence of important habitat resources within the proposal site.

The tidal flats between Shell Point and the entrance, and the sand flats along Riverside Drive are considered important habitat for wading and sea birds. The sand spit behind the training wall on the eastern side of the bridge is a significant habitat migratory and threatened waders and shorebirds. NPWS consider this area as potential breeding site for Pied Oystercatcher (*Haematopus longirostris*), listed as a vulnerable species under the BC Act. Wagonga Inlet is one of nine important sites for waders on the Eurobodalla Coast. Large numbers of several migratory waders listed under the EPBC Act are regularly recorded, including the Red Knot (*Calidris canutus*) and Bar-tailed Godwit (*Limosa lapponica*) (Spurway and Associates, 2006)).

The Australian Grayling (*Protroctes maraena*), listed under the FM Act and EPBC Act is known to breed in the freshwater creeks that feed Wagonga Inlet, and would migrate through the inlet to the ocean. These creeks and Wagonga Inlet are not identified as supporting important populations of the species (DSE, 2008).

The likelihood of occurrence of threatened fauna species in the study area is provided in Appendix D.



## **Wetlands of international or national importance**

No wetlands of international or national importance located within 10 kilometres of the proposal area.

### **6.3.3 Impact assessment**

#### **Direct impacts**

##### **Vegetation clearing**

The proposal would require the installation of two pipelines constructed through a combination of trenchless technique. Excavation would be required for the open trench and the entry and exit points of the HDD only and would involve minimal clearing of vegetation.

The proposal would be located within highly modified landscaped areas Mill Bay Boat Ramp carpark and Ken Rose Park. The proposal will result in the direct removal of approximately 900 m<sup>2</sup> of groundcover vegetation in Mill Bay Boat Ramp carpark at the entry pit site and 900 m<sup>2</sup> of groundcover vegetation at the exit pit site (Ken Rose Park), the pipe connections and the open trench sections are anticipated to require approximately 150 square meters. Disturbed groundcover will be reinstated as part of the final restoration phase and maintained until groundcover is re-established.

Ancillary activities including pipe-stringing, material stockpiling (including excavated materials), and plant & equipment storage would generally be undertaken within the entry pit area with connected sections of pipeline lying on previously disturbed areas of grassland adjoining the entry pit.

No intact stands of naturally occurring vegetation would be disturbed by the proposal. The proposal site has limited habitat value for native plants. The clearing required for the proposal would remove exotic grasses, planted non-threatened native plants and environmental weeds. The proposal would not require the removal of any canopy species and hollow-bearing trees.

Environmental safeguards to minimise the clearing of planted native vegetation, protect retained native vegetation, and minimise risk of impacts on fauna species are presented in Table 6.4.

#### **Indirect impacts**

There is limited potential for any indirect impacts as a result of the proposal, given the existing disturbed and modified nature of the proposal site and surrounding area. A summary of potential indirect impacts is provided below.

##### **Sedimentation of waterways and impacts to aquatic habitat**

Construction of the proposal has the potential to result in sedimentation of waterways or contaminated runoff through soil disturbance and construction activities as described in Section 6.1.3. However, since the proposal will be installed using trenchless construction, the areas of soil disturbance will be limited to the entry and exit pits. Stabilisation and rehabilitation of entry and exit pits would be undertaken immediately following completion of works.

Mitigation measures to minimise the potential impact on Wagonga Inlet are provided in Table 6.3, and include use of erosion and sediment control devices, and rehabilitation or landscaping of disturbed areas.

##### **Weed invasion and edge effects**

The proposal would not result in the creation of any new edge zones or habitats, nor would it exacerbate any existing edge effects that may be in operation.

Weed invasion is already present throughout the study area, given the location within a modified urban landscape including a network of sealed roads, access tracks, developed urban areas and existing infrastructure. The potential for the proposal to exacerbate weed invasion would be limited, given the extent of existing modification within the study area.

Mitigation measures, including weed control and minimising impacts on native vegetation, are provided in Table 6.4.

## Introduction of pests and pathogens

Construction activities have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*), Myrtle Rust (*Uredo rangelii*) and Chytrid fungus (*Batrachochytrium dendrobatidis*) in the study area through vegetation and soil disturbance and increased visitation.

The potential for impacts associated with these pathogens is low, given the disturbed nature and existing high visitation rates to the study area, and limited intact native vegetation and habitats within the proposal site.

## Noise and vibration

The study area already experiences low to moderate levels of noise and vibration disturbance. There would be additional temporary noise and vibration as a result of construction. The HDD work would increase noise and vibration during construction.

The duration of these impacts is expected to be short-term and thus impacts on any fauna in the vicinity are likely to be minimal.

Mitigation measures described in Section 6.3.4 have been identified to manage potential indirect impacts.

## Impacts on threatened biota

Only non-native vegetation and planted non-threatened native plants would be removed in landscaped areas. These vegetation types do not contain habitat for any threatened flora species.

The study area provides some limited potential foraging habitat for several bird species, including shorebirds, terns and raptors that may forage within Wagonga Inlet (see Appendix D). The proposal is unlikely to impact these threatened fauna species as no suitable foraging habitat would be removed within the proposal site and equivalent or better-quality habitat is present within the locality. Impacts on aquatic threatened species (such as the Australian Grayling) and protected or threatened marine vegetation (seagrass, saltmarsh and mangroves) are unlikely given the proposal is being HDD under the inlet and mitigation measures would be in place to prevent indirect impacts on water quality (see Section 6.3.4).

Based on the consideration of impacts outlined above, the proposal would not result in a significant impact on any threatened or migratory biota listed under the BC Act, FM Act or EPBC Act. Given the limited likelihood, extent and magnitude of impacts on threatened or migratory biota, no individual tests of significance pursuant to Section 7.3 of the BC Act (five-part test), Section 220ZZ of the FM Act (seven-part test) or the MNES Significant Impact Guidelines 1.1 (DoE, 2013) have been prepared.

## 6.3.4 Mitigation measures

Mitigation measures provided in Table 6.5 would be implemented to minimise potential impacts on ecology.

Table 6.5 Proposed mitigation measures - ecology

Impact	Mitigation measure	Timing	Responsibility
Vegetation clearing	Vehicles and machinery would be restricted to designated access roads and tracks.	Construction	Contractor
	Groundcover vegetation is to be re-established following construction.	Post-construction	Contractor
	The boundary of clearing limits will be fenced using high visibility fencing and clearly marked as the limits of clearing.	Pre-construction, Construction	Contractor
	If any damage occurs to vegetation outside of the proposal site, notify the Council Project Manager and Environmental Representative so that appropriate remediation strategies can be developed.	Pre-construction, Construction	Contractor
	In the event that a threatened flora or fauna species is identified on site during the course of works, all works will cease immediately at that location and a suitably qualified ecologist will be consulted.	Pre-construction, Construction	Contractor

Impact	Mitigation measure	Timing	Responsibility
Harm/injury to fauna	<p>If an animal is trapped within a trench an animal handling expert/wildlife carer or appropriately qualified ecologist would be contacted to assist with the capture and relocation.</p> <p>If excavations are unattended or are required to remain open for a period of time, barricading will be placed around the excavation to prevent the ingress of fauna. Steel plates may be used to cover smaller excavations. Escape ramps will be provided for fauna in larger excavations.</p> <p>Open pits will be checked each morning, prior to the commencement of construction, to salvage any fauna that have fallen in, and move them to a safe (and appropriate) nearby location.</p>	Construction	Contractor
Compound areas	Compound areas would only be located in cleared or degraded areas to prevent any damage to the surrounding plants or habitat. Implementation of mitigation measures to prevent damage to surrounding areas include those already mentioned in Table 6.2 and Table 6.3.	Construction	Contractor

## 6.4 Noise and vibration

### 6.4.1 Existing environment

#### 6.4.1.1 Sensitive receivers

The background noise environment is expected to be typical of a suburban area. Existing noise sources in the vicinity of the pipelines are expected to be associated with traffic on the road network, ocean noise and human activity in the area.

Based on aerial imagery, the proposal location and associated works will be in the vicinity of the following types of noise sensitive receivers:

- Residential
- Commercial
- Active recreation areas – Ken Rose Park.

#### 6.4.1.2 Background noise levels

In the absence of background noise monitoring, GHD has assumed the minimum Rating Background Levels (RBLs) in accordance with the Noise Policy for Industry (refer to Table 6.6).

*Table 6.6 Minimum assumed rating background noise levels*

Time of Day	Minimum assumed rating background noise level (dBA)
Day	35
Evening	30
Night	30

Note:

1. Daytime 7:00 am to 6:00 pm; Evening 6:00 pm to 10:00 pm; Night-time 10:00 pm to 7:00 am
2. Sundays and Public Holidays, Daytime 8:00 am to 6:00 pm; Evening 6:00 pm to 10:00 pm; Night-time 10:00 pm to 8:00 am
3. Morning shoulder period 6:00 am to 7:00 am

## 6.4.2 Noise criteria

### 6.4.2.1 Construction noise criteria

Construction noise criteria were developed in accordance with the ICNG (DECC, 2009) for each work area. Standard hours defined in the guideline are:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 1:00 pm on Saturday
- No work on Sundays or public holidays

Proposed construction activities are expected to occur during standard construction hours.

The ICNG acknowledges that the following activities can be justified to be conducted outside the recommended construction hours:

- The delivery of oversized plant or structure.
- Emergency work.
- Works for which it can be demonstrated that there is a need to operate outside the recommended standard hours.
- Works which maintain noise levels at receivers below the night-time noise affected construction noise management levels.

For standard construction hours, the following terms are used in relation to establishment of construction noise criteria:

- The ‘noise affected level’ represents the point above which there may be some community reaction to noise. For standard construction hours this level is established with reference to the measured rating background level (RBL) plus 10 dBA. Outside standard construction hours this level is the RBL plus 5 dBA.
- The ‘highly noise affected level’ represents the point above-which there may be strong community reaction to noise. This level is set at  $L_{Aeq(15min)}$  75 dBA.

The construction noise management levels (CNMLs) that apply to sensitive receivers near the pipeline proposal are presented in Table 6.7.

**Table 6.7** ICNG CNMLs at Identified receivers, dBA

Receiver Type	ICNG Management Level $L_{Aeq(15min)}$ dBA	
	Highly affected noise level	During standard construction hours
Residential	75	45
Commercial	N/A	70 <sup>1</sup>
Active recreation	N/A	65 <sup>1</sup>

Notes:

1. Noise management level only applicable when in use.

### 6.4.2.2 Operational noise criteria

As the pipelines are buried underground, airborne noise during operations is not anticipated to impact surrounding noise sensitive receivers. Therefore, operational noise compliance is not discussed further in this assessment.

### 6.4.2.3 Road traffic criteria

The *Road Noise Policy* (RNP) (DECCW, 2011) provides traffic noise criteria for residential receivers in the vicinity of existing roads (Table 6.8). The criteria is applied to operational and construction traffic on public roads to identify potential road traffic impacts and the requirement for feasible and reasonable mitigation measures.

The RNP application notes state that “for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.”

If road traffic noise increases due to construction or operation are within 2 dBA of current levels then the objectives of the RNP are met and no specific mitigation measures are required.

Table 6.8 Road traffic noise criteria, LAeq(period), dBA

Type of Development	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residence affected by additional traffic on arterial roads generated by land use developments	60 Leq(15 hour)	55 Leq(9 hour)
Existing residence affected by additional traffic on local roads generated by land use developments	55 Leq(1 hour)	50 Leq(1 hour)

### 6.4.3 Vibration criteria

#### 6.4.3.1 Human comfort

Vibration criteria for human comfort have been established with consideration to the *Assessing Vibration: A Technical Guideline* (AVTG) (February 2006) for guidance on human exposure to vibration.

The AVTG separates sources of vibration into continuous, impulsive and intermittent and explains that each category should be assessed differently. Vibration from construction work, passing heavy vehicles, and piling is provided as an example of an intermittent source of vibration which is to be assessed using the vibration dose value (VDV) method.

While the AVTG recommends that for intermittent vibration VDV is used as the primary indicator for human comfort, the British Standard BS 5228-2:2009 *Code of practice for noise and vibration on construction and open sites – Part 2: Vibration* guidance can be used as an additional indicator of perceptibility. BS 5228-2 recommends the guidance values presented in Table 6.9. These values are often more suitable for construction works as available information for construction activities and equipment is typically in the form of a peak particle velocity value rather than a dose value.

Table 6.9 Guidance on effects of vibration levels

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30 mm/s	Vibration might be just perceptible in residential environments.
1.00 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.0 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

### 6.4.3.2 Cosmetic damage

Vibration criteria for cosmetic damage have been established with consideration to:

- British Standard BS 7385:1993 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground Borne Vibration for guidance on cosmetic damage to residential buildings.
- German Standard DIN 4150-3: 2016 Vibrations in buildings – Part 3: Effects on structures for guidance on cosmetic damage to heritage buildings.
- BS 7385:1993 provides guidance on vibration level likely to cause cosmetic damage to residential buildings or reinforced structures. The British Standard and German Standard guide is reproduced below in Table 6.10 and Table 6.11, respectively.

**Table 6.10** Transient vibration guide for cosmetic damage (BS 7385:1993)

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 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
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	

**Table 6.11** Guideline values for short term vibration on structures (DIN 4150-3)

Type of structure	Guideline values for velocity, $v_i(t)^1$ (mm/s)		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz <sup>2</sup>
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (for example heritage listed buildings)	3	3 to 8	8 to 10

Notes:

1. The term  $v_i$  refers to vibration levels in any of the x, y or z axes.
2. At frequencies above 100 Hz the values given in this column may be used as minimum values.

### Guidelines for buried pipework and services

The British Standard *BS 7385-2:1993 Evaluation and measurement for vibration in buildings* notes that structures below ground are known to sustain higher levels of vibration and are very resistant to damage unless in very poor condition.

Guideline values for vibration to evaluate the effects of vibration on buried pipework is provided in *DIN 4150-3*. These values are reproduced in Table 6.12.

**Table 6.12** Guideline values for vibration effects on buried pipework

Line	Pipe material	Guideline values for vibration velocity measured on the pipe
1	Steel (including welded pipes)	100 mm/s
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80 mm/s
3	Masonry, plastic	50 mm/s

Notes:

1. In general, compliance with the guideline values for structural damage would result in compliance with the guideline values buried pipework.

## 6.4.4 Potential impacts

### 6.4.4.1 Construction noise impact assessment

Noise impacts associated with the construction of the pipelines have been assessed quantitatively as the construction works for the pipelines are anticipated to take 8 weeks in total.

Table 6.13 summarises the location of the different construction activities.

**Table 6.13** Construction location

Scenario ID	Activity	Location
S1	Planning and mobilisation	Entry and exit pits
S2	Entry pit operations	Entry pit
S3	Exit pit operations	Exit pit
S4	Decommissioning	Entry and exit pits
S5	Compounds	Ken Rose Park – Car Park

### 6.4.4.2 Construction equipment sound power levels

To assess the worst-case construction noise scenario, the assessment has assumed all construction activities proposed at the entry and exit pits will occur simultaneously. Major noise generating plant and their corresponding sound power levels that have been assumed for the construction of the pipelines are presented in Table 6.14.

Although it is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time, the assessment of the proposed works assumes that all equipment associated to an activity/scenario is operating simultaneously. This approach has been adopted to identify worst case impacts and any associated mitigation measures.

**Table 6.14** Construction equipment sound power levels

Scenario ID	Activity	Equipment	Qty	Sound Power Level <sup>1</sup>	Equivalent Sound Power Level
S1	Planning and mobilisation	Truck (Medium Rigid)	1	106	112
		Road Truck	1	109	
		Light vehicles	2	103	
		Hand power tools	1	101	
S2	Entry pit operations	HDD Rig	1	104	119
		Drill Rig HPU	1	115	
		Mud Pump / Generator Engines	1	112	
		Engine Exhausts	1	109	
		Mud Pump	1	98	
		Mud Cleaner	1	102	
		Shaker	1	108	
		Excavator	1	106	
		Light vehicles	2	106	
		Generator	1	102	
		Vacuum truck	1	106	
		Sheet Piling Rig	1	91	

Scenario ID	Activity	Equipment	Qty	Sound Power Level <sup>1</sup>	Equivalent Sound Power Level
S3	Exit pit operations	Road truck	1	109	120
		Light vehicles	2	103	
		Welder	1	101	
		Welder generator	1	102	
		Gas cutter	1	93	
		Excavator	1	106	
		Vacuum truck	1	106	
		Chainsaw	1	115	
		Tub grinder/mulcher	1	116	
		Sheet Piling Rig	1	91	
S4	Decommissioning	Truck (Medium Rigid)	1	106	113
		Road Truck	1	109	
		Light vehicles	1	103	
		Excavator	1	106	
		Hand Power Tools	1	101	
S5	Compounds	Road truck	1	109	113
		Light vehicles	2	103	
		Welder	1	101	
		Welder generator	1	102	
		Power generator	1	93	
		Gas cutter	1	93	
		Compressor	1	109	

Notes:

1. Equipment sound power levels are sourced from Transport for New South Wales construction and maintenance noise estimator (March 2017), BS5228-2009 and eNoise Control.

### 6.4.4.3 Noise Impact

Prediction of the construction noise impacts onto nearby noise sensitive receptors has been performed using Transport for New South Wales's construction and maintenance noise estimator tool (March 2017). Table 6.15 and Table 6.16 summarise the distance from the construction activity, where sensitive receivers located within that distance are expected to exceed the corresponding management level. The predicted values presented in the tables are based on the assumptions that:

- There is no effective barrier between the proposal site and the nearest noise sensitive premises.
- The construction equipment will be operating continuously at full capacity for the full 15-minute evaluation period which is very unlikely in the actual construction site.
- All the construction equipment will be operating simultaneously to estimate the worst-case condition, which is unlikely to occur during actual construction.
- The construction equipment will not generate any annoying characteristics (low frequency, tonality, impulsiveness, etc.).



Table 6.15 Construction noise impact distances

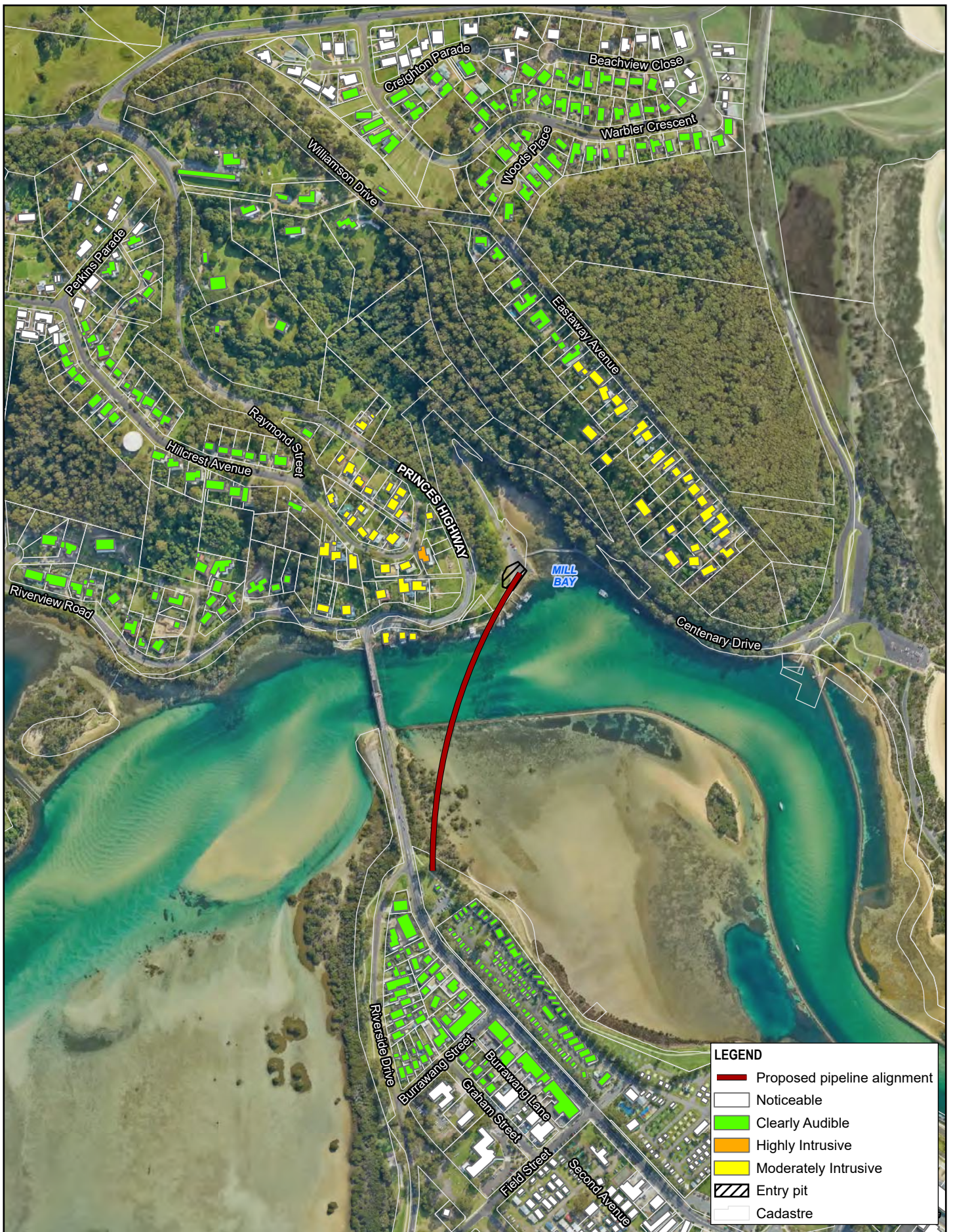
ID	Activities	Equivalent SWL	Residential Receivers		Commercial Receivers (70 dBA)	Active recreation areas (65 dBA)
			Construction Noise Management Level (45 dBA)	Highly Affected Level (75 dBA)		
S1	Planning and Mobilisation	112	< 423 m	< 17 m	< 31 m	< 65 m
S2	Entry Pit	119	< 727 m	< 41 m	< 80 m	< 133 m
S3	Exit Pit	120	< 768 m	< 45 m	< 88 m	< 142 m
S4	Compounds	113	< 471 m	< 21 m	< 38 m	< 76 m
S5	Decommissioning	113	< 441 m	< 19 m	< 34 m	< 69 m

Contours illustrating the construction noise impact zones are presented as figures in Appendix E.








Predicted results indicate that noise associated with the construction of the pipelines are expected to impact on nearby sensitive receivers. With some locations potentially above the “highly noise affected” level of 75 dBA.

The predicted noise exceedances are due to the nature of the proposed activities and their proximity to the nearest sensitive receptors. Noise exceedances for the three loudest scenarios are shown in Figure 6.6, Figure 6.7 and Figure 6.8. The fact that exceedances have been identified does not indicate that the proposed activities cannot be undertaken, but that care needs to be taken to identify feasible and reasonable mitigation and management measures that can be implemented to minimise the potential impacts. Proposed noise mitigation and management recommendations have been provided in Section 6.4.5.

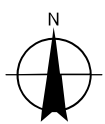
As per the requirements of the ICNG, predictions are based on a “worst case” assessment and, in most cases, the measured levels during construction of the pipelines are likely to be lower than predicted in this assessment. The modelling assumes that all equipment is operating at the same time, which is rarely the case in practice.



**LEGEND**

-  Proposed pipeline alignment
-  Noticeable
-  Clearly Audible
-  Highly Intrusive
-  Moderately Intrusive
-  Entry pit
-  Cadastre

Paper Size ISO A4  
 0 25 50 75 100  
 Metres



**Eurobodalla Shire Council**  
**Wagonga Inlet Crossing –**  
**Water and Sewer Trenchless Crossings**  
**Noise Assessment**

Project No. 12563160  
 Revision No. A  
 Date 02/12/2021

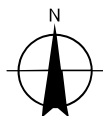
Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56

**Entry Pit – Exceedances of NML**

**FIGURE 6-6**



Paper Size ISO A4  
 0 25 50 75 100  
 Metres



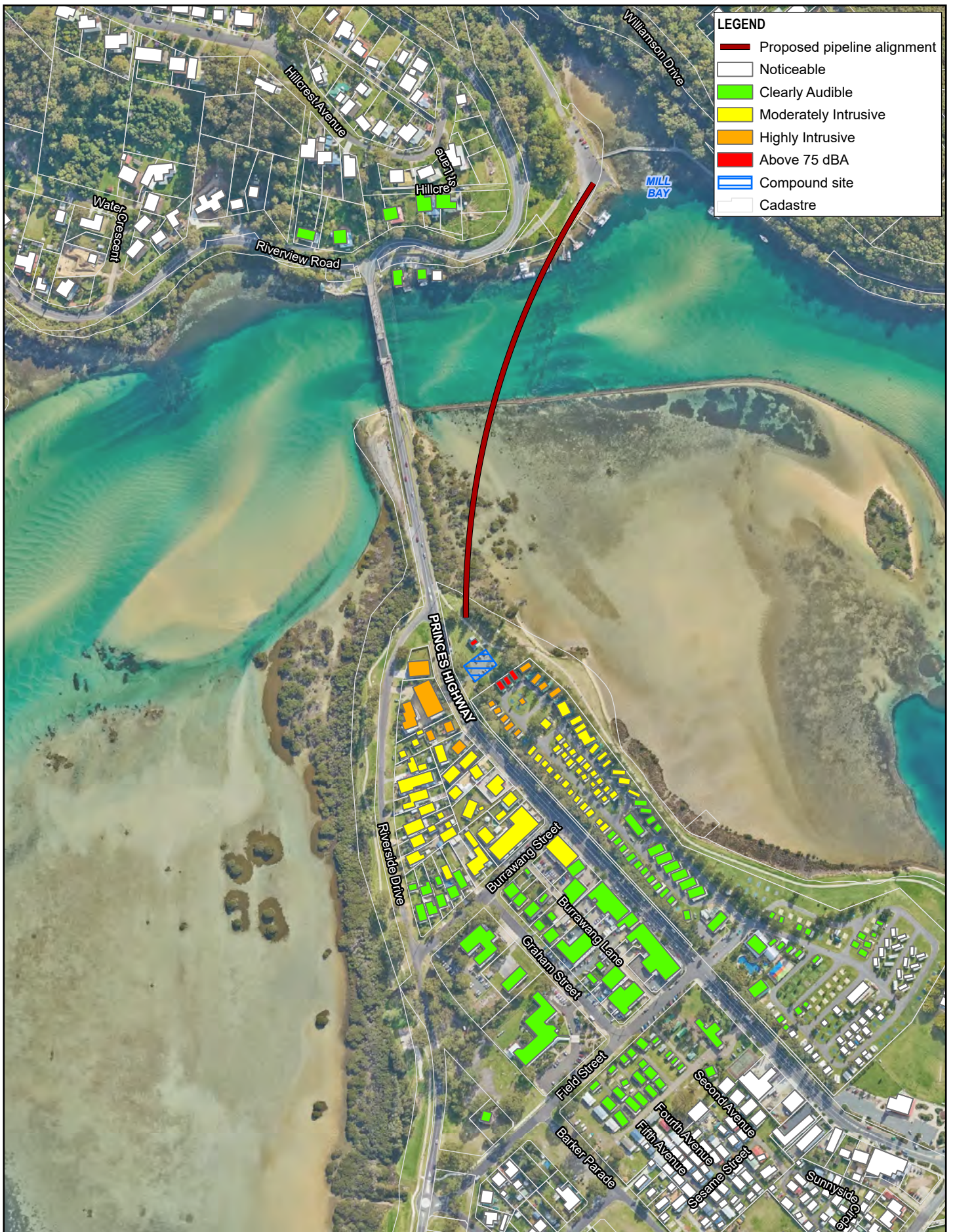
Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56

Eurobodalla Shire Council  
 Wagonga Inlet Crossing –  
 Water and Sewer Trenchless Crossings  
 Noise Assessment

Project No. 12563160  
 Revision No. A  
 Date 02/12/2021

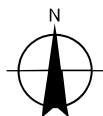
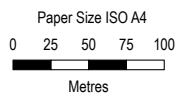
Exit Pit – Exceedances of NML

FIGURE 6-7



**LEGEND**

- Proposed pipeline alignment
- Noticeable
- Clearly Audible
- Moderately Intrusive
- Highly Intrusive
- Above 75 dBA
- Compound site
- Cadastre



Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



**Eurobodalla Shire Council**  
**Wagonga Inlet Crossing –**  
**Water and Sewer Trenchless Crossings**  
**Noise Assessment**

Project No. 12563160  
Revision No. A  
Date 02/12/2021

**Compound – Exceedances of NML**

**FIGURE 6-8**

## Construction traffic noise

Traffic impacts would be generated through transport of construction materials to the proposal site along the surrounding regional road network and local roads for material delivery. It is anticipated the delivery of construction materials would be via the Princes Highway to the compound site.

Anticipated construction work force traffic during the construction of the proposal includes:

- Approximately 10 light vehicle movements per day for construction workers over the construction period.
- Approximately 5 heavy vehicle movements per day for earthmoving and pipe deliveries over the construction period.

Given the low volume of construction traffic associated with the proposed works compared to expected traffic volumes on the Princes Highway it is expected that construction road traffic noise levels associated with the works would result in a relative increase in road traffic noise levels of less than 2 dBA at the most affected sensitive receivers.

### 6.4.4.4 Vibration impact assessment

#### Construction

Exact details of the equipment sizing, and type will be confirmed by the contractor during construction planning. For reference, an extract of the safe working buffer distances to comply with human comfort and cosmetic damage for standard dwellings were sourced from the Construction Noise and Vibration Strategy (Transport for NSW, 2018) and provided in Table 6.16. Note that construction will require use of other plant and equipment, but excavators and vibratory rollers are some of the typical equipment that generate the most vibration.

Table 6.16 Vibration safe working distances

Activity	Approx. size/weight/model	Human comfort (OE&H Vibration Guideline)	Cosmetic damage in Standard dwelling (BS 7385)
Vibratory roller	1-2 tonne	15 m to 20 m	5 m
	2-4 tonne	20 m	6 m
	4-6 tonne	40 m	12 m
	7-13 tonne	100 m	15 m
	13-18 tonne	100 m	20 m
	> 18 tonne	100 m	25 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	7 m	2 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	23 m	7 m
Large Hydraulic Hammer	1600 kg (18 to 34 t excavator)	73 m	22 m
Pile Driver - Vibratory	Sheet piles	20 m	2 m to 20 m
Pile boring	≤ 800 mm	4 m	2 m
Jackhammer	Handheld	Avoid contact with structure	1 m

The above safe working distances are indicative only and may vary depending on the specific equipment used and the ground conditions.

Like pile boring, vibration from directional drilling may be perceptible at sensitive receiver locations within 4 metres of the works, however these vibration levels can generally be tolerated if prior warning and explanation is provided to residents. Review of aerial imagery indicates that there are no residential receivers within 4 metres of the works. Vibration levels are expected to be within guideline values for structural damage at dwellings and buildings of similar design or construction. Vibration inducing activities near heritage structures will need further investigation before commencing.

Based on the other indicative type of equipment that is likely to be used for construction and the distance between construction areas and receivers, it is not expected that there will be other vibrational impacts on nearby sensitive receivers.

## **Operation**

The pipelines will be underground and not expected to generate any vibration during operation and therefore operational vibration compliance is not discussed further in this section.

## **6.4.5 Mitigation measures and management recommendations**

Mitigation measures provided in Table 6.17 would be implemented to minimise potential noise and vibration impacts.

### **6.4.5.1 In-principle noise and vibration control**

In principle, there are three approaches to controlling construction noise and vibration:

- Control at the source
- Control on the source-to-receptor pathway
- Control at the receptor

Control at the source is considered to be the most cost-effective in the reduction of noise and vibration levels and as such should be given highest priority when considering mitigation options. The solutions available include:

- Substitution of equipment:
  - Substitution involves where reasonably practicable the use of less noisy or vibration-generating equipment. This should be considered at the beginning of the construction phase, prior to any work being carried out. Equipment should be selected to meet the needs of the proposal or process it is required for and not be excessive.
- Modification of existing equipment:
  - Modification of equipment involves the addition of acoustic treatments to parts of the machinery. These include but are not limited to improved mufflers, stiffening of panels and surface coating of resonance dampening material. These options would often require discussion with the supplier and manufacturer of the equipment.
- Use and siting of equipment:
  - Plant should always be used in accordance with the manufacturer's instructions. Where possible the location of equipment should be away from noise-sensitive areas. This includes taking into consideration the emission direction of equipment and directing this away from noise sensitive receptors. Plant used intermittently should be shut down during the intervening periods or throttled down to a minimum. Dropping of material from height should be limited where possible, particularly the loading and unloading of scaffolding.
- Regular and effective maintenance.
  - Maintenance should be carried out to ensure equipment is running at optimal conditions.

There are two ways of mitigating noise along the transmission path:

- Increasing the distance between the source and receptor.
- Where distance is limited, screening of noise may be considered. In some circumstances it may also be possible to enclose the equipment during the operation.

Table 6.17 provides typical noise attenuation provided by noise control methods.

**Table 6.17** Typical attenuations for source to receptor noise control methods

Control by	Nominal noise reduction possible, in total A-weighted sound pressure level LpA dB
Distance	Approximately 6 for each doubling of distance
Screening	Normally 5 to 10, maximum of 15
Enclosure	Normally 15 to 25, maximum of 50

Reasonable and feasible mitigation measures at the receptors for this proposal are limited to effective community consultation. This is further outlined in Section 6.4.5.3.

### 6.4.5.2 Construction mitigation measures

The noise mitigation measures detailed in Table 6.18 would be implemented to reduce the impact of noise and vibration on the surrounding receptors and sensitive land uses.

**Table 6.18** Standard mitigation measures for construction noise and vibration

Action required	Details	Timing	Responsibility
<b>Management measures</b>			
Implement community consultation measures	Nearby receptors would be notified of the works prior to commencement. Notification would include expected noise levels, duration of the works and a method of contact.	Pre-construction	Council
Site inductions	All employees, contractors and subcontractors would receive an environmental induction. The induction would include: <ul style="list-style-type: none"> <li>– All relevant proposal specific and standard noise and vibration mitigation measures</li> <li>– Relevant license and approval conditions</li> <li>– Permissible hours of work</li> <li>– Any limitations on high noise generating activities</li> <li>– Location of nearest sensitive receptors</li> <li>– Employee parking areas</li> <li>– Designated loading/unloading areas and procedures</li> <li>– Construction works traffic routes</li> <li>– Site opening/closing times (including deliveries)</li> <li>– Environmental incident procedures</li> </ul>	Pre-construction, Construction	Contractor
Behavioural practices	No unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	Construction	Contractor

Action required	Details	Timing	Responsibility
<b>Source controls</b>			
Construction hours and scheduling	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Standard daytime construction hours: <ul style="list-style-type: none"> <li>– Monday to Friday: 7.00 am to 6.00 pm</li> <li>– Saturday: 8.00 am to 1.00 pm</li> <li>– Sundays and public holidays: no work</li> </ul>	Construction	Contractor
Construction respite period during normal hours (RO)	As a guide high noise and vibration generating activities near receivers should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers.	Construction	Contractor
Equipment selection	Use quieter and less noise and vibration emitting removal methods where feasible and reasonable.	Construction	Contractor
Use and siting of plant	Plant used intermittently would be throttled down or shut down. Noise-emitting plant would be directed away from sensitive receptors.	Construction	Contractor
Plan worksites and activities to minimise noise and vibration	Traffic flow, parking and loading/unloading areas would be planned to minimise reversing movements within the site.	Construction	Contractor
Non-tonal reversing alarms	Where feasible and reasonable, non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all vehicles and mobile plant regularly used on site.	Construction	Contractor
Minimise disturbance arising from delivery of goods to construction sites	Loading of materials would occur as far as practical from sensitive receptors. Site access points and roads would be located as far as possible away from sensitive receptors. Dedicated loading/unloading areas would be shielded if close to sensitive receptors. Delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible.	Construction	Contractor



Action required	Details	Timing	Responsibility
<b>Path controls</b>			
Shield stationary noise sources such as pumps, compressors, generators, fans etc.	Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	Construction	Contractor
Shield sensitive receptors from noisy activities	Structures would be used to shield residential receptors from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable)	Pre-construction/Construction	Contractor/Council
<b>Highly noise affected receivers</b>			
Communicate with impacted residences	Noise levels are predicted to exceed the Highly Affected noise limit during construction works at a number of receptors, most notably residences surrounding the exit pit and associated compound. As such, the proponent would communicate with the impacted residents clearly explaining the duration and noise level of the works and inform the residents of any respite periods.	Pre-construction/Construction	Contractor/Council

### 6.4.5.3 Additional mitigation measures - construction noise and vibration guideline

The Transport for New South Wales CNVG provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from noise and vibration generated during the construction of transportation projects (and related infrastructure) through the application of all feasible and reasonable mitigation measures.

The guideline includes a standard suite of noise and vibration management measures that are to be applied on all projects, together with additional mitigation measures which are applicable when construction noise or vibration is predicted to exceed the proposal's construction noise and vibration objectives.

The standard suite of mitigation measures includes management measures such as community consultation, site inductions (with guidance on how to minimise noise and vibration) and the preparation of site specific Construction Noise and Vibration Management Plans. The guideline also includes several recommendations for reducing the source noise levels of construction equipment via good planning and equipment selection.

In many instances, impacts from construction noise are unavoidable and it is not feasible to achieve the construction noise objectives. Therefore, the CNVG includes a list of additional noise mitigation measures which aim to minimise the potential noise impacts. These include measures ranging from letter box drops and phone calls to offers of alternative accommodation (should noise intensive night-time works be required). A summary of the additional noise and vibration mitigation measures matrix are provided in Table 6.19 and Table 6.20.

**Table 6.19 Triggers for additional mitigation measures – Airborne noise (from Construction Noise and Vibration Guideline)**

Predicted airborne $L_{Aeq(15\text{minute})}$ noise level at receiver			Additional mitigation measures type <sup>1</sup>	Mitigation levels <sup>2</sup>
Perception	dBA above RBL	dBA above NML		
<b>All hours</b>				
75 dB(A) or greater			N, V, PC, RO	HA
<b>Standard Hours: Mon - Fri (7:00 am – 6:00 pm), Sat (8:00 am – 1:00 pm), Sun/Pub Hol (Nil)</b>				
Noticeable	5 to 10	0	-	NML
Clearly Audible	10 to 20	< 10	-	NML
Moderately intrusive	20 to 30	10 to 20	N, V	NML+ 10
Highly intrusive	> 30	> 20	N, V	NML+ 20

Note:

- The following abbreviations are used: AA = Alternative Accommodation, V = Verification, IB = Individual briefings, N = Notification, R2 = Respite Period 2, DR = Duration Respite, R1 = Respite Period 1, PC = Phone calls, SN = Specific notifications, Perception = relates to level above RBL
- NML = Noise Management Level, HA = Highly Affected (>75 dB(A) – applies to residences only)

**Table 6.20 Additional mitigation measures if predicted vibration exceeds maximum levels – Vibration (from Construction Noise and Vibration Guideline)**

Time period	Additional mitigation measures	
	Type <sup>1</sup>	Applies to <sup>2</sup>
Standard Hours: Mon - Fri (7:00 am – 6:00 pm), Sat (8:00 am – 1:00 pm), Sun/Pub Hol (Nil)	V, N, RP	All

Note:

- The following abbreviations are used: AA = Alternative Accommodation, V = Verification, IB = Individual briefings, N = Notification, R2 = Respite Period 2, DR = Duration Respite, R1 = Respite Period 1, PC = Phone calls, SN = Specific notifications, Perception = relates to level above RBL
- All affected receivers

Predicted construction noise is expected to impact on nearby sensitive receivers, most notably on receivers located surrounding the exit pit site and associated compound. In accordance with the Transport for New South Wales CNVG the exceedances would require additional mitigation measures. Sensitive receivers within the Highly Affected impact distances for each construction activity presented in Appendix E would be given notification 7 days prior to commencement of any works associated with the activity, phone calls and construction respite periods. Sensitive receivers within the moderately and highly intrusive impact distances presented in on Figure 6.6 to Figure 6.7 would be given notification 7 days prior to commencement of any works associated with the activity.

Predicted construction vibration is not predicted to exceed maximum levels at nearby sensitive receivers and therefore additional mitigation measures have not been recommended.

## 6.5 Air quality and odour

### 6.5.1 Existing environment

Existing air quality is likely to be influenced by fugitive emissions from local road traffic from the local road network and the residential area surrounding the proposal site. Sea spray from the ocean may also influence air quality at this location.

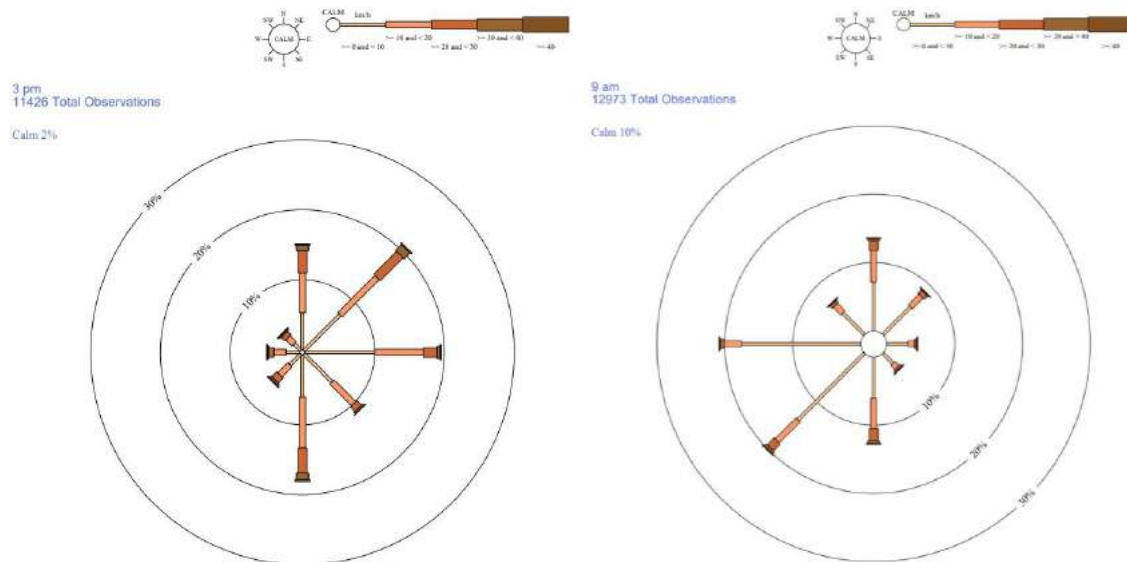


Figure 6.9 Annual Average Rose of Wind direction versus Wind speed in km/h at Narooma (Narooma (Marine Rescue) research station) AWS: Source: Australian Government Bureau of Meteorology

The transport and dispersion of air emissions during the construction work would be influenced by the direction and strength of prevailing winds. Figure 6.9 shows a review of representative meteorological conditions which indicate that prevailing winds are from the south-west at 9 am and the east at 3 pm.

No significant odour sources exist in the Narooma area.

### 6.5.2 Impact assessment

#### Construction

Potential impacts to air quality during construction include:

- Dust generation from earthworks
- Combustion engine emissions from plant and machinery

#### Operation

Routine maintenance activities have the potential to generate gaseous emissions and dust from maintenance vehicles.

#### Odour

There would be no change to odour impacts during operation. The reduction in routine maintenance activities required compared to existing infrastructure is likely to result in a negligible decline in odour impacts.

### 6.5.3 Mitigation measures

Mitigation measures provided in Table 6.21 would be implemented to minimise potential impacts on air quality.

Table 6.21 Proposed mitigation measures – air quality

Impact	Mitigation measure	Timing	Responsibility
Generation of dust	To reduce generation of dust: <ul style="list-style-type: none"> <li>– Limit earthmoving activities during periods of high winds</li> <li>– Implement dust suppression using water carts or binder sprays</li> <li>– Specify height and cover of stockpiles</li> <li>– Minimise vehicle movements</li> <li>– Cover loads during transport</li> <li>– Set vehicle speed limits</li> </ul>	Pre-construction	Contractor
	Limit the areas of clearing and ground disturbance to the minimum required.	Construction	Contractor
	Investigate any dust complaints and implement correction as soon as possible.	Construction	Contractor
	Maintain dust suppression controls on disturbed areas until rehabilitation is completed with appropriate vegetation coverage. Rehabilitate any exposed areas as soon as possible.	Construction	Contractor
Exhaust emissions	Turn off plant and machinery when not in use.	Construction	Contractor
	Maintain construction plant and equipment in good working condition in accordance with manufacturer requirements.	Construction	Contractor
Combustion emissions	No burning of any materials would be permitted on-site.	Construction	Contractor
Odour emissions	Any odour complaints would be managed in accordance with the site operational environmental management plan.	Operation	Council

## 6.6 Non-Aboriginal heritage

### 6.6.1 Existing environment

A desktop assessment was conducted on 10 January 2022 to assess the non-Aboriginal heritage issues present for the proposal. A search of the following databases was conducted:

- The Australian Heritage Database
- The State Heritage Register and Inventory
- Eurobodalla LEP

#### Australian Heritage Database

A search of the Australian Heritage Database identified 12 non-Aboriginal heritage within proximity of the proposal site. The sites located closest to the proposal are:

- Narooma Soldiers Memorial School of Arts located 838 m southeast of the proposal site.
- Glasshouse Rocks Geological Site located 3.16 km southeast of the proposal site.

## NSW State Heritage Register and Inventory

A search of the State Heritage Register and Inventory identified four non-Aboriginal heritage within proximity of the proposal site.

There is one item, listed on the State Heritage Inventory which is the Light from Montague Island Lighthouse located in the vicinity of the works. However, the light is located inside the Narooma visitor centre and will not be impacted by the works.

The sites located closest to the proposal are:

- Montague Island Light station located 10 km southeast of the proposal site.
- Lakeview Homestead Complex located 25.5 km north of the proposal site.

## Eurobodalla LEP

The search of the Eurobodalla LEP identified 376 non-Aboriginal heritage within the Eurobodalla region. The sites located closest to the proposal are:

- Old Ferry approaches and crossing located 249 m east of the proposal site.
- Old Ferry approaches and crossing located 249 m southeast of the proposal site.

### 6.6.2 Impact assessment

No items of non-Indigenous heritage would be impacted by the construction or operation of the proposal.

### 6.6.3 Mitigation measures

Mitigation measures provided in Table 6.22 would be implemented to minimise potential impacts on non-Aboriginal heritage.

*Table 6.22 Proposed mitigation measures – non-Aboriginal heritage*

Impact	Mitigation measure	Timing	Responsibility
Unexpected discovery and accidental impact to heritage objects or artefacts	As part of the site induction, all workers would be advised of their obligations in relation to heritage before construction begins, namely what to do in the event of an unexpected find (see below).	Pre-construction	Contractor
	In the event of an unexpected find of an archaeological deposit (or suspected item), work would cease in the affected area and the Council project manager would be contacted for advice on how to proceed.	Construction	Contractor

## 6.7 Aboriginal heritage

An Aboriginal Cultural Heritage Assessment (ACHA) has been completed by Virtus Heritage Pty Ltd (Virtus) in July 2022 on behalf of GHD (Virtus Heritage Pty Ltd, 2022). The full report was inclusive of an Archaeological Assessment (AA) and is provided in Appendix F

### 6.7.1 Methodology

#### Assessment approach

On the basis of an Aboriginal Heritage due diligence report completed by Virtus Heritage, GHD engaged Virtus Heritage to complete an Aboriginal Cultural Heritage Assessment (ACHA). The ACHA was completed in consultation with 21 Aboriginal groups and individuals. The consultation was completed in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010b) and included consultation with the Registered Aboriginal Parties (RAPs). The ACHA survey of the project area was completed on 6 and 7 June 2022.

All RAPs were provided with the opportunity to provide comment on the methodology for the ACHA, and to be involved in fieldwork. All submissions provided by the RAPs and finalised methodology for the assessment are provided in full in Appendix F. A representative/s from South Coast People's Native Title Claimants and the Wagonga Local Aboriginal Land Council were invited for fieldwork via email on 25 May 2022 and provided Proponent contact details for commercial engagement. The remaining 19 RAPs were also invited to a voluntary field day on the 25 May 2022. A representative from Guntawang Aboriginal Resources Incorporation attended this field assessment on 7 June 2022.

All consultation with the RAPs undertaken by GHD and Virtus Heritage is documented in greater detail in 0. GHD, on behalf of Council, carried out the commercial engagement and selection of interested RAPs for fieldwork for this project. Commercial engagement is stipulated in the ACHRs as separate to consultation and discussions between RAPs and GHD which are commercial in confidence will not be reiterated in the Aboriginal consultation log. It should be noted that consultation was undertaken through multiple forms of contact with RAPs for all correspondence including registered post via delivery confirmation, email (wherever possible), phone calls, SMS, and fax (where all other forms of contact were exhausted).

### 6.7.2 Existing environment

#### 6.7.2.1 Desktop review

The proposal site is located within the Wagonga Inlet, which is a drowned river-valley located in the township of Narooma on the NSW south coast. The earliest Aboriginal occupation dates for the region so far obtained, come from cultural deposits found at Bulee Brook 2, dating Aboriginal occupation as far back as the late Pleistocene. Bulee Brook is over 38 kilometres inland, north-west of the proposal site. The proposal site lies within lands traditionally associated with the Yuin language group.

The ACHA identified Wagonga Inlet as high archaeological potential and that the proposed project activities have a potential to harm unrecorded and known cultural material. This is due to the potential for undisturbed soils to be present sub-surface during excavation of the ground surface in the locations of the entry/exit pits. The proposal area has the potential to harm Aboriginal objects as yet undetected. The harm would not be 'trivial or negligible' as defined in the Code of Practice. Therefore, the ACHA was required prior to any additional ground surface disturbance, and included:

- An ACHA and archaeological test excavation process in accordance with the Code of Practice (Appendix F)
- Full Aboriginal consultation, in accordance with the Code of Practice

Following the completion of the ACHA an application for an AHIP, based on items identified. The test excavation process will be undertaken prior to commencement of works at the northern entry pit for the underbore.

A search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 2 July 2020. The search was completed for any Aboriginal heritage sites recorded within GDA, Zone: 56, Eastings: 351000 – 356000, Northings: 6294000 - 6299000. A total of ten Aboriginal heritage sites were registered within the search area.

Of the ten sites, three are listed as art sites, two artefact sites (also known as open camp sites), four are midden sites (two of these also containing stone artefacts), and one is listed as a potential archaeological deposit (PAD).

The results of the search indicated that there are two AHIMS sites registered within the vicinity of the proposal site, 62-7-0088 and 62-7-0165). The proposed location of Site 62-7-0088 was found to be erroneous on further investigation and is located on the Narooma Headland. The proposed location of Site 62-7-0165 is originally mapped within the inlet (outside of the project area). Research into the site completed by Virtus, through the site card, indicated that shell material was recorded on the northern foreshore and may exist within or in very close proximity to the northern entry site. It was also found that previous research noted that the shell material was 'Probably not a site', however, additional investigations have not been undertaken to support this statement. The Australian Heritage Database, NSW State Heritage Inventory and State Heritage Register, National Native Title Claims, and Eurobodalla LEP were also searched on the 11 January 2022. The register of Native Title Claims Details identifies an active claim by the South Coast People (NC2017/003) exists over the entire study area.

### **6.7.2.2 Field survey**

Members of Virtus with experience in Aboriginal cultural heritage assessment in NSW carried out survey of the project area on the 6 and 7 June 2022. The results of the survey indicate that the project area is heavily disturbed, with some previous surface disturbance associated with landscaping of the foreshore, the previous development of the pathway, vegetation clearance, introduction of grass and retaining wall along the foreshore.

## **6.7.3 Impact assessment**

### **Construction**

The proposal site was likely part used by Aboriginal people in the past as the inlet is known to have a high species diversity which would have provided Aboriginal people with plant and animal resources. The results of the search completed for the due diligence assessment indicated that there are two AHIMS sites ) registered within the proposal site (see ). The original mapped location of 62-7-0165 is located approximately 50 m east of the proposal site, 62-7-0088 is located within the stringing area. The northern side site, site 62-7-0165 is shown within Wagonga Inlet, however the artefact description provided on the site card indicated that the site is located on the northern side of the inlet. Therefore, there is potential for the artefact to be located within the footprint of the grassed area to be impacted by the proposal.

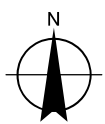
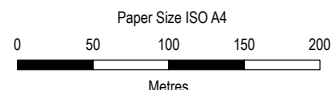


**LEGEND**

- AHIMS search results
- Cadastre

The proposal

- Entry points and laydown
- Under bore alignment



Eurobodalla Shire Council  
 Wagonga Inlet Crossing –  
 Water and Sewer Trenchless Crossings  
 Review of Environmental Factors

Project No. 12563160  
 Revision No. 0  
 Date 16 Sep 2022

Map Projection: Transverse Mercator  
 Horizontal Datum: GDA 1994  
 Grid: GDA 1994 MGA Zone 56

**AHIMS search results**

**FIGURE 6-10**



The Aboriginal cultural heritage survey for the project was conducted over two days. Both days were clear and sunny and all areas that were not under water were assessed for evidence of past Aboriginal occupation or use. Visibility and exposure along the entire project area was low (5%) due to the existing pathway, barbeques and caravan park infrastructure, bitumen and grass coverage. The RAPs present for the assessment made a request that additional assessment through test excavation be carried out on the foreshore and the entry and exit excavation pits for the under bore and trenching. Monitoring was also requested at the northern entry site, if the surface was to be disturbed as it was thought that there may be additional midden remains present relating to the AHIMS registered site Boat Shed Midden/ Wagonga Inlet (AHIMS ID# 62-7-0165).

The outcomes of the ACHA are presented in Table 6.23 below, the outcomes are assessed in the context of the categories of significance developed under the Burra Charter. These statements of significance have been prepared in consideration of the comments received from the RAPs during the consultation process, including those comments relating to the cultural significance of all sites and the interrelationships between the cultural and spiritual values with the natural landscape. It is noted that final review of the assessment has not been made by the RAPs.

**Table 6.23** Assessment of the Burra Charter Values within the project area

Category of Significance	Statement of Values
Aesthetic	The project area has aesthetic values as many of the natural landforms remain largely intact. Prior to colonisation the river would have been used to navigate between the mountains and the coast. At present the full aesthetic value cannot be assessed as Aboriginal community consultation is still taking place of which the RAPs have yet to have an opportunity to comment on this document.
Historic	The project area contains no identified historic values relating to Aboriginal heritage. At present the full extent of the historic value cannot be assessed as Aboriginal community consultation is still taking place of which the RAPs have yet had an opportunity to comment on this document.
Scientific / archaeological	The project area contains one identified Aboriginal archaeological and cultural heritage site, that comprise of midden (62-7-0165). There are a number of culturally modified trees registered on AHIMS to the northeast of the project area. The archaeological site within the project area is considered to be of low scientific (archaeological) value, due to past ground disturbance and intensive land use practices associated with the inlet and access, poor visibility, and the limited amount of information present on their AHIMS site card. The project area has the potential to yield information that would contribute to a further understanding of the cultural history of the local area and region. In particular, the nature of past Aboriginal land-use of the region, and the relationship between past Aboriginal land use and the use of available resources as expressed through archaeological sites and their context.
Social Value	The project area is of social significance to the Aboriginal community because it contains landscapes and resources that help define the communities' identity. During the field assessment all RAPs present identified that the foreshore was an area that Aboriginal people have used for collecting resources and swimming in both the past and to date. At present the full extent of the social value cannot be assessed as Aboriginal community consultation is still taking place of which the RAPs have yet had an opportunity to comment on this document.
Spiritual Value	During the site inspection the RAPs did not identify any spiritual values relating to Aboriginal heritage within the project area. At present the full extent of the spiritual value cannot be assessed as Aboriginal community consultation is still taking place of which the RAPs have yet had an opportunity to comment on this document.

## Operation

There are no expected impacts during operation.

### 6.7.4 Mitigation measures

Mitigation measures provided in Table 6.24 would be implemented to minimise potential impacts on Aboriginal heritage.

Table 6.24 Proposed mitigation measures –Aboriginal heritage

Impact	Mitigation measure	Timing	Responsibility
Further Assessment of known item	Prior to the commencement of the proposed works within the project area there must be an application for an Aboriginal Heritage Impact Permit (AHIP) to complete a test excavation of the northern entry site and the Boat Shed Midden/ Wagonga Inlet (AHIMS ID# 62-7-0165) if this site cannot be avoided by the proposed works.	Prior to approval	Council
Known items	Cultural salvage will be undertaken by members of the RAPs of the northern entry site, should there be any trenching or surface disturbance to the area.	Pre construction	Council
Known items	The existing AHIMS site card for Wagonga Head 28/94 (AHIMS ID#62-7-0088) should be updated with the correct location as per the information provided in Navin Officer (1997).	Pre construction	Council
Impact	All impact activities must be confined to the area assessed. Should the parameters of the proposed works extend beyond the area assessed, then further archaeological assessment may be required.	During construction	Council / Construction contractor
Unexpected finds protocol, induction	<p>All site workers and personnel involved in site impact works associated with the proposed work should be inducted and briefed on the identification of Aboriginal sites and objects during works and their responsibilities according to the provisions of the National Parks and Wildlife Act 1974 (NPW Act 1974), in case any additional unknown objects or items are uncovered during proposed works.</p> <p>Site workers should be made aware of the location of any Aboriginal sites that may at any stage occur within the proposal site and their significance, and their legal obligations in relation to the protection and management of these Aboriginal sites under the NPW Act 1974, and the National Parks and Wildlife Regulation 2019.</p> <p>As part of this induction, workers should be made aware that in the event that unexpected human remains are uncovered on site, the area of the suspected remains must be secured and cordoned off and the NSW Police notified. No further works can be undertaken until the NSW Police provide written advice.</p> <p>If these remains are deemed to require archaeological investigation by the NSW Police or NSW Coroner, then Heritage NSW and the relevant Aboriginal parties must be notified. A plan of management for the preservation of Aboriginal human remains or for their salvage must be put in place or conducted under an AHIP methodology and variation developed in consultation with all relevant Aboriginal parties and the Heritage NSW.</p> <p>NPWS or delegated authority may wish to consider the input and engagement of interested Aboriginal stakeholder groups in the development of inductions and toolbox talks for this project.</p>	During construction	Construction contractor
Unexpected finds	<p>If Aboriginal objects (excluding human remains or sites such as grinding groove complexes/engravings, rock art) are detected during ground disturbance, NPWS unexpected finds procedures (NSW National Parks and Wildlife Service 2020: 17) should be observed, namely:</p> <ul style="list-style-type: none"> <li>– establish an appropriate buffer around the Aboriginal object to exclude further works in the area and allow assessment and management;</li> <li>– engage with the relevant Aboriginal parties to assess the object's heritage values and undertake appropriate methods to avoid or move the object;</li> <li>– complete an AHIMS site card to register the site and document the movement or avoidance strategies taken;</li> <li>– complete a report detailing the unexpected find and the Aboriginal community's recommendations for management;</li> <li>– send the report to the relevant project manager, Registered Aboriginal Parties (RAPs), Heritage NSW and DPE's AHIMS area; and</li> <li>– continue works only once appropriate measures have been taken to avoid or move the site, in consultation with Heritage NSW.</li> </ul>	During construction	Construction contractor

Impact	Mitigation measure	Timing	Responsibility
Site induction	As part of an induction, in the unlikely event that any historical relics are uncovered during proposed works, all workers and subcontractors should be made aware of their responsibilities under the provisions of the NSW Heritage Act 1977 (for example, 19th century bottle dumps, sandstone footings, structural features in situ over fifty years old etc.). In this event all works must cease and the area where objects uncovered is protected until a qualified archaeologist is contacted and can inspect and assess the area to determine its significance in consultation with Heritage NSW.	Pre-construction	Council, construction contractor

## 6.8 Visual amenity

### 6.8.1 Existing environment

The study area predominantly comprises of the Wagonga Inlet, North Narooma, and Narooma, NSW. The landscape consists of a boat ramp, parklands, a carpark, park facilities (i.e., picnic table, walking path), and low and large lot residential areas.

Sensitive receivers include residences and open space.

### 6.8.2 Impact assessment

#### Construction

Construction activities would be visible to local residences as well as users of the open space areas at Wagonga Inlet in the area. Potential impacts could include visual impacts associated with the earthworks and construction machinery, particularly when works are being undertaken near the residential areas in Wagonga Inlet. Construction would cause some visual disturbance as clearing of grasses at the entry and exit pits would be required.

Visual impacts of construction activities, equipment and materials would be short-term, transient and temporary. Once the proposal is installed, it is expected that grass will take some time to establish following completion of the construction works.

Overall, the visual impacts associated with the construction of the proposal are considered very minor.

#### Operation

There will be minimal if any visual impact resulting from operation since the proposal will be installed underground.

### 6.8.3 Mitigation measures

No mitigation measures are required to address the temporary changes to visual amenity during construction.

## 6.9 Traffic and access

### 6.9.1 Existing environment

Roads in the vicinity of the proposal are included in Table 6.25.

*Table 6.25 Roads within and in the vicinity of the proposal site*

Road	Relevant authority
Princes Highway	Transport for NSW
Centenary Drive	Council
Riverside Drive	Council

Existing traffic movements in the vicinity of the proposal site are mainly associated with Princes Highway, the main road leading across Wagonga Inlet. Centenary Drive leads North off of Princes Highway and Riverside Drive to the south of the proposal site. Riverside Drive is a residential street with a speed limit of 50 km/h at this location.

The proposal site in the north at North Narooma will be accessed from Mill Bay Boat Ramp, via Centenary Drive accessed from Princes Highway from the west. The southern end of the proposal site will be accessed from Princes Highway, directly into Ken Rose Park.

## 6.9.2 Impact assessment

### Construction

Traffic impacts would be generated through transport of construction materials to the proposal site along the surrounding regional road network and local roads for material delivery.

All access for equipment to the Mill Bay Boat Ramp would be made through Centenary Drive on the northern side. The southern access to Ken Rose Park would be through Princes Highway and the carpark. To access the area, the site will require some modifications to remove wooden bollard to gain entry. This site will be constrained behind the toilet block and will need to be layout and staged for setup.

The contractor will be required to provide a detailed construction methodology, with details on proposed methods for maintaining access to Mill Bay Boat Ramp in the north and Ken Rose Park in the south. The area will be restored by the contractor post construction.

A summary of access for each aspect of the proposal and relevant compounds is provided in Section 3.

Anticipated construction work force traffic during the construction of the proposal includes:

- Approximately 10 light vehicle movements per day for construction workers over the construction period.
- Approximately 5 heavy vehicle movements per day for earthmoving and pipe deliveries over the construction period.

Any impacts would be localised and temporary and are not expected to significantly impact traffic users and local residences. With the implementation of mitigation measures outlined in Section 6.9.3, construction traffic impacts for the proposal are not expected to be significant.

### Operation

Operational traffic is anticipated to comprise one maintenance vehicle for periodical maintenance and/or inspection in line with Council maintenance requirements. As such, operational traffic and access impacts are considered negligible.

## 6.9.3 Mitigation measures

Mitigation measures provided in Table 6.26 would be implemented to minimise potential impacts on traffic and access.

*Table 6.26 Proposed mitigation measures – traffic and access*

Impact	Mitigation measure	Timing	Responsibility
Disruption to traffic from construction vehicle movements	<p>A Traffic Management Plan (TMP) would be prepared by the contractor and include the following detail:</p> <ul style="list-style-type: none"> <li>– Appropriate entry/exit points for the proposed compound area</li> <li>– Speed limits of the local road network</li> <li>– Appropriate traffic movements, with consideration to residential traffic using local roads and tracks</li> <li>– Management measures in relation to maintaining pedestrian access during construction</li> <li>– The requirement for all contractors and machinery operators to be inducted on the environmental sensitivities of the proposal site and relevant safeguards</li> </ul>	Prior to construction	Contractor

Impact	Mitigation measure	Timing	Responsibility
Road occupancy Traffic control	If traffic control is required on any of the local roads, then a road occupancy license must be obtained under Section 138 of the Roads Act.	Pre-construction	Contractor
	Ensure all traffic control devices are in accordance with: <ul style="list-style-type: none"> <li>– AS 1742.3-2009 – Manual of uniform traffic control Devices: Traffic control for works on roads</li> <li>– Transport for NSW (TfNSW) Traffic control at worksites manual</li> </ul>	Construction	Contractor
Road closures (if required)	Communicate proposed access changes to the impacted community at least two days prior.	Pre-construction and Construction	Contractor
Restricted property access	Maintain access to individual properties during construction, either via vehicle or on foot for short term periods where vehicle access is not possible.	Construction	Contractor
Works notifications	Surrounding residences and sensitive receivers directly affected by the works would be notified at least 14 days in advance.	Pre-construction	Contractor

## 6.10 Land use and services

### 6.10.1 Existing environment

The proposed site would be installed on land at both the north and south sides of Wagonga Inlet in the primarily residential beachside suburbs of Narooma and North Narooma, NSW. Impacted areas are used for passive and active recreation, and transport.

### 6.10.2 Impact assessment

#### Construction

Construction of the proposal would result in short term disturbance within the Mill Bay Boat Ramp Carpark site.

In addition, construction of the proposal and use of the compound area on Rose Park would have minor impacts on the adjacent caravan park residents (see Section 6.4). Construction would be undertaken in consultation with the relevant authorities, including consultation with Council's Crown Land Manager and DPIE – Crown Lands to confirm the need for an approval under the *Crown Land Management Act 2016*. This would include consultation in relation to activities within and around the Wagonga Inlet.

Construction activities have the potential to impact on existing utilities and services, in particular underground services such as water and telecommunications. Council would consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions which have the potential to impact on existing land use.

#### Operation

During operation of the pipelines, any maintenance activities would be restricted to the road corridor. As such, no operational impact to land use or services is expected as a result of the proposal.

## 6.10.3 Mitigation measures

Mitigation measures provided in Table 6.27 would be implemented to minimise potential impacts on land use and property.

Table 6.27 Proposed mitigation measures – land use and services

Impact	Mitigation measure	Timing	Responsibility
Access and acquisition	Arrangements for access on other properties would be negotiated and agreed with landowners prior to construction commencing.	Pre-construction	Construction Contractor
Crown land	Consultation with Council's Crown Land Manager and DPIE – Crown Lands will be required to confirm the need for an approval under the <i>Crown Land Management Act 2016</i> . This would include consultation in relation to sports and market activities at Rose Park.	Detailed design / Pre-construction	Council / Construction Contractor
Service provider impacts	Consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions during construction.	Detailed design / Pre-construction	Council / Construction Contractor
	Complete dial before you dig and pot holing to confirm location of services and reduce the potential for accidental strike.	Pre-construction	Construction Contractor
	Mark out services to prevent accidental strike. This includes any overhead cables.	Construction	Construction Contractor

## 6.11 Waste generation

### 6.11.1 Existing environment

The proposal site is not subject to any waste generating activities, with the exception of minor quantities of general waste (e.g. containers, food scraps, paper, cardboard, etc.) in relation to use of the public open spaces by the local community.

No notable waste items from existing land uses or illegal dumping were observed in the study area during investigations.

### 6.11.2 Impact assessment

#### Construction

The proposal would result in the generation of a small amount of waste materials. Waste materials generated by the proposal may include:

- Packaging and general waste including food scraps, aluminium cans, glass bottles, plastic and paper containers and putrescible waste generated by site construction personnel.
- Excess spoil generated during excavation activities (including drilling mud). Excess spoil not used onsite would be classified in accordance with the NSW *Waste Classification Guidelines* (EPA 2014) and disposal of at a registered waste management facility. The contractor would be responsible for disposing of excess spoil.
- ASS materials managed in accordance with an ASSMP.
- Dewatered groundwater.
- Chemicals and oils.
- Redundant erosion and sediment controls.
- Drilling mud (estimated quantity of 45 m<sup>3</sup>).

## Operation

Little to no waste is expected to be generated as a result of the proposal.

### 6.11.3 Mitigation measures

Mitigation measures provided in Table 6.28 would be implemented to minimise potential impacts on waste generation.

**Table 6.28** Proposed mitigation measures – waste generation

Impact	Mitigation measure	Timing	Responsibility
General	<p>Follow the resource management hierarchy principles:</p> <ul style="list-style-type: none"> <li>– Avoid unnecessary resource consumption as a priority</li> <li>– Re-use materials, reprocess, recycle and recover energy</li> <li>– Dispose as a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>).</li> </ul>	Construction	Contractor
Sludge management	All waste material (including drilling muds) would be classified, managed and disposed of in accordance with the POEO Act and <i>Waste Classification Guidelines</i> (EPA, 2014).	Construction	Contractor
	Drilling mud will be recycled to minimise the amount wasted.	Construction	Contractor
	Preferentially procure materials and products with a recycled content where that material or product is cost and performance effective.	Construction	Contractor
Generation of general construction waste	Provide labelled waste receptacles to promote the segregation of waste and recycle materials where appropriate.	Construction	Contractor
General	Conduct and record site inductions to ensure staff are aware of waste disposal protocols.	Construction	Contractor
	Preferentially procure materials with no or minimal packaging, or those where packaging is recyclable or able to be returned for re-use to the supplier.	Pre-construction, Construction	Contractor
	Maintain all working areas by keeping free of rubbish and cleaning up at the end of each working day.	Construction	Contractor

Impact	Mitigation measure	Timing	Responsibility
Generation of general construction waste	Do not accept waste from outside of the proposal site.	Construction	Contractor
	Provide portable toilets for construction workers and manage to ensure the appropriate disposal of sewage (i.e. removed by a licensed supplier).	Construction	Contractor
	Maintain all working areas by keeping free of rubbish and cleaning up at the end of each working day.	Construction	Contractor

## 6.12 Cumulative and consequential impacts

### 6.12.1 Impact assessment

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the added effects of other external projects. The proponent is required under Clause 228 (2) of the EP&A Act to take into account potential cumulative impacts as a result of the proposal.

Potential cumulative impacts may occur as a result of construction of the proposal occurring simultaneously with the construction of other projects. Subject to the timing of construction it is possible that there could be cumulative impacts. These could relate to:

- Construction noise and vibration impacts, although these are negligible given the proximity of the proposal to the other projects
- Construction traffic impacts
- Socio-economic impacts
- Visual impacts
- Air quality impacts

Potential short term and local amenity impacts may arise if construction of other project occurs simultaneously with the proposal.

The Wagonga Inlet Living Shoreline has been identified as a potential cumulative impact. The project involves transforming and restoring a section of the Wagonga Inlet Shoreline between the Narooma Swimming Centre and Ken Rose Park. However, the project is also run by Council and works will be coordinated to avoid potential conflicts.

Consultation with relevant stakeholders would be carried out during construction planning to ensure that potential cumulative impacts are minimised. Any additional mitigation measures from the consultation would be included in the CEMP for the proposal.

### 6.12.2 Mitigation measures

Mitigation measures provided in Table 6.29 would be implemented to minimise potential cumulative impacts.

**Table 6.29** Proposed Mitigation Measures – cumulative and consequential impacts

Proposed mitigation measures – cumulative Impact	Mitigation measure	Timing	Responsibility
Cumulative impacts	As the proponent of both projects, Council will need to coordinate activities to avoid conflict.	Pre-construction	Council



# 7. Consideration of environmental factors

## 7.1 EP&A Act Clause 228 checklist

The following factors listed in clause 228(2) of the *Environmental Planning and Assessment Regulation, 2000* have been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the *Environmental Planning and Assessment Act 1979*.

Table 7.1 Clause 228 factors

Factor	Comment	Impact
a. Any environmental impact on the community?	<p>During construction, the proposal would have minor short-term negative environmental impacts on the community since the proposal will generate some noise, traffic etc. Impacts can be mitigated through the measures summarised in Section 8.</p> <p>The long-term impact would be positive since the proposal will address the problems with the current crossing.</p>	<p>Short term minor negative</p> <p>Long term positive</p>
b. Any transformation of a locality?	There would be short-term localised visual impacts associated with construction. Impacts would be mitigated through the implementation of measures summarised in Section 6.8.3.	Short term minor negative
c. Any environmental impact on the ecosystems of the locality?	The study area comprises of heavily modified vegetation and therefore a long-term impact on the ecosystems of the locality is not anticipated. However, a short-term minor negative impact is likely during construction.	Short term minor negative
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	<p>During construction, the proposal would result in a minor reduction in the aesthetic quality of the locality as a result of potential dust generation, noise and vibration, visual impacts and traffic movements. These impacts would be minimised through implementation of the management measures and safeguards summarised in Section 8.</p> <p>The proposal would not reduce recreational, scientific or other environmental qualities of the locality.</p> <p>Environmental qualities of the locality would be improved by the proposal.</p>	<p>Short term negative</p> <p>Long term positive</p>
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	<p>There is one item located within the footprint of work, listed on the State Heritage Inventory which is the Light from Montague Island Lighthouse. However, the light is located inside the visitor centre and will not be impacted by the works.</p> <p>The nearest heritage item to the proposal is the Old Ferry Approaches and Crossing is located 300 m from Mill Bay Boat Ramp Carpark in North Narooma. On the southern side of the inlet, there is also an Old Ferry Approaches and Crossing located approximately 150 m southwest of Ken Rose Park. The Narooma Memorial School of Arts is located approximately 1 km away from Ken Rose Park which is on the southern side of the proposal.</p> <p>Per the ACHA completed as part of the Aboriginal Heritage assessment, an AHIP application has been prepared and test excavation methodology proposed in order to minimise potential impact on a known AHIMS site.</p>	Nil
f. Any impact on the habitat of any protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i> )?	Given the limited likelihood, extent and magnitude of impacts on threatened or migratory biota, no individual tests of significance pursuant to Section 7.3 of the BC Act (five-part test), Section 220ZZ of the FM Act (seven-part test) or the MNES Significant Impact Guidelines 1.1 (DoE, 2013) have been prepared. Consequently, a SIS or BDAR is not required for determination of the proposal under Part 5, Division 5.1 of the EP&A Act (see 9.3).	Nil

Factor	Comment	Impact
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	No	Nil
h. Any long-term effects on the environment?	The proposal would result in a long-term positive impact. Negative impacts from construction are all considered minor and short term, with recovery to previous conditions anticipated following rehabilitation.	Short term minor negative
i. Any degradation of the quality of the environment?	Construction of the proposal has the potential to result in minor short-term impacts on water quality, soils and geology, noise and dust. Construction impacts would be managed through the implementation of mitigation measures outlined in this REF and are expected to be minor.	Short term minor negative
j. Any risk to the safety of the environment?	The proposal would reduce the risk of the existing pipelines experiencing failures resulting in a reduction of risks to the safety of the environment.	Long term positive
k. Any reduction in the range of beneficial uses of the environment?	The proposal would not reduce the range of beneficial uses of the environment.	Nil
l. Any pollution of the environment?	The proposal may result in minor short-term pollution impacts through vehicle and machinery emissions/spills during construction activities. However, these impacts would be minimised through the mitigation measures outlined in this REF.	Short term negative Long term positive
m. Any environmental problems associated with the disposal of waste?	The proposal would not place increased demands on limited resources. All resources required for the works are readily available and able to be sourced locally.	Nil
n. Any increased demands on resources, natural or otherwise, which are, or are likely to become in short supply?	The proposal would not place increased demands on limited resources. All resources required for the works are readily available and able to be sourced locally.	Nil
o. Any cumulative environmental effect with other existing or likely future activities?	Potential cumulative impacts may occur as a result of construction of the proposal occurring simultaneously with the construction of other projects. The Wagonga Inlet Living Shoreline is not expected to be impacted by the proposal, if so, it is considered the cumulative impact would be minor and short-term. The long-term effect is considered to be positive. Cumulative impacts would be minimised through the application of individual proposal specific environmental mitigation measures, as summarised in Section 6.12.2.	Short-term negative  Long term positive
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	The proposal is not expected to result in any direct or indirect impacts to coastal processes (refer to Section 6.2).	Nil

## 8. Summary of mitigation measures

Potential environmental impacts relating to the proposal have been identified and assessed in this REF. Where applicable, mitigation measures have been suggested in order to avoid or minimise these impacts.

Environmental impacts are discussed in Section 6 and the recommended mitigation measures are summarised in Table 8.1. Mitigation measures will be incorporated into the construction environmental management plan (CEMP).

Table 8.1 Summary of mitigation measures

Aspect	Mitigation measure	Timing	Responsibility
<b>Soils and geology</b>			
<b>Unexpected discovery of contaminated soils</b>	Preparation of a contingency plan for unexpected finds/contaminated soils as part of the CEMP. The plan would include details of excavation, segregation, stockpiling, remediation, validation and disposal requirements for any contaminated matter.	Pre-construction, Construction	Contractor
<b>Fracture management plan</b>	Prepare a fracture management plan and include measures to manage this risk including maintaining depth of cover, providing bunding/silt fencing around the pits.	Pre-construction, Construction	Contractor
<b>ASSMP</b>	An ASSMP would be prepared for the proposal in accordance with prepared in accordance with the NSW ASS Manual (ASSMAC, 1998a) and ASS Assessment Guidelines (ASSMAC, 1998b).	Pre-construction, Construction	Contractor
<b>Exposure of soil to erosion</b>	<p>Prepare an erosion and sediment control plan (ESCP) in accordance with Blue Book - Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and Volume 2A: Installation of Services, which must include the following:</p> <ul style="list-style-type: none"> <li>– Identification of materials including potentially contaminated material.</li> <li>– Stockpiling and tracking of all materials throughout construction.</li> <li>– Validation and certification of material stockpiles prior to re-use.</li> <li>– Tracking of materials incoming and outgoing from site.</li> <li>– Establish all erosion and sediment control measures before ground disturbance work commences and these are to remain in place until all surfaces have been fully restored and stabilised.</li> <li>– Inspect and maintain controls regularly to ensure effectiveness over the entire duration of the proposal and clean out before 30% capacity is remaining.</li> <li>– Provide a clean water diversion around disturbed areas.</li> <li>– Stockpiles would be located outside of drainage lines and the dripline of trees and would have appropriate controls installed to prevent erosion, control runoff and prevent sedimentation.</li> <li>– All excavations are to be progressively backfilled and stabilised within ten working days during the course of construction works to minimise the potential for erosion.</li> <li>– Final rehabilitation works would be undertaken within 10 days of the completion of works, and in consultation with the relevant landowner.</li> <li>– Stabilise stockpiles against erosion and flood management in instances where they would be in place for greater than twenty working days.</li> <li>– Revise the ESCP throughout the proposed works covering all stages.</li> </ul>	Pre-construction, Construction	Contractor

Aspect	Mitigation measure	Timing	Responsibility
<b>Accidental contamination from leaks or spills of fuels/chemicals etc.</b>	<p>Prepare an incident emergency spill plan as part of the CEMP to include procedures for the storage and handling of hazardous materials including fuel and chemicals as follows:</p> <ul style="list-style-type: none"> <li>– No refuelling to occur on-site unless appropriate bunded hardstand and spill protection/spill plan is prepared.</li> <li>– Storage of hazardous materials on-site to be kept to a minimum and would be in accordance with national guidelines and the safety data sheets relating to bunding, coverage, storage of incompatible materials, etc.</li> <li>– A 'spill kit' would be kept on site at all times for potential chemical or fuel spills.</li> <li>– Construction contractors will be trained in the correct use of the spill kit.</li> </ul>	Pre-construction	Contractor
<b>Rehabilitation</b>	Minimise disturbance areas during construction and progressively stabilise and rehabilitate disturbed areas following completion of construction activities.	Construction	Contractor
	Disturbed soils shall be stabilised and revegetated with hydromulch or turf.	Construction	Contractor
	Monitor, inspect and maintain rehabilitated areas on a regular basis.	Post Construction	Council
<b>Hydrology, flooding and water quality</b>			
<b>Groundwater dewatering</b>	A spearpoint dewatering system would be implemented to manage groundwater inflow into excavations.	Construction	Contractor
	The potential for dewatering to result in settlement of loose sand would be considered in the design of a dewatering system, as there is potential for exposure of ASS as a result of lowering the groundwater around the excavation. Shoring of excavations will reduce inflow of loose sand and groundwater.	Pre-construction, Construction	Contractor
<b>Excavations</b>	Keep all excavations free of water, where possible.	Construction	Contractor
	Excavations would be minimised where possible.	Construction	Contractor
<b>Flood contingency plan</b>	Where possible stockpiles, machinery, equipment etc. are located outside the 5% AEP flood level or can be easily relocatable out of the 5% AEP in the event of heavy rainfall.	Pre-construction, Construction	Contractor
<b>Sedimentation of waterways</b>	Implement erosion and sediment control measures described in Section 6.1.3 particularly concerning placement of stockpiles and soil treatment areas as far away from drainage lines and waterways as possible.	Construction	Contractor
	Any material removed from the waterway that is to be temporarily deposited or stockpiles on land is to be located well away from the waterway and to be contained by appropriate sediment control devices.	Construction	Construction Contractor
	Vehicle wash down and/or cement truck washout would occur in a designated bunded area or offsite.	Construction	Contractor
	Disturbed soils shall be stabilised and revegetated with pavement or turf.	Construction	Contractor
	Rehabilitation would be undertaken along the length of the construction corridor in all areas subject to ground disturbance, including ground stabilisation and establishment of vegetative groundcover in all disturbed areas. Sediment and erosion controls (including dust) would be maintained until vegetation cover is suitable.	Construction	Contractor

Aspect	Mitigation measure	Timing	Responsibility
<b>Discharge of water</b>	Pre commissioning pipeline cleaning water will be managed in accordance with CEMP requirements. Measures will include: <ul style="list-style-type: none"> <li>– Monitoring requirements for potential contaminants.</li> <li>– Installation of appropriate erosion and sediment controls such as; discharge sump, boom/silt curtains.</li> <li>– Inspection/maintenance as required.</li> </ul> Trigger action response plan.	Construction	Contractor
<b>Discharge of water</b>	Consultation with Marine Rescue will be conducted in relation to the discharge of water into the inlet.	Pre-construction	Council
<b>Biodiversity</b>			
<b>Vegetation clearing</b>	Vehicles and machinery would be restricted to designated access roads and tracks.	Construction	Contractor
	Groundcover vegetation is to be re-established following construction.	Post-construction	Contractor
	The boundary of clearing limits will be fenced using high visibility fencing and clearly marked as the limits of clearing.	Pre-construction, Construction	Contractor
<b>Harm/injury to fauna</b>	If any damage occurs to vegetation outside of the proposal site, notify the Council Project Manager and Environmental Representative so that appropriate remediation strategies can be developed.	Pre-construction, Construction	Contractor
<b>Vegetation clearing</b>	In the event that a threatened flora or fauna species is identified on site during the course of works, all works will cease immediately at that location and a suitably qualified ecologist will be consulted.	Pre-construction, Construction	Contractor
<b>Harm/injury to fauna</b>	If an animal is trapped within a trench an animal handling expert/wildlife carer or appropriately qualified ecologist would be contacted to assist with the capture and relocation. If excavations are unattended or are required to remain open for a period of time, barricading will be placed around the excavation to prevent the ingress of fauna. Steel plates may be used to cover smaller excavations. Escape ramps will be provided for fauna in larger excavations. Open pits will be checked each morning, prior to the commencement of construction, to salvage any fauna that have fallen in, and move them to a safe (and appropriate) nearby location.	Construction	Contractor
<b>Compound areas</b>	Compound areas would only be located in cleared or degraded areas to prevent any damage to the surrounding plants or habitat. Implementation of mitigation measures to prevent damage to surrounding areas include those already mentioned in Table 6.2 and Table 6.3.	Construction	Contractor
<b>Noise and vibration</b>			
<b>Implement community</b>	Nearby receptors would be notified of the works prior to commencement. Notification would include expected noise levels, duration of the works and a method of contact.	Pre-construction	Council

<b>Aspect</b>	<b>Mitigation measure</b>	<b>Timing</b>	<b>Responsibility</b>
<b>consultation measures</b>			
<b>Site inductions</b>	<p>All employees, contractors and subcontractors would receive an environmental induction. The induction would include:</p> <ul style="list-style-type: none"> <li>– All relevant proposal specific and standard noise and vibration mitigation measures</li> <li>– Relevant license and approval conditions</li> <li>– Permissible hours of work</li> <li>– Any limitations on high noise generating activities</li> <li>– Location of nearest sensitive receptors</li> <li>– Employee parking areas</li> <li>– Designated loading/unloading areas and procedures</li> <li>– Construction works traffic routes</li> <li>– Site opening/closing times (including deliveries)</li> <li>– Environmental incident procedures</li> </ul>	Pre-construction, Construction	Contractor
<b>Behavioural practices</b>	<p>No unnecessary shouting or loud stereos/radios on site.</p> <p>No dropping of materials from height, throwing of metal items and slamming of doors.</p>	Construction	Contractor
<b>Construction hours and scheduling</b>	<p>Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.</p> <p>Standard daytime construction hours:</p> <ul style="list-style-type: none"> <li>– Monday to Friday: 7.00 am to 6.00 pm</li> <li>– Saturday: 8.00 am to 1.00 pm</li> <li>– Sundays and public holidays: no work</li> </ul>	Construction	Contractor
<b>Construction respite period during normal hours (RO)</b>	<p>As a guide high noise and vibration generating activities near receivers should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers.</p>	Construction	Contractor
<b>Equipment selection</b>	<p>Use quieter and less noise and vibration emitting removal methods where feasible and reasonable.</p>	Construction	Contractor
<b>Use and siting of plant</b>	<p>Plant used intermittently would be throttled down or shut down. Noise-emitting plant would be directed away from sensitive receptors.</p>	Construction	Contractor
<b>Plan worksites and activities to minimise noise and vibration</b>	<p>Traffic flow, parking and loading/ unloading areas would be planned to minimise reversing movements within the site.</p>	Construction	Contractor

Aspect	Mitigation measure	Timing	Responsibility
<b>Non-tonal reversing alarms</b>	Where feasible and reasonable, non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all vehicles and mobile plant regularly used on site.	Construction	Contractor
<b>Minimise disturbance arising from delivery of goods to construction sites</b>	<ul style="list-style-type: none"> <li>– Loading of materials would occur as far as practical from sensitive receptors.</li> <li>– Site access points and roads would be located as far as possible away from sensitive receptors.</li> <li>– Dedicated loading/unloading areas would be shielded if close to sensitive receptors.</li> <li>– Delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible.</li> </ul>	Construction	Contractor
<b>Shield stationary noise sources such as pumps, compressors, generators, fans etc.</b>	Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	Construction	Contractor
<b>Shield sensitive receptors from noisy activities</b>	Structures would be used to shield residential receptors from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable).	Pre-construction/ Construction	Contractor/ Council
<b>Communicate with impacted residences</b>	Noise levels are predicted to exceed the Highly Affected noise limit during construction works at a number of receptors, most notably residences surrounding the exit pit and associated compound. As such, the proponent would communicate with the impacted residents clearly explaining the duration and noise level of the works and inform the residents of any respite periods.	Pre-construction/ Construction	Contractor/ Council
<b>Air quality and odour</b>			
<b>Generation of dust</b>	To reduce generation of dust: <ul style="list-style-type: none"> <li>– Limit earthmoving activities during periods of high winds</li> <li>– Implement dust suppression using water carts or binder sprays</li> <li>– Specify height and cover of stockpiles</li> <li>– Minimise vehicle movements</li> <li>– Cover loads during transport</li> <li>– Set vehicle speed limits</li> </ul>	Pre-construction	Contractor
	Limit the areas of clearing and ground disturbance to the minimum required.	Construction	Contractor
	Investigate any dust complaints and implement correction as soon as possible.	Construction	Contractor
	Maintain dust suppression controls on disturbed areas until rehabilitation is completed with appropriate vegetation coverage. Rehabilitate any exposed areas as soon as possible.	Construction	Contractor



Aspect	Mitigation measure	Timing	Responsibility
Exhaust emissions	Turn off plant and machinery when not in use.	Construction	Contractor
	Maintain construction plant and equipment in good working condition in accordance with manufacturer requirements.	Construction	Contractor
Combustion emissions	No burning of any materials would be permitted on-site.	Construction	Contractor
Odour emissions	Any odour complaints would be managed in accordance with the site operational environmental management plan.	Operation	Council
<b>Non-Aboriginal heritage</b>			
Unexpected discovery and accidental impact to heritage objects or artefacts	As part of the site induction, all workers would be advised of their obligations in relation to heritage before construction begins, namely what to do in the event of an unexpected find (see below).	Pre-construction	Contractor
	In the event of an unexpected find of an archaeological deposit (or suspected item), work would cease in the affected area and the Council project manager would be contacted for advice on how to proceed.	Construction	Contractor
<b>Aboriginal heritage</b>			
Further Assessment of known item	Prior to the commencement of the proposed works within the project area there must be an application for an Aboriginal Heritage Impact Permit (AHIP) to complete a test excavation of the northern entry site and the Boat Shed Midden/ Wagonga Inlet (AHIMS ID# 62-7-0165) if this site cannot be avoided by the proposed works.	Prior to approval	Council
Known items	Cultural salvage will be undertaken by members of the RAPs of the northern entry site, should there be any trenching or surface disturbance to the area.	Pre construction	Council
Known items	The existing AHIMS site card for Wagonga Head 28/94 (AHIMS ID#62-7-0088) should be updated with the correct location as per the information provided in Navin Officer (1997).	Pre construction	Council
Impact Area	All impact activities must be confined to the area assessed. Should the parameters of the proposed works extend beyond the area assessed, then further archaeological assessment may be required.	During construction	Council / Construction contractor
Unexpected finds protocol, induction	<p>All site workers and personnel involved in site impact works associated with the proposed work should be inducted and briefed on the identification of Aboriginal sites and objects during works and their responsibilities according to the provisions of the National Parks and Wildlife Act 1974 (NPW Act 1974), in case any additional unknown objects or items are uncovered during proposed works.</p> <p>Site workers should be made aware of the location of any Aboriginal sites that may at any stage occur within the proposal site and their significance, and their legal obligations in relation to the protection and management of these Aboriginal sites under the NPW Act 1974, and the National Parks and Wildlife Regulation 2019.</p> <p>As part of this induction, workers should be made aware that in the event that unexpected human remains are uncovered on site, the area of the suspected remains must be secured and cordoned off and the NSW Police notified. No further works can be undertaken until the NSW Police provide written advice.</p>	During construction	Construction contractor

Aspect	Mitigation measure	Timing	Responsibility
	<p>If these remains are deemed to require archaeological investigation by the NSW Police or NSW Coroner, then Heritage NSW and the relevant Aboriginal parties must be notified. A plan of management for the preservation of Aboriginal human remains or for their salvage must be put in place or conducted under an AHIP methodology and variation developed in consultation with all relevant Aboriginal parties and the Heritage NSW.</p> <p>NPWS or delegated authority may wish to consider the input and engagement of interested Aboriginal stakeholder groups in the development of inductions and toolbox talks for this project.</p>		
<b>Unexpected finds</b>	<p>If Aboriginal objects (excluding human remains or sites such as grinding groove complexes/engravings, rock art) are detected during ground disturbance, NPWS unexpected finds procedures (NSW National Parks and Wildlife Service 2020: 17) should be observed, namely:</p> <ul style="list-style-type: none"> <li>– establish an appropriate buffer around the Aboriginal object to exclude further works in the area and allow assessment and management;</li> <li>– engage with the relevant Aboriginal parties to assess the object’s heritage values and undertake appropriate methods to avoid or move the object;</li> <li>– complete an AHIMS site card to register the site and document the movement or avoidance strategies taken;</li> <li>– complete a report detailing the unexpected find and the Aboriginal community’s recommendations for management;</li> <li>– send the report to the relevant project manager, Registered Aboriginal Parties (RAPs), Heritage NSW and DPE’s AHIMS area; and</li> </ul> <p>continue works only once appropriate measures have been taken to avoid or move the site, in consultation with Heritage NSW.</p>	During construction	Construction contractor
<b>Site induction</b>	<p>As part of an induction, in the unlikely event that any historical relics are uncovered during proposed works, all workers and subcontractors should be made aware of their responsibilities under the provisions of the NSW Heritage Act 1977 (for example, 19th century bottle dumps, sandstone footings, structural features in situ over fifty years old etc.). In this event all works must cease and the area where objects uncovered is protected until a qualified archaeologist is contacted and can inspect and assess the area to determine its significance in consultation with Heritage NSW.</p>	Pre-construction	Council, construction contractor
<b>Traffic and access</b>			
<b>Disruption to traffic from construction vehicle movements</b>	<p>A Traffic Management Plan (TMP) would be prepared by the contractor and include the following detail:</p> <ul style="list-style-type: none"> <li>– Appropriate entry/exit points for the proposed compound area.</li> <li>– Speed limits of the local road network.</li> <li>– Appropriate traffic movements, with consideration to residential traffic using local roads and tracks.</li> <li>– Management measures in relation to maintaining pedestrian access during construction.</li> <li>– The requirement for all contractors and machinery operators to be inducted on the environmental sensitivities of the proposal site and relevant safeguards.</li> </ul>	Prior to construction	Contractor

Aspect	Mitigation measure	Timing	Responsibility
<b>Road occupancy Traffic control</b>	If traffic control is required on any of the local roads, then a road occupancy license must be obtained under Section 138 of the Roads Act.	Pre-construction	Contractor
	Ensure all traffic control devices are in accordance with: <ul style="list-style-type: none"> <li>– AS 1742.3-2009 – Manual of uniform traffic control Devices: Traffic control for works on roads</li> <li>– Transport for NSW (TfNSW) Traffic control at worksites manual</li> </ul>	Construction	Contractor
<b>Road closures (if required)</b>	Communicate proposed access changes to the impacted community at least two days prior.	Pre-construction and Construction	Contractor
	Diversions with adequate signage and notice would be provided during any road closures.	Construction	Contractor
<b>Restricted property access</b>	Maintain access to individual properties during construction, either via vehicle or on foot for short term periods where vehicle access is not possible.	Construction	Contractor
<b>Works notifications</b>	Surrounding residences and sensitive receivers directly affected by the works would be notified at least 14 days in advance.	Pre-construction	Contractor
<b>Land use and services</b>			
<b>Access and acquisition</b>	Arrangements for access on other properties would be negotiated and agreed with landowners prior to construction commencing.	Pre-construction	Construction Contractor
<b>Crown land</b>	Consultation with Council's Crown Land Manager and DPIE – Crown Lands will be required to confirm the need for an approval under the <i>Crown Land Management Act 2016</i> . This would include consultation in relation to sports and market activities at Rose Park.	Detailed design / Pre-construction	Council / Construction Contractor
<b>Service provider impacts</b>	Consult with relevant service providers during detailed design to identify possible interactions and develop procedures to be implemented to minimise the potential for service interruptions during construction.	Detailed design / Pre-construction	Council / Construction Contractor
	Complete dial before you dig and pot holing to confirm location of services and reduce the potential for accidental strike.	Pre-construction	Construction Contractor
	Mark out services to prevent accidental strike. This includes any overhead cables.	Construction	Construction Contractor
<b>Waste generation</b>			
<b>General</b>	Follow the resource management hierarchy principles: <ul style="list-style-type: none"> <li>– Avoid unnecessary resource consumption as a priority</li> <li>– Re-use materials, reprocess, recycle and recover energy</li> <li>– Dispose as a last resort (in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>)</li> </ul>	Construction	Contractor

Aspect	Mitigation measure	Timing	Responsibility
<b>Sludge management</b>	All waste material (including drilling muds) would be classified, managed and disposed of in accordance with the POEO Act and <i>Waste Classification Guidelines</i> (EPA, 2014).	Construction	Contractor
	Drilling mud will be recycled to minimise the amount wasted.	Construction	Contractor
	Preferentially procure materials and products with a recycled content where that material or product is cost and performance effective.	Construction	Contractor
<b>Generation of general construction waste</b>	Provide labelled waste receptacles to promote the segregation of waste and recycle materials where appropriate.	Construction	Contractor
<b>General</b>	Conduct and record site inductions to ensure staff are aware of waste disposal protocols.	Construction	Contractor
	Preferentially procure materials with no or minimal packaging, or those where packaging is recyclable or able to be returned for re-use to the supplier.	Pre-construction, Construction	Contractor
	Maintain all working areas by keeping free of rubbish and cleaning up at the end of each working day.	Construction	Contractor
<b>Generation of general construction waste</b>	Do not accept waste from outside of the proposal site.	Construction	Contractor
	Provide portable toilets for construction workers and manage to ensure the appropriate disposal of sewage (i.e. removed by a licensed supplier).	Construction	Contractor
	Maintain all working areas by keeping free of rubbish and cleaning up at the end of each working day.	Construction	Contractor
<b>Cumulative impacts</b>			
<b>Cumulative impacts</b>	As the proponent of both projects, Council will need to coordinate activities to avoid conflict.	Pre-construction	Council

## 9. Conclusion

### 9.1 Justification for the proposal

The existing pipelines were constructed in 1978 and Council are looking to replace the existing crossing with two new underbored pipelines to provide reliability to both water and sewer systems. The proposal will construct and operate two new OD450 mains. The key objective of the proposal is to replace the existing crossing with two new trenchless pipes.

The primary objectives of the proposal ensure:

- A reliable water supply and sewer system is provided to the local communities of Narooma and North Narooma.
- Impacts to the environment that could occur as a result of damage to the aged pipelines are minimised.
- Reduced potential for system redundancy.
- Increased transfer capacity into the future.
- That the future conflict with the proposed wharf upgrades is eliminated.

### 9.2 Ecologically sustainable development

Ecologically sustainable development (ESD) is defined in section 6 (2) of the *Protection of the Environment Administration Act 1991*. The key principles of ESD, as they relate to the proposal, are discussed in the following sections.

#### 9.2.1 The precautionary principle

This principle states ‘if there are threats of serious or irreversible damage, lack of scientific certainty would not be used as a reason for postponing measures to prevent environmental degradation’.

Evaluation and assessment of alternative options has aimed to reduce the risk of serious and irreversible impacts on the environment.

The design of the development has sought to minimise impacts on the amenity of the study area while maintaining engineering feasibility and safety. A number of mitigation measures have been proposed to minimise potential impacts. These mitigation measures would be implemented during construction and operation of the proposal. No mitigation measures have been postponed as a result of lack of scientific certainty.

A CEMP would be prepared before construction starts. This requirement would ensure the proposal achieves a high-level of environmental performance. No management measures or mechanisms would be postponed as a result of a lack of information.

#### 9.2.2 Intergenerational equity

This principle states, ‘the present generation would ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations’.

The proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for future generations. The proposal would benefit future generations by ensuring that a reliable water supply is provided to the local communities of Narooma and North Narooma which has a positive benefit for all of the community.

If the proposal does not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service associated with aging infrastructure.

## 9.2.3 Conservation of biological diversity and ecological integrity

This principle states the 'diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'.

An assessment of the existing local environment was undertaken to identify and manage any potential impacts of the proposal on local biodiversity. The proposal would not have a significant impact on biological diversity and ecological integrity. A biodiversity assessment and appropriate site-specific safeguards are provided in Section 6.3.

## 9.2.4 Improved valuation, pricing and incentive mechanisms

This principle states 'that environmental factors would be included in the valuation of assets and services'.

The REF has examined the environmental consequences of the proposal and identified management measures to manage the potential for adverse impacts. The requirement to implement these management measures would result in an economic cost to Council. This signifies that environmental resources have been given appropriate valuation.

The proposal design has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the proposal is being developed with an environmental objective in mind.

## 9.3 Summary and recommendations

This REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. A review of relevant legislation has been undertaken in preparation of this REF.

A number of potential environmental impacts from the proposal have been avoided or reduced during the design development and options assessment process. Mitigation measures as detailed in this REF would generally ameliorate or minimise the remaining potential impacts. The REF has found that:

- Development consent under Division 4.1 of the EP&A Act is not required.
- An assessment of potential impacts on this species has been undertaken pursuant to *Part 7 of the BC Act, Section 220ZZ of the FM Act and Section 1.7 of the EP&A Act*, and the proposed works would not have a significant effect on threatened species, populations, communities or their habitats, as listed under the BC Act or FM Act, therefore a species impact statement is not required.
- The matters listed under Section 5.5 of the EP&A Act and Clause 228 of the EP&A Regulation have been considered and the proposed works would not significantly affect the environment; therefore an environmental impact statement is not required under Section 5.7 of the Act.
- The proposed works would not impact on any matters of NES, as listed under the EPBC Act, therefore referral to the Commonwealth Minister for the Environment is not required.
- It is recommended that a detailed CEMP be prepared before works commence. The CEMP is to include (as a minimum) the measures summarised in Section 7. With these measures in place, a significant residual impact is not anticipated. Relevant approval would also be required as follows:
  - Consultation with Council's Crown Land Manager and DPIE – Crown Lands will be required to confirm the need for an approval under the *Crown Land Management Act 2016*.
- Consultation with Batemans Marine Parks will be conducted as the proposal site is located within a Marine Park and will require a permit for works.
- Prior to the commencement of the proposed works within the project area there must be an application for an Aboriginal Heritage Impact Permit (AHIP) to complete a test excavation of the norther entry site and the Boat Shed Midden/ Wagonga Inlet (AHIMS ID# 62-7-0165) if this site cannot be avoided by the proposed works. Cultural salvage by members of the RAPs of the northern entry site, should there be any trenching or surface disturbance to the area.

## 10. Declaration

This report: has been prepared by GHD for Council and may only be used and relied on by Council for the purpose agreed between GHD and Council as set out in Section 1.2.

GHD otherwise disclaims responsibility to any person other than Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

This Review of Environmental Factors provides a true and fair review of the activity in relation to its likely impact on the environment. It addresses to the fullest extent possible, all the factors listed in Clause 228 of the *Environmental Planning and Assessment Regulation Act* (as amended) and the *Commonwealth Environmental Protection and Biodiversity Conservation Act* (as amended).

Signed:



Name: Simon Murphy

Position: Technical Director - Environment

Date: 16 September 2022

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