

Addendum Review of Environmental Factors

South Nowra SPS24 Rising Main

WI220851B

Prepared for
Shoalhaven Water

24 May 2022



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Contact Information

Cardno (NSW/ACT) Pty Ltd

ABN 95 001 145 035

16 Burelli Street
Wollongong NSW 2500
PO Box 1285

Phone +612 4228 4133

Fax +612 4228 6811

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Author(s):



Hayley Ackroyd
Environmental Scientist

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Approved By:



Daniel Lidbetter
Senior Environmental Advisor

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Executive Summary

Shoalhaven Water approached Cardno, now Stantec in 2021 to provide a Review of Environmental Factors to assess the potential environmental impacts associated with the South Nowra Surcharge Main Major Upgrades. Following the completion of the Review of Environmental Factors, Shoalhaven Water proposed an amendment to the alignment of the sewer pumping station 24 rising main. The amended alignment is located outside of the study area that was assessed in the original scope of works.

Due to this, Shoalhaven Water requested an addendum Review of Environmental Factors for the amended alignment of the rising main in 2022. This report will assess the potential environmental impacts of the amended alignment in comparison to the impacts that were assessed in the project Review of Environmental Factors. It will also discuss the mitigation measures for the amended alignment alongside those that were suggested in the project Review of Environmental Factors. A revised list of the Environmental Management Measures has been included as part of this summary below:

Summary of Mitigation Measures

Ecology

General

- > Use of previously cleared and non-native (e.g. miscellaneous) vegetated area for the footprint of the project layout where possible, including laydown areas during the construction phase;
- > Use of non-invasive techniques for decommissioning of underground mains (e.g. grout-filling) within the project footprint to avoid earthworks and associated soil and vegetation disturbance, as well as preventing sedimentation and erosion impacts into adjacent lands, including Browns Creek and its riparian corridor;
- > Install project boundary fencing on laydown areas and/or site compounds to ensure activities and ancillary facilities are restricted to the project footprint.

Vegetation clearing

While all attempts to avoid vegetation clearing would be put in place, should some limited tree removal be required the following mitigation measures would apply:

- > If required, tree removal to be supervised as detailed in 'Wildlife protection during construction' section below
- > Compensatory planting at rate of 1:1 to occur for any large trees (i.e., Diameter at Breast Height (DBH) ≥50 cm).
- > No native vegetation clearing is permitted in the areas marked as a TEC on Figure 6-2.

In addition, weed removal shall follow weed management mitigation measures listed above.

Wildlife protection during construction

- > Stop-work procedure on the chance encounter of any dispersing wildlife during works should be implemented to avoid death or injury
- > If tree clearing is unavoidable, ensure that a suitably qualified ecologist is present during the removal of any trees to act as a spotter-catcher that can relocate any captured wildlife
- > Ensure that a suitable qualified ecologist is present during the removal of all trees to act as a spotter-catcher that can relocate any captured wildlife
- > Ensure that all captured animals are relocated into the nearest suitable native vegetation; and
- > Ensure that any injured animals are taken to a local wildlife carer for treatment.

Aquatic habitat

- > Strict erosion and sedimentation control measures should be implemented where required to ensure that the water quality and hydrological regime of Browns Creek adjacent to the study area is not impacted.

Non- Aboriginal Heritage

- > Construction activities, including site access and ancillary activities are to remain within the study area only
- > The CEMP should include an unexpected finds protocol to manage the risk of unexpected archaeological finds. If any non-Aboriginal items are discovered during the works, or suspected items of non-Aboriginal heritage significance, then works in the immediate area should stop immediately and Shoalhaven Water should be contacted to advise of management measures prior to recommencing works in the vicinity
- > All construction workers should be informed of their responsibilities in relation to Aboriginal and non-Aboriginal cultural heritage under the relevant legislation

Aboriginal Heritage

- > Construction activities, including site access and ancillary activities are to remain within the study area only
- > Areas of moderate and high (PAD site) archaeological potential as shown on Figure 6-4 and in Appendix C are to be delineated as no-go areas and communicated to all site personnel. The no-go zone is to delineate areas where laydown, parking, traffic of light vehicle/plant or any other works with a risk of ground disturbance are prohibited
- > All construction workers should be informed of their responsibilities in relation to Aboriginal and non-Aboriginal cultural heritage under the relevant legislation
- > The CEMP should include an unexpected finds protocol to manage the risk of unexpected archaeological finds. If any Aboriginal items are discovered during the works, or suspected items of Aboriginal heritage significance, then works in the immediate area should stop immediately and Shoalhaven Water and DPIE should be contacted to advise of management measures prior to recommencing works in the vicinity. Where the find comprises human remains, NSW Police must be contacted in the first instance.

Soils and Contamination

- > Prepare a CEMP containing an Unexpected Finds Protocol (UFP) outlining appropriate management of contamination items which may be encountered or disturbed by constructions
 - In the event of an unexpected contamination find a suitably qualified environmental consultant will be required to attend site to assess contamination and provide advice on appropriate management or treatment
- > For the areas within the proposal where ASS is deemed to be present, it is recommended that further investigation be undertaken. This further investigation will inform any future mitigation measures required
- > Where asbestos materials (i.e. former pipes) are to remain buried onsite these are to be noted in Council property records with an Asbestos Management Plan (AMP) in place to ensure appropriate long term management.

Water Quality and Hydrology

- > Locate site amenities away from waterbodies or drainage lines
- > Include emergency procedures for chemical/fuel spills in the CEMP and keep a functioning 'spill kit' on site at all times for clean-up of accidental spills
- > Chemicals and fuels are required to be stored in bunded storage containers, and the Material Safety Data Sheets (MSDSs) for any chemicals must be available onsite. Spill and incident management procedures must be in place and communicated to crews prior to works commencing.
- > Record all stored chemicals on a register with their MSDS's
- > Do not use equipment with fuel, oil or hydraulic leaks. Repair or remove equipment immediately

- > The site will be managed to minimise the extent of exposed soils. Erosion and sediment control measures will be implemented in accordance with the "Blue Book" (*Managing Urban Stormwater: Soils and construction – Volume 1, fourth edition*, dated March 2004)
- > If the intersection of groundwater occurs, testing of excavation water to ensure suitable quality for ground/stormwater disposal would be implemented
- > Prior to commencement of construction, the contractor would need to determine the anticipated volume of groundwater likely to require collection and disposal off-site and put in place measures to monitor the actual volumes if encountered during construction

It is considered likely that the groundwater system will be intercepted during excavation. The contractor must obtain a Water Access Licence (WAL) from DPI Water/ NRAR if groundwater extraction volume will be greater than 3ML / year, although it is considered unlikely that this will occur.

Odour

No specific mitigation measures are required for the control of normal operating odours. However, regular inspection of the pump stations and sewer pipelines must be undertaken including the detection of odours. Furthermore, complaints received related to odours must be fully investigated and corrective action undertaken where required if practicable and reasonable

Air Quality and Energy

- > Exposed areas of soil will be kept to the smallest areas practicable to minimise the potential for dust generation
- > The work areas and stockpiles will be monitored for dust generation and will be sprayed with appropriate non-potable water as required
- > No matter of any kind will be burnt on site
- > Equipment will be maintained to ensure no exhaust particulates are visible for more than 10 continuous seconds
- > Vehicles will not be left idling
- > Works will be scheduled to minimise journeys
- > Fuel and energy usage will be recorded
- > Odour or air pollutant emission complaints will be dealt with promptly and the source will be eliminated wherever practicable
- > Details of the complaint will be recorded
- > In addition to the above, Shoalhaven Water may wish to consider opportunities for reducing the overarching energy requirements associated with the water and sewage supply network and/or options for supplying the system from renewable sources.

Waste Management

- > Recommendation's as detailed in the PSI (included in Appendix D) and Section 6.4 be carried out to ensure contaminated waste and soils are managed appropriately
- > CEMP to include waste management strategy prepared in accordance with the waste management hierarchy including details such as:
 - List of waste likely to be generated
 - Procedure for sorting and storing waste
 - Waste register to record: quantity, type, transportation method; time of and location of waste disposal
 - Strategy devised and implemented to recycle, reuse or avoid waste generation.
- > All waste disposal locations to be suitably licenced
- > All waste leaving the site must be appropriately characterised

- > No waste is to be left on-site post construction
- > Working site is to be kept free of rubbish and cleaned at the end of each working day; and
- > EPA is to be notified of any incidents of pollution or environmental harm (as per part 5.7 of the POEO Act).

Traffic and Site Access

- > Contractor to secure a section 138 permit prior to work on any local road reserves;
- > Greenwell Point Road is classified by Transports for NSW (TfNSW) as a Regional Road (pursuant to the Road Act 1993 - i.e. Those Regional Roads that are not classified as Highway, Main Road, Secondary Road or Tourist Road under the Roads Act) and is managed by TfNSW. The contractor will secure a Road Occupancy License as required from TfNSW for any works likely to impact on traffic flow, such as trenching or underboring for pipeline installation.
- > A traffic management plan will be prepared as part of securing the ROL and Council requirements regarding traffic control, access and road restoration will be complied with
- > Open trenches would be fenced off during construction where required to ensure pedestrian safety
- > Erect signs regarding proposed works, temporary road / pavement closures, diversions etc.
- > Provide alternate access (e.g. ramps and bike ramps) if access is impeded for an extended period
- > Avoid blocking access to vehicular or pedestrian roads, private driveways, public facilities or businesses wherever possible
- > Adequately notify affected people and businesses
- > Restore access quickly.

Noise & Vibration

- > Work and deliveries will preferably occur during the following times: Monday to Friday 7am to 6pm, Saturday 8am to 1pm. No construction work or deliveries will occur on Sundays or public holidays;
- > Limited works will be permitted outside of the standard construction hours outlined above (e.g. to minimise impacts of road closures)
- > Surrounding residences and/or businesses will be given reasonable notice of the proposed works (including proposed start date, work methods and duration); and
- > Equipment will have noise mufflers and be well maintained.

Social, Visual and Land Uses

- > All work will be contained within the boundaries of the study area shown on Figure 1-1
- > It is proposed to powder coat the visible pump station infrastructure in a colour that blends into the surrounding environment to reduce the visual impact
- > The site must be kept clean of general litter and tidy for the duration of the works
- > The spread of stockpiles, waste, and parking will be minimised
- > Accurate public information signs will be provided until site restoration is complete
- > Work sites will be restored as close to their original condition as possible
- > Community and stakeholder liaison will be carried out before and during the site works
- > A Dial Before You Dig search will be completed prior to the commencement of site works to located underground services, and these services will be pegged out as no-go areas to avoid service disruptions

All personnel will exercise courtesy in dealing with the community.

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1 Introduction

1.1 Proposal Modification Overview

Shoalhaven Water propose to modify the South Nowra Surcharge Main (SNSM) Major Upgrades (the project) by amending the alignment of the sewer pumping stations (SPS) 24 Rising Main (proposed modification), which falls outside of the original study area.

Section 2 describes the proposed modification in more detail and the location of the proposed modification is shown in Section 2.4.

A Review of Environmental Factors (REF) was prepared by Cardno, now Stantec (Cardno) on behalf of Shoalhaven Water in October 2021 to assess the potential environmental impacts associated with the proposed development of the surcharge main upgrades.

Following the completion of the project REF, Shoalhaven Water proposed the additional alignment of the SPS 24 Rising Main, which falls outside of the development footprint that was assessed during the preparation of the project REF. As a consequence, this addendum REF has been prepared by Cardno to ensure that the REF fully considers the potential environmental impacts of the project.

Modifications are also proposed at the new SPS site at the corner of Clipper Road and Greenwell Point Road. The new sub-station will be relocated from Greenwell Point Road to Clipper Road. This modification falls within the existing study area of the original REF and no further assessment was required to inform the addendum REF.

1.2 Background

Shoalhaven Water propose to upgrade the SNSM. The SNSM is operated by Shoalhaven Water and transfers the sewerage from six different SPS's (SPSs 17, 19, 20, 22, 24 and 28) to the Nowra Wastewater Treatment Plant.

In the project REF, SPSs 17 and 19 share a common rising main before flowing into a discharge maintenance hole near the corner of Old Southern Road and Killara Road, while the remaining four SPSs (SPS 20, 22, 24 and 28) pump into the gravity section below static water levels.

The project REF followed on from the Options Assessment for the South Nowra Surcharge Main Air Relief and Odour Control project. Whilst the Options Assessment began as an odour assessment, it was discovered that there were significant hydraulic impacts to the existing system due to excessive surcharging in the main. The surcharge was a major contributing factor to increased odour issues within the network. The reduced hydraulic capacity also contributed to more frequent overflows at the pump stations as there is insufficient capacity in the network and at the pump stations to store wet weather flows.

Shoalhaven Water decided to undertake a larger series of upgrades to the network to remove the hydraulic constraints. The project works were designed to remove the hydraulic bottlenecks in the system that have caused the issues mentioned above and allow each pump station to pump to its full capacity during wet weather events, when it is most needed. The project was designed to deliver increased hydraulic capacity which is important to the future growth of the area.

The proposed modification involves an additional alignment for the SPS 24 rising main to increase its hydraulic capabilities during wet weather events.

A full description of the proposal is provided in Section 2.

1.3 Purpose of this Report

This addendum REF has been prepared in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is to be read in conjunction with the project REF.

The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in context of Clause 171 of the *Environmental Planning Regulation 2021* (EP&A Regulation), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the

Australian Governments *Environment Protection Conservation Act 1999* (EPBC Act). In doing so, the addendum REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, namely that Shoalhaven Water examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the addendum REF will be considered when assessing:

- > Whether the proposed modification is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.1 of the EP&A Act,
- > The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement; and
- > The potential for the proposed modification to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

1.4 Structure of this Report

The structure of this report is as follows:

- > Section 1 – Introduces the project and the proposed modification
- > Section 2 – Describes the proposed modification in greater detail, including the needs and justification
- > Section 3 – Assesses the proposed modification in relation to relevant planning legislation and policies
- > Section 4 – Summarises any consultation undertaken to date
- > Section 5 – Summarises recommended environmental safeguards/management measures
- > Section 6 – Summarises and concludes the assessment
- > Section 7 – Lists the references discussed in this assessment; and
- > Appendices – Contains supporting information including design details and database searches.

2 Proposed Modification

2.1 Objectives of the Proposed Modification

Section 2.1 of the project REF addresses the project objectives. The proposed modification described and addressed in this addendum REF is consistent with the objectives of the project. The objective of the proposed modification is to increase the hydraulic capabilities of SPS 24.

2.2 Need for the Proposed Modification

Section 2.1 of the project REF addresses the need for the project. The proposed modification described and addressed in this addendum REF is consistent with the need for the project.

2.3 Options Considered

Section 3.2 of the project REF addresses the options considered for the project. This addendum REF is consistent with the options considered for the project REF, and the amended alignment proposed was selected by Shoalhaven Water.

2.4 Proposed Modification Description

The proposed modification will involve an additional alignment to the SPS 24 rising main, the extent of the proposed modification is shown in Figure 2-1. The proposed works footprint has been highlighted in green, and the rising main will follow the light blue alignment indicated in the image. The study area from the project REF is shown in Figure 2-2 below.

The scope of works for the proposed modification comprises of:

- > An extension to the SPS 24 rising main to the existing air valve within The Garden Walk, which will be replaced with a discharge chamber.
- > The discharge chamber will flow through the new gravity network to the gravity main near SPS 20 and into the new sewer pump station, as outlined in Package 1 of the SNSM Major Upgrades.
- > This will increase the output of SPS 24 rising main to deliver 112L/sec instead of the original project proposal which was designed to deliver 86L/sec.



Figure 2-1 SPS 24 Revised Works Area



Figure 2-2 Study Area from Project REF

Section 3.3 of the project REF addresses the construction methodology for the project. The proposed modification described and addressed in this addendum REF is consistent with the methodology outlined and will be run concurrently with the project development works.

3 Statutory Planning and Framework

This section of the addendum REF provides an overview of the key planning instruments and legislation relevant to the proposed modification.

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

The EP&A Act is the principal planning legislation for NSW. Part 5 of the EP&A Act applies to infrastructure and environmental impact assessment of activities undertaken by or on behalf of Government departments or agencies, which has been identified as the determining authority. *Division 5.1 – Environmental impact assessment*, refers to the assessment of impacts of an “activity”. An activity is defined in Section 5.1 as:

- “(a) the use of land, and
- (b) the subdivision of land, and
- (c) the erection of a building, and
- (d) the carrying out of a work, and
- (e) the demolition of a building or work, and
- (f) any other act, matter or thing referred to in section 3.14 that is prescribed by the regulations for the purposes of this definition,
- but does not include—
- (g) any act, matter or thing for which development consent under Part 4 is required or has been obtained, or
- (h) any act matter or thing that is prohibited under an environmental planning instrument, or
- (i) exempt development, or
- (j) development carried out in compliance with a development control order, or
- (k) any development of a class or description that is prescribed by the regulations for the purposes of this definition.”

In this case, the ‘activity’ proposed is the *carrying out of work* (Section 5.1(d)).

Section 1.5 to the EP&A Act lists the categories of development under this Act. The proposed work fits the category of:

“development that is an activity requiring environmental assessment under Division 5.1 before it is carried out by a public authority or before a public authority gives approval for the carrying out of the activity,

Section 4.1 of the EP&A Act applies to development that does not need consent and states as follows:

“4.1 Development that does not need consent

(1) General

“If an environmental planning instrument provides that specified development may be carried out without the need for development consent, a person may carry the development out, in accordance with the instrument, on land to which the provision applies”.

The work is permissible without consent in accordance with *State Environmental Planning Policy (Transport and Infrastructure) 2021* as outlined under Section 3.2 of this REF.

In accordance with the definitions in Section 5.1 of the EP&A Act:

- > the proponent for the activity is Shoalhaven Water (a Public Authority) and
- > the determining authority is also Shoalhaven Water being the:

“public authority by or on whose behalf the activity is or is to be carried out” as well as the *“public authority whose approval is required in order to enable the activity to be carried out”*.

Section 5.5 to the EP&A Act sets out the duty of the determining authority for assessing the impacts for work under Part 5 and states as follows:

“(1) For the purpose of attaining the objects of this Act relating to the protection and enhancement of the environment, a determining authority in its consideration of an activity shall, notwithstanding any other provisions of this Act or the provisions of any other Act or of any instrument made under this or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.”

This addendum REF examines all matters related to the potential environmental impacts of the activity including methods for avoidance, mitigation and management of impacts as appropriate to the case.

3.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

The aim of the Transport and Infrastructure SEPP (TISEPP) is to facilitate the effective delivery of transport and infrastructure across NSW by identifying whether certain types of transport and infrastructure require consent, can be carried out without consent or are exempt development.

Chapter 2, Division 18 (Sewerage Systems) Clause 2.124 applies to **biosolids treatment facility, sewage reticulation system, sewage treatment plant, sewerage system** and **water recycling facility** as defined in the Standard Instrument.

The proposed works fit the following definitions in the Standard Instrument:

“sewerage system means any of the following—

- (a) *biosolids treatment facility,*
- (b) *sewage reticulation system,*
- (c) *sewage treatment plant,*
- (d) *water recycling facility,*
- (e) *a building or place that is a combination of any of the things referred to in paragraphs (a)–(d).”*

The works are characterised as a ‘sewage reticulation system’ from the above, which means:

“a building or place used for the collection and transfer of sewage to a sewage 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) *sewage overflow structures, and*
- (f) *vent stacks.”*

In accordance with Clause 2.125(6) of the Transport and Infrastructure SEPP, Shoalhaven Water (being a public authority) can undertake the proposed modification works without consent subject to the prescribed circumstances. Clause 2.125(6) states:

- > *“Development for the purpose of **sewage reticulation systems** may be carried out without consent on any land in the prescribed circumstances”,*

Clause 2.126(a) of the ISEPP states that:

*“Development is carried out in the prescribed circumstances if the development (a) is carried out **by or on behalf of a public authority** [...]”.*

Therefore, in summary, the proposed modification can be carried out by Shoalhaven Water provided they examine and consider to the fullest extent possible all matters affecting or likely to affect the environment. This addendum REF documents those matters and provides the basis on which Shoalhaven Water can determine whether to proceed with this proposed modification.

Part 2 (Division 1) of the Transport and Infrastructure SEPP contains provisions for public authorities to consult with local councils and other authorities prior to the commencement of certain types of development. Consultation, including that required by the Transport and Infrastructure SEPP, is discussed in Section 4 of this addendum REF.

3.3 Resilience and Hazards SEPP 2021

Chapter 4 of the *State Environmental Planning Policy (SEPP) – Resilience and Hazards* relates to the remediation of contaminated land, consent requirements for this, and considerations for the rezoning and development of land. The contamination status of the land has been assessed via a desktop review of potential contaminant sources. The site is partially an existing road reserve that is highly disturbed due to previous installation of utility infrastructure. The EPA Contaminated Lands Register did not yield any results

of contaminated land in proximity to the site. Consequently, the proposal site is not expected to be contaminated. Therefore, this SEPP is not relevant to the project.

An unexpected finds protocol is proposed to be implemented during construction of the proposed modification.

Should contamination be uncovered during the construction, the relevant provisions within the SEPP for remediation work may be applicable. These will be identified in the contractor's CEMP to ensure that contaminated material is identified and removed in accordance with NSW WorkCover and EPA guidelines.

3.4 Local Government Act 1993

The purpose of the *Local Government Act 1993* is to provide a legal framework for the local government system of New South Wales, and sets out the responsibilities and functions of local government in order to provide an accountable, sustainable, flexible and effective system.

Under Section 60 of the *Local Government Act 1993*, local water utilities are required to obtain ministerial approval for the provision of "*sewage from its area to be discharged, treated or supplied to any person.*"

Section 60 is not considered to be applicable to the proposed modification as the sewage system is already approved and is in operation. This proposal is for upgrade and extension works to the existing sewage system.

3.5 Heritage Act 1977

The *Heritage Act 1977* relates to the registration, conservation, interim protection and adaptive reuse of items of State heritage significance. The subject site does not contain any known State Heritage objects. A number of LEP listed heritage sites are located to the west and east of the study area.

The proposed modification works are located outside the property boundaries of all LEP listed heritage sites and consequently, it is considered unlikely that the proposed works will disturb any items of heritage significance and a permit is not required from the Department of Premier and Cabinet – Heritage NSW. An unexpected finds protocol is proposed and mitigation measures will be incorporated into the works to ensure there will be no adverse effects to any heritage items in the event of an unexpected find (Refer to Section 6.2.2 of the project REF).

3.6 National Parks and Wildlife Act 1974 (NPW Act)

The *National Parks and Wildlife Act 1974* aims to conserve nature, places, objects and features of cultural value (including those of significance to Aboriginal people), fostering public appreciation and providing for the management of these places.

Section 86 lists offences relating to harming or desecrating Aboriginal objects. Under Section 90(1) of the Act, where harm to an Aboriginal object or Aboriginal place cannot be avoided, an Aboriginal Heritage Impact Permit (AHIP) is required.

An Aboriginal Cultural Heritage Due Diligence Assessment (ACHDDA) was undertaken by Austral Archaeology. The full report is provided in Appendix C of the project REF and Appendix B of the addendum REF.

The ACHDDA identified areas within the study area that have the potential to contain archaeological deposits, however the proposed works are unlikely to cause disturbance or destruction of any Aboriginal objects or places as they are located outside of the potential archaeological deposit areas.

These areas require further investigation (including test excavations) to be documented in an Aboriginal Cultural Heritage Assessment Report (ACHAR). Depending on the findings of the ACHAR, an Aboriginal Heritage Impact Permit (AHIP) may be required before construction of the proposal could proceed.

An unexpected finds protocol is proposed and mitigation measures will be incorporated into the works to ensure there will be no adverse effects to any nature, places, objects or features of cultural significance in the event of an unexpected find.

3.7 Water Management Act 2000

The *Water Management Act 2000* provides that certain types of development and activities carried out within 40 m of a river, lake or estuary are controlled activities and require a controlled activity approval (CAA). A controlled activity includes "*The erection of a building or the carrying out of a work.*" The proposal constitutes

'carrying out a work' and is proposed to be installed within 40 m of a drainage channel. Clause 41 of the related *Water Management (General) Regulation 2018* allows public authorities to be exempt from having to obtain a CAA in order to carry out controlled activities on prescribed land.

Clause 41 states as follows:

"A public authority is exempt from section 91E(1) of the Act in relation to all controlled activities that it carries out in, on or under waterfront land."

The WM Act 2000 includes the following definition of a public authority:

"public authority means—

- (a) a Minister of the Crown, or
- (b) a Public Service agency, or
- (c) a statutory body representing the Crown, or
- (d) a statutory State owned corporation (or any of its subsidiaries) within the meaning of the *State Owned Corporations Act 1989*, or
- (e) a council or county council within the meaning of the *Local Government Act 1993*,
but does not include any person or body declared by the regulations not to be a public authority."

Shoalhaven Water is a Category 1 business operated by Shoalhaven Council as a Local Water Utility Provider. Shoalhaven Water is operated under Shoalhaven Council's governance framework under the Local Government Act, 1993. Therefore, Shoalhaven Water is exempt from a CAA.

The NSW Aquifer Interference Policy outlines the requirement for an aquifer interference licence under the WM Act. The proposed works involve trenching and under boring to install the water main, which is defined as a minimal impact aquifer interference activity under Section 3.3 of the NSW Aquifer Interference Policy.

If groundwater is intersected during excavation, the incidental discharge volume is likely to be less than 3 Mega Litres (ML) per year, and all extracted groundwater will be returned to the groundwater system as outlined in the mitigation measures in Section 6.4.

Therefore, no aquifer interference licence will be required.

3.8 Protection of Environmental Operations Act 1997 (POEO Act)

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates land, air, noise and water pollution in NSW. It also aims to provide opportunity for increased public involvement and access to information regarding environmental protection.

The POEO Act focuses on environmental protection and provisions for the reduction of water, noise and air pollution as well as the storage, treatment and disposal of waste. Shoalhaven Water and/or contractors working on behalf of Shoalhaven Water are required to notify the EPA when a 'pollution incident' occurs that is likely to impact upon the environment as per Section 148 of the Act. An incident management plan would be included within the Construction Environmental Management Plan (CEMP).

Shoalhaven Water holds an Environmental Protection Licence (EPL) for the operation of the Nowra Sewage Treatment Plant (STP). The project REF includes the upgrade of sewer pipes that connect to the Nowra STP, which has an existing EPL (licence number '1734'). No other licence is required for the proposed modification works.

3.9 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) commenced on 25 August 2017 and replaced the *Threatened Species Conservation Act 1997* and the *Native Vegetation Act 2003*.

The BC Act outlines protection of threatened species, populations or ecological communities, or their habitats, and delivers a strategic approach to biodiversity conservation in NSW whilst supporting improved farm productivity and sustainable development.

The proposal would only involve minor clearing of non-significant vegetation which will be reinstated following construction.

Provided the recommendations within the project REF and the addendum REF are undertaken, the proposed modification is unlikely to have a significant impact on threatened flora or fauna species or ecological communities.

3.10 Local Government Provisions

Shoalhaven City Council's Local Environment Plan 2014 (LEP) is the principal legal document for controlling development at the council level. The zoning provisions establish permissibility of uses and standards to regulate the extent of development. The LEP zones the land on which the sewer works are proposed as:

- > RE1 – Public Recreation
- > RU1 – Primary Production
- > SP2 – Infrastructure
- > R1 – General Residential
- > R2 – Low Density Residential
- > R3 – Medium Density Residential
- > E2 – Environmental Conservation.

Subject to *Clause 2.126(a)* of Transport and Infrastructure SEPP development consent under the LEP is not required. The provisions of the Transport and Infrastructure SEPP prevail over the LEP in terms of permissibility.

3.11 Other Relevant Legislation

3.11.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation, focusing on Matters of National Environmental Significance (MNES), with States and Territories having responsibility for matters of State and local significance.

Approval is required from the Commonwealth Minister for the Environment for any controlled action that may result in a significant impact on MNES.

A search of the EPBC Act database (Protected Matters Search Tool (PMST)) was undertaken to identify the potential for occurrence of MNES within 10km of the proposed modification works (full search results within Ecological Impact Assessment in **Appendix B** of the project REF). The MNES protected under the EPBC Act are shown in Table 3.1 which also identifies the potential for occurrence within 10km of the proposed modification.

Potential impacts to the MNES identified within the proposed modification site are addressed in Section 6.1 of the project REF.

Table 3-1 Potential Impacts on MNES

Matters of National Environmental Significance	Potentially Occurring
World heritage properties	None
National heritage places	None
Wetlands of international importance (listed under the Ramsar Convention)	None
Great Barrier Reef Marine Park	None
Commonwealth marine areas	None
Threatened ecological communities	6
Threatened species	82 (10 critically endangered species)
Migratory species	57 (only 6 of these species were considered relevant given the others were marine or wetland species)

Other Commonwealth matters identified through the PMST are identified in Table 3-2. Commonwealth Land and Commonwealth Heritage Places are addressed in Section 6.2 of the project REF and listed marine species are addressed in Section 6.1 of the project REF.

Table 3-2 Other Commonwealth matters

Other Commonwealth matters	Number
Commonwealth Land	11
Commonwealth Heritage Places	1
Listed Marine Species	67

4 Consultation

4.1 Transport and Infrastructure SEPP Consultation

Chapter 2 of the Transport and Infrastructure SEPP (TI SEPP) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 2.10 to 2.13 of the Transport and Infrastructure SEPP outlines the requirements for consultation with public authorities and local council where the development has impacts on council related infrastructure or services, impacts on local heritage or impacts on flood liable land. As Shoalhaven Water (Council) is the proponent for the proposed works, Clauses 2.10 to 2.13 are to be addressed via internal consultation with respect to the development.

The consultation requirements detailed in the TI SEPP have been outlined in Table 4-1 below. Based on the inputs below additional consultation is required for the proposed modification works.

Table 4-1 Transport and Infrastructure SEPP Consultation Requirements

Relevant SEPP Clause	Is consultation with Council or others required under clauses 13-16 of the Infrastructure SEPP?	
2.10(1)(a)	Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No. The modification works relate to the sewer network. The proposed modification may have minor impacts on stormwater management while the proposed modification is under construction (e.g. potential for sediment entering stormwater) however any such impacts are manageable with the mitigation measures outlined in Section 5.
2.10(1)(b)	Are the works likely to generate traffic to an extent that will strain the existing road system in a Local Government Area?	No. The modification works will result in temporary and minimal levels of traffic generated during construction.
2.10(1)(c)	Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	Yes. The modification works involve the upgrade of a Council owned sewerage system and will improve the operational capacity of the system into the future. As Shoalhaven Water is the proponent for the works, consultation with the relevant departments within Council has been and will be ongoing throughout the proposal.
2.10(1)(d)	Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No
2.10(1)(e)	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	Yes. A site compound area is proposed within the north western corner of Ratcliff Park, which will be enclosed. The site compound will not cause more than a minor or inconsequential disruption to pedestrian or vehicular flow. Open trenches would be fenced off during construction where required to ensure pedestrian safety. Such fences would not disrupt pedestrian or vehicle flow.
2.10(1)(f)	Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes. The modification works will involve excavation of roads where the alignment crosses roads for installation of pipes. As Shoalhaven Water is the proponent for the works, consultation with the relevant departments within Council has been undertaken internally and will be ongoing throughout the proposed modification works.

Relevant SEPP Clause	Is consultation with Council or others required under clauses 13-16 of the Infrastructure SEPP?	
2.11	Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential?	No. The study area for the proposed modification works does not contain local heritage items or a heritage conservation area. An unexpected finds protocol would be implemented should the proposal unearth any unexpected heritage items during trench excavation.
2.12&2.13	Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?	Yes, the modification works are located on flood liable land, however will not change flooding patterns to more than a minor extent.
2.14	Are the works likely to impact land within the coastal zone?	No, the proposed modification works is not in the coastal zone.
2.15	Is consultation with other agencies required under clause 2.15 of the Transport and Infrastructure SEPP?	
2.15(2)(a and b)	Are the works adjacent to a national park, nature reserve or other area reserved under the <i>National Parks and Wildlife Act 1974</i> ?	No. Worrigeer Nature Reserve is located approximately 400 m east of the study area and would not be impacted by or adjacent to the proposal.
16(2)(c)	Do the works involve the installation of a fixed or floating structure in or over navigable waters?	No
16(2)(d)	Will 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?	No
16(2)(e)	Are the works located on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument?	No
16(2)(f)	Are the works located on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961?	No

4.2 Stakeholder and Community Consultation

Prior to commencement of construction, the construction contractor will notify:

- > Shoalhaven City Council
- > Land owners
- > Utility owners
- > Residents that will potentially be impacted by the proposed works.

These parties would be contacted by letter 28 days prior to the work starting. Responses received within 21 days will be considered prior to works commencing. Potentially affected land owners and residents who will be directly impacted by the works (access or noise) will be notified by letter 28 days before work starts and by telephone or door knocking 7 days before works start. Signs will be posted around construction site fences with contact details for the Construction Project Manager.

The draft Project REF was issued for exhibition.

5 Environmental Impacts

This section of the addendum REF provides an assessment of the potential environmental impacts of the proposed modification in comparison to the potential impacts assessed in the project REF.

5.1 Ecology

An updated biodiversity assessment was undertaken by Cardno in March 2022 (See **Appendix A**) to assess the potential environmental impacts of the proposed modification.

5.1.1 Existing Environment

Updated desktop searches of records of threatened species, populations and communities were undertaken for the project REF including the proposed modification (see **Appendix A**). More threatened species were predicted to occur within the 10km locality surrounding the updated study area, but no known records of threatened species or threatened ecological communities were found for the proposed modification.

A random meander transect was walked across the proposed modification for SPS24 alignment with vegetation present therein comprising mostly of exotic grasslands / cleared land and native tree patch (The Garden Walk). Other small areas within the proposed modification included planted exotics, planted natives, paddock trees, creek line vegetation (along a drain channel) and a residential property (28 Sugarwood Road, Worrigea). Any of the vegetation present within the proposed modification conforms to a known plant community type (PCT) due to lack of vegetation strata, high disturbance and presence of exotic plants (see Figure 5-1). These vegetation areas are consistent with description provided in the appended Biodiversity Impact Assessment of the project REF. No bird nests, hollow-bearing trees or other fauna habitat were observed in the project modification.

Flora, fauna and exotic species present in the proposed modification works area were recorded in the previously surveyed study area and were presented in Chapter 3 of the appended BIA in the project REF.

No threatened ecological communities, species or population were recorded in the proposed modification.

5.1.2 Potential Impact

An updated likelihood of occurrence was undertaken for the study area, including the proposed modification works (see Appendix A). Only four microbat species were considered to have low-moderate likelihood of occurrence in the proposed modification area. Similarly, to the BIA (see chapter 5) for the project REF, it is considered that the proposed works would not result in significant impacts to threatened species, populations or ecological communities.

5.1.3 Mitigation Measures

Mitigation measures proposed to minimise the impacts on non-threatened native flora and fauna were presented in Chapter 6 of the BIA for the project REF. The mitigation measures listed in section 6.1.3 of the project REF are considered to be sufficient for the proposed modification works, and will be implemented accordingly.



Figure 5-1 Ground-truthed vegetation at the proposed modification

5.2 Non-Aboriginal Heritage

5.2.1 Existing Environment

Section 6.2.1 of the project REF assesses the existing non-Aboriginal heritage conditions at the proposed modification site. A brief desktop assessment was conducted, using NSW State Heritage Register (SHR) and the Shoalhaven LEP 2014, *Clause 5.10 Heritage Conservation*, to confirm that there are no non-Aboriginal heritage items within the vicinity of the proposed modification.

5.2.2 Potential Impact

The proposed development area does not contain any known non-Aboriginal heritage items or encroach on conservation area boundaries, and the proposal does not interfere with any heritage items or lot boundaries containing known items of significance. A significant impact on non-Aboriginal heritage is unlikely. The findings of this addendum REF are consistent with the findings in Section 6.2.2 of the project REF.

Should previously unidentified sites or artefacts of non-Aboriginal heritage significance be uncovered during the works, the mitigation measures in Section 6.2.3 of the project REF should be followed.

5.2.3 Mitigation Measures

The mitigation measures proposed to minimise the impacts on non-Aboriginal heritage as a result of the proposed project works are presented in Section 6.2.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.3 Aboriginal Heritage

Austral Archaeology Pty Ltd (Austral) were engaged to provide an updated Aboriginal Cultural Due Diligence Assessment (ACHDDA) for the proposed modification works. A copy of this report is provided in Appendix B. This report consisted of a desktop assessment and a visual site inspection undertaken on 11 March 2022.

5.3.1 Existing Environment

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted on the 15 February 2022 (Client Service ID: 659538). The search identified 58 Aboriginal archaeological sites within a 10km search area centred on the proposed modification area. None of these registered sites is located within the study area, with the closest one being located approximately 1.7km from the southern-most boundary of the study area. This site, AHIMS #52-5-0605, is recorded as an 'artefact', which is the most commonly occurring site type recorded.

The proposed modification area has been subject to a high level of disturbance and the majority of the area has been excavated, levelled and filled.

The area immediately surrounding the creek has been filled, a drainage system has been installed, as has a rock feature which is likely to assist with water flow during flood situations. Housing and road infrastructure are located to the south of the creek, and the ground slopes in a northerly direction to the north of the creek, which is likely a natural runoff.

5.3.2 Potential Impact

All areas of the proposed modification study area were considered to have a low archaeological potential. The works however will be conducted within close proximity to areas of moderate archaeological potential. Provided the mitigation measures are followed, it is considered unlikely that the proposal will have a significant impact on Aboriginal heritage.

No further investigation is required and the works can proceed with caution.

5.3.3 Mitigation Measures

The mitigation measures proposed to minimise the impacts on Aboriginal heritage as a result of the proposed project works are presented in Section 6.3.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.4 Soils and Contamination

An updated preliminary site investigation (PSI) was conducted in March 2022 by Cardno, and has been provided in Appendix C. The purpose of the investigation was to identify potential contamination issues and constraints that could be associated with the proposed modification works. The objective of the PSI is to assess whether contamination has the potential to exist on the additional part of the site, and whether further investigation is needed.

The PSI included the following:

- > A desktop site history review
- > A site walkover by an Environmental Scientist
- > Preparation of this PSI report.

5.4.1 Existing Environment

5.4.1.1 Contaminated Materials

The study area has a maximum elevation of approximately 20m Australia Height Datum (AHD) in the south-eastern portion and falls to approximately 6m AHD in the north-western portion. Potential areas of cut and fill was observed along a ridgeline at Ratcliffe Park and beneath the substation and electrical equipment in the north-western portion of the study area.

The infrastructure located within the study area included the existing sewer system, asphalt roads and concrete footpaths, underground and aboveground utilities, residential dwellings and electrical supply infrastructure. Fences were also observed around the causeway, electrical supply infrastructure and residential lots. Minor discolouration to the concrete hardstand on the footpaths across the site was noted, and no evidence of historical structures was found within the study area.

The study area also contains a drainage easement and an unnamed drainage channel in the western portion, within Ratcliffe Park, which flows north beneath Greenwell Point Road. The drainage channel discharged in to the Shoalhaven River approximately 2.8km to the north.

5.4.1.2 Geology and Soils

The proposed modification area is mapped as underlain by the Nowra soil landscape (9028sf). This landscape is described as moderately to gently undulating rises to low hills on Nowra Sandstone. Broad ridges and crests. Bench sandstone outcrops adjacent to drainage lines. The topography has a relief of >40 m with slope gradients of >5%. Vegetation is extensively to moderately cleared with stands of tall open-forest. Soils are moderately deep (50–100 cm). Brown Podzolic Soils occur on crests and upper slopes. Soloths and/ or Yellow Earths occur mid-slope. Yellow Podzolic Soils occur on lower slopes and drainage lines.

The proposed modification area is mapped as being underlain by two geological units with the Berry Siltstone Formation (Pshb) of the Guadalupain age Shoalhaven Group making up the majority of the site and Alluvial fan deposits (Q_avf) of the Quaternary age found in the north-western portion of the site.

- > The Berry Siltstone Formation is described as mid to dark grey siltstone, grades up sequence to very fine-grained sandstone, highly fossiliferous, sporadic dropped pebbles.
- > The Alluvial fan deposits are described as fluvially-deposited quartz-lithic sand, silt, gravel and clay.

5.4.1.3 Acid Sulfate Soil

The proposed modification area is predominantly mapped within a Soil Class 5 area. Class 5 soils are considered to require an acid sulfate soils (ASS) preliminary assessment if the work is carried out within 500 m of an adjacent Class 2, 3 or 4 area where this adjacent area is below 5 m AHD and where the works are likely to lower the water table below 1m.

Class 4 soils make up a small portion of Ratcliffe Park in the north-western corner of the site. Class 4 are considered to require an ASS preliminary assessment if the depth of works is 2 m below the natural ground surface and/or likely to lower the water table by more than 2 m below the natural ground surface.

It is noted that ASS testing has been undertaken for the project by Cardno as part of a geotechnical investigation as reported in the Geotechnical Investigation Report, South Nowra Surcharge Main – Major Upgrades, W1221102IP, prepared for Shoalhaven Water, dated May 2021.

5.4.2 Potential Impact

The PSI identified the following potential sources of contamination within the proposed modification area which could be uncovered/disturbed during the construction of the modification:

- > Potential fill materials of an unknown environmental quality during the development and installation of the existing electrical storage facility and substation in the north west portion of the site.
- > Potential fill materials of an unknown environmental quality during the development of embankments, mounds and ridgelines in the proposed modification area.
- > The potential sewerage leakage from the existing use of the site as a sewerage system.

5.4.3 Mitigation Measures

The mitigation measures proposed to minimise the impacts of soils and contamination as a result of the proposed project works are presented in Section 6.4.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

In addition to this, all materials removed from the site during construction are to be assessed as per the NSW EPA (2014) *Waste Classification Guidelines* and/or the relevant NSW EPA Resource Recovery Exemptions/Orders.

5.5 Water Quality and Hydrology

5.5.1 Existing Environment

Section 6.5.1 of the project REF discusses the existing hydrology, flooding and water quality conditions within the vicinity of the proposed modification site. The environment listed in the project REF is consistent with the environment surrounding the proposed modification site.

5.5.2 Potential Impact

The proposed modification works would have the potential to impact on the water quality and hydrology of the surrounding area during the construction works. The potential impacts outlined in Section 6.5.2 of the project REF are consistent with the potential impacts of the modification works. The potential impacts would be minor in nature.

The proposed modification works consist of a change in alignment to the upgrade of the SPS 24 sewer rising main and will reduce potential future sewer overflows and odour control, resulting in positive impacts to the surrounding area.

5.5.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on water quality and hydrology as a result of the proposed project works are presented in Section 6.5.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.6 Odour

5.6.1 Existing Environment

Section 6.6.1 of the project REF discusses the existing odour conditions and potentially affected sensitive receptors within the vicinity of the project and the proposed modification site.

5.6.2 Potential Impact

An odour concentration assessment has been undertaken and the results are presented in Table 6-7 of Section 6.6.2 of the project REF. As outlined in the odour concentration assessment, all scenarios, with the exception of 'Scenario 1', would be adequate to minimise odour impacts to the closest receptor.

5.6.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on odour as a result of the proposed project works are presented in Section 6.6.3 of the project REF. No specific mitigation measures have been proposed,

however, there will be regular inspections undertaken. This is considered to be sufficient for the proposed modification works, and will be implemented accordingly.

5.7 Air Quality and Energy

5.7.1 Existing Environment

Section 6.7.1 of the project REF discusses the existing air quality and energy conditions within the vicinity of the proposed modification site.

5.7.2 Potential Impacts

The potential impacts of the proposed modification works are consistent with the potential impacts of the project works, which have been outlined in Section 6.7.2 of the project REF. This includes minor dust emissions as part of the disturbance of soil, however, as the works are being undertaken within an open environment the impact to nearby residents will be minor.

The proposed modification will continue to utilise energy from the grid once the upgrade works have been complete. This amount of energy utilised is unlikely to change and the proposed modification has been designed to cater for the realistic future needs of the community.

5.7.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on air quality and energy as a result of the proposed project works are presented in Section 6.7.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.8 Waste Management

5.8.1 Existing Environment

See Section 6.8.1 of the project REF for the existing waste conditions at the project and proposed modification site.

5.8.2 Potential Impacts

See Section 6.8.2 of the project REF for a comprehensive list of the waste that could be generated during the project works, which is consistent with the waste that could be generated during the proposed modification works. The proposed modification works are unlikely to produce further waste streams.

5.8.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on waste as a result of the proposed project works are presented in Section 6.8.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.9 Traffic and Site Access

5.9.1 Existing Environment

Section 6.9.1 of the project REF discusses the existing traffic and site access conditions within the vicinity of the proposed project and modification site.

5.9.2 Potential Impacts

The proposed modification would result in a temporary disruption to traffic flow during construction, however it is unlikely to be significant. Access to all private properties and businesses would be maintained at all times. The potential impacts of the proposed modification are consistent with those outlined in Section 6.9.2 of the project REF.

5.9.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on traffic and site access as a result of the proposed project works are presented in Section 6.9.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.10 Noise and Vibration

5.10.1 Existing Environment

Section 6.10.1 of the project REF discusses the existing noise and vibration conditions within the vicinity of the proposed modification site.

5.10.2 Potential Impacts

The potential impacts of the proposed modification works are consistent with those outlined in Section 6.10.2 of the project REF.

Temporary noise and vibration will be created through the operation of site machinery for the duration of the construction works, however, this will only be for a limited period of time. The mitigation measures outlined in Section 6.10.3 of the project REF will be implemented and it is unlikely that the construction of the proposed modification is unlikely to exceed the noise criteria in the *Industrial Noise Policy* (EPA 2000) or *Interim Construction Noise Guideline* (DECC 2009).

Significant noise and vibration impacts are not expected from the proposed modification once it is in operation.

5.10.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on noise and vibration as a result of the proposed project works are presented in Section 6.10.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

5.11 Social, Visual and Land Uses

5.11.1 Existing Environment

Section 6.11.1 of the project REF discusses the existing social, visual and land use conditions within the vicinity of the proposed modification site.

5.11.2 Potential Impacts

The potential impacts of the proposed modification are considered to be consistent with the potential impacts that have been outlined in Section 6.11.2 of the project REF.

Construction of the proposed modification will result in short term visual impacts, however, this will only be temporary in nature and limited to the proposed alignment. Several landholders may be temporarily affected by during the installation of the pipeline. Shoalhaven Water has and will continue to consult with any landholders that will be impacted on by the proposed modification works.

5.11.3 Mitigation Measures

The mitigation measures proposed to minimise impacts on social, visual and land use as a result of the proposed project works are presented in Section 6.11.3 of the project REF. The mitigation measures listed in the project REF are considered to be sufficient for the proposed modification, and will be implemented accordingly.

6 Conclusions and Recommendations

The proposal must be considered in accordance with the four principles of Ecologically Sustainable Development (ESD) as outlined in section 6(2) of the *Protection of the Environment Administration Act 1991*. ESD consideration is detailed below:

Table 6-1 ESD Considerations

The precautionary principle If there are threats of serious or irreversible damage to the environment, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	The proposed modification will not result in serious or irreversible environmental damage. The identification of environmental risks and mitigation measures as outlined in this addendum REF has addressed the precautionary principle by providing a thorough analysis of potential environmental impacts. No significant impacts on the environment as a result of this proposal are expected.
Inter-generational equity The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.	The proposed modification is important to ensure the area is capable of meeting the current and future wastewater requirements of adjacent developments. The amended infrastructure will contribute to the protection of the surrounding environment from potential impacts such as wastewater overflow from the existing sewage systems. The proposed modification will not compromise the local environment or surrounding environment for current or future generations.
Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The proposed modification is unlikely to have a significant impact on biodiversity or ecological integrity. The proposed modification has been designed to minimise disturbance on mature vegetation. Mitigation measures (outlined in Section 5.1.3) will ensure that potential indirect impacts to flora and fauna are minimised.
Improved valuation, pricing and incentive mechanisms Users pay for their products or services including their full life-cycle impacts and cost-effective market mechanisms should be implemented to attribute externalities.	Shoalhaven Water propose to run a competitive tender process to ensure the work is delivered in a cost-effective manner. Sewerage services provided by Shoalhaven Water are funded, at least in part, by the rate payers they service. By requiring compliance with the safeguards outlined in the project REF, the externalities associated with the proposed modification have been considered.

Clause 171 of the *Environmental Planning and Assessment Regulation 2021* lists the factors to be taken into account when considering likely environmental impacts. This is summarised below for the proposal.

Table 6-2 Clause 171 Factors

Clause 171 Factor	REF Findings
a) The environmental impact on the community	It is unlikely that the proposed modification will generate unacceptable impacts on the community once it is in operation. There may be some temporary impacts during the construction phase, however these impacts will be minimised through the mitigation measures listed in this addendum REF and the project REF.
b) The transformation of the locality	The proposed modification area is likely to undergo temporary transformation to locality during construction due to minor clearing of vegetation and earthworks. However, these changes are not likely to create long-term changes and would be considered insignificant once the project works are complete.
c) The environmental impact on the ecosystems of the locality	The proposed modification is unlikely to result in an environmental impact to ecosystems within the locality. The proposed footprint is subject to high levels of disturbance. With the implementation of the mitigation measures outlined in this addendum REF and the project REF, it is unlikely that the proposal will impact ecosystems within the locality.
d) Reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	It is likely that there will be some minor short-term impacts during the construction phase however it is unlikely that the proposed modification will permanently reduce aesthetic, scientific, recreational or any other environmental quality or value of the locality once operational.
e) The effects on any locality, place or building that has— (i) aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or (ii) other special value for present or future generations,	It is unlikely that the proposed modification will have an impact on the locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations. There would be no impact to the identified PAD site identified in the project REF and areas of moderate archaeological potential provided the mitigation measures listed in Section 6.3.3 of the project REF are implemented.
f) The impact on the habitat of protected animals, within the meaning of the <i>Biodiversity Conservation Act 2016</i> ,	There is no protected fauna habitat identified in the study area. Therefore, the potential impact to fauna species and their habitat is considered to be negligible. Mitigation measures would be implemented to ensure potential impacts are minimised.
g) The endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,	It is unlikely that the proposed modification will be endangering any species of animal, plant or other life forms whether living on land, in water or in the air.
h) Long-term effects on the environment,	It is unlikely that the proposed modification will have any long-term effects on the environment. The proposed modification would result in environmental benefits by increasing the capacity of the sewage network to appropriately cater for the community it serves.
i) Degradation of the quality of the environment	Some minor short-term impacts may occur during the construction phase, however in the medium to long term, degradation of the quality of the environment is unlikely. The proposed modification would result in environmental benefits

	by increasing the capacity of the sewage network to appropriately cater for the community it serves.
j) Risk to the safety of the environment	Mitigation measures proposed in the project REF will effectively minimise any risk to the safety of the environment. The proposed modification would result in environmental benefits by increasing the capacity of the sewage network to appropriately cater for the community it serves.
k) Reduction in the range of beneficial uses of the environment	It is unlikely that any reduction in the range of beneficial uses of the environment will occur as a result of the proposed modification.
l) Pollution of the environment	There is potential for pollution from fuels or chemical spills used during the works and from erosion, sedimentation, dust and noise. The mitigation measures proposed in the project REF will minimise the potential for pollution. The proposed modification would result in environmental benefits by increasing the capacity of the sewage network to appropriately cater for the community it serves and thereby reducing potential sewage overflows.
m) Environmental problems associated with the disposal of waste	With adherence to the mitigation measures presented in the project REF, there should not be any significant environmental problems associated with the disposal of waste.
n) Increased demands on natural or other resources that are, or are likely to become, in short supply,	It is unlikely that the proposed modification will result in an increased demand on resources or in a shortage of supplies.
o) The cumulative environmental effect with other existing or likely future activities,	The proposed modification will benefit future development in Nowra in accordance with the objectives of the Land Use Zones within the area. Cumulative environmental impacts are not anticipated; however, mitigation measures will be in place to ensure potential impacts are minimised.
p) The impact on coastal processes and coastal hazards, including those under projected climate change conditions,	There are no impacts on coastal processes and coastal hazards including those under the current climate change conditions likely to occur as a result of the proposed modification.
q) Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,	There are no applicable local strategic planning statements, regional strategic plans or district strategic plans associated to the proposed modification works.
r) Any other relevant environmental factors	There are no other relevant environmental factors associated with the proposed modification works.

The proposed modification is unlikely to significantly affect the environment and an environmental impact statement is not required.

6.1.1.2 Significance of impact under NSW legislation

The proposed modification would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required.

6.1.1.3 Significance of impact under Australian legislation

The proposed modification is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Department of Agriculture, Water and the Environment is not required.

The main potential environmental impacts of the proposed modification relate to minor vegetation clearance, noise, erosion, sedimentation and heritage impacts. Environmental risks will be managed by implementing the mitigation measures identified in this addendum REF and the project REF and through the preparation of a CEMP. The engaged contractor is responsible for the preparation of the CEMP and managing construction risks. The engaged contractor will comply with the REF and CEMP.

If the scope of work or methodology changes significantly at any time during the project, the engaged contractor is responsible for identifying the need for any additional Environmental Impact Assessment (EIA) and for communicating this to Shoalhaven Water.

Council Determination

This Review of Environmental Factors has assessed the likely environmental impacts, in the context of Part 5 of the Environmental Planning and Assessment Act 1979, of a proposal by Shoalhaven City Council for the South Nowra Surcharge Main Major Upgrades project.

Shoalhaven City Council has considered the potential environmental effects of the proposal and the effectiveness and feasibility of measures for reducing or preventing detrimental effects. It is determined that:

1. The proposed safeguards and mitigation measures identified in the report (Section 6) shall be adopted and implemented.
2. The proposal is unlikely to significantly affect the environment and an environmental impact statement is not required.
3. The proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required.
4. No additional statutory approvals, licences, permits and external Government consultations are required.

The proposed activity is recommended to proceed subject to the implementation of the measures to avoid, minimise or manage environmental impacts listed in this REF. The mitigation measures outlined in the REF will be incorporated in the construction contract documents.



Robert Horner
Executive Manager, Shoalhaven Water

Date: **8 July 2022**

7 References

- > Cardno (2021). *Review of Environmental Factors: Concept and Detailed Design of South Nowra Surcharge Main – Major Upgrades*. Prepared for Shoalhaven Water October 2021.
- > NSW Environment Protection Agency – POEO Public Register, accessed March 2022. Retrieved from: <http://www.epa.nsw.gov.au/prpoeoapp/>
- > Department of Agriculture, Water and the Environment – Australian Heritage Database, accessed March 2022. Retrieved from: <http://www.environment.gov.au/heritage/publications/australian-heritage-database>
- > NSW DPE – eSPADE NSW Soil and Land Information Online Mapping Tool, accessed March 2022. Retrieved from: <http://www.environment.nsw.gov.au/eSpade2WebbApp>

APPENDIX

A

DESKTOP SEARCHES



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A.1 BioNet Atlas

Table A-1 shows the list of threatened species with known records in the BioNet Atlas within a 10 km locality surrounding the REF and AREF Study Area.

An updated search in BioNet Atlas was undertaken on 9 March 2022. Records of 18 additional threatened species were found and considered for assessment.

Table A-1. BioNet Atlas records of threatened species within 10km surrounding the REF and AREF Study Area

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records
Amphibia					
Hylidae	<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	635
Limnodynastidae	<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	4
Reptilia					
Cheloniidae	<i>Chelonia mydas</i>	Green Turtle	V	V	2
Elapidae	<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	1
Aves					
Anatidae	<i>Stictonetta naevosa</i>	Freckled Duck	V		4
Columbidae	<i>Ptilinopus superbus</i>	Superb Fruit-Dove	V		1
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	P	V, C, J, K	6
Ardeidae	<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	E	7
Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	V		5
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	V		2
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		31
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	V		2
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	V		30
Accipitridae	<i>Pandion cristatus</i>	Eastern Osprey	V		3
Falconidae	<i>Falco subniger</i>	Black Falcon	V		1
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	E		4
Burhinidae	<i>Esacus magnirostris</i>	Beach Stone-curlew	CE		1
Haematopodidae	<i>Haematopus longirostris</i>	Pied Oystercatcher	E		10
Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand-plover	V	E, C, J, K	1
Charadriidae	<i>Thinornis cucullatus cucullatus</i>	Eastern Hooded Dotterel	CE	V	1
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	E	E	1
Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	V	C, J, K	1
Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	P	CE, C, J, K	7
Scolopacidae	<i>Xenus cinereus</i>	Terek Sandpiper	V	C, J, K	1

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records
Laridae	<i>Sternula albifrons</i>	Little Tern	E	C, J, K	2
Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	31
Cacatuidae	<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V		345
Psittacidae	<i>Glossopsitta pusilla</i>	Little Lorikeet	V		11
Psittacidae	<i>Lathamus discolor</i>	Swift Parrot	E	CE	1
Psittacidae	<i>Neophema pulchella</i>	Turquoise Parrot	V		4
Strigidae	<i>Ninox connivens</i>	Barking Owl	V		1
Strigidae	<i>Ninox strenua</i>	Powerful Owl	V		62
Tytonidae	<i>Tyto novaehollandiae</i>	Masked Owl	V		13
Tytonidae	<i>Tyto tenebricosa</i>	Sooty Owl	V		7
Dasyornithidae	<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	1
Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	3
Meliphagidae	<i>Epthianura albifrons</i>	White-fronted Chat	V		8
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		19
Artamidae	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		4
Petroicidae	<i>Petroica boodang</i>	Scarlet Robin	V		9
Petroicidae	<i>Petroica rodinogaster</i>	Pink Robin	V		1
Mammalia					
Dasyuridae	<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	12
Dasyuridae	<i>Sminthopsis leucopus</i>	White-footed Dunnart	V		1
Peramelidae	<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E	E	6
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	V	E	8
Burramyidae	<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V		14
Petauridae	<i>Petaurus australis</i>	Yellow-bellied Glider	V		377
Petauridae	<i>Petaurus norfolcensis</i>	Squirrel Glider	V		2
Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider	P	V	12
Potoroidae	<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	1
Macropodidae	<i>Macropus parma</i>	Parma Wallaby	V		1
Macropodidae	<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	4
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	193 7
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V		6
Molossidae	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V		9
Vespertilionidae	<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	14
Vespertilionidae	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V		15
Vespertilionidae	<i>Myotis macropus</i>	Southern Myotis	V		17
Vespertilionidae	<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		20

Family	Scientific Name	Common Name	BC Act Status	EPBC Act Status	Records
Miniopteridae	<i>Miniopterus australis</i>	Little Bent-winged Bat	V		2
Miniopteridae	<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	V		31
Muridae	<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V	1
Dugongidae	<i>Dugong dugon</i>	Dugong	E		1
Otariidae	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V		2
Flora					
Dilleniaceae	<i>Hibbertia puberula</i>		E		7
Dilleniaceae	<i>Hibbertia stricta subsp. furcatula</i>		E		22
Fabaceae (Mimosoideae)	<i>Acacia pubescens</i>	Downy Wattle	V	V	3
Myrtaceae	<i>Eucalyptus langleyi</i>	Albatross Mallee	V	V	32
Myrtaceae	<i>Eucalyptus langleyi</i>	Eucalyptus langleyi population north of the Shoalhaven River in the Shoalhaven local government area	E	V	32
Myrtaceae	<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	1
Myrtaceae	<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	1
Myrtaceae	<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE	CE	11
Myrtaceae	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	V	4
Myrtaceae	<i>Triplarina nowraensis</i>	Nowra Heath Myrtle	E	E	408
Orchidaceae	<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	4
Orchidaceae	<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E	E	24
Orchidaceae	<i>Pterostylis gibbosa</i>	Illawarra Greenhood	E	E	109
Orchidaceae	<i>Pterostylis pulchella</i>	Waterfall Greenhood	V	V	1
Orchidaceae	<i>Pterostylis ventricosa</i>		CE		1
Orchidaceae	<i>Pterostylis vernalis</i>		CE	CE	28
Rutaceae	<i>Zieria baeuerlenii</i>	Bomaderry Zieria	E	E	117
Rutaceae	<i>Zieria tuberculata</i>	Warty Zieria	V	V	5
Solanaceae	<i>Solanum celatum</i>		E		4
Notes: BC Act = NSW Biodiversity Conservation Act 2016; EPBC Act = Commonwealth Environment Protection and Biodiversity Conservation Act 1999; Status: V = Vulnerable; E = Endangered; CE = Critically Endangered; Migratory agreements: J – JAMBA (Japan-Australia Migratory Bird Agreement); C = CAMBA (China-Australia Migratory Bird Agreement); K = ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement);					

A.2 PMST

An updated search was undertaken on the 9th March 2022, an additional 16 species were predicted to occur within the Study Area, mostly relating to marine fauna. All terrestrial species were considered for assessment of likelihood of occurrence.

The PMST report is provided below.



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 09-Mar-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	98
Listed Migratory Species:	72

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	236
Commonwealth Heritage Places:	1
Listed Marine Species:	99
Whales and Other Cetaceans:	8
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	14
Regional Forest Agreements:	1
Nationally Important Wetlands:	2
EPBC Act Referrals:	17
Key Ecological Features (Marine):	None
Biologically Important Areas:	5
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[\[Resource Information \]](#)

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community known to occur within area	In feature area
Illawarra and south coast lowland forest and woodland ecological community	Critically Endangered	Community likely to occur within area	In feature area
Illawarra-Shoalhaven Subtropical Rainforest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area	In buffer area only
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area	In buffer area only

Listed Threatened Species

[\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat known to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysogaster Orange-bellied Parrot [747]	Critically Endangered	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In buffer area only
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In buffer area only
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
FISH			
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
FROG			
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area	In feature area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area	In feature area
Litoria watsoni Watson's Tree Frog [91509]	Endangered	Species or species habitat known to occur within area	In feature area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In buffer area only
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petaurus australis australis Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat known to occur within area	In feature area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus trisulcatus Long-nosed Potoroo (southern mainland) [86367]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area	In feature area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus langleyi Albatross Mallee, Green Mallee Ash [56224]	Vulnerable	Species or species habitat known to occur within area	In feature area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat known to occur within area	In feature area
Genoplesium vernale East Lynne Midge-orchid [68379]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Grevillea parviflora subsp. parviflora Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Irenepharsus trypherus Delicate Cress, Illawarra Irene [14664]	Endangered	Species or species habitat may occur within area	In buffer area only
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat may occur within area	In feature area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prasophyllum affine Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid [2210]	Endangered	Species or species habitat known to occur within area	In feature area
Prostanthera densa Villous Mintbush [12233]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat known to occur within area	In feature area
Pterostylis pulchella Pretty Greenhood [6448]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pterostylis vernalis Halbury Rustyhood [84711]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat known to occur within area	In feature area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Triplarina nowraensis Nowra Heath-myrtle [64544]	Endangered	Species or species habitat known to occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area	In feature area
Zieria baeuerlenii Bomaderry Zieria, Bomaderry Creek Zieria [56781]	Endangered	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
SHARK			
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species [\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardena carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Ardena grisea			
Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In buffer area only
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea epomophora			
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea exulans			
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Sternula albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Migratory Marine Species			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area	In feature area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limnodromus semipalmatus Asian Dowitcher [843]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]		Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia			
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis			
Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [11865]	NSW	In buffer area only
Commonwealth Land - Australian Postal Corporation [16179]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [11853]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12009]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11866]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [15738]	NSW	In buffer area only
Defence		
Commonwealth Land - Defence Service Homes Corporation [11860]	NSW	In buffer area only
Commonwealth Land - Defence Service Homes Corporation [11867]	NSW	In buffer area only
Defence - DCO NOWRA [10109]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10129]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10127]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10124]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10125]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10122]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence - HMAS ALBATROSS [10123]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10120]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10138]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10128]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10141]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10140]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10143]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10126]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10142]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10145]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10144]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10119]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10118]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10117]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10115]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10116]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10113]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10112]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10114]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10134]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10136]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10137]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10135]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10132]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10131]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10133]	NSW	In buffer area only
Defence - HMAS ALBATROSS [10121]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence - HMAS ALBATROSS [10139]	NSW	In buffer area only
Defence - PARACHUTE DROPPING ZONE (PARACHUTE TRAINING SCHOOL) ; NOWRA - PTS [10067]	NSW	In buffer area only
Defence - Shop 3 [10111]	NSW	In buffer area only
Defence - Suite 18, Holt Centre [10110]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Defence Housing Authority [11949]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11948]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11941]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11940]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11943]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11942]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11945]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11944]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11947]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11946]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11996]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11997]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11990]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11994]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11995]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11992]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11993]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11852]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11998]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16351]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15086]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11966]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11858]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11909]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11999]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11906]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16036]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11905]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11869]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11908]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12346]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11907]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16031]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11851]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11902]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16032]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11856]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16033]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16287]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11904]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12004]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11854]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11903]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12006]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12005]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11855]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11976]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11901]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11900]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [15437]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [16037]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11987]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11861]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11986]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11862]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11985]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11863]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11984]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16288]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11983]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11910]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11982]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16038]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16039]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11912]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16034]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16035]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11850]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [12272]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12273]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11914]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11915]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11916]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11917]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16407]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16400]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [16405]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16406]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12003]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16403]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12001]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12002]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [12000]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16414]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16040]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11918]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15979]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16043]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11913]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16041]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16042]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11859]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11919]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11953]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11952]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11957]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11956]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11955]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11954]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16404]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15967]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11958]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11959]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11883]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11881]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11880]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11857]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15685]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [16402]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16401]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11950]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11951]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11968]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11961]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15968]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11960]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11899]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11898]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11849]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11965]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11964]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11967]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11936]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11937]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15631]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11978]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11979]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11969]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15630]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11938]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [15586]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11935]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11934]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11922]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11923]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11921]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11939]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11981]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11975]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11972]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11973]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11970]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11931]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [15632]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11868]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11980]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11988]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11989]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16409]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11930]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11933]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16408]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11929]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11928]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11875]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11874]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11876]	NSW	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11870]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11871]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11872]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11873]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11974]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11977]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11882]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11885]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11884]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [16411]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16410]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11991]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11911]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11963]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11925]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11886]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [16412]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16413]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11962]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11879]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [15633]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11877]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [11878]	NSW	In feature area
Commonwealth Land - Defence Housing Authority [16399]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11920]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [16398]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11927]	NSW	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Housing Authority [11924]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11971]	NSW	In buffer area only
Commonwealth Land - Defence Housing Authority [11926]	NSW	In buffer area only

Unknown

Commonwealth Land - [16190]	NSW	In buffer area only
Commonwealth Land - [11864]	NSW	In buffer area only
Commonwealth Land - [11848]	NSW	In buffer area only
Commonwealth Land - [11932]	NSW	In buffer area only

Commonwealth Heritage Places

[[Resource Information](#)]

Name	State	Status	Buffer Status
Historic			
Bundanon Trust Property	NSW	Listed place	In buffer area only

Listed Marine Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Ardenna grisea as Puffinus griseus			
Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Arenaria interpres Ruddy Turnstone [872]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Foraging, feeding or related behaviour known to occur within area	In feature area
Calidris alba Sanderling [875]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Limicola falcinellus Broad-billed Sandpiper [842]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In buffer area only
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysogaster Orange-bellied Parrot [747]		Species or species habitat may occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]		Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Breeding likely to occur within area	In buffer area only
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<u>Thalassarche melanophris</u> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area	In buffer area only
<u>Thalassarche salvini</u> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<u>Thalassarche steadi</u> White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
<u>Thinornis cucullatus as Thinornis rubricollis</u> Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only
<u>Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis</u> Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In buffer area only
<u>Tringa brevipes as Heteroscelus brevipes</u> Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
<u>Tringa glareola</u> Wood Sandpiper [829]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
<u>Tringa nebularia</u> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Foraging, feeding or related behaviour known to occur within area overfly marine area	In buffer area only
Fish			
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In buffer area only
Cosmocampus howensis Lord Howe Pipefish [66208]		Species or species habitat may occur within area	In buffer area only
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In buffer area only
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In buffer area only
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In buffer area only
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In buffer area only
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In buffer area only
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In buffer area only
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In buffer area only
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In buffer area only
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In buffer area only

Reptile

Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Whales and Other Cetaceans

[[Resource Information](#)]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]	Endangered	Species or species habitat may occur within area	In buffer area only
Eubalaena australis Southern Right Whale [40]		Species or species habitat known to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat likely to occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Bamarang	Nature Reserve	NSW	In buffer area only
Bomaderry Creek	Regional Park	NSW	In buffer area only
Brundee Swamp	Nature Reserve	NSW	In buffer area only
Cambewarra Range	Nature Reserve	NSW	In buffer area only
Comerong Island	Nature Reserve	NSW	In buffer area only
Jervis Bay	National Park	NSW	In buffer area only
Jervis Bay	Marine Park	NSW	In buffer area only
Parma Creek	Nature Reserve	NSW	In buffer area only
Saltwater Swamp	Nature Reserve	NSW	In buffer area only
Tapitallee	Nature Reserve	NSW	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Triplarina	Nature Reserve	NSW	In buffer area only
Wogamia	Nature Reserve	NSW	In buffer area only
Woollamia	Nature Reserve	NSW	In buffer area only
Worrigee	Nature Reserve	NSW	In feature area

Regional Forest Agreements [\[Resource Information \]](#)

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Southern RFA	New South Wales	In feature area

Nationally Important Wetlands [\[Resource Information \]](#)

Wetland Name	State	Buffer Status
Jervis Bay	NSW	In buffer area only

Shoalhaven/Crookhaven Estuary	NSW	In buffer area only
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EPBC Act Referrals [\[Resource Information \]](#)

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Action clearly unacceptable				
Construct and operate north Nowra link road	2008/4473	Action Clearly Unacceptable	Completed	In buffer area only

Controlled action				
North Nowra Link Road	2009/5238	Controlled Action	Completed	In buffer area only

Not controlled action				
Culvert replacement & ren mattresses installation, Browns Creek, South Nowra	2015/7517	Not Controlled Action	Completed	In feature area
Golf Course Extension	2001/215	Not Controlled Action	Completed	In buffer area only
Improvements to the stormwater drainage at Worrigee Road and Isa Road intersect	2010/5574	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Mixed retail development, Princes Highway, South Nowra, NSW	2015/7499	Not Controlled Action	Completed	In buffer area only
Princes Hwy upgrade, Sth Nowra, Forest Rd & Parma Rd	2013/6944	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Residential Development Lot 3 and Lot 384	2012/6327	Not Controlled Action	Completed	In buffer area only
Subdivision of Lot 2 D.P.1131675 corner Greenwell & Worrigee Roads	2010/5523	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
construction & operation of gas-fired power facility, installation of transmission lines & gas pipeline, Bamarang	2006/3056	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Princes Highway upgrade	2012/6233	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Proposed Residential Development at George Evans Road, Mundamia, NSW	2012/6470	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Residential Subdivision of Lot 1433 Bangalee	2011/6207	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In buffer area only
Biologically Important Areas				
Scientific Name		Behaviour	Presence	Buffer Status
Dolphins				
Tursiops aduncus				
Indo-Pacific/Spotted Bottlenose Dolphin [68418]		Breeding	Likely to occur	In buffer area only
Seabirds				
Ardena pacifica				
Wedge-tailed Shearwater [84292]		Foraging	Likely to occur	In buffer area only
Ardena tenuirostris				
Short-tailed Shearwater [82652]		Foraging	Likely to occur	In buffer area only
Pelagodroma marina				
White-faced Storm-petrel [1016]		Breeding	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Sharks			
Carcharias taurus			
Grey Nurse Shark [64469]	Foraging	Known to occur	In buffer area only

Bioregional Assessments			
SubRegion	BioRegion	Website	Buffer Status
Sydney	Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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Department of Agriculture Water and the Environment

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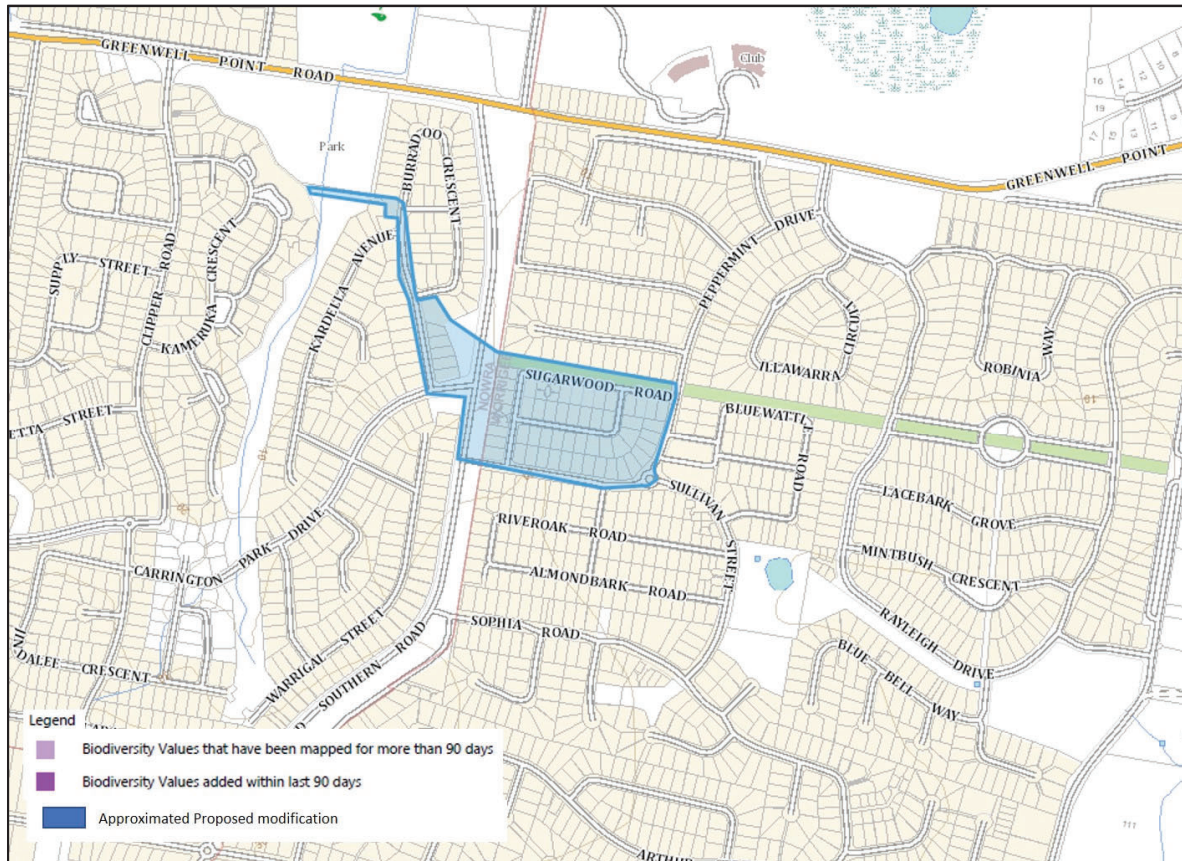
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+61 2 6274 1111

A.3 BOSET

No high biodiversity values are mapped in the biodiversity values map (BVM) within the proposed modification as per search undertaken on 23 March 2022.

Figure A-1 Proposed modification and Biodiversity Values Map (23 March 2022)



A.4 Likelihood of Occurrence Table

A.4 Likelihood of Occurrence and Risk Table

Threatened species, populations and ecological communities, and migratory species (listed under the BC Act, FM Act and/or EPBC Act) that are known, or have potential, to occur within a 10 km radius of the Study Area have been considered in this section. The likelihood of occurrence within the Study Area of each species or TEC was assessed using the criteria described in **Table A-2** and the findings presented in **Table A-3**. This assessment was undertaken based on previous records, the results of the field survey and known species habitat requirements. **Table A-3** also provides an assessment of the potential impact of the proposed project on each species and TEC.

Table A-2. Likelihood of Occurrence Criteria

Likelihood Rating	Criteria
Known	The species was recorded within the Study Area during the field surveys.
High	It is likely that a species would inhabit or utilise habitat within the Study Area. Criteria for this category may include: > Species recently and/or regularly recorded in contiguous or nearby habitat; > High quality habitat or resources present within the Study Area; > Species is known or likely to maintain a resident population surrounding the Study Area; and > Species is known or likely to visit during migration or in response to seasonal availability of resources present on site.
Moderate	Potential habitat for a species occurs within the Study Area. Criteria for this category may include: > Species previously recorded in contiguous habitat albeit not recently (>10 years); > Habitat present, but poor quality, depauperate or modified types and/or resources; > Species has potential to utilise habitat during migration or seasonal availability of resources; and > Cryptic flora species with potential habitat within the Study Area that have not been targeted by surveys (for example, surveys were not undertaken with the flowering season).
Low	It is unlikely that the species inhabits the area, if it did, it would likely be a transient visitor. Criteria for this category may include: > The Study Area does not support the specific habitat types or resources required by the species; > The Study Area is beyond the current distribution of the species or is isolated from known populations; and > Non-cryptic flora species not observed during targeted surveys.
None/Absent	The habitat within the Study Area is unsuitable for the species.

Table A-3. Likelihood of Occurrence and Risk Impact Assessment of threatened species, populations and communities

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Fish						
Black Rockcod, Black Cod, Saddled Rockcod (<i>Epinephelus daemeli</i>)	FM Act: V	V	PMST-L	The Black Rockcod is found in warm temperate and subtropical parts of the south-western Pacific.	Absent: the species inhabits marine waters which are not present within the Study Area. No known records of the species occur within the Site.	Unlikely: The project will not impact marine habitat or the species.
Macquarie Perch (<i>Macquaria australasica</i>)	E	E	PMST-M	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Spawning occurs just above riffles (shallow running water). Populations may survive in impoundments if able to access suitable spawning sites.	Absent: Riparian habitat suitable for the species is not present within the Study Area. No known records of the species occur within the Site.	Unlikely: The project will not impact riparian habitat; therefore, it is unlikely impacts would occur of habitat for the species
Australian Grayling (<i>Prototroctes maraena</i>)	-	V	PMST-K	The Australian Grayling is a small to medium-sized, slender, silvery fish with soft-rayed fins lacking any spines. It is endemic to south-eastern Australia, including Victoria, Tasmania and New South Wales, and is a migratory species that inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults.	Absent: Riparian habitat suitable for the species is not present within the Study Area. No known records of the species occur within the Site.	Unlikely: The project will not impact riparian habitat; therefore, it is unlikely impacts would occur of habitat for the species
Frogs						
Giant Burrowing Frog (<i>Heleioporus australiacus</i>)	V	V	BioNet – 4 PMST-K	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.	Absent: substandard aquatic habitat is present within the Study Area which is not suitable habitat for the species. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is not present within the Site, therefore, it is unlikely impacts would occur on habitat of this species.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Green and Golden Bell Frog (<i>Litoria aurea</i>)	E	V	BioNet: 635 PMST-K	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available.	Absent: substandard aquatic habitat is present within the Study Area which is not suitable habitat for the species. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is not present within the Site, therefore, it is unlikely impacts would occur on habitat of this species.
Watson's Tree Frog (<i>Litoria watsoni</i>)	-	E	PMST-K	Watson's Tree Frog is a forest-dependent species, recorded from wet and dry forest, woodland, bushland, and heathland at low to high elevations. Watson's Tree Frog prefers moister areas, with most records from wet forest, followed by damp forest, and warm temperate rainforest.	Absent: substandard aquatic habitat is present within the Study Area which is not suitable habitat for the species. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is not present within the Site, therefore, it is unlikely impacts would occur on habitat of this species.
Stuttering Frog, Southern Barred Frog (<i>Mixophyes balbus</i>)	E	V	PMST-M	Stuttering Frog is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understory vegetation on the forest floor.	Absent: substandard aquatic habitat is present within the Study Area which is not suitable habitat for the species. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is not present within the Site, therefore, it is unlikely impacts would occur on habitat of this species.
Birds						
Regent Honeyeater (<i>Anthochaera phrygia</i>)	CE	CE	BioNet – 3 PMST-K	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Low: limited suitable habitat for the species is present at the site. No known records of the species occur within the Site.	Unlikely: although limited suitable habitat for the species occurs at the site, the proposed project is unlikely to result in impacts on suitable resources for the species.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Flesh-footed Shearwater (<i>Ardenna carneipes</i>)	V	-	PMST-L	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia. Nest on LHI on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1 - 2 metres in length.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Dusky Woodswallow (<i>Artamus cyanopterus cyanopterus</i>)	V	-	BioNet-4	The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath.	Low: limited suitable habitat for the species is present at the site. No known records of the species occur within the Site.	Unlikely: although limited suitable habitat for the species occurs at the site, the proposed project is unlikely to result in impacts on suitable resources for the species.
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	E	E	BioNet-7 PMST-K	In NSW, they may be found over most of the state except for the far north-west. Favors permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Bush Stone-curlew (<i>Burhinus grallarius</i>)	E	-	BioNet - 4	The Bush Stone-curlew is found throughout Australia except the central southern coast and inland. The species inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. It is largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Red Knot, Knot (<i>Calidris canutus</i>)	-	E, Mi	PMST-K	The Red Knot is a medium-sized shorebird which breeds in tundra and the Arctic Cordillera in the far north of Canada, Europe, and Russia. The Red Knot occurs in Australian's coasts during its non-breeding migrating phase. Red Knots gather in large flocks with other waders. They walk fast, probing rapidly in soft sand and mud for worms, bivalves	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
and crustaceans and also eat spiders, insects, seeds and shoots. They feed by day and night, regulated by the tide.						
Curllew Sandpiper (<i>Calidris ferruginea</i>)	-	CE, Bonn, C, J, K	PMST-K	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Pectoral Sandpiper (<i>Calidris melanotos</i>)	-	J, K, Bonn, Ma	PMST-K	is a small, migratory wader that breeds in North America and Asia, wintering in South America and Oceania. It eats small invertebrates. Its nest, a hole scraped in the ground and with a thick lining, is deep enough to protect its four eggs from the cool breezes of its breeding grounds. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Great Knot (<i>Calidris tenuirostris</i>)	V	CE	PMST-K	The Great Knot is a migratory medium-sized wader. The species breeds in tundra in northeast Siberia and visits Australia during its non-breeding phase. It occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Gang-gang Cockatoo (<i>Callocephalon fimbriatum</i>)	V	-	BioNet – 31 PMST-K	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. Most birds return north in March and April, however some individuals may stay over winter in Australia. Forages for food by methodically thrusting its bill deep into the mud to search for invertebrates, such as bivalve molluscs, gastropods, polychaete worms and crustaceans.	Low: no suitable habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or roosting within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)	V	-	BioNet – 345	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i>, and <i>A. gymnathera</i>. Belah is also utilised and may be a critical food source for some populations.	Low: limited suitable foraging and roosting habitat for the species occurs in within the Study Area. Given the low abundance of foraging resources for the species within the Study Area, its occasional occurrence cannot be precluded. However, it is not expected the species would depend on resources within the Study Area for its survival.	Unlikely: limited suitable foraging resources for the species occurs within the site. However, given the substandard and low amount of foraging resources within the Study Area, it is considered the proposal would not result in significant impacts on foraging habitat for the species.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Spotted Harrier (<i>Circus assimilis</i>)	V		BioNet-2	The Spotted Harrier occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	No known records of the species occur within the Site. Low: no suitable breeding habitat for the species occurs within the Study Area, limited foraging habitat for the species occurs in within the study area. No known records of the species occur within the Site.	Unlikely: limited suitable foraging habitat for the species occurs within the Study Area. However, given the substandard and low amount of foraging resources within the Study Area, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
Greater Sand Plover, Large Sand Plover (<i>Charadrius leschenaultii</i>)	Vshy	V, C, J, K	PMST-K	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Lesser Sand Plover, Mongolian Plover (<i>Charadrius mongolus</i>)	V	E, C, J, K	PMST-K	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Varied Sittella (<i>Daphoenositta chrysoptera</i>)	V	-	BioNet – 19	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Low: suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or roosting within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the site. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species
Eastern Bristlebird (<i>Dasyornis brachypterus</i>)	E	E	BioNet-1 PMST-K	Eastern Bristlebird are shy, cryptic birds that mostly occur in coastal habitats. Habitat for the central and southern populations of the Eastern Bristlebird is characterised by dense, low vegetation including heath and open woodland with a healthy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Pilotbird (<i>Pycnoptilus floccosus</i>)	-	V	PMST-K	Pilotbirds are strictly terrestrial, living on the ground in dense forests with heavy undergrowth. Largely sedentary, they are typically seen hopping briskly over the forest floor and foraging on damp ground or among leaf-litter.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Antipodean Albatross (<i>Diomedea antipodensis</i>)	V	V, Ma	PMST-L	The species ranges across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. The majority of birds breed on Antipodes Island, with a small number of pairs breeding on Campbell Island.	Absent: No suitable aquatic habitat for it occurs within the Study Area. This migratory bird does not depend on terrestrial habitat for feeding or reproduction.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Gibson's Albatross (<i>Diomedea antipodensis gibsoni</i>)	V	V	PMST-L	Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle. This species is known only to breed on the Adams, Disappointment and Auckland Islands in the subantarctic Auckland Island group.	No known records of the species occur within the Site. Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Southern Royal Albatross (<i>Diomedea epomorphia</i>)	-	V	PMST-L	Endemic to New Zealand, the majority of the southern royal breeding population is found on subantarctic Campbell Island, with smaller numbers on the Auckland Islands.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Wandering Albatross (<i>Diomedea exulans</i>)	E	V	PMST-L	Visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. Has been recorded along the length of the NSW coast. At other times birds roam the southern oceans and commonly follow fishing vessels for several days. Breeds on a number of islands just north of the Antarctic Circle: South Georgia Island (belonging to the UK), Prince Edward and Marion Islands (South Africa), Crozet and Kerguelen Islands (French Southern Territories) and Macquarie Island (Australia).	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Northern Royal Albatross (<i>Diomedea sanfordi</i>)	-	E	PMST-L	The Northern Royal Albatross primarily forages in inshore and offshore waters over the continental shelf to the shelf edge. It feeds mainly on cephalopods and fish, but also salps, crustacea and carrion. The Northern Royal Albatross breeds in New Zealand waters. The main population (estimated at 6,500 to 7,000 pairs) nests on islands off the Chatham Islands, and up to 50 pairs nest at Taiaroa Head on the South Island. Away from its nesting sites	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Indian Yellow-nosed Albatross (<i>Thalassarche carteri</i>)	-	V	PMST-L	this Albatross is circumpolar between 30 and 45 degrees south. Most the population spends the non-breeding period off both coasts of southern South America, especially off Chile and Argentina. It is a rare visitor to NSW waters, predominantly visiting southern waters in the winter and early spring period. The Indian Yellow-nosed Albatross is a marine bird, located in subtropical and warmer subantarctic waters. The Indian Yellow-nosed Albatross has been observed over waters of surface-temperature 10° to 23°C, but is most abundant over the warmer parts of the subtropical zone. In breeding and non-breeding seasons, the species concentrates over the productive waters of continental shelves, often at coastal upwellings and the boundaries of currents. Birds breeding south of the Subtropical Convergence may be pelagic and travel far to subtropical feeding grounds. In the Australasian region, the species occupies inshore and offshore waters, particularly where there are calm seas and light winds.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
White-fronted Chat (<i>Epthianura albifrons</i>)	V	-	BioNet-8	The White-fronted Chat is an endemic Australian passerine bird. It is a gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 m above the ground). Two to three eggs are laid in each clutch, and the complete nesting cycle from nest-building to independent young is approximately 50 days. Birds can breed at one year of age and are estimated to live for five years. It occupies foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Beach Stone-Curlew (<i>Esacus magnirostris</i>)	-	CE	BioNet-1	grasslands and sometimes in low shrubs bordering wetland areas. In NSW, the species occurs regularly to about the Manning River, and the small population of north-eastern NSW is at the limit of the normal range of the species in Australia. Found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Grey Falcon (<i>Falco hypoleucos</i>)	E	V	PMST-M	The Grey Falcon is a medium-size bird of prey. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range.	Low: suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands and the coast, the possibility of the species occasionally flying over or roosting within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland or native grassland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
Black Falcon (<i>Falco subniger</i>)	V	-	BioNet-1	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. It is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day.	Low: suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands and the coast, the possibility of the species occasionally flying over or roosting within the	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland or native grassland areas, it is considered the proposal would not result in

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Latham's Snipe (<i>Gallinago hardwickii</i>)	-	Bonn, J, K	PMST-K	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	Study Area cannot be precluded. No known records of the species occur within the Site. Absent: No suitable aquatic habitat for it occurs within the Study Area. This migratory bird does not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site.	significant impacts on foraging habitat for the species. Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Little Lorikeet (<i>Glossopsitta pusilla</i>)	V	-	BioNet-11	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	Low: suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or roosting within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
Painted Honeyeater (<i>Grantiella picta</i>)	-	V	PMST-L	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	Low: limited suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Pied Oystercatcher (<i>Haematopus longirostris</i>)	E	-	BioNet-10	The species is distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site. Absent: No suitable aquatic habitat for it occurs within the Study Area. No known records of the species occur within the Site. Unlikely: No suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.	significant impacts on foraging habitat for the species.
White-bellied Sea-Eagle (<i>Haliaeetus leucogaster</i>)	V	C	BioNet – 31	Habitats are characterized by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest).	Low: no suitable roosting or breeding habitat for the species occurs within the study area. Given that the species is migratory and highly mobile, its occasional occurrence at the Study Area cannot be precluded. No known records of the species occur within the Site. Unlikely: the species is highly mobile, limited resources are likely to occur within the Study Area. Given that the species is migratory and highly mobile and that there would be resources for it elsewhere in the locality, it is unlikely that the project would result in a significant effect on the species.	
Little Eagle (<i>Hieraaetus morphnoides</i>)	V	-	BioNet – 2	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Low: limited suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not	

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White-throated Needletail (<i>Hirundapus caudacutus</i>)	-	V, Mi	BioNet-6 PMST-K	Found across a range of habitats, more often over wooded areas, where it is almost exclusively aerial. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for the species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces. Appears to have traditional roost sites.	Study Area to woodlands, the possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site.	result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
					Low: limited suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
Black Bittern (<i>Ixobrychus flavicollis</i>)	V		BioNet-5	The Black Bittern has a wide distribution, from southern NSW north to Cape York and along the north coast to the Kimberley region. The species also occurs in the south-west of Western Australia. In NSW, records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night.	Low: limited suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.

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Swift Parrot (<i>Lathamus discolor</i>)	E	CE	PMST-K	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylo</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Inland Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> .	No known records of the species occur within the Site. Low: suitable seasonal foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.
Bar-tailed Godwit (<i>Limosa lapponica</i>)	-	C, J, K, Bonn, Ma	PMST-K	The Bar-tailed Godwit is a large wader and member of the Tringinae family. The Bar-tailed Godwit is a migratory marine wader that visits Australia during its non-breeding phase. It has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.	Absent: The species is mainly coastal. No suitable habitat for it occurs within the Study Area. This migratory bird does not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site.	Unlikely: The species is coastal and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Black-tailed Godwit (<i>Limosa limosa</i>)	-	C, J, K	PMST-K BioNet- 1	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water.	Absent: The species is mainly coastal. No suitable habitat for it occurs within the Study Area. This migratory bird does not depend on terrestrial habitat for feeding or reproduction.	Unlikely: The species is coastal and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Square-tailed Kite (<i>Lophoictinia isura</i>)	V	-	BioNet- 30	Roosts and loaf on low banks of mud, sand and shell bars The Square-tailed Kite is a long-winged raptor with scattered known records across most of NSW. It is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. The species appears to occupy large hunting ranges of more than 100km².	No known records of the species occur within the Site. Low: suitable foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands and the coast, the possibility of the species occasionally flying over or roosting within the Study Area cannot be precluded. No known records of the species occur within the Site. Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland or native grassland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.	
Southern Giant-Petrel, Southern Giant Petrel (<i>Macronectes giganteus</i>)	E	E, Ma, Bonn	PMST-M	The Southern Giant Petrel is a marine seabird and the largest petrel. It breeds on six subantarctic and Antarctic islands in Australian territory; Macquarie Island, Heard Island and McDonald Island in the Southern Ocean, and Giganteus Island, Hawker Island, and Frazier Island in the Australian Antarctic Territories.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site. Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.	
Northern Giant Petrel (<i>Macroneces halli</i>)	V	V	PMST-M	Northern Giant Petrel is a large seabird with circumpolar pelagic distribution. Its breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site. Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.	

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
White-bellied Storm-Petrel (<i>Fregetta grallaria grallaria</i>)	-	V	PMST-L	The White-bellied Storm-Petrel occurs across sub-tropical and tropical waters in the Tasman Sea, Coral Sea and, possibly, the central Pacific Ocean. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia. It breeds, in Australian territory, on offshore islets and rocks in the Lord Howe Island group. It nests in crevices between large volcanic rocks, and in burrows excavated in banks. Breeding colonies are often situated along dykes. A single chick is raised and although breeding occurs annually, approximately 30% of the potential breeding population do not nest. There are marked differences in diet between the sexes. Females obtain most of their prey live from the sea, while males also scavenge from the carcasses of penguins and seals on land. At sea, both sexes are aggressive opportunists, feeding on fish, cephalopods, birds and crustaceans, including euphausiids or krill, and regularly scavenge on fishing vessels. During the vulnerable early chick phase adult birds utilise land-based carrion resources (e.g. seals) extensively.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Gould's Petrel (<i>Pterodroma leucoptera leucoptera</i>)	V	E	PMST-M	They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees.	Absent: The species is mainly marine. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Kermadec Petrel (<i>Pterodroma neglecta neglecta</i>)	V	V	PMST-M	Marine species, breeding on islands across the South Pacific. In Australia it breeds on Ball's Pyramid and Phillip Island (near Norfolk Island). Nests in a crevice amongst rocks.	Absent: The species is mainly marine. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Superb Fruit-Dove (<i>Ptilinopus superbus</i>)	V	-	BioNet-1	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: Habitat for the species does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Orange-bellied Parrot (<i>Neophema chrysogaster</i>)	-	CE	PMST-M	On the mainland, the Orange-bellied Parrot spends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. The species also inhabits small islands and peninsulas and occasionally saltworks and golf courses. Birds forage in low samphire herbland or taller coastal shrubland. Diet mainly comprises seeds and fruits of sedges and salt-tolerant coastal and saltmarsh plants. Occasionally, flowers and stems are eaten. Orange-bellied Parrots are known to forage among flocks of Blue-winged Parrots. Recent records from unexpected places, including Shellharbour and Maroubra suggest that the species may be expanding their selection of habitats and foraging plant species. Birds seen in NSW in 2003 were foraging on weed species several hundred metres from the coast.	Absent: The species is mainly coastal and do not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site.	Unlikely: The species is coastal and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Turquoise Parrot (<i>Neophema pulchella</i>)	V	-	BioNet – 4	The Turquoise Parrot lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. It prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. It nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	Low: suitable seasonal foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is considered the proposal would not result in significant impacts on foraging habitat for the species.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Barking Owl (<i>Ninox connivens</i>)	V	-	BioNet-1	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	Low: suitable foraging habitat for the species occurs within the Study Area. Large tree hollows and hollowed stags suitable for breeding were not observed across the Study Area during surveys. Therefore, the Study Area does not provide suitable breeding habitat. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the Study Area. Given that no suitable breeding habitat for the species occur, it is considered unlikely that the proposal would result in significant impacts to the species or its habitat.
Powerful Owl (<i>Ninox strenua</i>)	V	-	BioNet – 62	Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (<i>Syncarpia glomulifera</i>), Black She-oak (<i>Allocasuarina littoralis</i>), Blackwood (<i>Acacia melanoxylon</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Cherry Ballart (<i>Exocarpus cupressiformis</i>) and a number of eucalypt species. Forages on arboreal marsupials, flying foxes and birds. Nest in large tree hollows (at least 0.5m deep) in large eucalypts (DBH 80-240 cm) that are at least 150 years old.	Low: suitable foraging habitat for the species occurs within the Study Area. Large tree hollows and hollowed stags suitable for breeding were not observed across the Study Area during surveys. Therefore, the Study Area does not provide suitable breeding habitat. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the Study Area. Given that no suitable breeding habitat for the species occur, it is considered unlikely that the proposal would result in significant impacts to the species or its habitat.
Eastern Curlew, Far Eastern Curlew (<i>Numenius madagascariensis</i>)	-	CE, J, K, C	BioNet-7 PMST-K	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding or reproduction.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Whimbrel (<i>Numenius phaeopus</i>)		C, J, K, Ma	PMST-K	saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. The numbers of Eastern Curlew recorded during one study were correlated with wetland areas. Whimbrels are common across northern Australia and uncommon to rare further south. They breed in central Siberia to Iceland. The subspecies <i>variegatus</i> is the one mainly found in Australia and also the Bay of Bengal through to Melanesia, Micronesia and to New Zealand in small numbers. Whimbrels are found mainly on the coast, on tidal and estuarine mudflats, especially near mangroves. They are sometimes found on beaches and rocky shores. Whimbrels feed on intertidal mudflats by day and night, on worms, crustaceans and occasionally fish and nestling birds	No known records of the species occur within the Site.	the species or its habitat.
Fairy Prion (<i>Pachyptila turtur subantarctica</i>)	-	V, Ma	PMST-L	The fairy prion is found throughout oceans and coastal areas in the Southern Hemisphere. Fairy prions are numerous and circumpolar in their distribution, ranging north to subtropical waters during non-breeding periods. Fairy prions occur through most of their range, with subantarctica restricted to Antipodes, Big South Cape, Shores Is. and Macquarie Islands. Prions are normally zooplankton eaters.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding or reproduction. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Eastern Osprey (<i>Pandion cristatus</i>)	V	-	BioNet-3	Eastern Osprey favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometres of the sea.	Absent: No suitable aquatic habitat for the species occur within the Study Area. No known records of the species occur within the Site.	Unlikely: Aquatic habitat for the species do not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Scarlet Robin (<i>Petroica boodang</i>)	V	-	BioNet-4	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Low: suitable seasonal foraging habitat for the species occurs within the Study Area. Given the proximity of the Study Area to woodlands, the	Unlikely: suitable foraging habitat for the species occurs within the study area. Given the proposal would not result in removal of woodland areas, it is

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Pink Robin (<i>Petroica rodinogaster</i>)	V	-	BioNet-1	Inhabits rainforest and tall, open eucalypt forest, particularly in densely vegetated gullies.	possibility of the species occasionally flying over or foraging within the Study Area cannot be precluded. No known records of the species occur within the Site.	considered the proposal would not result in significant impacts on foraging habitat for the species.
Australian Painted Snipe (<i>Rostratula australis</i>)	E	E	BioNet-1 PMST-K	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: Habitat for the species does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Little Tern (<i>Sterna albiglans</i>)	E	-	BioNet-2	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Absent: The species is a coastal shorebird and do not depend on terrestrial habitat for feeding. No known records of the species occur within the Site.	Unlikely: The species is a coastal bird for which no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Australian Fairy Tern (<i>Sterna nereis nereis</i>)	-nino	V	PMST-K	The Fairy Tern is found on coastal beaches, inshore and offshore islands, sheltered inlets, sewage farms, harbours, estuaries and lagoons. It favours both fresh and saline	Absent: The species is a coastal shorebird and do not depend on	Unlikely: The species is a coastal bird for which no suitable habitat occurs within the Study

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Freckled Duck (<i>Stictonetta naevosa</i>)	V	-	BioNet-4	The Freckled Duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. It breeds in large temporary swamps created by floods in the Bulloo and Lake Eyre basins and the Murray-Darling system, particularly along the Paroo and Lachlan Rivers, and other rivers within the Riverina. The duck is forced to disperse during extensive inland droughts when wetlands in the Murray River basin provide important habitat. The species may also occur as far as coastal NSW and Victoria during such times. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally, rest in dense cover during the day, usually in deep water. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. Nests are usually located in dense vegetation at or near water level	terrestrial habitat for feeding. No known records of the species occur within the Site. Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat. Unlikely: The species depend on aquatic wetland habitat which does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Buller's Albatross (<i>Thalassarche bulleri</i>)	-	V	PMST-M	Buller's Albatross is one of the smallest albatross. Occurs in both inshore and offshore waters, including the continental shelf break and pelagic waters. Feeds mainly on squid, fish, tunicates, octopus and crustacea. This albatross only nests on islands off New Zealand. The northern subspecies (platei) nests on islands off Chatham Island with an estimated population of around 18,200 breeding pairs. The southern subspecies (bulleri) breeds on the Snarres and Solander islands with a total population of around 13,600 breeding pairs. After breeding both subspecies migrate to the seas off Peru and Chile. In NSW waters it is a relatively common visitor between March and October, with few sightings outside this period.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Northern Buller's Albatross, Pacific Albatross (<i>Thalassarche bulleri platei</i>)	-	V	PMST-M	Northern Buller's Albatross is a migratory bird and one of the smallest species of albatross. It nests on islands off Chatham Island with an estimated population of around 18,200 breeding pairs	species would land or roost therein. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Shy Albatross (<i>Thalassarche cauta</i>)	V	E	PMST-L	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and New Zealand provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in Queensland along the entire south coast of the continent to Carnarvon in Western Australia. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park.	Absent: The species is mainly marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Chatham Albatross (<i>Thalassarche eremita</i>)	-	E	PMST-L	The Chatham Albatross is a true pelagic species only returning to land to breed. The only breeding location is the isolated windswept 1.7 hectare rock stack, The Pyramid, located at the southern end of the Chatham Islands. One pair has attempted to breed on Western Chain, Snares Island. During the breeding season, Chatham Albatross are commonly seen at sea around The Pyramid and the southern Chatham Islands and occasionally at sea around the eastern New Zealand coastline. They migrate to coastal waters off Chile and Peru outside their breeding season. There are records of vagrant Chatham Island mollymawks from eastern Australia, Tasmania and southern Africa. Chatham Albatross breed in a single colony on The Pyramid, Chatham Islands. They are monogamous, annual breeders, with shared incubation and chick rearing. Chatham Albatross are generally surface feeders, but will shallow dive for food. They are known to feed on fish, squid and krill.	No known records of the species occur within the Site. Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the see, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Campbell Albatross, Campbell Black-browed Albatross (<i>Thalassarche impavida</i>)	-	V	PMST-M	This species nests only at Campbell Island and the adjacent Isle de Jeanette Marie south of New Zealand, with a total population estimated at 24,600 pairs. It ranges widely in Australasian seas. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Black-browed Albatross	Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the see, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Black-browed Albatross (<i>Thalassarche melanophris</i>) (formerly <i>Diomedea melanophris</i>)	V	V	PMST-M	Black-browed Albatross is a large seabird of the albatross family Diomedidae; it is the most widespread and common member of its family. Spends most of its time at sea, breeding on small isolated islands. It is circumpolar in the southern oceans, and it breeds on 12 islands throughout that range. In the Atlantic Ocean, it breeds on the Falkland Islands, South Georgia and the South Sandwich Islands, and the Cape Horn Islands. In the Pacific Ocean it breeds on Islas Idefonso, Diego de Almagro, Islas Evangelistas, Campbell Island, Antipodes Islands, Shores Islands, and Macquarie Island. In the Indian Ocean it breeds on the Crozet Islands, Kerguelen Islands, Heard Island, and McDonald Island. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park.	No known records of the species occur within the Site. Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Salvin's Albatross (<i>Thalassarche salvinii</i>)	-	V	PMST-L	During the breeding season (August-April) Salvin's Albatross occur throughout coastal New Zealand, especially from Cook Strait south, and also across to south-east Australian waters. After breeding it migrates to seas off Peru and Chile and occurs as a vagrant in the South Atlantic. A small population of a few pairs was reported breeding on the Crozet Islands in the Indian Ocean.	Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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White-capped Albatross (<i>Thalassarche steadi</i>)		V	PMST-L	This species breeds on a number of islands in New Zealand waters. Virtually the entire population nests in the Auckland Islands, comprising between 75,000 and 117,000 breeding pairs. A small number of pairs nest on Bollons Island in the Antipodes Islands and occasionally on The Forty-Fours in the Chatham Islands. After breeding most birds remain in Australasian waters with some adults migrating across the Indian Ocean to seas off South Africa and Namibia. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Shy Albatross. However, it appears to be a regular visitor principally occurring between March and December.	No known records of the species occur within the Site. Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein. No known records of the species occur within the Site.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Eastern Hooded Dotterel, Eastern Hooded Plover (<i>Thinornis cucullatus</i>)	CE	V	BioNet-1 PMST-K	The Hooded Plover (Eastern) is a small beach-dwelling bird. Widely dispersed along coastal south-east Australia, they are easily disturbed while nesting on sandy beaches and numbers have fallen over time in areas where human activity has increased.	Absent: The species is marine and do not depend on terrestrial habitat for feeding. Given the proximity of the Study Area to the sea, the possibility of this migratory species being observed on flight could occur. However, given the lack of suitable habitat on the Study Area, it is unlikely the species would land or roost therein.	Unlikely: The species is marine and no suitable habitat occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Masked Owl (<i>Tyto novaehollandiae</i>)	V	-	BioNet- 13	Masked Owl distribution extends from the coast to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	No known records of the species occur within the Site. Low: suitable foraging habitat for the species occurs within the Study Area. Large tree hollows and hollowed stags suitable for breeding were not observed across the Study Area during surveys. Therefore, the Study Area does not provide suitable breeding habitat. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the Study Area. Given that no suitable breeding habitat for the species occur, it is considered unlikely that the proposal would result in significant impacts to the species or its habitat.
Sooty Owl (<i>Tyto tenebricosa</i>)	V	-	BioNet- 7	Sooty Owl occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>) or Sugar Glider (<i>Petaurus breviceps</i>). Nests in very large tree-hollows	Low: suitable foraging habitat for the species occurs within the Study Area. Large tree hollows and hollowed stags suitable for breeding were not observed across the Study Area during surveys. Therefore, the Study Area does not provide suitable breeding habitat. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species occurs within the Study Area. Given that no suitable breeding habitat for the species occur, it is considered unlikely that the proposal would result in significant impacts to the species or its habitat.
Terek Sandpiper (<i>Xenus cinereus</i>)	V	-	BioNet-1	A rare migrant to the eastern and southern Australian coasts, being most common in northern Australia, and extending its distribution south to the NSW coast in the east. The two main	Absent: No suitable aquatic and/or wetland habitat for the species	Unlikely: The species depend on aquatic wetland habitat which

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Sanderling (<i>Calidris alba</i>)	V		PMST-K	sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. The latter has been identified as nationally and internationally important for the species. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common, arriving from September and leaving by May (some may overwinter in Australia). Sanderlings occur along the NSW coast, with occasional inland sightings. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands.	occurs within the Study Area. No known records of the species occur within the Site.	does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Broad-billed Sandpiper (<i>Limicola falcinellus</i>)	V		PMST-K	The eastern form of this species breeds in northern Siberia before migrating southwards in winter to Australia. In Australia, Broad-billed Sandpipers overwinter on the northern coast, particularly in the north-west, with birds located occasionally on the southern coast. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW. Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: The species depend on aquatic wetland habitat which does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Flesh-footed Shearwater (<i>Puffinus carneipes</i>)	V		PMST-L	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: The species depend on aquatic wetland habitat which does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Little Tern (<i>Sterna albigrons</i>)	E		PMST-L	Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts, from Shark Bay in Western Australia to the Gulf of St Vincent in South Australia. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. It breeds in spring and summer along the entire east coast from Tasmania to northern Queensland, and is seen until May, with only occasional birds seen in winter months. Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands.	Absent: No suitable coastal habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	impacts to the species or its habitat. Unlikely: The species depends on coastal habitat which does not occur within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Migratory Terrestrial Birds						
Oriental Cuckoo (<i>Cuculus optatus</i>)	-	C, J, R	PMST-M	Oriental Cuckoo is a winter visitor in Australia during its non-breeding phase. It inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae.	Low: suitable habitat for the species occurs within the site. Given that the species is migratory, its occasional occurrence at the site cannot be precluded. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species occurs within the site. Given its migratory nature, the species would not depend on resources within the site for its long-term survival. It is unlikely that the proposal would result in significant impact on the species.
Black-faced Monarch (<i>Monarcha melanopsis</i>)	-	K	PMST-K	Wet forest specialist, found mainly in rainforest and wet sclerophyll forest, especially in sheltered gullies and slopes with a dense understorey of ferns and/or shrubs.	Low: suitable habitat for the species occurs within the site. Given that the species is migratory, its occasional	Unlikely: suitable habitat for the species occurs within the site. Given its migratory nature, the species would not depend on

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Spectacled Monarch (<i>Monarcha trivirgatus</i>)	-	Bonn	PMST-M	Usually considered a denizen of the dense rainforests and moist eucalypt forests of eastern and north-eastern Australia, the Spectacled Monarch sometimes also inhabits mangroves and other densely vegetated habitats. The species occurs at all strata of the forest, but stays mostly in the middle to lower levels, where it gleans, sallies and flutter-chases insect prey among the inner foliage of the trees and shrubs.	occurrence at the site cannot be precluded. No known records of the species occur within the Site.	resources within the site for its long-term survival. It is unlikely that the proposal would result in significant impact on the species.
Satin Flycatcher (<i>Myagra cyanoleuca</i>)	-	K, Ma	PMST-K	Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along watercourses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. Wintering birds in northern Qld will use rainforest - gallery forests interfaces, and birds have been recorded wintering in mangroves and paperbark swamps.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Rufous Fantail (<i>Rhipidura rufifrons</i>)	-	Bonn, Ma	PMST-K	Moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests with a dense understorey. When on passage a wider range of habitats are used including dry eucalypt forests and woodlands and Brigalow shrublands.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Fork-tailed Swift (<i>Apus pacificus</i>)	-	M, Ma	PMST-K	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	Low: suitable habitat for the species occurs within the site. Given that the species is migratory, its occasional occurrence at the site cannot be precluded.	Unlikely: suitable habitat for the species occurs within the site. Given its migratory nature, the species would not depend on resources within the site for its long-term survival.

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Yellow Wagtail (<i>Motacilla flava</i>)	-	M, Ma	PMST-K	Breeds in northern latitudes and travels south before the onset of winter. Occurs in a variety of damp or wet habitats with low vegetation. Outside of the breeding season, it is also found in cultivated areas.	No known records of the species occur within the Site. Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	It is unlikely that the proposal would result in significant impact on the species. Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Migratory Wetland Birds						
Common Sandpiper (<i>Actitis hypoleucos</i>)	-	M, Ma	PMST-K	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Sooty Shearwater (<i>Ardenna grisea</i>)	-	M	PMST-L	In Australia, the Sooty Shearwater breeds on islands off New South Wales (NSW) and Tasmania. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The Sooty Shearwater breeds mainly on subtropical and sub-Antarctic islands, as well as on the mainland of New Zealand. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Ruddy Turnstone (<i>Arenaria interpres</i>)	-	M, Ma	PMST-K	Coastline and only occasionally inland. They are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches.	Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in

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Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)	-	Mi, Ma	PMST-K	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No known records of the species occur within the Site. Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	impacts to the species or its habitat. Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Red-necked Stint (<i>Calidris ruficollis</i>)	-	M, Ma	PMST-K	It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint breeds in Siberia and sporadically in north and west Alaska, probably from Taymyr region to Anadyr Territory and Koryakland. The Red-necked Stint mostly forages on bare wet mud on intertidal mudflats or sandflats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. Roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Streaked Shearwater (<i>Calonectris leucomelas</i>)	-	M, Ma	PMST-M	Found in the western Pacific, breeding on the coast and on offshore islands of Japan, Russia, and on islands off the coasts of China, North Korea and South Korea. This marine species can be found over both pelagic and inshore waters.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Double-banded Plover (<i>Charadrius bicinctus</i>)	-	M	PMST-K	The Double-banded Plover can be found in both coastal and inland areas. The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Oriental Plover (<i>Charadrius veredus</i>)	-	M, Ma	PMST-K	The Oriental Plover is a non-breeding visitor to Australia, where the species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia, and there are records at a few scattered sites elsewhere, mainly along the northern coast, such as in the Top End, the Gulf of Carpentaria and on Cape York Peninsula. Forage among short grass or on hard stony bare ground, but also on mudflats or among beachcast seaweed on beaches. Sometimes roost on soft wet mud or in shallow water of beaches and tidal mudflats, and also occasionally in dry, open habitats, such as saltmarsh or paddocks.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
				Breeding populations are found in the tropical waters of Indian and Pacific Oceans, except in the east Pacific, and the South Atlantic on remote tropical and sub-tropical islands. Mainly feeds on fish but can snatch bird eggs and chicks as well as scavange.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Lesser Frigatebird (<i>Fregata ariel</i>)	-	M, Ma	PMST-L	Few definite records exist for Swinhoe's Snipe in Australia. The species has been recorded in the north between the Kimberley Divide and Cape York Peninsula. Breeds in central and southern Siberia. During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands and drier cultivated areas.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Pin-tailed Snipe (<i>Gallinago stenura</i>)	-	M, Ma	PMST-L	The species distribution within Australia is not well understood. In NSW a single banded bird was reported near West Wyalong. Non-breeding migrant in Australia. During non-breeding period the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Grey-tailed Tattler (<i>Heteroscelus brevipes</i>)	-	M	PMST-K	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats.	Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal

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				It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.	No known records of the species occur within the Site.	is unlikely to result in impacts to the species or its habitat.
			PMST-K		Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site.
Little Curlew (<i>Numenius minutus</i>)	-	M, Ma		Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast. The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated.	No known records of the species occur within the Site.	Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
			PMST-M		Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site.
White-tailed Tropicbird (<i>Phaethon lepturus</i>)	-	M		The white-tailed Tropicbird can be found over pelagic waters and the coast of tropical and subtropical seas. It feeds on small fish, especially flying-fish, squid and some crustaceans (especially crabs). Its diet varies locally, for example taking mostly fish in the Seychelles. Most prey is caught by plunge-diving but flying-fish can be taken on the wing. Breeding is seasonal in places but elsewhere can be more or less continuous. It is loosely colonial, nesting in rocky crevices or sheltered scrape on the ground on small-remote islands preferring inaccessible spots on cliffs where take-off is relatively easy.	No known records of the species occur within the Site.	Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
			PMST-K		Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site.
Pacific Golden Plover (<i>Pluvialis fulva</i>)	-	M, Ma		Most Pacific Golden Plovers occur along the east coast, and are especially widespread along the Queensland and NSW coastlines. In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks.	No known records of the species occur within the Site.	Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
			PMST-K		Absent: no suitable habitat for the species occurs across the Study Area.	Unlikely: no suitable habitat for the species occurs within the site.
Grey-tailed Tattler (<i>Tringa brevipes</i>)	-	M		In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.	No known records of the species occur within the Study Area.	Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

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Wood Sandpiper (<i>Tringa glareola</i>)	-	M	PMST-K	The Wood Sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia. Uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes.	No known records of the species occur within the Site. Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	impacts to the species or its habitat. Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Common Greenshank (<i>Tringa nebularia</i>)	-	M, Ma	PMST-K	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Marsh Sandpiper (<i>Tringa stagnatilis</i>)	-	M	PMST-K	Fresh or brackish (slightly salty) wetlands such as rivers, water meadows, sewage farms, drains, lagoons and swamps.	Absent: no suitable habitat for the species occurs across the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the site. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Mammals						
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	V	V	BioNet – 14 PMST-K	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	Low: suitable foraging habitat for the species occurs within the Study Area. No suitable breeding habitat occurs therein. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species is present. Given that no breeding habitat is present, and that the proposal would not remove treed areas, it is considered unlikely the proposed works would result in significant impacts on

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Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	V	-	BioNet – 15	Prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	Low: suitable habitat for the species occurs within the Study Area, including hollow-bearing trees and trees with decorticated bark. No known records of the species occur within the Site.	the species or its habitat.
Southern Brown Bandicoot (eastern) (<i>Isodon obesulus obesulus</i>)	E	E	BioNet-6 PMST-L	Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruited) fungi. Their searches for food often create distinctive conical holes in the soil.	Low: limited suitable habitat for the species occurs in remnant native vegetation within the Study Area. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is present. Given the non-intrusive activities to be undertaken on native vegetation, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Spotted-tailed Quoll (<i>Dasyurus maculatus</i>)	V	E	BioNet-12 PMST-K	Found in a variety of forested habitats. This species creates a den in fallen hollow logs or among rocky outcrops. Generally, does not occur in otherwise suitable habitats that are in close proximity to urban development.	Low: limited suitable habitat for the species occurs in remnant native vegetation within the Study Area. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is present. Given the non-intrusive activities to be undertaken on native vegetation, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Parma Wallaby	V	-	BioNet-1	Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and	Absent: No suitable habitat for the species	Unlikely: no suitable habitat for the species

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<i>(Macropus parma)</i>				ranges of central and northern NSW from the Gosford district to the Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. Typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas.	occurs within the Study Area. No known records of the species occur within the Site.	occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Eastern Coastal Free-tailed Bat <i>(Micronomus norfolkensis)</i>	V	-	BioNet – 9	The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. It occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous	Low-Moderate: suitable habitat for the species occurs within the Study Area, including hollow-bearing trees and trees with decorticated bark. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is present. Given the low frequency of hollow-bearing trees and trees with decorticated bark, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Little Bent-winged Bat <i>(Miniopterus australis)</i>	V	-	BioNet – 2	The Little Bent-winged Bat occurs in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. The species roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters.	Low: suitable foraging habitat for the species occurs within the Study Area. No suitable breeding habitat occurs therein. No known records of the species occur within the Site.	Unlikely: suitable foraging habitat for the species is present. Given that no breeding habitat is present, and that the proposal would not remove treed areas, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Large Bent-winged Bat <i>(Miniopterus orianae oceanensis)</i>	V	-	BioNet – 31	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific	Low: suitable foraging habitat for the species occurs within the Study Area. No suitable	Unlikely: suitable foraging habitat for the species is present. Given that no breeding habitat is present, and

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Southern Myotis (<i>Myotis Macropus</i>)	V	-	BioNet – 17	Generally, the Southern Myotis roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	breeding habitat occurs therein. No known records of the species occur within the Site.	that the proposal would not remove treed areas, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Yellow-bellied Glider (<i>Petaurus australis</i>)	V	-	BioNet – 377 PMST-K	The Yellow-bellied Glider is a nocturnal arboreal (hollow-dependent) mammal that occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. The species feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein.	Low: limited substandard suitable habitat for the species occurs within the Study Area. Limited hollows occur within the Study Area. No known records of the species occur within the Site.	Unlikely: substandard suitable habitat for the species is present. Given that large trees and HBT are unlikely to be removed as part of the proposal, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Squirrel Glider (<i>Petaurus norfolcensis</i>)	V	-	BioNet-2	Occurs in eucalypt forests and woodlands where it feeds on sap exudates and blossoms. In these areas tree hollows are utilised for nesting sites. This species also requires winter foraging resources when the availability of normal food	Low: limited substandard suitable habitat for the species occurs within the Study Area. Limited hollows	Unlikely: substandard suitable habitat for the species is present. Given that large trees and HBT are unlikely to be removed as part of

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Greater Glider (<i>Petauroides volans</i>)	-	V	BioNet-12 PMST-K	resources may be limited, such as winter-flowering shrub and small tree species. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	occur within the Study Area. No known records of the species occur within the Site.	the proposal, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Brush-tailed Rock Wallaby (<i>Petrogale penicillata</i>)	-	V	BioNet-4 PMST-L	Occurs in forests and woodlands along the Great Divide and on the western slopes in escarpment country with rocky outcrops, steep rocky slopes, gorges, boulders and isolated rocky areas. The majority of populations favour north-facing aspects, but some southern aspects have been recorded. Apart from the critical rock structure, Brush-tailed Rock-wallaby also requires adjacent vegetation types, associated types include, dense rainforest, wet sclerophyll, vine thicket, dry sclerophyll forest and open forest. They also require suitable caves and rocky overhangs for shelter and also for 'lookout' posts.	Low: limited substandard suitable habitat for the species occurs within the Study Area. Limited hollows occur within the Study Area. No known records of the species occur within the Site.	Unlikely: substandard suitable habitat for the species is present. Given that large trees and HBT are unlikely to be removed as part of the proposal, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Koala (<i>Phascolarctos cinereus</i>) Koala (combined populations of Queensland, NSW and ACT) (<i>Phascolarctos cinereus</i>)	V	E	BioNet – 8 PMST-K	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
					Low: suitable foraging habitat for the species occurs within the Study Area. Given the highly disturbed landscape and minimal connectivity to native bushland, it is considered unlikely the	Likely: limited suitable habitat for the species is present. it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.

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Long-nosed Potoroo (<i>Potoros tridactylus</i>)	-	V	BioNet-1 wallPMST-L	Long-nosed Potoroo inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Often digs small holes in the ground in a similar way to bandicoots. The species is mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours.	species would occur within the Study Area. No known records of the species occur within the Site. Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
New Holland Mouse, Pookila (<i>Pseudomys novaehollandiae</i>)	-	V	BioNet-1 PMST-L	New Holland Mouse are known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes. It is a social animal, living predominantly in burrows shared with other individuals. Its distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	V	V	BioNet – 1937 PMST-K	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	Low: suitable foraging habitat for the species occurs within the Study Area. The species roosts in 'roost camps' where hundreds to thousands of individuals co-exist and breed. At dusk, the colony fly out in search for food, individuals can travel over 20km each night in search for food. The site	Unlikely: suitable foraging habitat for the species is present. It is considered unlikely the proposal would result in significant impacts to the species or its habitat.

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Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)	V	-	BioNet – 6	Yellow-bellied Sheath-tail-bat is an insectivorous microbat that roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	do not contain a 'roost camp'. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is present. Given the low frequency of hollow-bearing trees and trees with decorticated bark, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	V	-	BioNet – 20	Greater Broad-nosed Bat is found mainly in the gullies and river systems, it utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young.	Low-Moderate: suitable habitat for the species occurs within the Study Area, including hollow-bearing trees and trees with decorticated bark. No known records of the species occur within the Site.	Unlikely: suitable habitat for the species is present. Given the low frequency of hollow-bearing trees and trees with decorticated bark, it is considered unlikely the proposed works would result in significant impacts on the species or its habitat.
White-footed Dunnart (<i>Sminthopsos leucopus</i>)	V	-	BioNet-1	The White-footed Dunnart occurs in Tasmania and along the Victorian and southern NSW coast. The Shoalhaven area is the species' northern-most limit. It has not been recorded west of the coastal escarpment with the western-most record being from Coolangubra State Forest, approximately 10 km south-east of Bombala. In NSW, the species seems to favour vegetation communities with an open understorey structure	Low: limited suitable habitat for the species occurs within the Study Area.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would

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Reptiles						
Broad-headed Snake (<i>Hoplocephalus bungaroides</i>)	E	V	BioNet-1 PMST-L	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. The Broad-headed Snake is nocturnal. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. It moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.	No known records of the species occur within the Site.	result in significant impacts on the species or its habitat
Flora						
Bynoe's Wattle (<i>Acacia bynoeana</i>)	E	V	PMST-L	Bynoe's Wattle is a semi-prostrate shrub found in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Downy Wattle (<i>Acacia pubescens</i>)	V	V	BioNet-3	Downy Wattle is spreading shrub, 1 - 5 m high with brilliant yellow flowers, it occurs on alluviums, shales and at the intergrade between shales and sandstones. The soils are characteristically gravelly soils, often with ironstone. It occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Thick-lipped Spider-orchid, Daddy Long-legs (<i>Caladenia tessellata</i>)	-	V	PMST-L	The Thick Lip Spider Orchid is from a ground orchid generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations). The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border.	No known records of the species occur within the Site. Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Longevity is unknown, but clonal species have been known to survive for many decades. Flowers from August to October. Pollination of Acacia flowers is usually by insects and birds. The pods mature in October to December. Recruitment is more commonly from vegetative reproduction than from seedlings. The percentage of pod production and seed fall for this species appears to be low. Acacia species generally have high seed dormancy and long-lived persistent soil seedbanks. It is thought that the species needs a minimum fire free period of 5 - 7 years to allow an adequate seedbank to develop. The species distribution is concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon.	result in impacts to the species or its habitat.
Leafless Tongue-orchid (<i>Cryptostylis hunteriana</i>)	-	V	BioNet-4 PMST-K	The Leafless Tongue-orchid does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations of the species typically occur in woodland dominated by Scribbly Gum (<i>Eucalyptus sclerophylla</i>), Silvertop Ash (<i>E. sieberi</i>), Red Bloodwood (<i>Corymbia gummifera</i>) and Black Sheoak (<i>Allocasuarina littoralis</i>); appears to prefer open areas in the understorey of this community and is often found in association with the Large	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Tongue Orchid (<i>C. subulata</i>) and the Tartan Tongue Orchid (<i>C. erecta</i>).						
White-flowered Wax Plant (<i>Cynanchum elegans</i>)	E	E	PMST-L	White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (<i>Leptospermum laevigatum</i>) – Coastal Banksia (<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>) coastal scrub; Forest Red Gum (<i>Eucalyptus tereticornis</i>) aligned open forest and woodland; Spotted Gum (<i>Corymbia maculata</i>) aligned open forest and woodland; and Bracelet Honeymyrtle (<i>Melaleuca armillaris</i>) scrub to open scrub	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Albatross Mallee (<i>Eucalyptus langleyi</i>)	V	V	BioNet-32 PMST-K	Albatross Mallee is a mallee to 5m high that occurs on skeletal soils on rocky sloping Nowra Sandstone outcrops along Bomaderry Creek. The endangered population occurs at an altitude of 30-40 m above sea level whilst the general <i>E. langleyi</i> population occurs at an altitude of between 130 and 255 m.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Eucalyptus langleyi population north of the Shoalhaven River in the Shoalhaven local government area (<i>Eucalyptus langleyi</i>)	E	V		It occurs as a midstorey species in woodland dominated by Grey Gum (<i>E. punctata</i>), but sometimes with Spotted Gum (<i>Corymbia maculata</i>) present. The woodland habitat has a shrubby midstorey comprising species such as Sweet Pittosporum, Tick Bush, Bracellett Honey-myrtle, Black Sheoak, Tea-tree and Sandpaper Fig. The woodland habitat has a mostly shrubby ground layer, but in some places there are significant patches of Blady Grass. Vigorous regrowth has been observed from plants that have been burnt only occasionally, however regrowth becomes weak on frequently burnt plants. No seedling regrowth has been observed within the endangered population, but whether this is due to lack of seedling vigour or other environmental factors has not yet been established. Insects are presumed to be the primary pollinators of <i>Eucalyptus langleyi</i> , limiting the distance over which pollen will be exchanged between plants and populations. Current estimates of pollen movement for eucalypts are <1 km with rare events >5 km. This endangered population of the Albatross Mallee occurs north of the Shoalhaven River in the Shoalhaven local	No known records of the species occur within the Site.	

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
				government area. The population occurs as a series of fragmented stands across approximately 1.3 km ² and occurs on both sides of the boundary between Bomaderry Creek Regional Park and land owned by Shoalhaven City Council. In 1998 the population was estimated at 32 plants but a survey in 2008 found only 20 of these still alive. The endangered population is approximately 5 km from the closest population of the main Albatross Mallee (a listed Vulnerable species) occurrences which is located to the southwest across the Shoalhaven River.		
Bauer's Midge Orchid, Yellow Gnat-orchid (<i>Genoplesium baueri</i>)	E	E	BioNet – 24 PMST-K	Bauer's Midge Orchid is a terrestrial orchid which grows in dry sclerophyll forest and moss gardens over sandstone. It flowers February to March.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
East Lynne Midge-orchid (<i>Genoplesium vernale</i>)	V	V	PMST-M	The East Lynne Midge Orchid is currently known from only a narrow belt, approximately 12 km wide, of predominantly Dry Sclerophyll Forest from 17 km south of Batemans Bay to 24 km north of Ulladulla. The East Lynne Midge Orchid grows in 'poorer' dry sclerophyll woodland and forest on the south coast of New South Wales between Mogo and Ulladulla. It is confined to areas with good drainage and shallow, low fertility soils. Confined to areas with well-drained shallow soils of low fertility. The plant exists only as a dormant tuber for part of the year, dying back after flowering and fruiting in mid-November to late December.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Small-flower Grevillea (<i>Grevillea parviflora subsp. parviflora</i>)	V	V	PMST-K	Small-flower Grevillea is a low spreading to erect shrub that grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park. The species occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant

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Wingless Raspwort, Square Raspwort (<i>Haloragis exalata subsp. exalata</i>)	V	V	PMST-L	Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. however, other communities occupied include <i>Corymbia maculata</i> - <i>Angophora costata</i> open forest in the Dooralong area, in Sydney Sandstone Ridgetop Woodland at Wedderburn and in Cooks River / Castlereagh Ironbark Forest at Kemps Creek. It is found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Hunter occurrences are usually 30-70m ASL, while the southern Sydney occurrences are typically at 100-300m ASL. Often occurs in open, slightly disturbed sites such as along tracks.	No known records of the species occur within the Site.	impacts on the species or its habitat
				Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
<i>Hibbertia stricta subsp. furcatula</i>	E	-	BioNet-22	<i>Hibbertia stricta subsp. furcatula</i> is a small shrub growing to 1.3 m in height and up to 70 cm wide. <i>Hibbertia stricta subsp. furcatula</i> (<i>Hibbertia sp. nov.</i> 'Menai') is known to occur in two populations, one in the southern outskirts of Sydney, and one near Nowra on the mid-South Coast of NSW. The Southern Sydney population occurs on both sides of the Woronora River gorge, near Loftus and in Royal National Park. The southern population is mainly in the vicinity of Nowra. Habitat of the Southern Sydney population is broadly dry eucalypt forest and woodland. This population appears to occur mainly on upper slopes and above the Woronora River gorge escarpment, at or near the interface between the Lucas Heights soil landscape and Hawkesbury sandstone. It has been noted that the species usually grows in 'gravelly loam or clay soil in heath under open woodland'. Habitat of the South Coast population is poorly recorded, but appears to be dry sclerophyll forest or woodland associations	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat

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				in sandy soils over sandstone. <i>Hibbertia</i> sp. nov. 'Menai' flowers in spring and summer ('September to January (February)' yet also noted as July to about December (in NSW Flora online) and 'winter to summer' (Flora of the Sydney Region). Its longevity, seed biology, and most aspects of its ecology are unknown, although in common with most species of <i>Hibbertia</i> it is probably pollinated primarily by bees. It appears to propagate by seed, with no evidence to date of vegetative reproduction or regeneration.		
<i>Hibbertia puberula</i>	E	-	BioNet-7	Has not been seen for over 40 years. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. Occurs on sandy soil often associated with sandstone.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Delicate Cress, Illawarra Irene (<i>Irenepharsus trypherus</i>)	E	E	PMST-M	<i>Irenepharsus typherus</i> is a herb to 2.5m height which is restricted to the Illawarra district. The plant is short lived like most herbs in the Mustard family, and it is not known whether it is a perennial or an annual. It grows on moist rock walls, steep rocky slopes or disturbed rocky areas, often near cliff tops, and seems to prefer the fertile volcanic rocks like latite. Typically inhabits steep rocky slopes near cliff lines and ridge tops. The species is less typically found growing out of rock crevices or on narrow benches along cliff lines. The vast majority of sites are recorded from the upper slopes of the ridge systems that extend south and east of the Illawarra escarpment, although the species has also been recorded from the deep sandstone gorges of the Shoalhaven River. Associated vegetation includes moist sclerophyll forest, Ironwood <i>Backhousia myrtifolia</i> thicket, and rainforest.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
The species has been recorded from 18 sites within the local government areas of Kiama, Shellharbour, Shoalhaven, Tallaganda, Wingecarribee, and Wollongong. Found at such						

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Biconvex Paperbark (<i>Melaleuca biconvexa</i>)	V	V	BioNet-1 PMST-K	places as Minnamurra Falls, the Jamberoo area, and Morton and Macquarie Pass National Parks. The species has rarely been collected, perhaps because it looks like a weed. Biconvex Paperbark is a shrub or small tree, usually up to 10 m tall, though occasionally as high as 20 m. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Deane's Paperbark (<i>Melaleuca deanei</i>)	V	V	BioNet-1	Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Knotweed, Tall Knotweed (<i>Persicaria elatior</i>)	V	V	PMST-M	Tall Knotweed normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Spiked Rice-flower (<i>Pimelea spicata</i>)	E	E	PMST-M	Spiked Rice-flower occurs in both the Cumberland Plain and Illawarra environments this species is found on well-structured clay soils.	Low: limited suitable habitat for the species occurs within the Study Area. The species was	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is

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				On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark. The co-occurring species in the Cumberland Plain sites are grey box (<i>Eucalyptus moluccana</i>), forest red gum (<i>E. tereticornis</i>) and narrow-leaved ironbark (<i>E. crebra</i>). Blackthorn (<i>Bursaria spinosa</i>) is often present at sites (and may be important in protection from grazing) and kangaroo grass (<i>Themeda australis</i>) is usually present in the groundcover (also indicative of a less intense grazing history). In the coastal Illawarra it occurs commonly in Coast Banksia open woodland with a better developed shrub and grass understorey. Coastal headlands and hilltops are the favoured sites. The Illawarra populations usually occur in one of two communities - a woodland or a coastal grassland. Woodland sites are dominated by forest red gum (<i>E. tereticornis</i>) and stringybark (<i>E. eugenoides</i>), with a groundcover dominated by kangaroo grass (<i>Themeda australis</i>) and matrush (<i>Lomandra longifolia</i>). The grassland sites are dominated by kangaroo grass (<i>Themeda australis</i>) and matrush (<i>Lomandra longifolia</i>), with blady grass (<i>Imperata cylindrica</i>). A shrubby layer, where present, is dominated by coastal wattle (<i>Acacia sophorae</i>) and coast rosemary (<i>Westringia fruticosa</i>) with coast banksia (<i>Banksia integrifolia</i>).	not recorded along RMT during surveys. No known records of the species occur within the Site.	considered unlikely the proposed works would result in significant impacts on the species or its habitat
Brown Pomaderris, Rufous Pomaderris (<i>Pomaderris brunnea</i>)	E	V	PMST-K	Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October. The species is expected to live for 10 - 20 years, while the minimum time to produce seed is estimated to be 4 - 6 years. The species has been found in association with <i>Eucalyptus amplifolia</i> , <i>Angophora floribunda</i> , <i>Acacia parramattensis</i> , <i>Bursaria spinosa</i> and <i>Kunzea ambigua</i> .	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Cotoneaster Pomaderris (<i>Pomaderris cotoneaster</i>)	E	E	PMST-K	Cotoneaster Pomaderris has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a	Absent: No suitable aquatic and/or wetland habitat for the species	Unlikely: no suitable habitat for the species occurs within the Study

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid (<i>Prasophyllum affine</i>)	E	E	PMST-K	The Jervis Bay Leek Orchid is a ground orchid which produces a single onion-like leaf that can grow to 40 cm long. Grows on poorly drained grey clay soils that support low heathland and sedgeland communities. The underground dormant tubers commence shooting in mid winter and leaves are known to have emerged above ground by June. The flowering period reliably commences in the first week of November and extends for about 3 weeks. The fruit (small green ovoid capsules) develop rapidly following flowering and eventually split to release fine dust-like seeds. Each capsule contains thousands of seeds that are primarily wind dispersed. By January the leaves and fruiting stems have withered and the plants then persist as underground tubers until they resprout the following winter. Jervis Bay Leek Orchid is currently known from three areas south-east of Nowra on South Coast. These are Kinghorne Point, Wowly Gully near the town of Callala Bay, and near the township of Vincentia.	occurs within the Study Area. No known records of the species occur within the Site.	Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Villous Mint-bush (<i>Prosanthera densa</i>)	V	V	PMST-L	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. Villous Mint-bush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat

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Illawarra Greenhood (<i>Pterostylis gibbosa</i>)	E	E	BioNet-109 PMST-K	Illawarra Greenhood is a ground orchid whose known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Illawarra region, the species grows in woodland dominated by Forest Red Gum (<i>Eucalyptus tereticornis</i>), Woollybutt (<i>E. longifolia</i>) and White Feather Honey-myrtle (<i>Melaleuca decora</i>). Near Nowra, the species grows in an open forest of Spotted Gum (<i>Corymbia maculata</i>), Forest Red Gum and Grey Ironbark (<i>E. paniculata</i>). In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark (<i>E. crebra</i>), Forest Red Gum and Black Cypress Pine (<i>Callitris endlicheri</i>). The Illawarra Greenhood is a deciduous orchid that is only visible above the ground between late summer and spring, and only when soil moisture levels can sustain its growth. The leaf rosette grows from an underground tuber in late summer, followed by the flower stem in winter. After a spring flowering, the plant begins to die back and seed capsules form (if pollination has taken place). As with many other greenhoods, male fungus gnats are believed to be the pollinator. The Illawarra Greenhood can survive occasional burning and grazing because of its capacity to reshoot from an underground tuber. Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra). It is apparently extinct in western Sydney which is the area where it was first collected ('1803).	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Pretty Greenhood (<i>Pterostylis pulchella</i>)	V	V	BioNet-1 PMST-K	The Waterfall Greenhood is found on cliff faces close to waterfalls and creek banks and mossy rocks alongside running water. Flowers appear from February to May. The Waterfall Greenhood is found only at Fitzroy Falls, Belmore Falls, upper Bundanoon Creek (Meryla) and Minnamurra Falls.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat

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<i>Pterostylis ventricosa</i>	CE	-	BioNet-1	Predominantly in more open areas of tall coastal eucalypt forest often dominated by one or more of the following tree species:- Terpetine, Spotted Gum, Grey Ironbark, Blackbutt, White Stringybark, Scribbly Gum and Sydney Peppermint.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Halbury Rustyhood (<i>Pterostylis vernalis</i>)	CE	CE	BioNet-28 PMST-K	Halbury Rustyhood is a perennial ground orchid with flowering stems 10-20 cm tall. <i>Pterostylis vernalis</i> grows in open sites around moss gardens in shallow soil over sandstone sheets or moss gardens on heavy laterite associated soils, in heath and dry heathy forest/woodland. The distribution of the plants throughout its range is naturally patchy as the species is often restricted to sections of rock shelf where there is only a thin layer of soil over the rock shelf and where these sites are subject to particular hydrological conditions. Habitat generally contains moss gardens on various substrates. <i>Pterostylis vernalis</i> is a seasonal perennial which is present above ground in the cooler months between late autumn until it sets seed in late spring. The above ground parts then wither and the plants persist as a dormant tuber underground over summer. <i>Pterostylis vernalis</i> is the only <i>Pterostylis</i> species in the vicinity of Nowra that flowers in spring.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Eastern Underground Orchid (<i>Rhizanthella slateri</i>)	V	E	PMST-K	Eastern Underground Orchid is an orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. The flowering heads mature below the soil surface or may extend to 2 cm above the ground. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore, usually located only when the soil is disturbed. Flowers September to November.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat

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Scrub Turpentine, Brown Malletwood (<i>Rhodamnia rubescens</i>)	CE	-	BioNet-11 PMST-K	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Scrub Turpentine is a shrub or small tree to 25 m high with reddish/brown, fissured bark. It is found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts. Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>R. rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Native Guava (<i>Rhodomyrtus psidioides</i>)	CE	-	PMST-M	Native Guava is a shrub or small tree to 12 m high. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts. Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
<i>Solanum celatum</i>	E	-	BioNet-4	<i>Solanum celatum</i> is a shrub 1 - 2.5 m high. It grows in rainforest clearings, or in wet sclerophyll forests. Flowers August to October and produces fruit December to January. Fire sensitive obligate seeder, with adult plants killed by fire and recruitment occurring from a soil stored seed bank. Normally recorded in disturbed margins and clearings. Restricted to an area from Wollongong to just south of Nowra, and west to Bungonia. Majority of records are prior to 1960	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
				and the majority of populations are likely to have been lost to clearing.		
Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	E	V	BioNet – 4 PMST-K	Magenta Lilly Pilly occurs on the south coast, where it is found on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Kangaloon Sun Orchid (<i>Thelymitra kangaloonica</i>)	CE	CE	PMST-M	Kangaloon Sun Orchid is found in swamps in sedgelands over grey silty grey loam soils. It is thought to be a short-lived perennial, flowering in late October and early November. The species is only known to occur on the southern tablelands of NSW in the Moss Vale / Kangaloon / Fitzroy Falls area at 550-700 m above sea level. It is known to occur at three swamps that are above the Kangaloon Aquifer. These swamps are a part of the ecological community "Coastal Upland Swamp" a TEC.	Absent: No suitable aquatic and/or wetland habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Austral Toadflax, Toadflax (<i>Thesium australe</i>)	V	V	PMST-L	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys. No known records of the species occur within the Site.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant impacts on the species or its habitat
Nowra Heath Myrtle (<i>Triplarina nowraensis</i>)	E	E	BioNet-408 PMST-K	Nowra Heath Myrtle is a small, erect shrub to 5 m tall that occurs on poorly drained, gently sloping sandstone shelves or along creek lines underlain by Nowra Sandstone. The sites are often either treeless or have a very open tree canopy due to the impeded drainage. Individuals have been observed to resprout from lignotubers and they are also expected to reproduce from seed though this needs to be confirmed.	Low: limited suitable habitat for the species occurs within the Study Area. The species was not recorded along RMT during surveys.	Unlikely: limited suitable habitat for the species is present in vegetated areas. It is considered unlikely the proposed works would result in significant

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Swamp Everlasting, Swamp Paper Daisy (<i>Xerochrysum palustre</i>)	-	V	PMST-M	There are five known populations of Nowra Heath Myrtle. Three of these forms a cluster to the immediate west of Nowra. A fourth, much smaller population is found 18km south-west of Nowra in the Boolijong Creek Valley. The fifth population is located north of the Shoalhaven River on the plateau above Bundanon. Swamp Everlasting is a perennial, erect herb growing to 30-100 cm tall. rows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses. Re-sprouts after fires. Sometimes grows in bogs with Sphagnum. Swamp Everlasting is endemic to south-eastern Australia, where it is widely distributed from south-eastern New South Wales through Victoria to north-eastern Tasmania. In New South Wales it occurs as far north as the Southern Tablelands and ranges up to about 1300 m altitude. In Victoria, the species is widely but patchily distributed from the South Australian border to near Bairnesdale, generally below 500 m altitude.	No known records of the species occur within the Site.	impacts on the species or its habitat
Bomaderry Zieria (<i>Zieria baeuerlenii</i>)	E	E	BioNet-117 PMST-K	Bomaderry Zieria is an 80 cm tall shrub, it occurs on skeletal sandy loam overlaying sandstone, on a rocky plateau amongst sandstone boulders in either shrubby open forest, shrubby woodland or closed scrub. Seed production has never been observed in the Bomaderry Zieria and all evidence collected to date suggests that the species has lost its capacity to reproduce sexually. Plants resprout following fire. The species occurs in only one location north-west of Nowra. The population occurs in a total of 43 colonies in six discrete clusters. These clusters are confined within a 0.5 km x 1.0 km area of the bushland, and are found on both sides of Bomaderry Creek.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Warty Zieria (<i>Zieria tuberculata</i>)	V	V	BioNet-5	Grows in the Mt. Dromedary and Tilba Tilba area. A total of 13 sites are currently known and the total population (all age classes) is about 3,000 plants. The Warty Zieria grows in heath amongst rocky outcrops on rain forest edges and in tall forest and shrubland.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Vegetation Communities						
Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community	EEC	EEC	PMST-L	Coastal Swamp Oak Forest is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Coastal Swamp Oak Forest has a dense to sparse tree layer in which <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagui. Other trees including <i>Acmena smithii</i> (lilly pilly), <i>Glochidion</i> spp. (cheese trees) and <i>Melaleuca</i> spp. (paperbarks) may be present as subordinate species, and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and <i>Melaleuca ericifolia</i> is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines, <i>Parsonsia straminea</i>, <i>Geitonoplesium cymosum</i> and <i>Stephania japonica</i> var. <i>discolor</i>, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. The composition of the ground stratum varies depending on levels of salinity in the groundwater. Under less saline conditions prominent ground layer plants include forbs such <i>Centella asiatica</i>, <i>Commelina cyanea</i>, <i>Persicaria decipiens</i> and <i>Viola banksii</i>; graminoids such as <i>Carex appressa</i>, <i>Gahnia clarkei</i>, <i>Lomandra longifolia</i>, <i>Oplismenus imbecillis</i>; and the fern <i>Hypolepis muelleri</i>. On the fringes of coastal estuaries, where soils are more saline, the ground layer may include the threatened grass species, <i>Alexfloydia repens</i>, as well as <i>Baumea juncea</i>, <i>Juncus kraussii</i>, <i>Phragmites australis</i>, <i>Selliera radicans</i> and other saltmarsh species.	Absent: No suitable habitat for the species occurs within the Study Area. No known records of the species occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
Illawarra and south coast lowland forest and	CEEC	CEEC	PMST-L	The Lowlands Grassy Forest occurs in near coastal areas below about 200 metres on gently undulating terrain. It occurs on Berry Siltstone, Budgong Sandstone and Quaternary	Moderate: Suitable habitat and associated species occur within	Unlikely: suitable habitat for this TEC occurs within the Study

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
woodland ecological community				Alluvium. Much of this community has been cleared and it now occurs chiefly as scattered fragments. Provides habitat for the endangered orchid <i>Pterostylis gibbosa</i>. Some remnants consist of regrowth after clearing or other disturbances. This community comprises vegetation types that occupy the Illawarra coastal plain and escarpment foothills. Characteristic tree species include Forest Red Gum (<i>Eucalyptus tereticornis</i>), Thin-leaved Stringybark (<i>Eucalyptus eugenioides</i>), Woollybutt (<i>Eucalyptus longifolia</i>), Coast Grey Box (<i>Eucalyptus bosistoana</i>) and White Feather Honey-myrtle (<i>Melaleuca decora</i>). The understorey is not necessarily grassy as moist forest vegetation types are also included within this broad community. Common shrub species include <i>Acacia mearnsii</i> and <i>Dodonaea viscosa subsp. angustifolia</i>. Floodplain vegetation dominated by <i>Casuarina</i> species or rainforests on latite soils are not part of this community.	vegetated areas in the Study Area. PCTs associated with this TEC have been mapped near the Study Area.	Area, however the vegetation community was not recorded therein. Therefore, the proposal is unlikely to result in impacts to this TEC.
Illawarra-Shoalhaven subtropical Rainforest of the Sydney Basin Bioregion	EEC	CEEC	PMST-L	The Illawarra Subtropical Rainforest Occupies the Illawarra coastal plain and escarpment foothills, rarely extending onto the upper escarpment slopes. Usually found on Permian volcanic rocks, but can occur on a range of rock types. Illawarra Subtropical Rainforest (ISR) is a rainforest community that occupies high nutrient soils in the Illawarra region, south of Sydney. Characteristic tree species include <i>Baloghia inophylla</i> (Brush Bloodwood), <i>Brachychiton acerifolius</i> (Flame Tree), <i>Dendrocnide excelsa</i> (Giant Stinging Tree), <i>Diploglottis australis</i> (Native Tamarind), <i>Ficus</i> spp., <i>Pennantia cunninghamii</i> (Brown Beech), and <i>Toona ciliata</i> (Red Cedar). Species of <i>Eucalyptus</i>, <i>Syncarpia</i> and <i>Acacia</i> may also be present as emergents or incorporated into the dense canopy. While rainforest canopies are generally closed, in highly disturbed stands the canopy of ISR may be irregular and open. The height of the canopy varies considerably, and structurally some stands of ISR are scrub.	Absent: No suitable habitat for the vegetation community occurs within the Study Area. No known records of the vegetation community occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	EEC	CEEC	PMST-L	River-flat Eucalypt Forest has an important role in maintaining river ecosystems and riverbank stability due to its habitat. It is associated with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river	Low: Limited suitable habitat for the vegetation community occurs within the Study	Unlikely: limited suitable habitat for the vegetation community occurs within the Study

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
Subtropical and Temperate Coastal Saltmarsh			PMST-L	terraces associated with coastal floodplains. Generally, it occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level. The structure of the community may vary from tall open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees. Typically form mosaics with other floodplain forest communities and treeless wetlands, and often fringe treeless floodplain lagoons or wetlands with semi-permanent standing water. River-Fat Eucalypt Forest on Coastal Floodplains provides habitat for a broad range of animals, including many that are dependent on trees for food, nesting or roosting. These include cormorants and egrets, the Osprey (<i>Pandion haliaetus</i>), Whistling Kite (<i>Haliaeetus spheerurus</i>), White-bellied Sea-eagle (<i>Haliaeetus leucogaster</i>), as well as the Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>), Yellow-bellied Glider (<i>Petaurus australis</i>), Squirrel Glider (<i>Petaurus norfolcensis</i>), Sugar Glider (<i>Petaurus breviceps</i>) and Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>).	Area and the broader locality. No known records of the vegetation community occur within the Site	Area, but it was not recorded during surveys. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.
				Species composition varies with elevation and latitude. with Saltmarsh in southern NSW being generally more species-rich than further north. The sediment surface may support a diversity of seaweed species. Species restricted to coastal saltmarshes include <i>Distichlis distichophylla</i> (Endangered), <i>Halosarcia pergranulata</i> subsp. <i>pergranulata</i> , <i>Wilsonia backhousei</i> (Vulnerable) and <i>Wilsonia rotundifolia</i> (Endangered). Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include <i>Baumea juncea</i> , Sea Rush (<i>Juncus kraussii</i> subsp. <i>australiensis</i>), Samphire (<i>Sarcocornia quinqueflora</i> subsp. <i>quinqueflora</i>), Marine Couch (<i>Sporobolus virginicus</i>), Streaked Arrowgrass (<i>Triglochin striata</i>), Knobby Club-rush (<i>Ficinia nodosa</i>), Creeping Brookweed (<i>Samolus repens</i>), Swamp Weed (<i>Selliera sellicana</i>), Seablite (<i>Suaeda australis</i>) and Prickly Couch (<i>Zoysia macrantha</i>). Occasionally mangroves	Absent: No suitable habitat for the vegetation community occurs within the Study Area. No known records of the vegetation community occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

Species / Community Name	BC Act / FM Act	EPBC Act	Records Source	Habitat / Community Description	Likelihood of Occurrence	Potential for Impact
BC Act: Blue Mountains Basalt Forest in the Sydney Basin Bioregion EPBC Act: Upland Basalt Eucalypt Forest of the Sydney Basin Bioregion	EEC	EEC	PMST-M	are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans. The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion are generally tall open eucalypt forests found on igneous rock (predominately Tertiary basalt and microsyenite) in, or adjacent to, the Sydney Basin Bioregion. The ecological community occurs in areas of high rainfall, generally ranging from 950 to 1600 mm/year. The ecological community typically occurs as an open to tall open forest with a sparse to dense layer of shrubs and vines, and a diverse understorey of native grasses, forbs, twiners and ferns. the structure of the ecological community may vary from tall open forest with trees up to and above 30 m tall with a projected foliage cover of 30–70% (e.g. <i>Eucalyptus fastigata</i> forest on basalt near Sassafras in and around Morton National Park) to woodland with trees 10–30 m tall, with a projected foliage cover of 10–30% (e.g. exposed woodland on rocky microsyenite at Mt Jellore) depending on aspect, slope, soil conditions, soil depth, and previous clearing and disturbance. The Blue Mountains Basalt Forest is usually a tall eucalypt forest (over 30 m in mature stands) with a dense shrub or small tree layer, often including tree ferns (<i>Cyathea</i> spp.) and moist herbaceous ground cover. The canopy composition is variable but usually dominated by one or more of the species <i>Eucalyptus fastigata</i>, <i>E. blaxlandii</i>, <i>E. cypellocarpa</i> or <i>E. radiata</i> subsp. <i>radiata</i>. Other canopy species which may be locally common or dominant include <i>E. oreades</i> (which is often dominant on south-facing slopes at the transition to a sandstone substrate) and <i>E. viminalis</i>. A eucalypt canopy may be absent from previously cleared or otherwise highly disturbed stands.	Absent: No suitable habitat for the vegetation community occurs within the Study Area. No known records of the vegetation community occur within the Site.	Unlikely: no suitable habitat for the species occurs within the Study Area. Therefore, the proposal is unlikely to result in impacts to the species or its habitat.

APPENDIX

B

ACHDDA



now



Reference: 22016
22 April 2022

Josh Tracey
Environmental Engineer
Cardno/Stantec
By email: Joshua.tracey@cardno.com.au

Dear Josh,

**RE: ABORIGINAL CULTURAL HERITAGE DUE DILIGENCE ADVICE FOR
PROPOSED SURCHARGE MAIN UPGRADES BETWEEN PEPPERMINT DRIVE AND
RATCLIFFE PARK, SOUTH NOWRA, NEW SOUTH WALES**

Austral Archaeology Pty Ltd (Austral) has been engaged by Cardno/Stantec to provide Aboriginal Cultural Heritage Due Diligence Advice (ACHDDA) for the proposed rising main upgrades associated with Peppermint Drive and Ratcliffe Park, South Nowra, New South Wales (NSW) [the study area]. The location of the study area is provided in Figure 1 and Figure 2.

This advice is intended to assist Cardno/Stantec in determining their obligations with regard to the *National Parks and Wildlife Act 1974* (NPW Act) and to determine whether the project will involve activities that may harm Aboriginal objects or places.

The study area is an approximately 30,848 metres² in size and the proposed development involves the insertion of a new rising main between the roundabout at Peppermint Drive and Ratcliffe Park, South Nowra. As part of this project, geotechnical investigations in the form of 5 bore holes will also be excavated between Peppermint Drive and Burradoo Crescent.

Section 87 of the NPW Act makes it a strict liability offence to knowingly or unknowingly harm Aboriginal objects or declared Aboriginal places without an AHIP. Harm is defined under the NPW Act as "*any act or omission that destroys, defaces or damages the object or place or in relation to an object, moves the object from the land on which it had been situated*". The NPW Act allows for a person or organisation to exercise due diligence in determining whether their actions will or are likely to impact upon Aboriginal objects or places. Any person or organisation who can demonstrate that they have exercised due diligence has a defence against prosecution under the strict liability provisions of the NPW Act. Where an activity is likely to harm Aboriginal objects or places, consent in the form of an Aboriginal Heritage Impact Permit (AHIP) is required.

The *National Parks and Wildlife Regulation 2009* (NPW Regulation) adopted the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a) (the Code). The Code sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

- Identify whether Aboriginal objects are, or are likely to be, present within the study area.
- If Aboriginal objects are, or are likely to be present, determine whether their activities are likely to cause harm.
- Determine whether further assessment or an AHIP application is required for the activity to proceed.

This advice has been formulated to provide a robust assessment that will identify whether Aboriginal objects or places are present or are likely to be present within the study area. This has been achieved through the completion of a desktop review and archaeological survey of the study area. The Code provides a series of questions that clarify whether it is applicable to a proposed project. These questions are addressed in Table 1.

Table 1 Applicability of the Code to the proposed activity

Question	Response
Is the activity a declared project under Part 3A of the EP&A Act?	No
Is the activity an exempt activity listed in the NPW Act or other legislation?	No
Will the activity involve harm that is trivial or negligible?	No
Is the activity in an Aboriginal place or are you already aware of Aboriginal objects on the land?	No
Is the activity a low impact activity for which there is a defence in the NPW Regulation?	No
Do you want to use an industry specific code of practice?	No
Do you wish to follow your own procedure?	No

As none of the questions outlined in Table 1 apply to the project, due diligence must be established through using the Code, which consists of a series of 5 steps outlined below.

STEP 1. WILL THE ACTIVITY DISTURB THE GROUND SURFACE OR ANY CULTURALLY MODIFIED TREES?

The proposed undertaking of a rising main upgrade and associated works form part of the South Nowra Surcharge Main, located in South Nowra. Significant ground disturbance in the form of trench excavations will be required for the installation of the pipe which will be around 1.2 metres in width and with a depth varying from between 1 and 10 metres.

The activity will disturb the ground surface and therefore consideration of steps 2a and 2b of the Code is required.

STEP 2A. SEARCH THE ABORIGINAL HERITAGE INFORMATION MANAGEMENT SYSTEM (AHIMS) DATABASE AND USE ANY OTHER SOURCES OF INFORMATION OF WHICH YOU ARE ALREADY AWARE

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted on 15 February 2022 (Client service ID: 659538).

The search identified 58 Aboriginal archaeological sites/objects within a 10 kilometre search area centred on the proposed study area. None of these registered sites are located within the study area (Figure 3).

The nearest previously recorded Aboriginal archaeological site was located approximately 1.7 kilometres from the southern-most boundary of the study area. This site, AHIMS #52-5-0605, is recorded as an 'artefact', which is also the most commonly occurring site type recorded (Table 2).

Spatial information for this report is displayed using the GDA94 Datum. Where AHIMS site records were provided on a different datum, they were converted using standard functions in QGIS software.

Table 2 AHIMS sites identified within 10 kilometres of the study area.

Site type	Occurrence	Percentage (%) Frequency
Artefact	26	44.83
Art (Pigment or Engraved)	7	12.07
Potential Archaeological Deposit (PAD)	6	10.34
Artefact, Potential Archaeological Deposit (PAD)-	4	6.90
Grinding Groove	3	5.17
Modified Tree (Carved or Scarred)	3	5.17
Artefact, Art (Pigment or Engraved)	2	3.45
Artefact, Grinding Groove	1	1.72
Artefact, Habitation Structure	1	1.72
Artefact, Habitation Structure, Grinding Groove	1	1.72
Burial	1	1.72
Grinding Groove, Artefact, Art (Pigment or Engraved)	1	1.72
Grinding Groove, Habitation Structure -	1	1.72
Shell, Artefact	1	1.72
Total	58	100.00

Overall, the site types with the highest frequencies within 10 kilometres of the study area were artefacts (n=37, 63.78%), art sites (n=10, 17.24%) and PAD (n=10, 17.24%). Therefore, the overall highest site types are artefacts, either singular or multiple, and this is the form that Aboriginal cultural material is most likely to take in the study area. However, high levels of disturbance present within the study area impacts the identification of Aboriginal archaeological site types occurring due to the levelling, excavation and construction works that have been undertaken.

A review of the reports held on the AHIMS database identified several archaeological studies which have been undertaken within the locality of the study area. These are summarised in Table 3. Austral has also undertaken a review of information to identify whether the activity is located within landscape features likely to contain Aboriginal objects. This includes an assessment of ethnographic information, soils, geology, landform, disturbance and resource information pertinent to the study area. The outcome of this review is outlined in Table 4.

Table 3 Archaeological studies undertaken in the vicinity of the study area.

Author	Details
Paton (1990)	Completed a report on a 500m wide strip of land located approximately 1km south-east of the study area on the edge of Brundee Swamp. Two artefact sites had previously been recorded; AHIMS #52-2-204, which contained one stone artefact, and AHIMS #52-5-502, which contained 4 stone artefacts. Both of these sites were located on a level ground area that was adjacent to the swamp.
Navin (1992)	Completed an archaeological investigation on a 900m by 700m sized area located approximately 5km north-east of the study area on the northern side of the Shoalhaven River. Two isolated finds were recorded. APPM Isolated Find 1 (AHIMS not available at this time) was a stone hatchet found in a drainage ditch. APPM Isolated Find 2 (AHIMS not available at this time) was a broken water-worn pebble with some flake scars. Several trees displaying scarring were noted, however, it was determined that the likelihood of these being Aboriginal in origin was minimal and instead they appeared to be natural scars. Much of this study area was likely disturbed by flood scouring and subsequent erosion.
Kuskie (1995)	Undertook an Aboriginal archaeological assessment approximately 200m north of the study area over an area measuring 350m by 550m. No Aboriginal objects were identified. The lack of archaeology in this area was attributed to a low intensity of use by Aboriginal people and/or due to the impacts of recent land practices.
Clarke & Kuskie (2006)	Completed an Aboriginal heritage and cultural mapping project across the lower Shoalhaven River Basin, encompassing the study area. This study was a predictive modelling project that identified that artefact scatters were the most likely site type to occur within virtually any landscape across the region. It was noted that these artefact sites would likely occur in low densities which were consistent with background discard but some areas of high density would occur which was characteristic of campsites. No archaeological sites were identified during this project.

Author	Details
Kelleher Nightingale Consulting Pty Ltd (2010)	Completed a report on an area located approximately 7km north-west of the study area. The study area consisted of a forested sloped area that varied from gentle to moderately steep. An exposed sandstone escarpment was visible. A total of 28 sites were located; these included 20 rock shelters and an axe-grinding site that were located on the escarpment. There were 4 open sites which included artefact scatters, 2 isolated finds and one open midden site. One recent scar tree was also recorded. The artefact scatters included 'BCRP 014 – West Cambewarra Open Site 02' (AHIMS #52-5-0546), which was located near a terrace, 2m above Bomaderry Creek. More than 20 artefacts were noted, including some made from fine-grained material, grey silcrete and a pale white fine-grained material.
Kayandel Archaeological Services (2011)	The study area was approximately 5.5 km in length with the southern-most point located 3km north of the present study area. This was located along the edges of modern road reserves, with a combination of open grassland and modern housing development located alongside the road. No Aboriginal objects were identified as being within the impact area during the site survey.
Artefact Heritage Pty Ltd (2018)	Artefact Heritage undertook an Aboriginal Cultural Heritage Assessment at the northern and southern ends of Nowra Bridge, covering a total of 61 hectares and located 4km north-west of the study area. This area is located at the Shoalhaven River Margins and extends north and south where the landscape comprises open parkland and developed urban areas. There were 10 sites included within the study area recorded by Artefact during their survey and testing works. Along the edge of the north side of the Shoalhaven River was one scar tree (AHIMS #52-5-0857) and one PAD (AHIMS #52-5-0860). Located slightly higher on the terrace were 3 artefact scatters (AHIMS #52-2-0853, #52-5-0855 and #52-5-085). One further artefact scatter was recorded on the south side of the bridge on a flat area next to the road reserve (AHIMS #52-5-0852). There were 2 additional PADs recorded north of the river, located to the north and south of the Bomaderry Creek on either side of Princes Highway (AHIMS #52-5-0858 and #52-5-0854). Two other small PADS were located on the south side of the river, located on small grassed flat areas next to road reserves (AHIMS #52-5-0852 and #52-5-0859).
Austral Archaeology Pty Ltd (2021)	Due Diligence advice was previously provided to Cardno in 2021 regarding the South Nowra Surcharge Main, which is part of the same project as the current study area. No Aboriginal cultural heritage was identified during the survey but an area of moderate potential and another area of high potential were recorded, outside of the current study area.

Table 4 Assessment of landscape features

Information	Details
Ethnographic	Tindale identified the Dharawal-speaking Wodi Wodi group as the Aboriginal custodians of the Nowra area (Tindale 1974, p.156). The Shoalhaven region was a very densely populated area with between 2 to 4 people present per km² (Organ & Speechley 1997, p.1). It has been estimated that in 1825 there were 1,800 Aboriginal people in the Shoalhaven area, spread as far south as Batemans Bay (Organ & Speechley 1997). Ethnohistorical sources indicate the diverse economy of the local area. In terms of food sources or subsistence activities recorded, fish and fishing are commonly noted, in addition to the gathering of shellfish and also the exploitation of sea mammals where possible (Boot 1994, Sullivan 1982, pp.25–27). In hinterland areas, macropods and possums are the most frequently mentioned animal foods. Other animal food items mentioned include birds, honey, reptiles, dogs, grubs and bandicoots (Sullivan 1982, p.44). The most commonly mentioned plant foods are fruits, berries, cabbage palms and macrozamia (burrawangs), and there are references to roots and yams (Sullivan 1982, p.43). Low (1992) lists a possible 72 edible plant species, the known distributions of which take in the study area and surrounds. The Aboriginal people of the area also had a diverse material culture, and ethnographically recorded items include; spears, both barbed and unbarbed and possibly made from 2 pieces of wood and pointed, clubs made of “heavy wood”, bark canoes which ranged from about 7’6” to 12’ (2.28 to 3.65m) in length, fishing lines and nets, stone axes, vine traps, ropes, weirs (as mentioned above for catching fish), bark huts, bark containers and shields, containers made from knots on trees, possum and kangaroo skin cloaks, possum fur string, items of personal adornment such as kangaroo tooth necklaces, body paint, belts and ‘kilts’ for ceremonial occasions, and ceremonial items such as bull roarers (Sullivan 1982, pp.25–77).
Soils	The study area is within the Shoalhaven sandstone landscape (Figure 4). The Shoalhaven sandstone landscape is moderately deep: between 500mm to 1m. It consists of 6 dominant soil formations: Prairie, Red Earths and Yellow and Red Podzolic, Alluvial and Gleyed Podzolic Prairie soils found on levees, Red Earths and Yellow and Red Podzolic soils found on the terraces, and Alluvial Soils and Gleyed Podzolic (potential Acid Sulphate) soils located on the floodplains (Hazelton et al. 1992, p.63). The Shoalhaven soil landscape is characterised by 4 different forms within the soil profile. This profile includes sf1, a brownish-black to brown colour that is a fine sandy loam that exhibits hard setting behaviour; sf2, a brown to yellowish-brown colour that this a weakly pedal light sandy clay loam; sf3, a yellowish-brown sandy clay; and sf4, a reddish-brown colour with a moderately pedal medium clay (Hazelton et al. 1992, p.69).



Information	Details
Hydrology	The study area is located within the Shoalhaven River catchment area. The Shoalhaven River has a catchment area of approximately 7,250km ² . The Shoalhaven River has 2 mouths – one permanently open at Crookhaven Heads; the other intermittently open at Shoalhaven Heads, approximately 5 kilometres further north. In the north-western portion of the study area, a 1 st and 2 nd order creek are present. The 2 nd order creek runs from south to north before connecting with Crookhaven Creek (Figure 5). This has been modified in the northern part of the study area where it runs through Terra Swamp and is crossed by a small 1 st order creek which has also been realigned.
Landform	The study area is located in the southern portion of the Sydney Basin. It is characterised by level to gently undulating riverbeds and banks as well as active floodplains (Hazelton et al. 1992, p.68). The Terra Swamp borders the north end of the study area. Behind this, the ground rises into gentle slopes, with 2 hill crests included in the study area. Along one hillcrest is The Garden Walk, and the second is lined by Worrigee Road. To the south is the Worrigee Swamp, which has been transformed into housing developments, heavily modifying the study area and surrounds into modern subdivisions.
Disturbance	The study area consists of roadways that have been heavily disturbed and areas of natural ground that show limited signs of disturbance. The northern portion of the study area through Terra Swamp shows signs of some modification and disturbance through the construction of the existing sewer pipeline which is located partially on the western boundary. However, the excavation for this is unlikely to have been more than 2 metres wide based on the plans for the currently proposed works. In 1969, the study area was surrounded by undeveloped farmland, with housing development starting to encroach from the west, as seen in Figure 6. The housing development has been built up along the western side of the study area since the 1960s (Figure 6). The parts of the study area in Ratcliffe Park showed some signs of modification to the eastern side of the park which had been excavated out. A small portion located to the north end of the park showed no signs of disturbance, with no pipeline recorded in this low potential area. The area of the creek located to the south of Ratcliffe Park also has an existing pipeline running through it, however, this is also likely to have had excavations that were no more than 2 metres in width for the installation of the pipe. It is important to note that the creek has been fenced off close to the east and west sides, and terraces have been removed, that may have held archaeological potential above the creeks high water level. The southern and eastern portions of the site have been heavily disturbed as they are located within a road reserve or a recently developed area of the town (Figure 7 to Figure 10).



Information	Details
Resources	Before the removal of the natural vegetation, the ecological diversity of the area would have provided a wide range of resources for Aboriginal people. The Shoalhaven landscape is almost completely cleared except for small concentrations of <i>Melaleuca quinquenervia</i> (decorative paperbark), <i>Quercus bicolor</i> (swamp oak), <i>Brachychiton acerifolius</i> (Illawarra flame trees) and various reeds. Similarly, the Nowra landscape has also been nearly completely cleared, however, it still retains several tree species, including <i>Syncarpia glomulifera</i> (turpentine), <i>Eucalyptus punctata</i> (grey gum), <i>Corymbia maulata</i> (spotted gum), <i>E. piperita</i> (Sydney peppermint), <i>E. obliqua</i> (thinleaved stringybark), <i>C. gummifera</i> (red bloodwood), <i>Allocasuarina torulosa</i> (forest oak) and <i>E. pilularis</i> (blackbutt) (Department of Environment and Conservation 2005, Stewart & Percival 1997). The soft, spongy bark of the Illawarra flame tree was used to make nets and fishing lines, while sap from the red bloodwood trees were utilised to tan fishing nets for stability and stain artefacts for ownership and creative and spiritual expression (Grieves 2008, Department of Environment and Conservation 2005). Swamp oak bark provided material for canoe making and bark from the paperbark tree was used for bedding and blankets (Department of Environment and Conservation 2005). The study area and its surroundings would have provided habitats for mammals including kangaroos, brush-tail possums, sugar gliders and common wombats, and the rivers and creeks nearby would provide access to additional faunal resources such as fish, a range of water birds and a variety of lizards. (Grieves 2008, Department of Environment and Conservation 2005). Swamp oak bark provided material for canoe making and bark from the paperbark tree was used for bedding and blankets (Department of Environment and Conservation 2005). The study area and its surroundings would have provided habitats for mammals including kangaroos, brush-tail possums, sugar gliders and common wombats, and the rivers and creeks nearby would provide access to additional faunal resources such as fish, a range of water birds and a variety of lizards. These resources would have provided food for Aboriginal people travelling between the coastline and further inland along the Shoalhaven River and its tributaries (Attenbrow 2003). As well as being important food sources, animal products were also utilised for tool making. Examples include 'bone points', which would have functioned as awls or piercers, as well as tail sinews, which were used to make fastening cords. Animals such as brush-tailed possums were highly prized for their fur, with possum-skin cloaks (Attenbrow 2003). Many of the flora and fauna species found within the vicinity of the study area were crucial for Aboriginal people and were used for numerous purposes as well as providing habitat for faunal resources (Attenbrow 2003).

Based upon the results of these background studies, Austral has been able to develop a series of predictive statements relating to the type and character of Aboriginal cultural heritage sites that are likely to exist in the study area and where they are more likely to be located. These predictive statements indicate that:

- Artefact scatters are most likely to occur on raised, level ground, near sources of freshwater or wetlands, or along spur crest or ridgelines.
- Subsurface archaeological material can be found in areas where no visible surface archaeological remains are evident.
- While surface artefact scatters may indicate the presence of archaeological deposits, surface artefact distribution and density may not accurately reflect those of subsurface archaeological deposits.
- PADs are most likely to occur along valley floors and low slopes in well-drained areas.
- Sites are most likely to occur at or close to ecotones, i.e., where different environments meet.
- Low lying wetland areas subject to constant inundation will be unlikely to contain Aboriginal occupation.
- A low density “background” of artefacts in the form of isolated finds, subsurface or surface scatters will exist in areas not considered primary occupation sites.

STEP 2B. ACTIVITIES IN AREAS WHERE LANDSCAPE FEATURES INDICATE THE PRESENCE OF ABORIGINAL OBJECTS

Table 5 Applicability landscape features from the Code likely to have Aboriginal objects to the study area.

Question	Response
Is the activity within 200m of 'waters'?	Yes
Is the activity within a sand dune system?	No
Is the activity located on a ridge top, ridge line or headland?	No
Is the activity located within 200m below or above a cliff face?	No
Is the activity within 20m of or in a cave, rock shelter or cave mouth?	No
Is the activity (or any part of it) on land that is disturbed?	Yes
Do the predictive statements of 2A indicate Aboriginal Objects or places are likely to occur on any of the topographic elements of the activity area?	No

The proposed works are being undertaken within the township of Nowra, which is disturbed land, and within 200 metres of water. The study area has been impacted by the development of the suburb, which has resulted in significant ground disturbance. Areas that have not been heavily disturbed may contain previously unrecorded Aboriginal cultural heritage.

STEP 3. CAN YOU AVOID HARM TO THE OBJECT OR DISTURBANCE OF THE LANDSCAPE FEATURE?

Due to the nature of the proposed work, it is not possible to avoid harm to objects or landscape features identified in Table 4.

STEP 4. DESKTOP ASSESSMENT AND VISUAL INSPECTION

In order to ground-truth the desktop assessment, a visual inspection of the study area was undertaken on 11 March 2022 by Taylor Foster (Archaeologist, Austral) and Nowra Local Aboriginal Land Council representative Trudy Trindall. The visual inspection consisted of a systematic pedestrian survey of the study area to identify and record any Aboriginal archaeological sites visible on the surface or areas of Aboriginal archaeological potential and cultural sensitivity. The archaeological survey was conducted on foot. The methods used during the visual inspection conformed to requirements 5 to 8 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b).

The survey began at Ratcliffe Park, in the north-western portion of the study area and terminated at Peppermint Drive in the south-eastern section. During the inspection, it was noted that the study area had been heavily landscaped and modified during suburban development (Figure 7 to Figure 10). As part of this development, a majority of the study area has been excavated, levelled and filled for the development of housing and roads.

An additional visual inspection was undertaken on 14 April 2022 by Taylor Foster to further investigate the study area between Buraddo Crescent and Peppermint Drive along Sugarwood Road (Figure 9 and Figure 10). During this inspection, it was recorded that the development of modern infrastructure had impacted the landscape and the likelihood of any subsurface archaeology with bulk earthworks. During the site visit, Ground Surface Visibility was recorded as low in grassed areas and afforded only in areas of high disturbance, such as the road reserve and in heavily landscaped lawns.

It was assessed by both Austral and LALC members that the proposed development had a limited potential to harm cultural values. The results of the visual inspection are outlined in Figure 11.

STEP 5. FURTHER INVESTIGATIONS AND IMPACT ASSESSMENT

Based upon the outcome of steps 1 to 4 of the Code, no further assessment is warranted based on the levels of disturbance identified during the site inspection. As such the project may proceed with caution. The following recommendations apply:

1. No further investigations are required in regards to Aboriginal cultural heritage and the works can proceed with caution.
2. All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by Heritage NSW. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying Heritage NSW and Aboriginal stakeholders.
3. Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity, you must:
 - immediately cease all work at that location and not further move or disturb the remains
 - notify the NSW Police and Heritage NSW's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location
 - not recommence work at that location unless authorised in writing by Heritage NSW.



If you have any questions regarding the advice within this letter, please do not hesitate to contact me on the details below.

Yours sincerely,

Nicole Monk

Archaeologist

Austral Archaeology

M: 0429 625 098

E: nicolem@australarch.com.au

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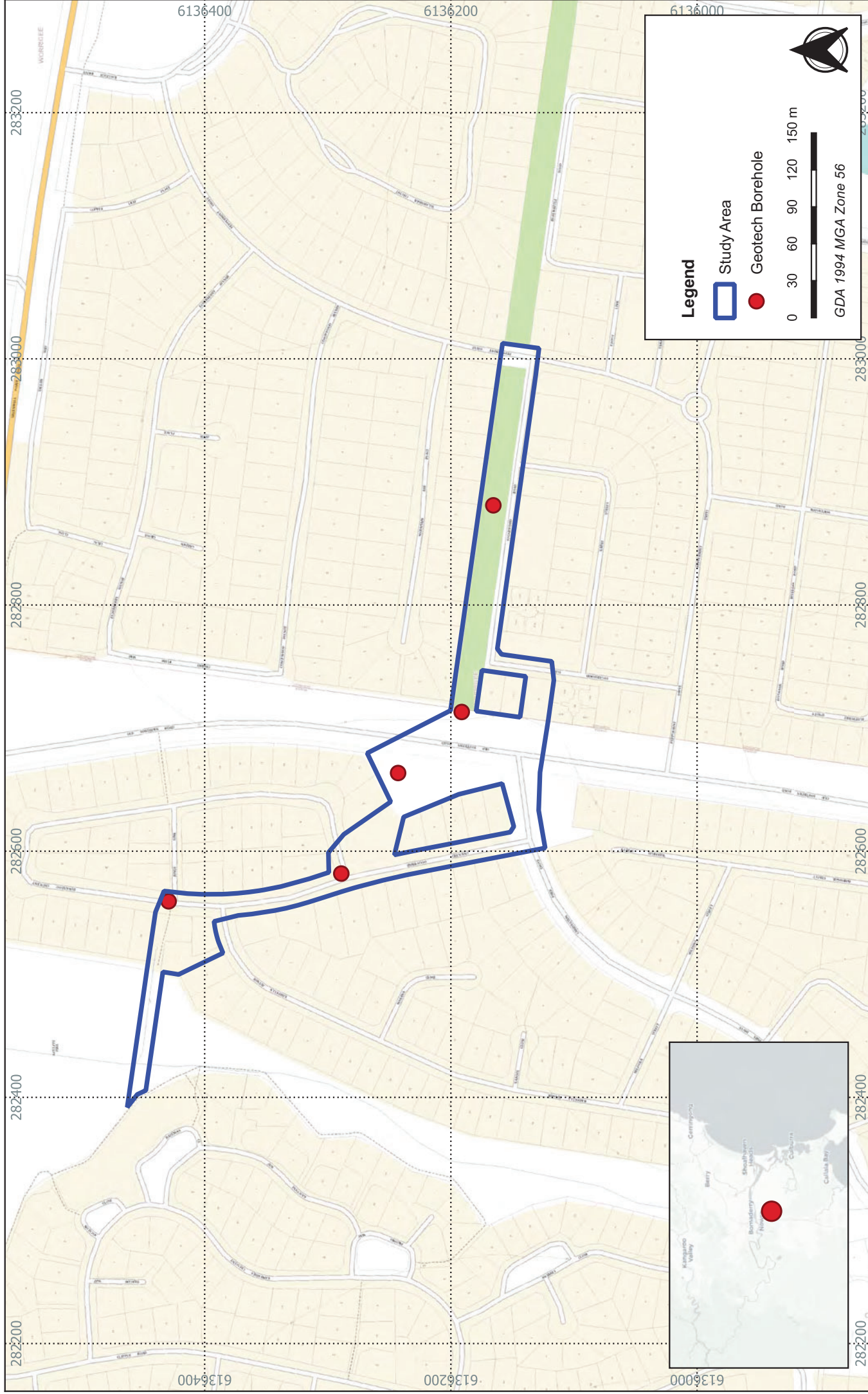


Figure 1 - Location of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Basemap, CartoDB Positron

Drawn by: ARH Date: 2022-04-20



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Figure 2 - Detailed aerial of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Aerial, CartoDB Positron

Drawn by: ARH Date: 2022-04-20

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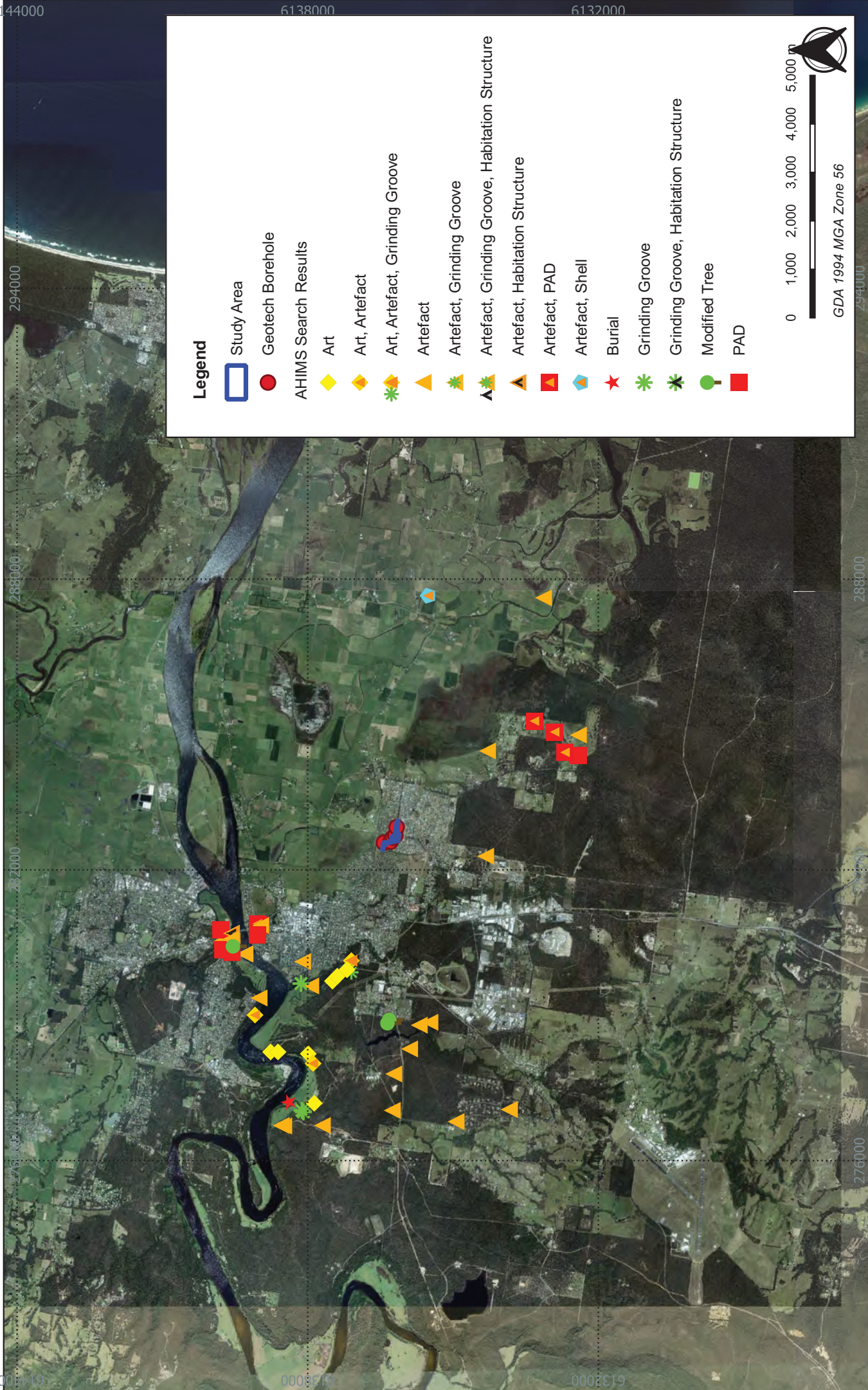


Figure 3 - AHIMS within 10km of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Aerial

Drawn by: ARH Date: 2022-04-20

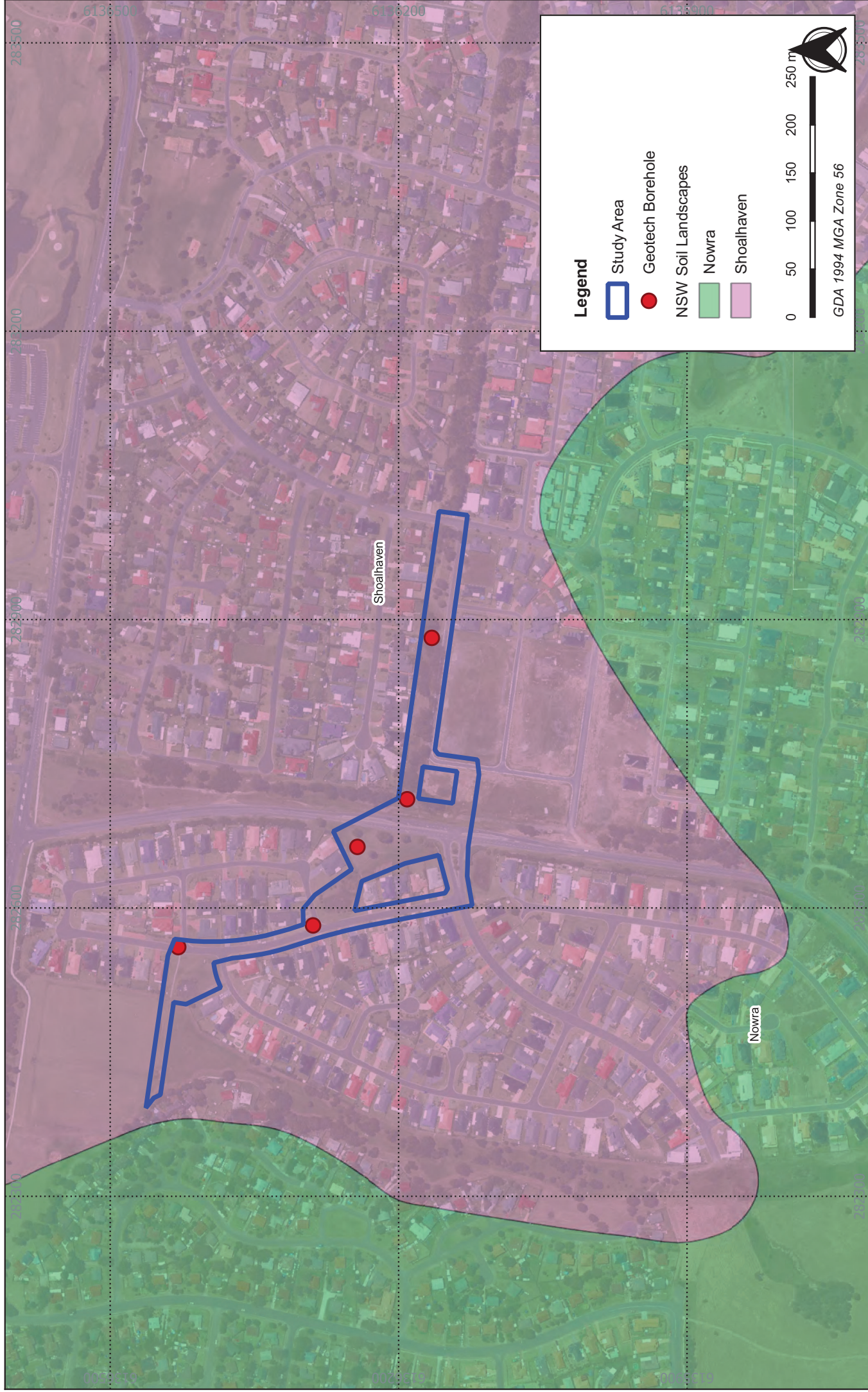


Figure 4 - Soils landscape of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Aerial, NSW Soil Landscape

Drawn by: ARH Date: 2022-04-20



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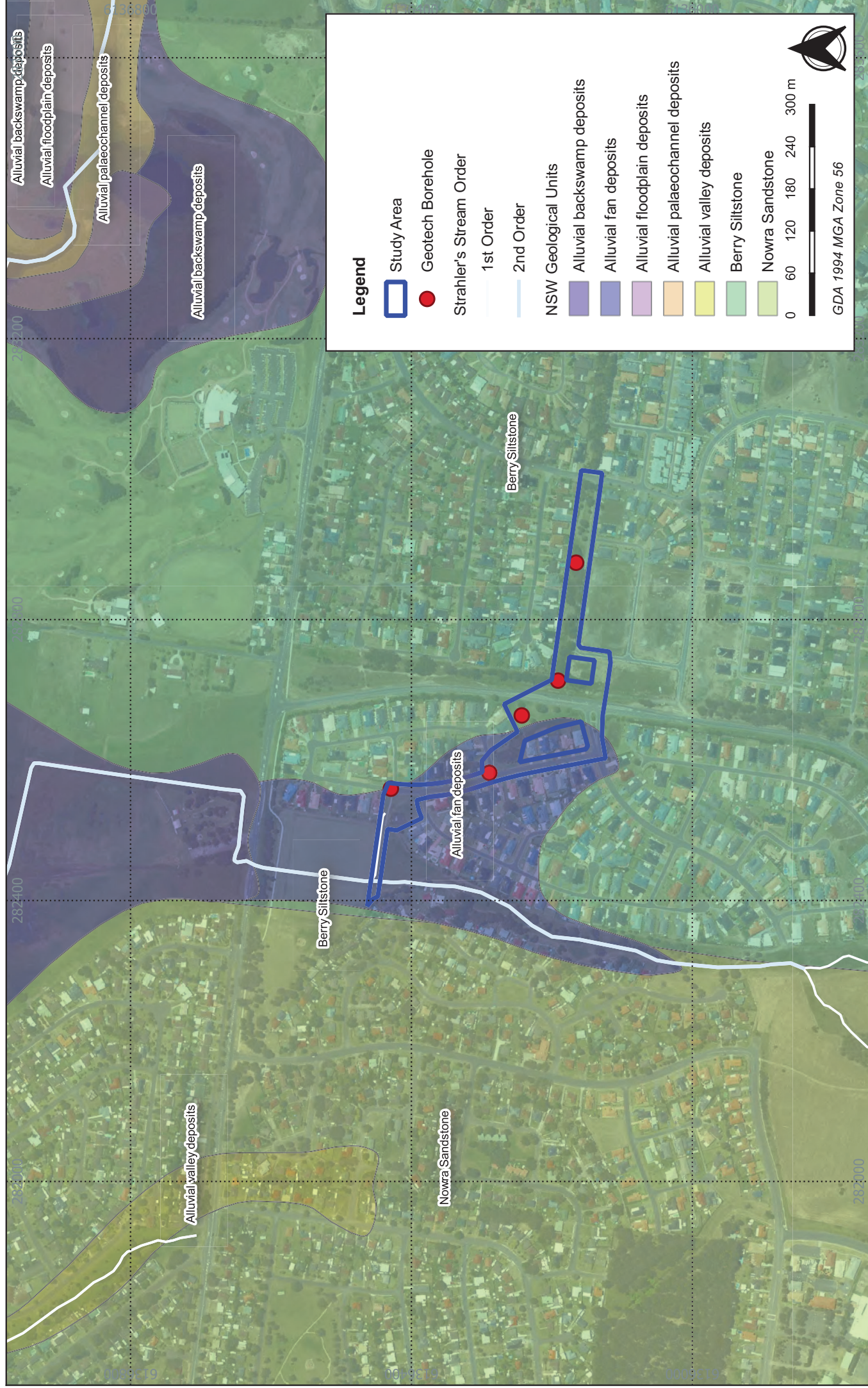


Figure 5 - Geology and Hydrology of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Aerial, NSW Geological Units

Drawn by: ARH Date: 2022-04-20

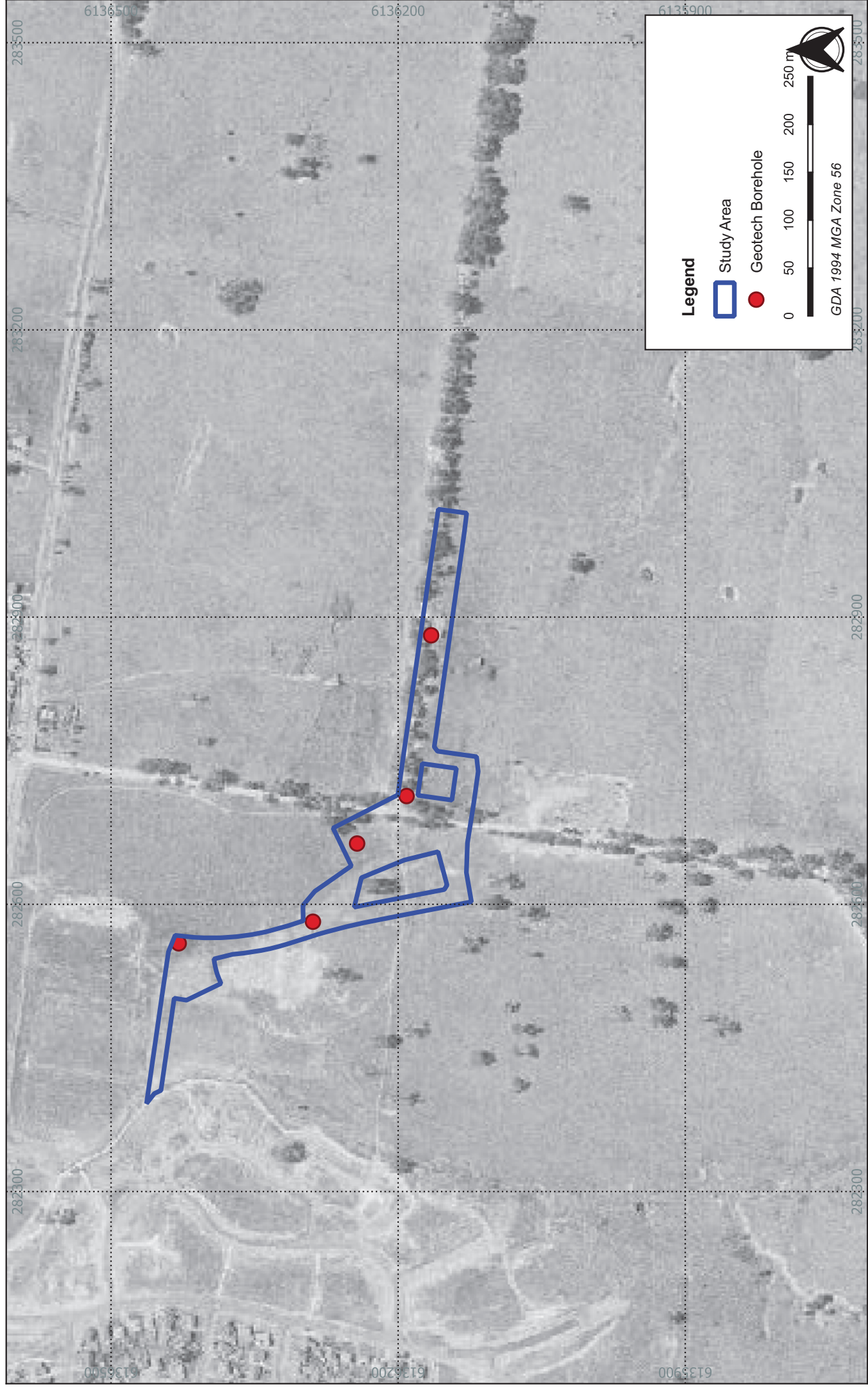


Figure 6 - 1969 Aerial of the study area

22016 - South Nowra , Rising Main

Source: NSW Spatial Services

Drawn by: ARH Date: 2022-04-20



Figure 7 South facing view of the study area on Burradoo Crescent.



Figure 8 North-west facing view of the study area with Ratcliffe Park in the north-west.



Figure 9 East facing view of the study area.



Figure 10 East facing view along Sugarwood Road.



Figure 11 - Archaeological potential of the study area

22016 - South Nowra , Rising Main

Source: NSW LPI Aerial

Drawn by: ARH Date: 2022-04-GI

APPENDIX

C

PSI



now



Preliminary Site Investigation

Design Amendments of South Nowra Surcharge Main - Major Upgrades

WI21102IP

Prepared for
Shoalhaven Water

31 March 2022



now



Contact Information

Cardno (NSW/ACT) Pty Ltd

ABN 95 001 145 035

16 Burelli Street
Wollongong NSW 2500
Australia

www.cardno.com

www.stantec.com

Phone +61 2 4228 4133

Fax +61 2 4228 6811

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Author(s):



Evie Dillon
Graduate Environmental Scientist

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Approved By:



Mitch Blencowe
Senior Environmental Scientist – CEnvP

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

Executive Summary

Cardno (NSW/ACT) Pty Ltd was engaged by Shoalhaven Water (the client) to undertake a Preliminary Site Investigation (PSI) of the proposed upgrade of the South Nowra Surcharge Main (SNSM) (the site). The PSI is being prepared as part of a broader suite of works by Cardno to inform an addendum Review of Environmental Factors (AREF).

An additional rising main was proposed that was not included within the initial assessment area. The site is this proposed additional area of the SNSM and is shown in **Figure 1 and 2, Appendix A** with the site location shown in **Figure 1, Appendix A**. The proposed design amendments of the SNSM upgrade is located within road reserves, drainage reserves, adjacent existing mains and in close proximity to properties located along Sugarwood Road, Carrington Park Drive, Old Southern Road, Burradoo Crescent and Kardella Avenue.

The purpose of this investigation was to undertake a PSI to identify potential contamination issues and constraints on the proposed additional upgrades of the SNSM in order to inform an addendum REF. The objective of the PSI is to assess whether contamination has the potential to exist on the additional part of the initial area, the site, and whether further investigation is needed.

The investigation of the site included:

- > A desktop site history review
- > A site walkover by an Environmental Scientist
- > Preparation of this PSI report.

The key findings of the PSI included:

- > There is potential for fill material of unknown environmental quality to be present within the site associated with the development of the existing electrical storage facility and substation and ridgeline at Ratcliffe Park
- > There is the potential for sewerage leakage from the existing use of the site as a sewerage system.

For the purposes of the site development the above noted contaminant sources present an increased risk to human and ecological health in the event of disturbance during construction however they do not impact site suitability for the proposed use.

Based on the findings of this investigation the following recommendations are made:

- > Prepare a Construction Environmental Management Plan (CEMP) containing an Unexpected Finds Protocol (UFP) outlining appropriate management of contamination items which may be encountered or disturbed by constructions
 - In the event of an unexpected contamination find a suitably qualified environmental consultant will be required to attend site to assess contamination and provide advice on appropriate management or treatment
- > All materials to be disposed of offsite are to be assessed as per the NSW EPA (2014) *Waste Classification Guidelines* or the relevant NSW EPA Resource Recovery Orders prior to removal from site.

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1 Introduction

Cardno (NSW/ACT) Pty Ltd was engaged by Shoalhaven Water (the client) to undertake a Preliminary Site Investigation (PSI) of the proposed upgrade of the South Nowra Surcharge Main (SNSM) (the site). The site boundary is shown in **Figure 1, Appendix A** and is identified as the “Amended REF Study Area”.

The PSI is being prepared as part of a broader suite of works by Cardno to inform an addendum Review of Environmental Factors (AREF). An AREF is required due to an additional rising main being included in the proposed upgrade that not included within the initial assessment area. The proposed development is described in more detail in **Section 1.2**.

This AREF is an addendum to the original REF and PSI prepared by Cardno (Cardno (2021) *WI21102IP_South Nowra_REF_RevB*, dated 22 October 2021).

1.1 Purpose and objectives

The purpose of the PSI is to identify potential contamination issues and constraints associated with the proposed additional upgrades of the SNSM in order to inform an addendum REF.

The objective of the PSI and associated report is to assess whether contamination has the potential to exist on the site and whether further investigation is needed.

1.2 Proposed development

The proposed additional works for the upgrade of the SNSM include:

- > Construction of a new sewer mains between Peppermint Drive and Ratcliffe Park.
- > Extending the SPS 24 sewer rising main to the existing air valve within The Garden Walk. This air valve will be replaced with a discharge chamber. From here the sewage flows through the new gravity network to the Package 1 gravity main near SPS 20, and then to the new sewer pump station.

The proposed design amendments of the SNSM upgrade are located within road reserves, drainage reserves, adjacent existing mains and in close proximity to properties located along Sugarwood Road, Carrington Park Drive, Old Southern Road, Burradoo Crescent and Kardella Avenue.

1.3 Scope of works

The following scope of work was undertaken in order to achieve the above noted objectives:

- > A site walkover by an Environmental Scientist specialising in contaminated land assessment to identify any potential contamination sources
- > A desktop site history review including the following sources:
 - NSW Environmental Protection Authority (EPA) contaminated land public register and the Public Register under Section 308 of the Protection of the Environment Operations Act 1997
 - Local and regional geology, hydrogeology, topography and hydrology
 - Groundwater data available for the area
 - Historic aerial photographs
- > Preparation of a PSI report in accordance with the Consultants reporting on contaminated land, Contaminated land guidelines (NSW EPA, 2020) and National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 1999).

1.4 Applicable guidelines and legislation

The scope of this PSI has been developed in accordance with the following guidelines and legislation:

- > National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM 1999)
- > NSW Department of Urban Affairs and Planning (1998) Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land, 1998

- > NSW EPA (2017) Guidelines for the NSW Auditor Scheme (3rd edition). New South Wales Environment Protection Authority, September 2017
- > NSW EPA (2020) Consultants reporting on contaminated land; Contaminated land guidelines. New South Wales Environment Protection Authority

2 Site identification

2.1 Site information

Details related to the site are included in **Table 2-1**, below whilst **Figure 1, Appendix A** shows the site locality in the context of the local area.

Table 2-1 Site information

Details	Comments
Site address	Road reserves, drainage reserves, adjacent existing mains and in close proximity to properties located along Sugarwood Road, Carrington Park Drive, Old Southern Road, Burradoo Crescent and Kardella Avenue, South Nowra, NSW 2540.
Legal Identification	The site intersects or passes through the following lots: - Lot 2 Deposited Plan (DP) 1245988 - Part Lot 1 DP 1119599 - Part Lot 7318 DP 1177129 - Lot 518 DP 1179957 - Lot 3 DP 1245988
Current Land use	The current land use within the site includes road reserves, drainage reserves, sewer easements, open park land and light agricultural land, which are shown on Figure 2 in Appendix A .
Proposed Land use	The land use will remain unchanged following the upgrades.
Local Government Authority (LGA)	Shoalhaven City Council
Current Zoning - Shoalhaven Local Environment Plan (2014)	RE1 – Public Recreation SP2 – Infrastructure R1 – General Residential R2 – Low Density Residential
Site Area	Lineal extent: Approximately 600 m Average width: 20 m wide
Site Coordinates (GDA94 MGA 56)	Northern most point of the site. E: 282557 N: 6136435 Southern most point of the site. E: 282606 N: 6136135 Western most point of the site. E: 282424 N: 6136449 Eastern most point of the site. E: 282995 N: 6136140
Current Site Owner	Shoalhaven City Council, Crown Land, Private property

2.2 Site description

The site details provided below in **Table 2-2** is based upon public data sets, which are referenced where applicable.

Table 2-2 Site information summary

Item	Site information
Site slope and elevation	The site has a maximum elevation of approximately 20 m Australian Height Datum (AHD) in the south-eastern portion and falls to approximately 6 m AHD in the north-western portion.
Nearby water bodies (NSW DFSI, Spatial Services)	The site contains a drainage easement and an unnamed drainage channel in the western portion within Ratcliffe Park, which flows north beneath Greenwell Point Road and is inferred to discharge to the Shoalhaven River approximately 2.8 kilometers north.
Site soil landscapes (NSW OEH, 2013)	The site is underlain by the Nowra soil landscape (9028sf). This landscape is described as moderately to gently undulating rises to low hills on Nowra Sandstone. Broad ridges and crests. Benched sandstone outcrops adjacent to drainage lines. The topography has a relief of >40 m with slope gradients of >5%. Vegetation is extensively to moderately cleared with stands of tall open-forest. Soils are moderately deep (50–100 cm). Brown Podzolic Soils occur on crests and upper slopes. Soloths and/ or Yellow Earths occur midslope. Yellow Podzolic Soils occur on lower slopes and drainage lines.
Site surface geology (MinView, 2020)	The site is mapped as being underlain by two geological units with the Berry Siltstone Formation (Pshb) of the Guadalupain age Shoalhaven Group making up the majority of the site and Alluvial fan deposits (Q_avf) of the Quaternary age found in the north-western portion of the site. The Berry Siltstone Formation is described as mid to dark grey siltstone, grades up sequence to very fine-grained sandstone, highly fossiliferous, sporadic dropped pebbles. The Alluvial fan deposits are described as fluvially-deposited quartz-lithic sand, silt, gravel and clay.
Acid Sulfate Soils (LEP, 2014)	The indicated the site is predominantly mapped within a Soil Class 5 area. Class 5 soils are considered to require an acid sulfate soils preliminary assessment if the work is carried out within 500 m of an adjacent Class 2, 3 or 4 area where this adjacent area is below 5 m AHD and where the works are likely to lower the water table below 1 m. Class 4 soils make up a small portion of Ratcliffe Park in the north-western corner of the site. Class 4 are considered to require an acid sulfate soils preliminary assessment if the depth of works is 2 m below the natural ground surface and/or likely to lower the water table by more than 2 m below the natural ground surface.
Groundwater (Lotsearch source: NSW Department of Primary Industry – Office of Water and Bureau of Meteorology)	No registered bores were identified on site or within 500 m of the site boundary (see Appendix C).

2.3 Adjacent land uses

The surrounding land uses are summarised in **Table 2-3** below and shown on **Figure 2** of **Appendix A**.

Table 2-3 Surrounding land use

Site Area	Land use or activity
North	Single to two storey residential dwellings, grassed sports oval (Ratcliffe Park) with Greenwell Point Road further north.
East	Single to two storey residential dwellings, continuation of the Garden Walk with trees, grass and shrubs.
South	Single to two storey residential dwellings with Old Southern Road further north.
West	Single to two storey residential dwellings with an unnamed tributary of Shoalhaven river further north.

3 Site walkover

A site walkover was conducted on 9 March 2022 by an Experienced Environmental Scientist and contaminated lands professional from Cardno. The inspection was undertaken to identify potential sources or indicators of contamination on the site. Key site observations are summarised in **Table 3-1** below with key features identified on **Figure 2, Appendix A** and site photos shown in **Appendix B**.

Table 3-1 Key observations summary

Item	Observations
Weather Conditions	Overcast with temperatures ranging from 16.6 to 23.0 °C. (Sourced from BOM: http://www.bom.gov.au/climate/dwo/202203/html/IDCJDW2101.202203.shtml).
Site slope and drainage features	The eastern most part of Peppermint Drive plateaued with the western part sloping west towards Old Southern Road. Old Southern Road further sloped to the west and north-west. The lowest site point is the north-west corner of site near Ratcliffe Park which was flooded at the time of the site walkover. Adjacent floodplain and tributary of Shoalhaven River. Overflow flowing into causeways/culverts or collected in south-west drains along all adjacent roadways. Infiltration on exposed soils along Sugarwood Road.
Site surface coverings	Hardstand asphalt roads and concrete footpaths are present along most of the site. The area surrounding the asphalt roads and concrete footpaths along Burradoo Crescent and across Old Southern Road consists mostly of grass and cleared vegetation. Trees, grass and shrubs are adjacent to Sugarwood Road, making up part of the Garden Walk. The area of site south of Ratcliffe Park is covered in grass with some shrubs.
Site cut and fill	Potential fill was observed along a ridgeline at Ratcliffe Park and beneath the substation and electrical equipment storage in the north-western part of site.
Surface soils	Exposed silty clay and roadbase gravel soils were observed within part of the Garden Walk along Sugarwood Road and adjacent to Peppermint Drive.
Buildings and structures	Buildings and structures within the site included: - Asphalt roads and concrete footpaths - Underground and aboveground utilities - Residential dwellings directly adjacent to site in all directions - Electrical supply infrastructure adjacent to Burradoo Crescent and Ratcliffe Park.
Potential hazardous building materials	Not observed.
Manufacturing, industrial or chemical processes and infrastructure	Not observed.
Fuel storage tanks (USTs/ASTs)	Not observed.
Dangerous goods	Not observed.
Solid waste deposition	Not observed.
Liquid waste disposal features	The site contains the existing sewer system for the SNSM which services the area within South Nowra.
Evidence of previous site contamination assessments	Not observed.
Evidence of land contamination (staining or odours)	Minor discolouration on concrete hardstand on footpaths across site.
Evidence of groundwater contamination	Not observed.
Groundwater use	Not observed.

Item	Observations
Vegetation	Well maintained to overgrown healthy grass, sporadic paperbark trees and some shrubs along the Garden Walk at Sugarwood Road and Peppermint Drive. Overgrown healthy grass, reeds and small plants at the causeway.
Site fencing	Fences were observed around the causeway north east of the Old Southern Road and Carrington Park Drive intersection towards the center of site as seen in Figure 2, Appendix A . Fencing was also observed around the electrical supply infrastructure in the west of the site and around residential lots.

4 Review of Previous Reports

Cardno have reviewed a copy of the following previous documentation related to the site:

- > Cardno. (2021). *Geotechnical Investigation Report, South Nowra Surchage Main - Major Upgrades, WI21102IP.*
- > Cardno. (2021). *Preliminary Site Investigation, Concept and Detailed Design of South Nowra Surchage Main - Major Upgrades, WI21102IP.*

Cardno (2021) Geotechnical Investigation Report

The key findings and relevant conclusions of the report are provided below:

- > Thirty-one (31) boreholes were drilled across the original assessment area for SNSM upgrades with no boreholes located on the site investigated in this PSI.
- > BH01 is situated close to site in the north-west at Ratcliffe Park while BH20 is situated to the east along the Garden Walk near Peppermint Drive as shown in **Figure 4-1**.
- > The borehole logs indicate fill, described as below:
 - BH01: silt with low plasticity, dark brown with trace rootlets (0-0.1 m) and sandy clay, orange-brown and grey with fine to coarse grained sand (0.1-0.3 m)
 - BH20: silt with low plasticity, brown with trace rootlets (0-0.1 m).
- > The description of fill at both boreholes indicates a low probability of contamination.



Figure 4-1 Borehole locations from Geotechnical Investigation Report, South Nowra Surchage Main - Major Upgrades, WI21102IP prepared by Cardno (2021).

Cardno (2021) Preliminary Site Investigation

The key findings and relevant conclusions of the report are provided below:

- > Potential fill material of unknown environmental quality was found associated with the development of existing utility infrastructure, roads, drainage systems and within embankments and mounds along the proposed sewer alignment routes across site.
- > Noted the potential for sewerage leakage from the existing use of the site as a sewerage system.
- > Acid sulfate soils (ASS) and potential acid sulfate soils (PASS) were observed across site, however, not within the new site investigated in this PSI.
- > Potential asbestos containing material (PACM) were observed sporadically across the site, however, not within the new site investigated in this PSI.
- > Soil stockpiles containing construction and demolition waste were observed south of the new site investigated in this PSI.
- > The contaminant sources were identified to increase risk to human and ecological health in the event of disturbance during construction, however, would not impact site suitability for the proposed use.
- > Recommendations included:
 - Preparation of a Construction Environmental Management Plan (CEMP) containing an Unexpected Finds Protocol (UFP).
 - Further investigation for the areas where ASS were deemed to be present.
 - Offsite disposal of materials to be assessed according to the NSW EPA (2014) *Waste Classification Guidelines*.
 - Asbestos materials to be noted in Council property records with an Asbestos Management Plan (AMP).

5 Site history sources

- > A desktop site history review was undertaken of the following sources:
 - NSW Environment Protection Authority (EPA) registers and records
 - Historical business directories
 - Local and regional geology, hydrogeology, topography and hydrology
 - Historic aerial photographs.

5.1 NSW EPA records and registers

A search of the following NSW EPA databases was undertaken on 3 May 2021 to identify properties appearing on them that are within 1,000 m for the investigation Site:

- > List of NSW contaminated sites notified to EPA
- > Contaminated Land Records of Notice
- > EPA Location of former gasworks sites
- > EPA PFAS Investigation program
- > EPA Other Sites with Contamination Issues
- > Licensed Activities under the *Protection of Environment Operations Act 1997* (PoEO Act)
- > Delicensed PoEO Activities still regulated by the EPA
- > Former PoEO Licensed Activities now revoked or surrendered.

Results were returned for all searches of the NSW EPA databases, with the exception of 'EPA Location of former gasworks sites' and 'EPA Other Site with Contamination Issues', and are summarised in the subsections below.

5.1.1 List of NSW contaminated site notified to EPA

A search of the List of NSW Contaminated Sites Notified to the EPA identified one site, a commercial service station, within 1,000 m of the site and is summarised in **Table 5-1** below. Due to the significant distance from the site, the service station is not expected to be a source of contamination within the site, noting that the identified service station was formerly regulated under the CLM Act.

Table 5-1 List of NSW Contaminated Sites notified to the EPA search results

Site	Activity	Management Class	Distance	Direction
Mobil Service Station	Service Station	Contamination formerly regulated under the CLM Act	950 m	North West

5.1.2 Contaminated Land Records Notice

The search results of the Record of Notices identified a Mobil Service Station at Lot 3 Kalandar Street, approximately 950 m north west from the site. Due to the significant distance from the site, the service station is not expected to be a potential contaminant source at the site.

5.1.3 EPA PFAS Investigation Program

A search of the EPA PFAS Investigation Program did not identify any sites within 2,000 m of the site.

5.1.4 PoEO Public Register

The PoEO Public Register under Section 308 of the PoEO Act contains Environment Protection Licences (EPLs), applications and notices issued by the EPA. The Public Register was searched on 3 May 2021 within the suburb of South Nowra, Nowra and Worrigea to identify any issues of relevance to the site. The PoEO public register search identified the following:

- > Three former licensed activities under the PoEO Act 1997, now revoked or surrendered, were identified within 1,000 m of the site and are summarised in **Table 5-2** below.

Table 5-2 Search results for licensed activities under the PoEO Act 1997, now revoked or surrendered

Licence No	Organisation	Location	Status	Activity	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	Waterways throughout NSW	Surrendered	Other Activities / Non Scheduled Activity - Application of Herbicides	0 m	On-site
4838	Robert Orchard	Waterways throughout NSW	Surrendered	Other Activities / Non Scheduled Activity - Application of Herbicides	0 m	On-site
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	Waterways throughout NSW	Surrendered	Other Activities / Non Scheduled Activity - Application of Herbicides	0 m	On-site

All surrendered EPLs were identified as being located within the buffer for application of herbicides however these have been mapped to all waterways throughout NSW, as such it is unlikely that the activities described have taken place within the site boundaries in an intensive or significant way.

5.2 Historical business directories

Included within Lotsearch Reports LS020056 is a search of UBD Business to Business directories from 1991, 1982, 1970, 1961 and 1950. A search buffer of 150 m of the site was used for general business activities whilst a buffer of 500 m was used for dry cleaner and motor garages / service stations.

Twelve records for general business activities were identified within the search buffer. Of the 12 records identified 11 were based on road match with no address given, as a result the locations of these business activities may be greater than 150 m from site.

A summary of identified business that could present a potential contaminant risk are provided in **Table 5-3**.

Table 5-3 Historical business search for general activities

Business activity	Premises	Year	Location confidence	Distance from Site	Direction	Potential Contaminant Source
Bus services charter and tours	Stuarts Coaches Pty Ltd., Greenwell Point Road	1991	Road Match	150 m	North	Bulk fuel storage Vehicle servicing
Bus operators	Stuarts Coaches Pty Ltd., Greenwell Point Road	1991	Road Match	150 m	North	
Motor bus services	Stuarts Bus Service, Greenwell PL Road., Nowra-Bomaderry	1982	Road Match	150 m	North	
Motor garages and service stations	Mobil Service Station, Kalandar Street, Nowra	1991	Road Match	500 m	West	

5.3 Controlled chemicals

The NSW EPA uses chemical control orders (CCO) is a primary legislative tool under the Environmentally Hazardous Chemicals Act 1985 to manage chemicals of concern and limit their potential impact on the environment. A preliminary screening of the site history is provided in **Table 5-4** below to determine the likelihood of chemicals of concern within site.

Table 5-4 Preliminary Controlled Chemicals Screening

Chemical of Concern	Likelihood of Occurrence
Were aluminium smelter wastes used or stored on the site (CCO, 1986)?	Low

Chemical of Concern	Likelihood of Occurrence
Do dioxin contaminated wastes (CCO, 1986) have the potential to impact the site?	Low
Were organotin products (CCO 1989) used or stored on site?	Low
Were polychlorinated biphenyls (PCBs) used or PCB waste (CCO 1997) stored on site?	Low
If Yes to any of the above, has site sampling suite been optimised to include specific sampling for other chemicals of concern in soil, air, water?	NA

5.4 Per and Poly Fluoroalkyl Substances (PFAS)

A PFAS probability of occurrence desktop survey is provided in **Table 5-5** and has been undertaken on the basis of information provided in the PFAS National Environmental Management Plan (NEMP 2020). PFAS are known to be present in Aqueous Film Forming Firefighting Foams (AFFF) and Alcohol-Type Concentrate (ATC). The historic use of AFFF is reported as being used by Fire & Rescue NSW between 1976 and 2007, while other agencies used AFFF during training exercises as late as 2010 (Source: Fire & Rescue NSW, Information Sheet, Firefighting Foam and PFAS, reference D16/82523).

Table 5-5 PFAS Desktop Survey

Preliminary Screening Questions	Likelihood of Occurrence ^{1,2,3}
Is the past or present site activity listed in the NEMP 2020 as being an activity with risk of fire. If so, list activity:	Low
Is the past or present off-site activity up-gradient or adjacent to the site listed in the NEMP 2020 as being an activity with risk of fire. If so list activity:	Low likelihood, relevant activities include: - General chemical storage - Commercial laundries - Manufacturing of building products
Did fire training involving the use of suppressants occur on-site between 1970 and 2010?	Low
Did fire training occur up-gradient of or adjacent to the site between 1970 and 2010?	Low
Have "fuel" fires ever occurred on site between 1970 and 2010? (i.e. ignition of fuel storage tanks - solvent, petrol diesel, kerosene, other)?	Low
Have PFAS been used in manufacturing or stored on-site?	Low likelihood, relevant activities include: Wastewater treatment
Could PFAS have been imported to the site in fill materials from a site with activity listed in NEMP 2020 and subject to exposure to PFAS from 1970 to 2010?	Low
Could PFAS-contaminated groundwater or run-off have migrated beneath or on to the site?	Low
Is the site or adjacent sites listed in the NSW EPA PFAS Investigation program ⁴ ?	Low
If the likelihood is medium or high in any of the above factors, does the site analytical suite need to be optimised to include preliminary sampling and testing for PFAS in soil and waters (incl. ASLP or TCLP)? Provide rationale.	NA

Notes:

1 Likelihood: Low – All necessary documentation has been reviewed and there is no recorded instance of potential PFAS use or exposure

2 Medium - All necessary documentation has been reviewed and there is potential evidence of a recorded instance of potential PFAS use or exposure

3 High - All necessary documentation has been reviewed and there is evidence of a recorded instance of potential PFAS use or exposure

4 <https://www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program>

5.5 Historical Aerials

Eight historical aerial photographs dating back to 1949 were sourced and reviewed by Cardno, a review of these photographs is included in **Table 5-6** whilst the photographs are included within the Lotsearch report in **Appendix C**.

Table 5-6 Aerial photos summary

Year	Site Observations	Surrounding Areas
1949 (B&W)	The majority of the site appeared to be cleared and used for agricultural/grazing purposes. Old Southern Road was already visible. A possible creek line and dam was observed within the western portion of the site. The alignment of the Garden Walk was already visible in the eastern portion of the site.	The surrounding land use was mostly cleared with agricultural and grazing purposes. Greenwell Point Road is visible in the north. Patches of dense tree coverage is located south and west of site. Few residential dwellings are situated in the north-west. The Garden Walk extends to the east. Unnamed water bodies are visible north of Greenwell Point Road.
1961 (B&W)	The imagery is now clearer compared with 1949. The site land use appears generally unchanged.	The surrounding land use remains relatively unchanged however, some development had taken place with medium density residential properties observed north-west of the site.
1974 (B&W)	The site land use appears generally unchanged since 1961.	The surrounding land has undergone some development with medium density residential properties observed in the north-west and low-density residential properties observed in the south-west along Old Southern Road. Stripped surfaces associated with a potential subdivision development were observed west of the site. Several completed roads were also observed north-west of the site.
1984 (B&W)	The site land use appears to be relatively unchanged. Ratcliff Park (which the site passes through) as well as a rectangular structure and potential drainage infrastructure east of the site and within Ratcliff Park were observed.	Further low and medium-density residential structures as well as a potential commercial property with several structures have been constructed west of the site. The surrounding areas appear otherwise unchanged.
1993 (Colour)	The imagery is now in colour. The site land use appears to be relatively unchanged since 1984.	Two circular structures were observed west and east of the site and within Ratcliff Park. Further medium density residential structures and associated roads were observed to the west and east of the site. Low density residential structures were observed directly north of the site. More commercial structures were observed west and southwest of the site. Nowra Christian School was also observed east of the site. The surrounding land use appeared to be predominantly residential and agricultural, with some commercial use evident.
2002 (Colour)	The site land use appears relatively unchanged since 1993.	The surrounding land appears to have undergone significant development with a number of residential subdivisions completed to the west, south and east of the site and some surface scaring and road alignments associated to subdivision development observed to the north and south of the site. The surrounding land use appears to be predominantly residential with some commercial and agricultural use evident.
2009 (Colour)	Carrington Park Drive off Old Southern Road and Burradoo Crescent were observed on site with associated residential dwellings.	Residential development has occurred around the site in all directions on land previously observed to be vacant.
2020 (Colour)	The site appears to be relatively unchanged since 2009 and in its current configuration.	The surrounding land use appear to be relatively unchanged and consistent with its current configuration. Some residential development has occurred directly south of the site along Sugarwood Road and Peppermint Drive.

5.6 Site history data gaps

The site history information collected is considered of a high quality and suitable for the assessment undertaken. We note that the desktop database search results provided by Lotsearch apply to May 2021, however, the land use remains unchanged within the site and general surrounds, and we consider the findings to remain relevant.

In the context of the currently available site history and given that the site resides within areas that have historically been within vacant land for utility, drainage and road easements, it is considered unlikely that the searches listed below would identify any records of significantly contaminating activities not identified in currently reviewed records:

- > SafeWork NSW Schedule 11 records pertaining to the storage of Dangerous Goods
- > Historic land title records held by NSW Department of Land and Property Information
- > Section 10.7 planning certificates

Information on the site prior to 1950 is limited; however, it is considered unlikely that any activities with the potential to significantly contaminate the site were undertaken prior to this. Aerial imagery suggests that prior to 1949 the site was not significantly developed beyond land clearing and fence installation for paddocks and grazing.

6 Areas of Environmental Concern

As a result of the desktop review and observations made during the site inspection, a consolidated list of areas of environmental concern (AEC) are summarised in **Table 6-1** below with the location of each AEC shown in **Figure 3** of **Appendix A**.

Table 6-1 Areas of Environmental Concern

AEC Identification	Description	Contaminants of Interest
AEC 1: Filling associated with development of electrical storage facility and substation	Potential filling materials could be associated with the development and installation of the existing electrical storage facility and substation in the north-west corner of site. The origin of the filling materials and its chemical properties are of an unknown environmental quality.	Metals, polycyclic aromatic hydrocarbons (PAH), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), phenols, organochlorine pesticides (OCP), organophosphorous pesticides (OPP), polychlorinated biphenyls (PCB) and asbestos
AEC 2: Filling associated with ridgeline	Potential filling materials could be associated with the development of ridgelines observed along the proposed sewer alignments at Ratcliffe Park in the north-west corner of site. The origin of the filling materials is of an unknown environmental quality.	Metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB and asbestos
AEC 3: Sewerage leakage	The potential for sewerage leakage from the existing use of the site as a sewerage system. The exact location of existing subsurface pipelines is unknown and therefore is not shown on Figure 3 in Appendix A .	Metals, TRH, BTEX, PAH, PFAS and effluents

PFAS: per- and poly- fluoroalkyl substances; PAH: polycyclic aromatic hydrocarbons; TRH: total recoverable hydrocarbons; BTEX: benzene, toluene, ethylbenzene, xylene; OCP: organochlorine pesticides; OPP: organophosphorus pesticides; PCB: polychlorinated biphenyls

7 Conceptual Site Model

A conceptual site model (CSM) provides an assessment of the fate and transport of contaminants of potential concern (COPC) within the context of site-specific subsurface conditions with regard to their potential risk to human health and the environment. Risk to human health and the environment is identified through complete Source – Pathway – Receptor (SPR) linkages. In order to identify SPR linkages the CSM considers site specific factors, including:

- > Source(s) of contamination
- > Identification of COPC associated with past (and present) source(s)
- > Site specific information including soil type(s), depth to groundwater, inferred effective porosity, inferred groundwater flow direction, surface water bodies and interactions
- > Location of any identified sources relative to the proposed site development
- > Actual or potential receptors considering both current and future land use both for the site, adjacent properties and any sensitive ecological receptors.

Identified receptors for the potential site contamination include:

- > Ecological receptors dependent on-site soils in fill impacted areas and down gradient water bodies
- > Current site users and workers disturbing identified fill materials
- > Future site users and workers disturbing identified fill materials

The CSM for the site considers the AEC specified in **Section 6** is summarised in **Table 7-1**.

Table 7-1 Preliminary conceptual site model

Potential contaminant source	Impacted media	Potential contaminants	Potential exposure pathway	Receptors	Completeness
AEC 1: Filling associated with the development of the existing electrical storage facility and substation	Soils, surface water groundwater	Metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB and asbestos	Direct contact with media including ingestion and dust inhalation	Ecological Flora and fauna Aquatic ecosystems Groundwater dependent ecosystems	Potentially complete in the event of ground disturbance
AEC 2: Filling associated with ridgelines observed along the proposed sewer alignments			Migration of groundwater discharge to water bodies; interaction with		
AEC 3: Potential for sewerage leakage from the existing use of the site as a sewerage system		Metals, TRH, BTEX, PAH, PFAS, Nutrients, Biological Contaminants (E. coli, Enterococci, etc)	flora and fauna and biota Extraction of groundwater for human ingestion	Human Current site workers / users Future site workers / users	

8 Discussion

The proposed development is an upgrade to the SNSM and a change of land use is not proposed to the areas potentially impacted by potential contamination, and the risk to current and future site users and ecological receptors is considered to be low and generally unchanged by the development.

In the north-western part of site, potential filling will be encountered at the existing electrical storage facility and substation, and within the ridgeline at Ratcliffe Park. There is the potential for unidentified contamination to be present within the fill profile.

Given the site's existing use as sewerage infrastructure, there is potential for unidentified contamination to exist within the surrounding soils from potential sewerage pipe leaks.

For the purposes of the site development the above noted contaminant sources present an increased risk to human and ecological health in the event of disturbance during construction, however, they do not impact site suitability for the proposed use.

9 Conclusions

Cardno completed a Preliminary Site Investigation for the site located at the SNSM NSW on behalf of Shoalhaven Water. The purpose of the PSI was to identify potential contamination issues, risks and constraints in order to inform the AREF for the proposed development activities.

Based on the findings of this PSI, the following conclusions are made:

- > There is potential for fill material of unknown environmental quality and origin to be present beneath the existing electrical supply infrastructure and substation, and within a ridgeline at Ratcliffe Park
- > There is the potential for sewerage leakage from the existing use of the site as a sewerage system.

For the purposes of the site development the above noted contaminant sources present an increased risk to human and ecological health in the event of disturbance during construction however they do not impact site suitability for the proposed use.

9.1 Recommendations

Based on the findings of this investigation the following recommendations are made:

- > Prepare a Construction Environmental Management Plan (CEMP) containing an Unexpected Finds Protocol (UFP) outlining appropriate management of contamination items which may be encountered or disturbed by constructions
 - In the event of an unexpected contamination find a suitably qualified environmental consultant will be required to attend site to assess contamination and provide advice on appropriate management or treatment
- > All materials to be removed from the site during construction are to be assessed as per the NSW EPA (2014) *Waste Classification Guidelines* and/or the relevant NSW EPA Resource Recovery Exemptions / Orders.

10 Limitations

This assessment report is not any of the following:

- > A Site Audit Report or Site Audit Statement as defined under the *Contaminated Land Management Act 1997* (CLM Act)
- > A Detailed or Environmental Site Investigation sufficient for an Environmental Auditor to be able to conclude a Site Audit Report and Site Audit Statement
- > A geotechnical report
- > A detailed hydrogeological assessment in conformance with NSW DEC (2007) *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination*
- > An assessment of groundwater contaminants potentially arising from other sites or sources nearby
- > A total assessment of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land
- > A hazardous building material survey that will identify any specific building materials on site, which may pose a risk to human health or the environment
- > The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site.

This Document has been provided by Cardno subject to the following limitations:

- > This Document has been prepared for the particular purpose outlined in Cardno's variation request and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose
- > The scope and the period of Cardno's services are as described in Cardno's variation request, and are subject to restrictions and limitations. Cardno did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Cardno in regards to it
- > Conditions may exist which were undetectable given the limited nature of the enquiry Cardno was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required
- > In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Cardno's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Cardno to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations
- > Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document

Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Cardno for incomplete or inaccurate data supplied by others.

11 References

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APPENDIX

A

FIGURES



now









FIGURE 3
1:3,000 Scale at A3

0 25 50 75 100 m

Areas of Environmental Concern (AECs)

SOUTH NOWRA
SHOALHAVEN, NSW



APPENDIX

B

SITE PHOTOS



now





Photograph 1: View of intersection with Old Southern Road from Carrington Park Drive at the southern portion of site looking east.



Photograph 2: View from intersection of Old Southern Road and Carrington Park Drive at the southern portion of site looking west.



Photograph 3: View of Burradoo Crescent from Carrington Park Drive looking north.



Photograph 4: View of Old Southern Road from Carrington Park Drive intersection looking north-east.



Photograph 5: Services at Carrington Park Drive and Old Southern Road intersection at the southern portion of site.



Photograph 6: Fence line along causeway adjacent to Old Southern Road looking north-west.



Photograph 7: Causeway adjacent to Old Southern Road running towards the north-western portion of site looking west.



Photograph 8: Causeway from Carrington Park Drive looking north-west.



Photograph 9: Sewerage manhole along Carrington Park Drive looking east.



Photograph 10: View of Burradoo Crescent intersection in the north-west portion of site looking south-east.



Photograph 11: Electrical substation at corner of Burradoo Crescent and Kardella Avenue looking west.



Photograph 12: Flooded path at Ratcliffe Park at the north-west corner of site looking west.



Photograph 13: Close up of electrical storage facility at north-west corner of site.



Photograph 14: Electrical storage facility at north-west corner of site looking south.



Photograph 15: View from Sugarwood Road in the eastern portion of site looking north.



Photograph 16: View of the Garden Walk north of Sugarwood Road looking east.



Photograph 17: View of Old Southern Road from the Garden Walk in the eastern portion of site looking north-west.



Photograph 18: Exposed soil next to Garden Walk along Sugarwood Road looking west.



Photograph 19: Exposed soil next to Garden Walk along Sugarwood Road looking east.



Photograph 20: View from eastern end of Sugarwood Road and the Garden Walk looking west.



Photograph 21: Concrete drain along Garden Walk looking south-west.



Photograph 22: View of Garden Walk from Peppermint Drive looking west.

APPENDIX

C

LOTSEARCH



now





LOTSEARCH

LOTSEARCH ENVIRO LITE

Date: 03 May 2021 16:40:41

Reference: LS020056 EL

Address: Proposed Sewer Upgrade, South Nowra, NSW 2540

Disclaimer:

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features. You should obtain independent advice before you make any decision based on the information within the report. The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Finance, Services & Innovation	16/04/2021	16/04/2021	Quarterly	-	-	-	-
Topographic Data	NSW Department of Finance, Services & Innovation	25/06/2019	25/06/2019	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	14/04/2021	12/04/2021	Monthly	1000m	0	0	3
Contaminated Land Records of Notice	Environment Protection Authority	03/05/2021	03/05/2021	Monthly	1000m	0	0	1
Former Gasworks	Environment Protection Authority	13/04/2021	11/10/2017	Monthly	1000m	0	0	0
National Waste Management Facilities Database	Geoscience Australia	11/02/2021	07/03/2017	Quarterly	1000m	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	15/02/2021	13/07/2012	Annually	1000m	0	0	3
EPA PFAS Investigation Program	Environment Protection Authority	14/04/2021	15/03/2021	Monthly	2000m	0	0	2
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	29/04/2021	29/04/2021	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	29/04/2021	29/04/2021	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	26/04/2021	26/04/2021	Monthly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	13/04/2021	13/04/2021	Monthly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	02/02/2021	13/12/2018	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	13/04/2021	13/04/2021	Monthly	1000m	0	0	1
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	13/04/2021	13/04/2021	Monthly	1000m	0	0	1
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	13/04/2021	13/04/2021	Monthly	1000m	3	3	5
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	0	0	1
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	11	11
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	0
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	0	3
Points of Interest	NSW Department of Finance, Services & Innovation	18/02/2021	18/02/2021	Quarterly	1000m	0	5	51
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	16/02/2021	16/02/2021	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	16/02/2021	16/02/2021	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Finance, Services & Innovation	17/02/2021	17/02/2021	Quarterly	1000m	0	1	9
State Forest	Forestry Corporation of NSW	25/02/2021	14/02/2021	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	22/01/2021	11/12/2020	Annually	1000m	0	0	1
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000m	1	1	1
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	26/10/2020	21/02/2018	Annually	1000m	0	0	0
Groundwater Boreholes	NSW Dept. of Primary Industries - Water NSW; Commonwealth of Australia (Bureau of Meteorology)	24/07/2018	23/07/2018	Annually	2000m	0	0	72

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Geological Units 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000m	2	2	3
Geological Structures 1:250,000	NSW Department of Planning, Industry and Environment	20/08/2014		Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	19/05/2017	17/02/2011	As required	1000m	1	1	2
Soil Landscapes of Central and Eastern NSW	NSW Department of Planning, Industry and Environment	14/10/2020	27/07/2020	Annually	1000m	2	2	2
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	21/04/2021	26/02/2021	Monthly	500m	3	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000m	2	2	3
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	16/02/2021	16/02/2021	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	14/04/2021	14/04/2021	Monthly	1000m	0	0	0
Mining Title Applications	NSW Department of Industry	14/04/2021	14/04/2021	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	14/04/2021	14/04/2021	Monthly	1000m	8	8	8
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	21/04/2021	07/12/2018	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	21/04/2021	16/04/2021	Monthly	1000m	8	33	143
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	23/02/2021	20/11/2019	Quarterly	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	15/02/2021	30/11/2020	Quarterly	1000m	0	0	0
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	21/04/2021	31/03/2021	Monthly	1000m	0	0	9
Bush Fire Prone Land	NSW Rural Fire Service	30/04/2021	29/04/2021	Weekly	1000m	3	3	3
Vegetation of Southern Forests	NSW Office of Environment & Heritage	09/12/2014	10/10/2011	Unknown	1000m	2	2	4
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	24/02/2021	19/03/2020	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	14/08/2017	15/05/2017	Annually	1000m	6	6	6
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	14/08/2017	15/05/2017	Unknown	1000m	11	13	17
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	27/04/2021	27/04/2021	Weekly	10000m	-	-	-

Proposed Sewer Upgrade, South Nowra, NSW 2540



 Site Boundary

 Internal Parcel Boundaries

Total Perimeter: 16.94km

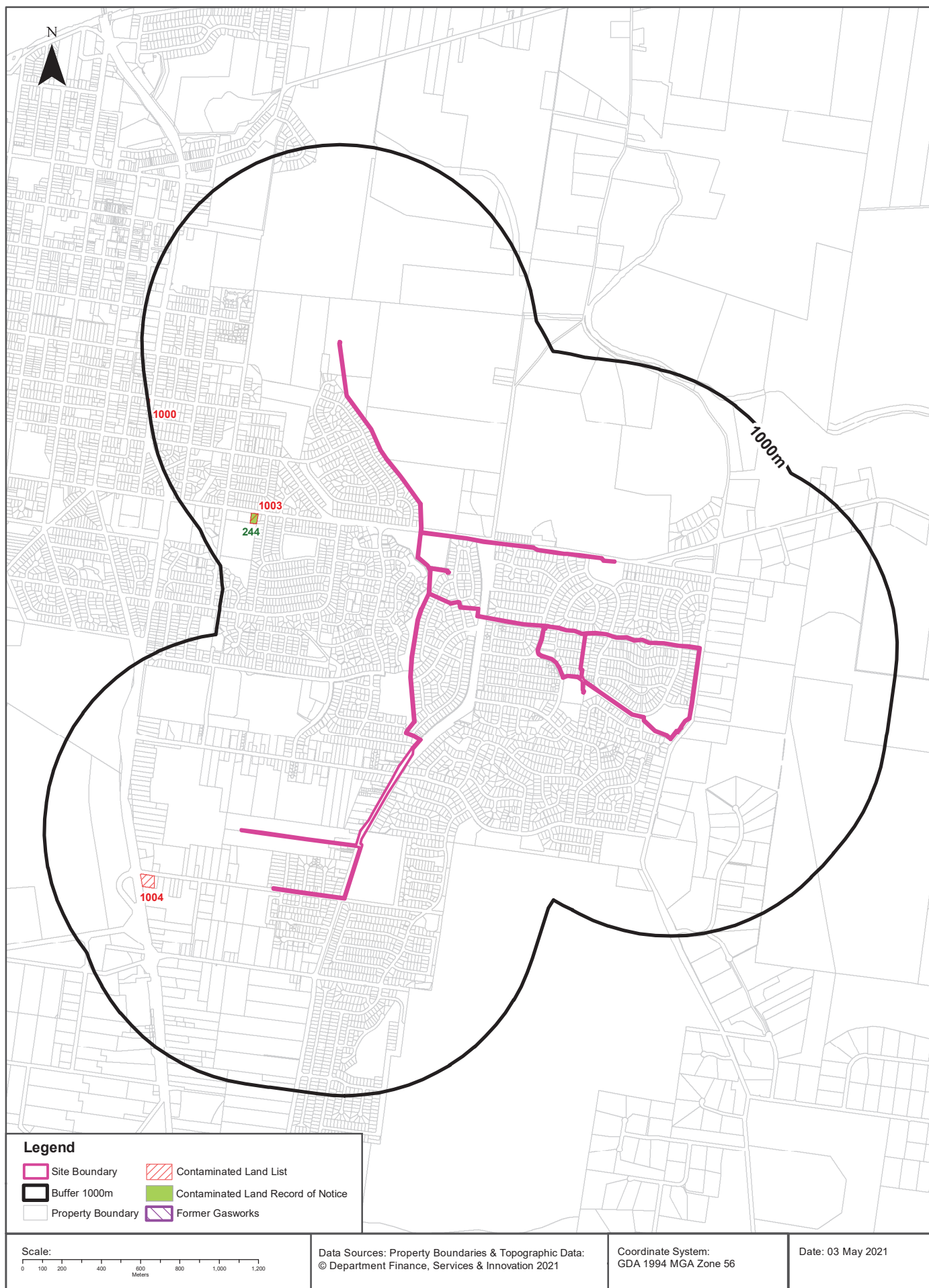
Measurements are approximate only and may have been simplified or smaller lengths removed for readability.

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 May 2021

Contaminated Land

Proposed Sewer Upgrade, South Nowra, NSW 2540



Contaminated Land

Proposed Sewer Upgrade, South Nowra, NSW 2540

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist	Direction
1004	Caltex South Nowra	100 Princes Highway	South Nowra	Service Station	Regulation under CLM Act not required	Current EPA List	Premise Match	495m	South West
1003	Mobil Service Station	Lot 3 Kalandar STREET	Nowra East	Service Station	Contamination formerly regulated under the CLM Act	Current EPA List	Premise Match	697m	North West
1000	Former Hollingworth Scrap Yard	72-74 Jervis and 117 East Street	Nowra	Other Industry	Regulation under CLM Act not required	Current EPA List	Premise Match	987m	North West

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Contaminated Land

Proposed Sewer Upgrade, South Nowra, NSW 2540

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
244	Mobil Service Station	Lot 3 Kalandar Street	Nowra East	6 former	3240	Premise Match	697m	North West

Contaminated Land Records of Notice Data Source: Environment Protection Authority

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Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit

<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

Former Gasworks

Former Gasworks within the dataset buffer:

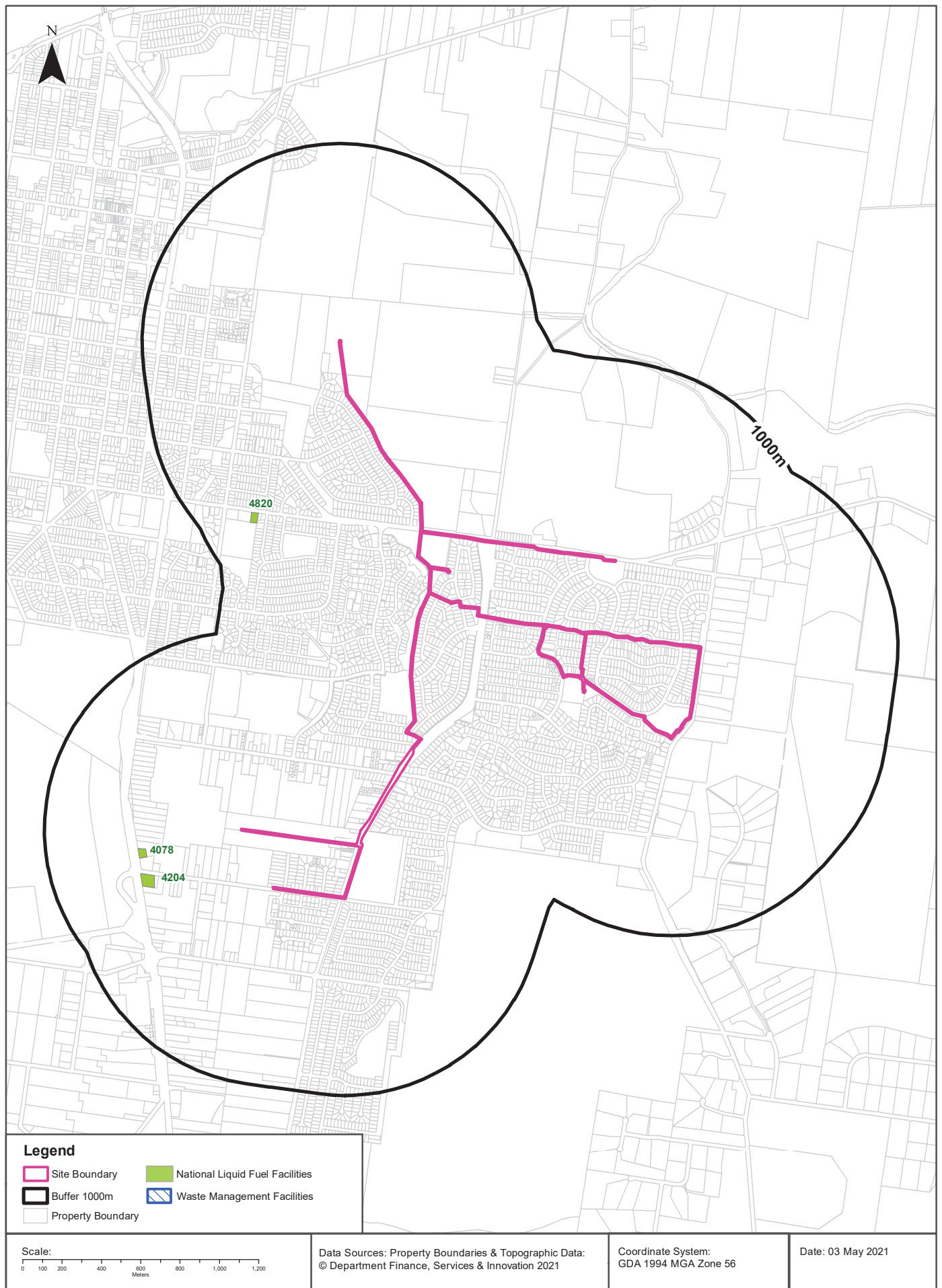
Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Waste Management & Liquid Fuel Facilities

Proposed Sewer Upgrade, South Nowra, NSW 2540



Waste Management & Liquid Fuel Facilities

Proposed Sewer Upgrade, South Nowra, NSW 2540

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia

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National Liquid Fuel Facilities

National Liquid Fuel Facilities within the dataset buffer:

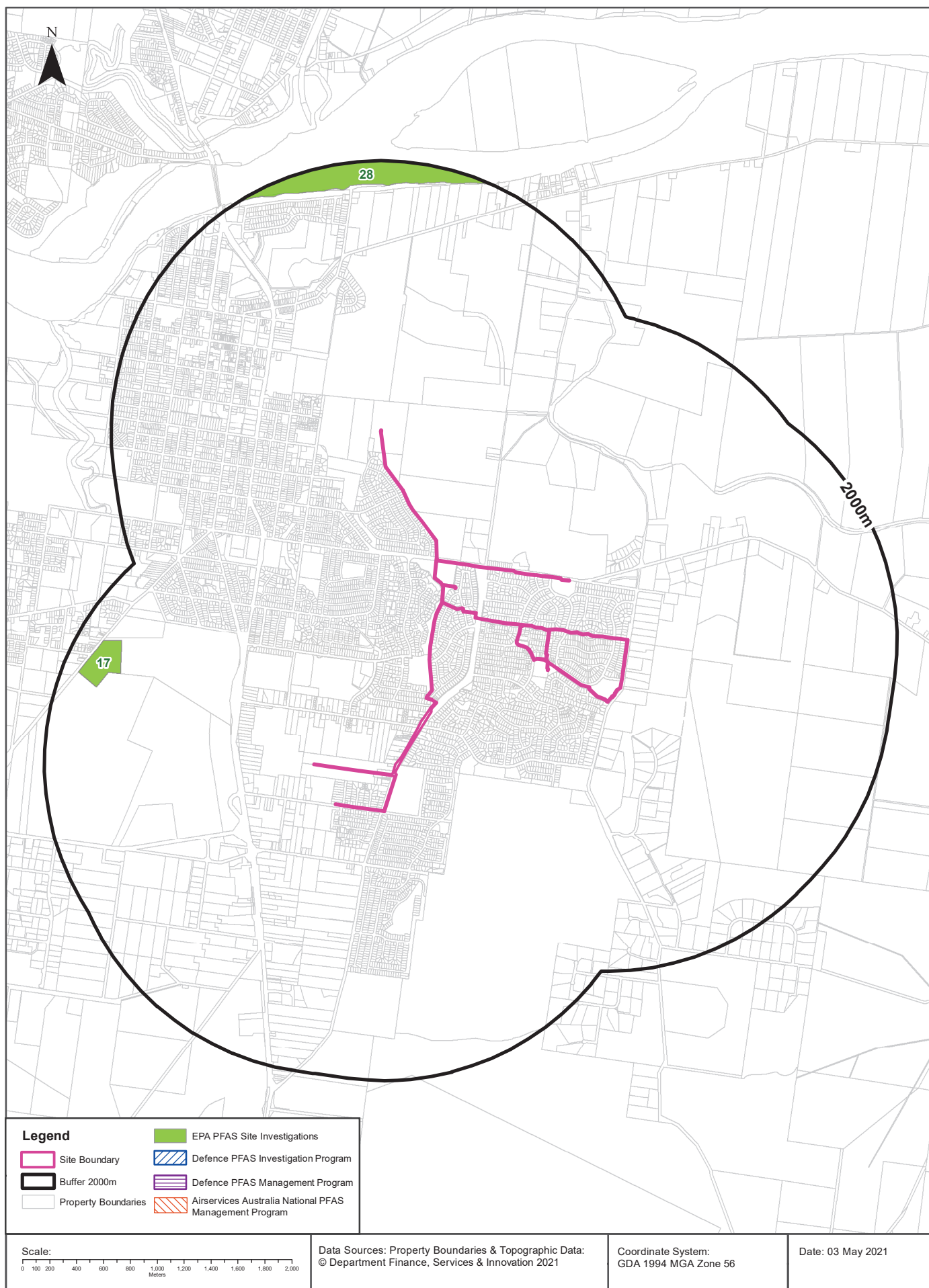
Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist	Direction
4078	United	United South Nowra	86 Princes Highway	South Nowra	Petrol Station	Operational		25/07/2011	Premise Match	493m	South West
4204	Caltex	Caltex Nowra South	100 Princes Highway	South Nowra	Petrol Station	Operational		25/07/2011	Premise Match	495m	South West
4820	7-Eleven Pty Ltd	Mobil Nowra East	128 Kalandar Street	Nowra	Petrol Station	Operational		13/07/2012	Premise Match	697m	North West

National Liquid Fuel Facilities Data Source: Geoscience Australia

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PFAS Investigation & Management Programs

Proposed Sewer Upgrade, South Nowra, NSW 2540



PFAS Investigation & Management Programs

Proposed Sewer Upgrade, South Nowra, NSW 2540

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Map ID	Site	Address	Loc Conf	Dist	Dir
17	South Nowra NSW Rural Fire Service	92 Albatross Road, South Nowra	Premise Match	1582m	West
28	Shoalhaven River	Shoalhaven River, 2541	Premise Match	1808m	North

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Proposed Sewer Upgrade, South Nowra, NSW 2540

Defence 3 Year Regional Contamination Investigation Program

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Other Sites with Contamination Issues

Proposed Sewer Upgrade, South Nowra, NSW 2540

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasminco Lead Abatement Strategy Area

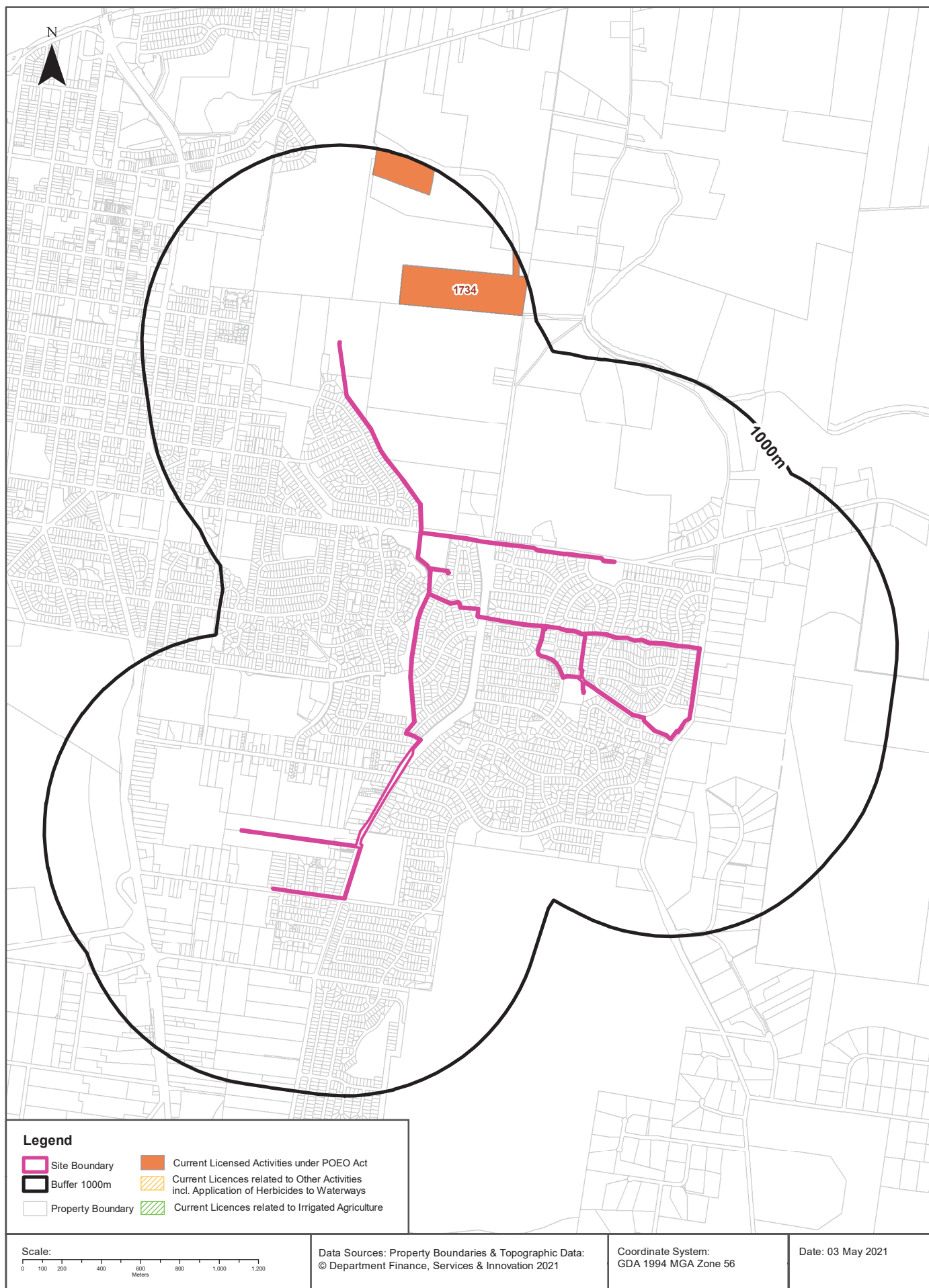
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Current EPA Licensed Activities

Proposed Sewer Upgrade, South Nowra, NSW 2540



EPA Activities

Proposed Sewer Upgrade, South Nowra, NSW 2540

Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

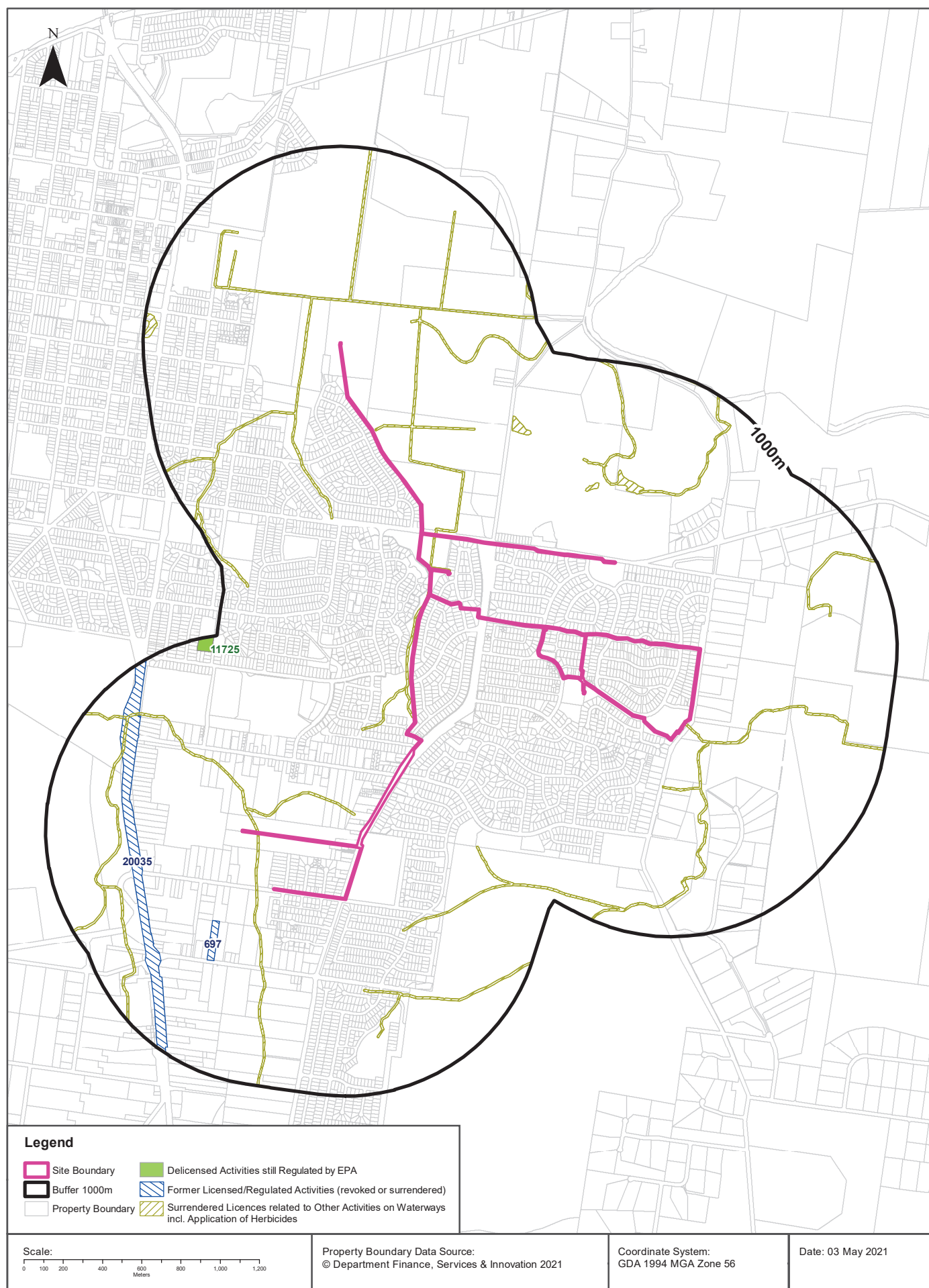
EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
1734	SHOALHAVEN CITY COUNCIL	NOWRA SEWAGE TREATMENT PLANT	TERARA ROAD	NOWRA	Sewage treatment processing by small plants	Premise Match	356m	North

POEO Licence Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Delicensed & Former Licensed EPA Activities

Proposed Sewer Upgrade, South Nowra, NSW 2540



EPA Activities

Proposed Sewer Upgrade, South Nowra, NSW 2540

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
11725	HCOA OPERATIONS (AUSTRALIA) PTY LIMITED	NOWRA PRIVATE HOSPITAL	WEEROONA PLACE	NOWRA	Hazardous, Industrial or Group A Waste Generation or Storage	Premise Match	919m	West

Delicensed Activities Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

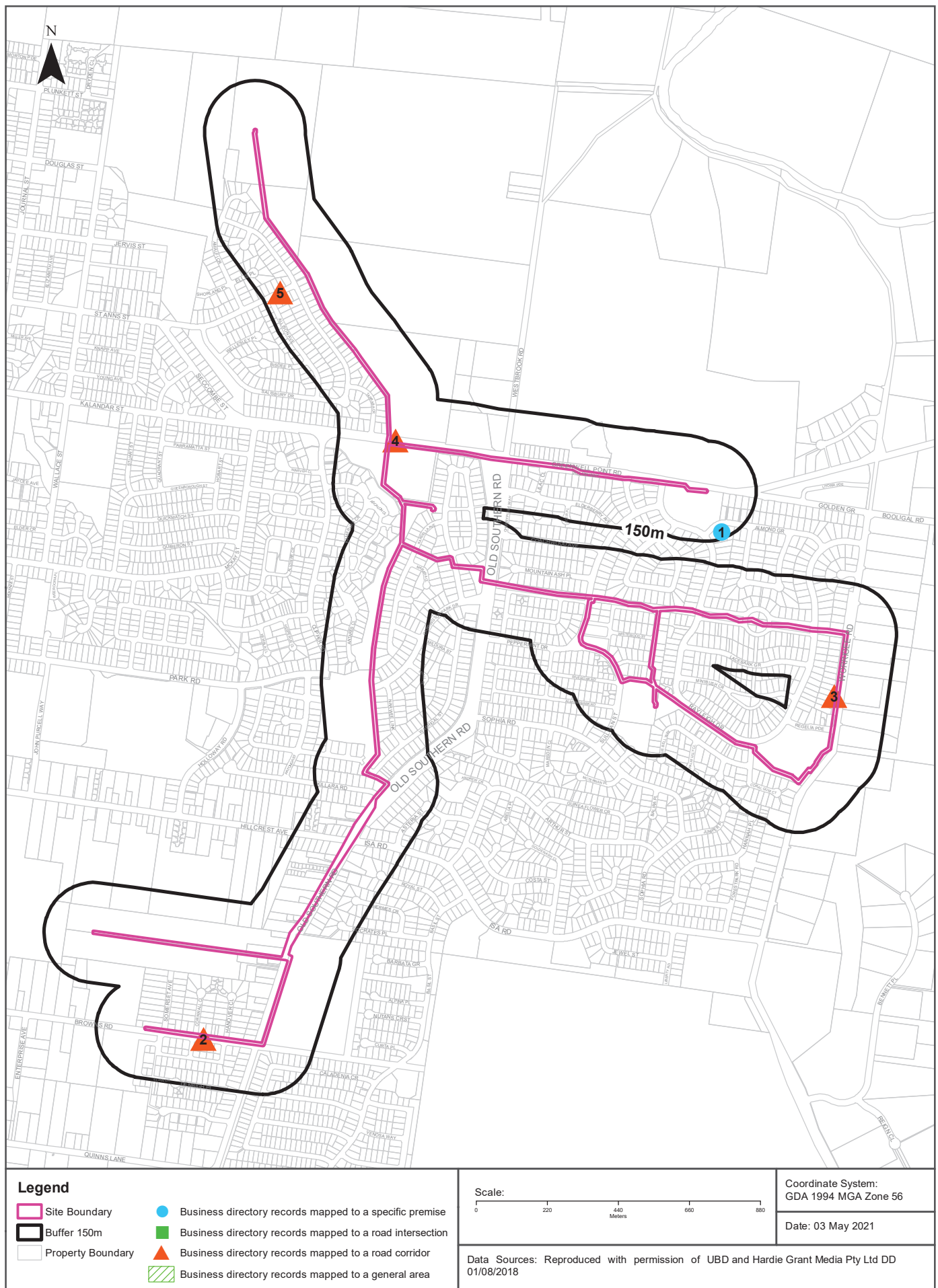
Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
697	RANDAMUSA PTY LTD	27-29 QUINNS LANE, NOWRA, NSW 2541	Surrendered	08/03/2000	Concrete works	Premise Match	320m	South West
20035	NACE CIVIL ENGINEERING PTY. LIMITED	HW1 Princes Highway South Nowra Duplication, Princes Highway between Kinghome Street and Forest Road, SOUTH NOWRA	Surrendered	03/11/2011	Road construction	Road Match	532m	South West

Former Licensed Activities Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Historical Business Directories

Proposed Sewer Upgrade, South Nowra, NSW 2540



Historical Business Directories

Proposed Sewer Upgrade, South Nowra, NSW 2540

Business Directory Records 1950-1991 Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	NOT LISTED	A & D Tree Lopping., 4 Robine Way East Nowra	103399	1991	Premise Match	113m	East

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Business Directory Records 1950-1991

Road or Area Matches

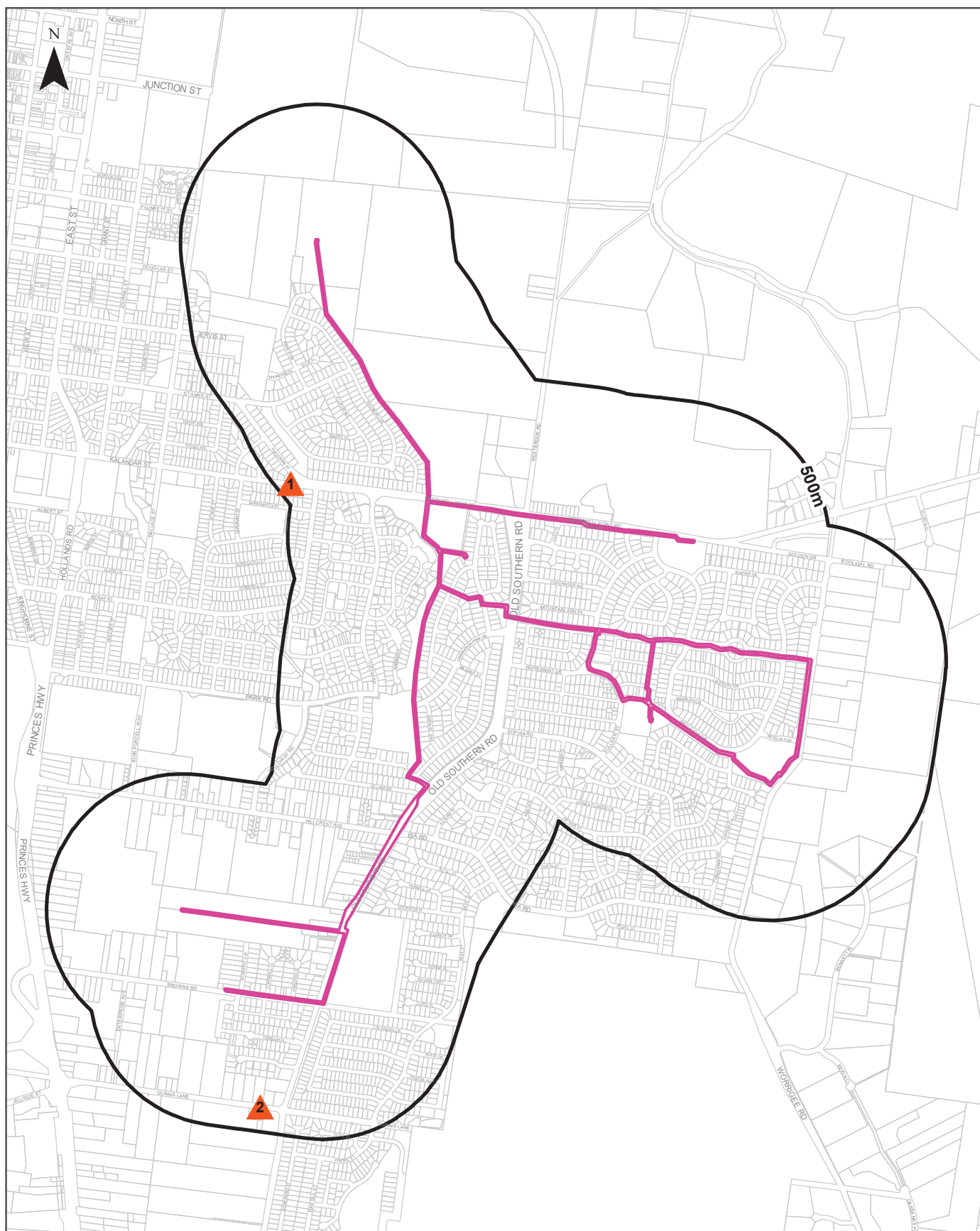
Universal Business Directory records from years 1991, 1982, 1970, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
2	CONCRETING CONTRACTORS	Casey & Sperring., Lot 1 Browns Rd South Nowra	98607	1991	Road Match	0m
	CAMPING GROUNDS &/OR CARAVAN PARKS.	Rest Point Caravan Park., Browns Rd South Nowra	100049	1991	Road Match	0m
3	PAINT &/OR ACCESSORIES - RETAIL	Dulux Trade Centre., Worrigee Rd Nowra	104127	1991	Road Match	0m
	PAINT ENAMEL VARNISH &/OR STAIN MFRS. &/OR IMPS. &/OR DIST.	Dulux Trade Centre., Worrigee Rd Nowra	104209	1991	Road Match	0m
	LAUNDRIES SELF SERVICE &/OR LAUNDRETTES.	Uptown Laundrette., Worrigee Rd Nowra	103039	1991	Road Match	0m
	FUNCTION VENUES.	Worrigee House., Worrigee Rd Nowra	99914	1991	Road Match	0m
4	BUS SERVICES CHARTER & TOURS.	Starts Coaches Pty Ud., Greenwell Point Rd Nowra	99495	1991	Road Match	0m
	BUS OPERATORS.	Stuarts Coaches Pty Ltd., Greenwell Point Rd Nowra	99452	1991	Road Match	0m
	MOTOR BUS SERVICES	Stuarts Bus Service, Greenwell PL Rd., Nowra-Bomaderry	137857	1982	Road Match	0m
5	APIARISTS	Gould, F. A. St. Anne St. Nowra	141916	1950	Road Match	52m
	APIARISTS	Gould, F. A., St. Anne St. Nowra	141918	1950	Road Match	52m

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Dry Cleaners, Motor Garages & Service Stations

Proposed Sewer Upgrade, South Nowra, NSW 2540



Legend

- Site Boundary
- Buffer 500m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale:



Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 May 2021

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Proposed Sewer Upgrade, South Nowra, NSW 2540

Dry Cleaners, Motor Garages & Service Stations Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
N/A	No records in buffer						

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Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
1	MOTOR GARAGES & SERVICE STATIONS.	Mobil Service Station., Kalander St Nowra	102484	1991	Road Match	372m
2	MOTOR GARAGES &/ OR ENGINEERS &FOR SERVICE STATIONS	South Nowra Auto Repairs. Lot 10 Quinns La., South Nowra	137922	1982	Road Match	396m
	MOTOR GARAGES &/ OR ENGINEERS &FOR SERVICE STATIONS	Wray, & L Automotive Repairs, Lot 4 Quinn's La., South Nowra	137924	1982	Road Match	396m

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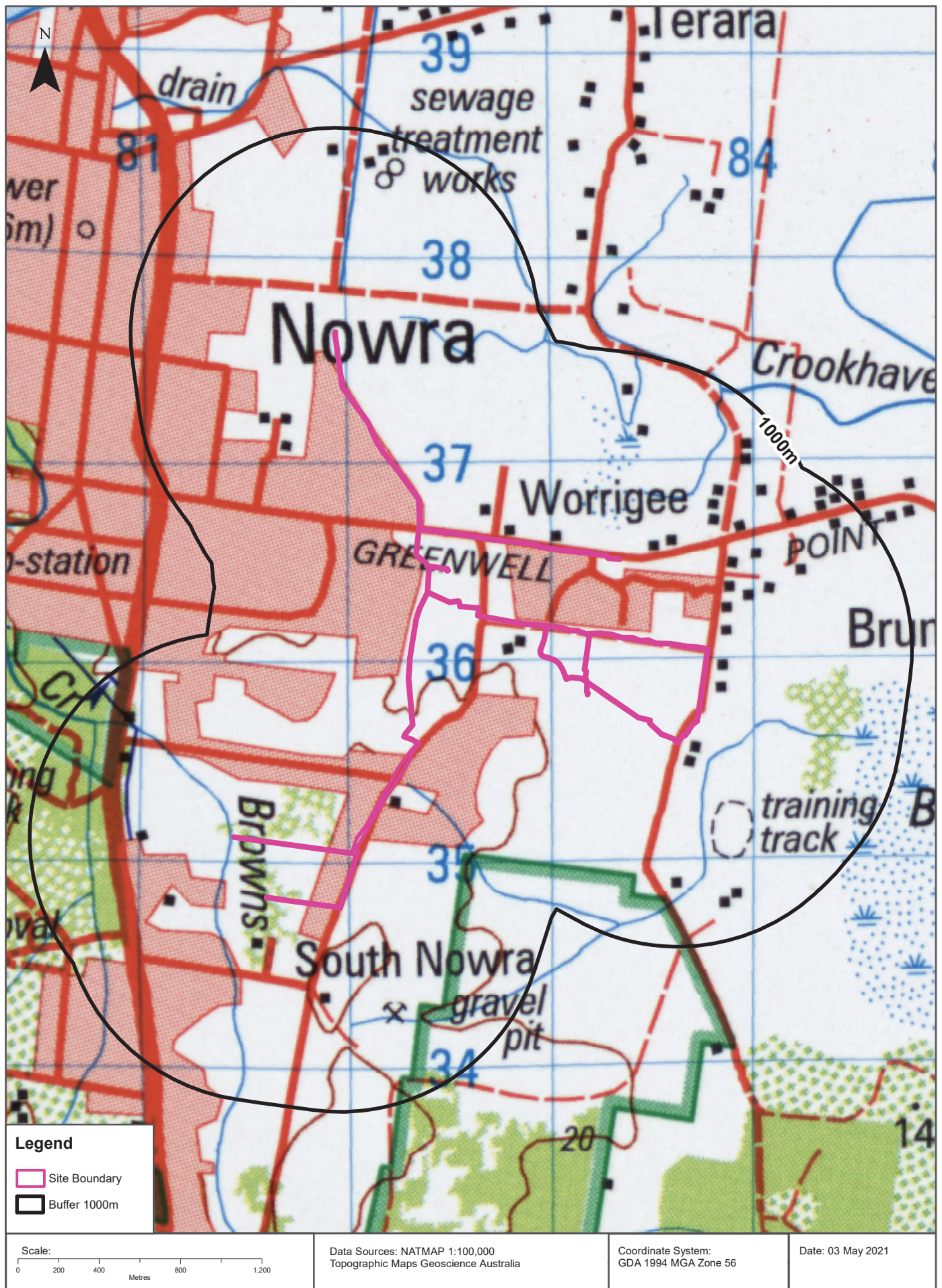
Topographic Map 2015

Proposed Sewer Upgrade, South Nowra, NSW 2540



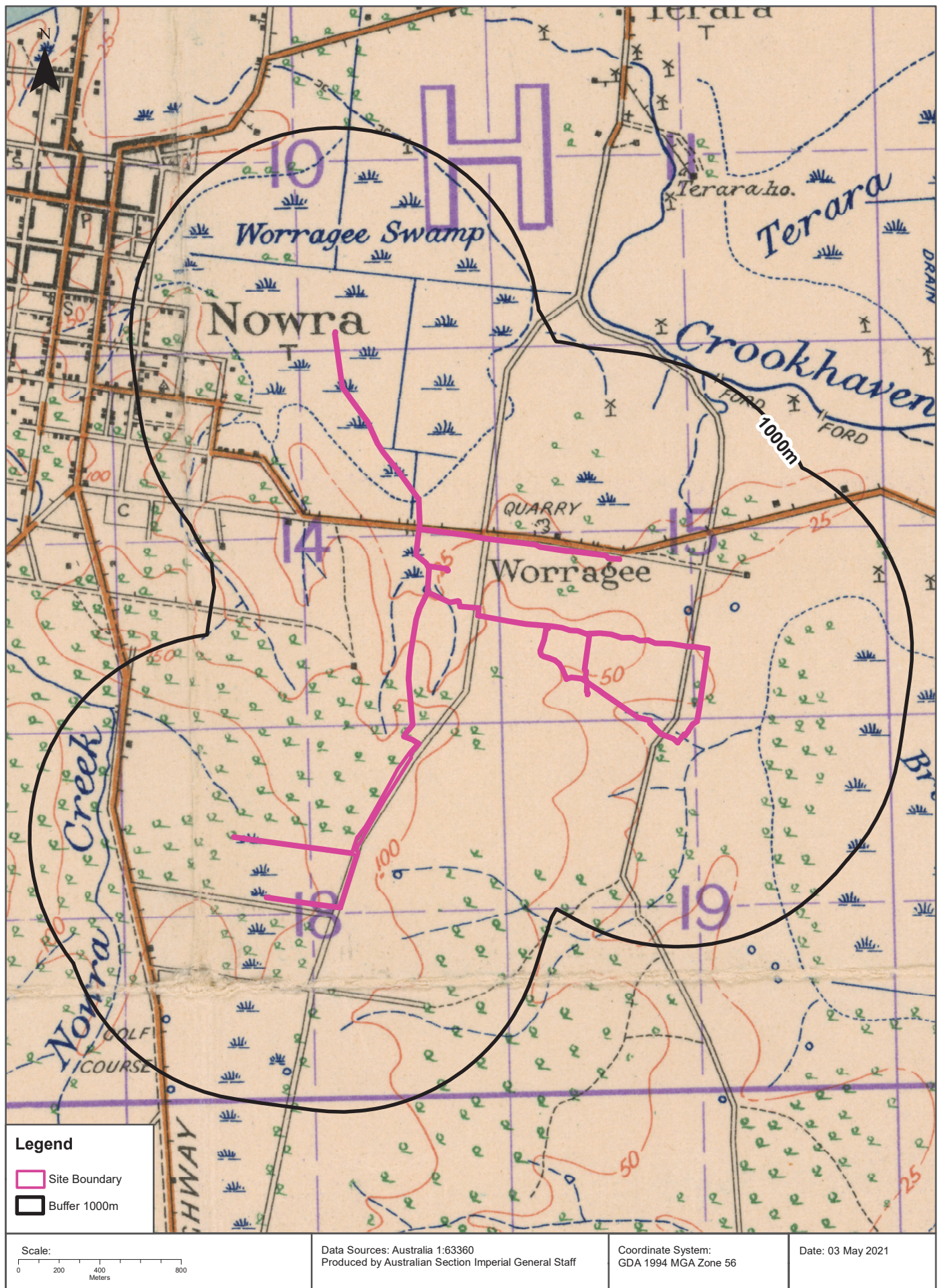
Historical Map 1998

Proposed Sewer Upgrade, South Nowra, NSW 2540



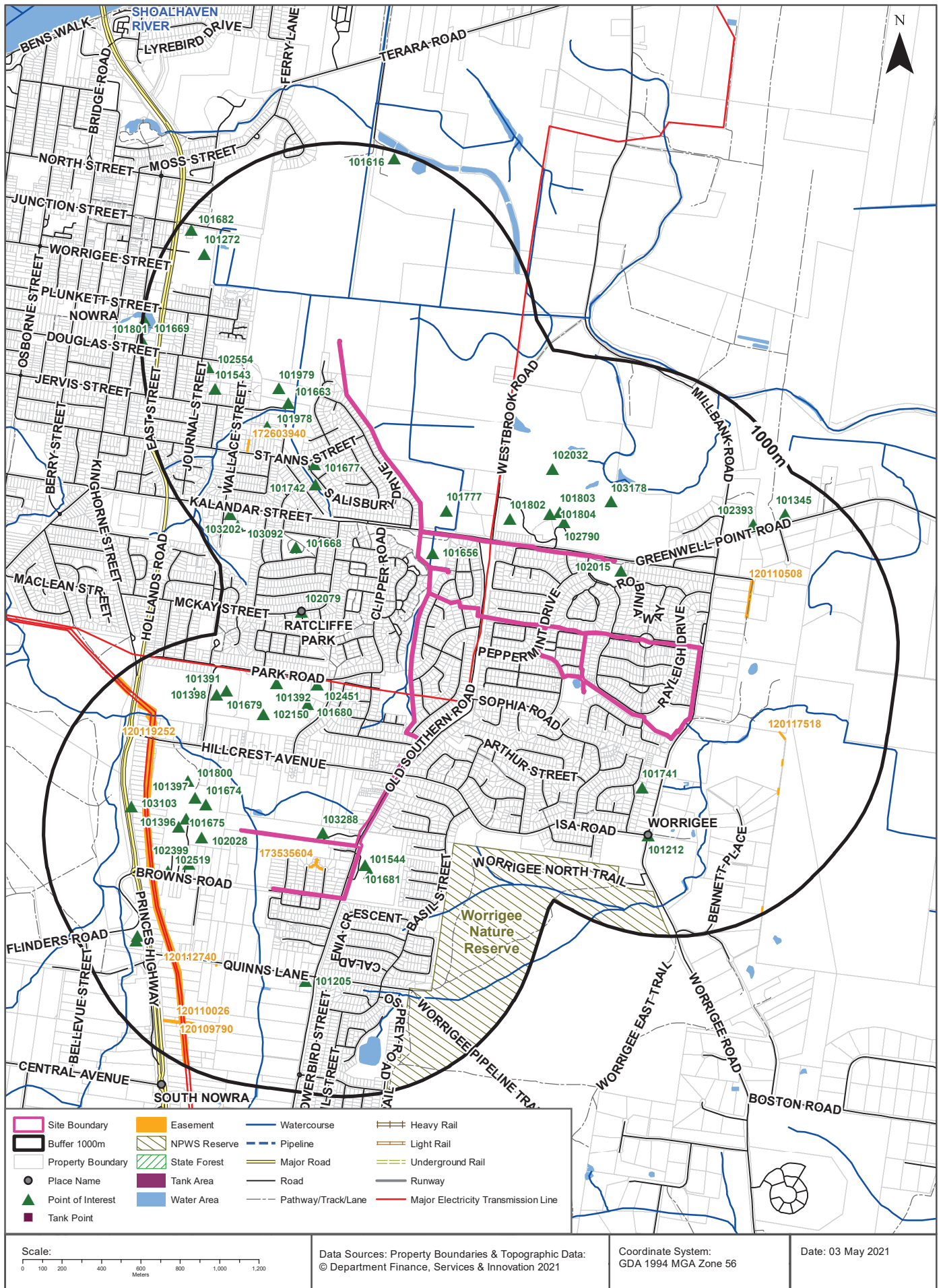
Historical Map c.1929

Proposed Sewer Upgrade, South Nowra, NSW 2540



Topographic Features

Proposed Sewer Upgrade, South Nowra, NSW 2540



Topographic Features

Proposed Sewer Upgrade, South Nowra, NSW 2540

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
103288	Nursing Home	JEAN ROSS HOUSE	38m	South West
101681	Place Of Worship	BAPTIST CHURCH	43m	South West
102015	Sports Court	TENNIS COURT	55m	East
101656	Park	RATCLIFFE PARK	59m	North West
101544	Combined Primary-Secondary School	NOWRA CHRISTIAN SCHOOL	78m	South West
101777	Golf Course	GOLF RANGE	118m	North
101802	Sports Field	HAYDEN DREXEL OVAL	124m	North
102790	Club	SHOALHAVEN EX SERVICEMENS SPORTS CLUB	151m	North East
101804	Sports Field	BOWLING GREEN	182m	North East
102028	Sports Field	Sports Field	199m	South West
101803	Sports Field	BOWLING GREEN	200m	North East
101674	Sports Field	SHOALHAVEN CITY SOCCER OVAL	218m	South West
103178	Swamp	WORRIGEE SWAMP	282m	North East
101397	Community Facility	SHOALHAVEN CITY SOCCER CLUB	282m	South West
101396	Community Facility	SHOALHAVEN DISTRICT AMATEUR SOCCER ASSOCIATION	283m	South West
101741	Park	FORESTPARK RESERVE	283m	South East
101663	Park	LYREBIRD SPORTS PARK	293m	North West
102399	Park	AMBROSE GOLDEN-BROWN PARK	312m	South West
101675	Sports Field	SOUTH NOWRA SOCCER FIELDS	312m	South West
101979	Sports Field	Sports Field	331m	North West
101677	Place Of Worship	SALVATION ARMY CHURCH	331m	North West
101800	Park	ISON PARK	366m	South West
101742	Park	SALISBURY RESERVE	372m	North West
102032	Golf Course	WORRIGEE LINKS GOLF COURSE	404m	North East
102519	Tourist Park / Home Village	REST POINT VILLAGE	422m	South West
101978	Sports Field	Sports Field	429m	North West
101205	Place Of Worship	JEHOVAHS WITNESSES CHURCH	434m	South West
102451	Community Medical Centre	NOWRA DAY CARE CENTRE	471m	South West
101212	Suburb	WORRIGEE	499m	South East
101680	Community Facility	SHOALHAVEN PCYC	517m	South West
103103	Roadside Rest Area	SOUTH NOWRA REST AREA	567m	South West

Map Id	Feature Type	Label	Distance	Direction
102079	Urban Place	RATCLIFFE PARK	585m	West
102150	Sports Field	RON BROWN OVAL	594m	South West
101668	Park	JAYCEE PARK	615m	West
101543	Primary School	NOWRA EAST PUBLIC SCHOOL	651m	North West
102554	Preschool	NOWRA EAST PUBLIC SCHOOL PRESCHOOL WAYEELA COOINDA	671m	North West
101392	High School	SHOALHAVEN HIGH SCHOOL	675m	West
102393	Cemetery	Cemetery	678m	East
101398	Community Facility	SHOALHAVEN NETBALL ASSOCIATION	695m	West
101679	Sports Court	PARK ROAD NETBALL COURTS	709m	West
103104	Roadside Rest Area	SOUTH NOWRA ROTARY REST AREA	724m	South West
101391	High School	ST JOHN THE EVANGELIST CATHOLIC HIGH SCHOOL	735m	West
102016	Park	SOUTH NOWRA ROTARY ROADSIDE PARK	738m	South West
101345	Homestead	CONGLA	800m	East
101272	Shopping Centre	NOWRA FAIR	813m	North West
103092	Nursing Home	JONATHAN ROGERS GC HOUSE	816m	West
103202	Post Office	NOWRA EAST POST OFFICE	827m	North West
101682	Community Facility	ABORIGINAL CULTURAL CENTRE	937m	North West
101616	Sewage Works	NOWRA WASTE TREATMENT PLANT	965m	North
101801	Picnic Area	Picnic Area	989m	North West
101669	Park	MARRIOTT PARK	991m	North West

Topographic Data Source: © Land and Property Information (2015)

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Topographic Features

Proposed Sewer Upgrade, South Nowra, NSW 2540

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks Data Source: © Land and Property Information (2015)

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Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
173535604	Primary	Right of way	Variable	88m	South West
120110508	Primary	Undefined		273m	East
120117518	Primary	Undefined		453m	South East
120119252	Primary	Undefined		455m	South West
120112740	Primary	Undefined		476m	South West
172603940	Primary	Right of way	2m	539m	North West
172775773	Primary	Right of way	2m	541m	North West
120110026	Primary	Undefined		786m	South West
120109790	Primary	Undefined		829m	South West

Easements Data Source: © Land and Property Information (2015)

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Topographic Features

Proposed Sewer Upgrade, South Nowra, NSW 2540

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)

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National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

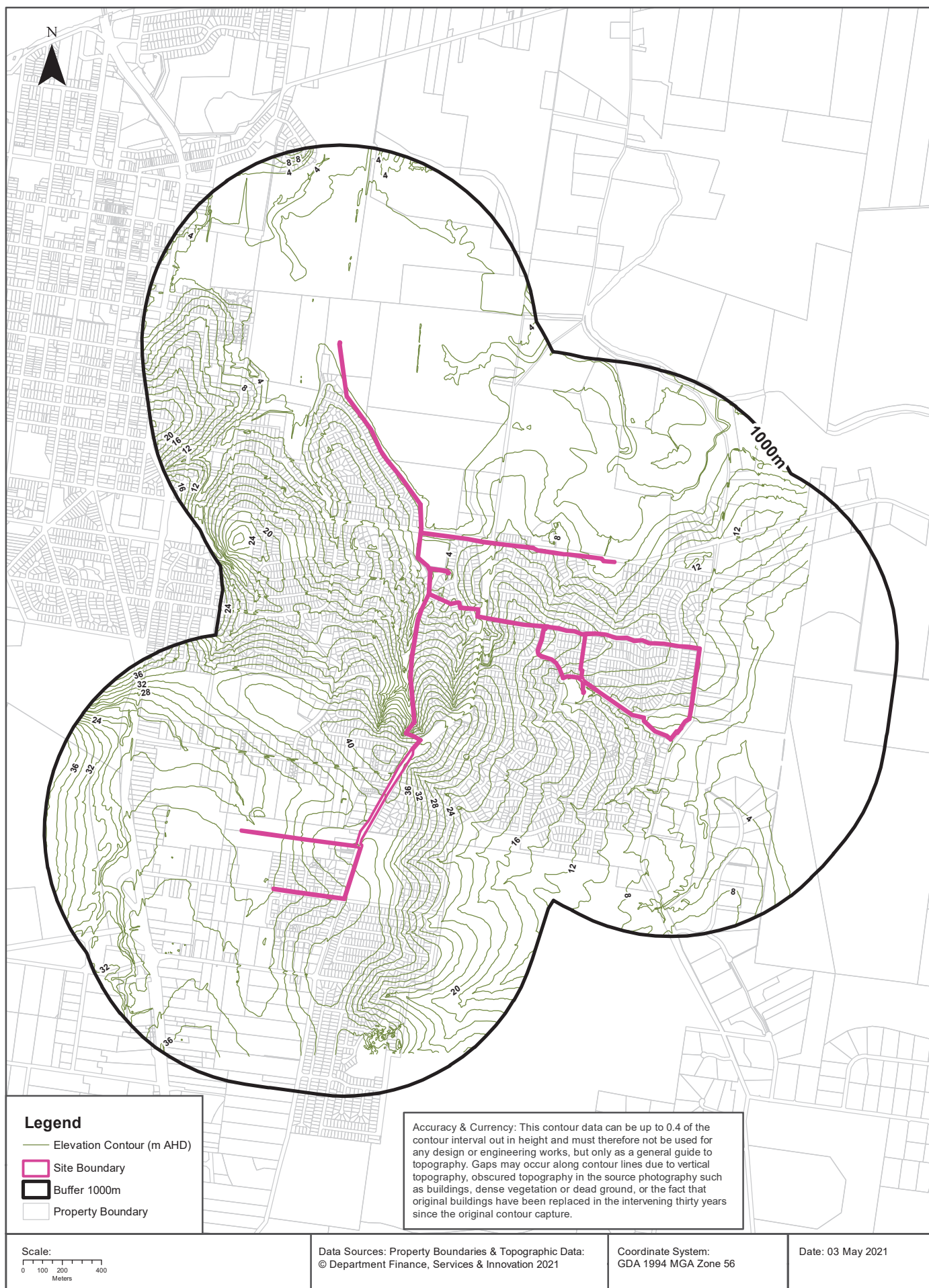
Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N0877	NATURE RESERVE	Worrigee Nature Reserve	01/01/2001	417m	South

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)

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Elevation Contours (m AHD)

Proposed Sewer Upgrade, South Nowra, NSW 2540



Hydrogeology & Groundwater

Proposed Sewer Upgrade, South Nowra, NSW 2540

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Fractured or fissured, extensive aquifers of low to moderate productivity	0m	On-site

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)

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Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

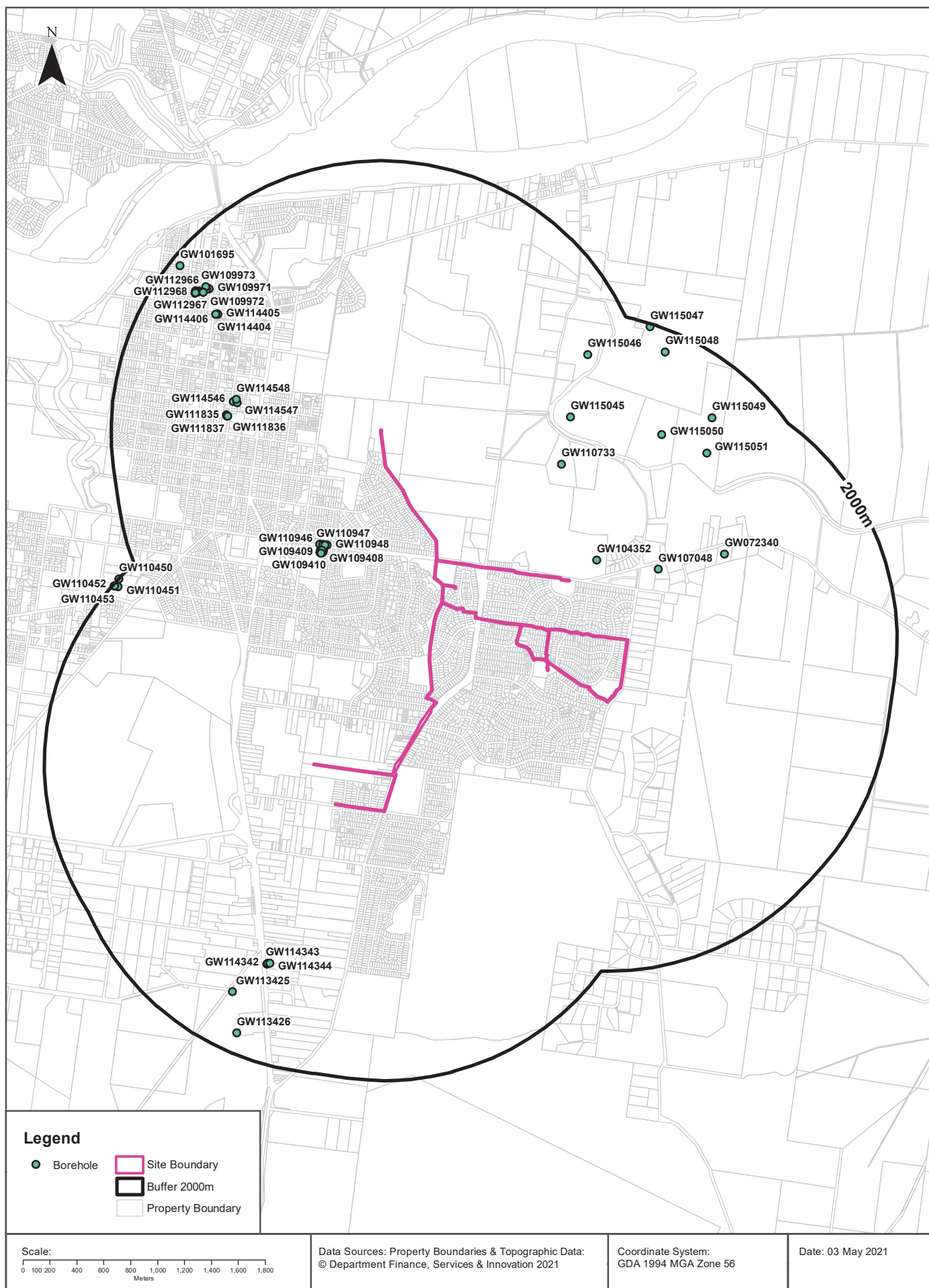
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries

Groundwater Boreholes

Proposed Sewer Upgrade, South Nowra, NSW 2540



Hydrogeology & Groundwater

Proposed Sewer Upgrade, South Nowra, NSW 2540

Groundwater Boreholes

Boreholes within the dataset buffer:

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW104 352	10BL160 695, 10WA10 6330	Bore	Private	Domestic	Domestic		25/06/2002	210.00	210.00	7.2	2.50	0.170		251m	North East
GW107 048	10BL164 189, 10WA10 6428	Bore	Private	Domestic	Domestic		17/03/2004	76.00	76.00					566m	East
GW110 948	10BL600 159	Bore	Private	Monitoring Bore	Monitoring Bore		16/02/2006	13.00	13.00					676m	North West
GW110 949	10BL600 159	Bore	Private	Monitoring Bore	Monitoring Bore		15/02/2006	14.00	14.00					691m	North West
GW110 947	10BL600 159	Bore	Private	Monitoring Bore	Monitoring Bore		15/02/2006	14.30	14.30					703m	North West
GW109 426	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		15/02/2006	14.00						707m	North West
GW109 430	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		07/11/2007	9.50						711m	North West
GW109 428	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		14/10/2008	12.00						713m	North West
GW109 424	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		02/05/2006	14.30						715m	North West
GW109 433	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		07/10/2007	6.50						717m	North West
GW109 421	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		12/05/2005	14.00						717m	North West
GW109 412	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		25/08/2004	14.00						719m	North West
GW109 429	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		07/11/2007	7.00						721m	North West
GW109 417	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		29/11/2005	14.00						722m	North West
GW110 946	10BL600 159	Bore	Private	Monitoring Bore	Monitoring Bore		14/02/2006	14.50	14.50					722m	North West
GW109 416	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		29/11/2005	14.00						723m	North West
GW109 420	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		25/08/2004	14.00						725m	North West
GW109 422	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		09/03/2006	14.00						727m	North West
GW109 409	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		07/10/2007	9.50						727m	North West
GW109 408	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		18/05/2004	14.00						727m	North West
GW114 749	10BL604 824	Bore	Private	Monitoring Bore	Monitoring Bore		19/07/2011	7.00	7.00					728m	North West
GW109 418	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		12/05/2005	15.00						729m	North West
GW109 431	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		07/11/2007	9.50						729m	North West
GW109 411	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		17/05/2004	15.00						729m	North West
GW109 414	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		11/05/2005	12.00						731m	North West
GW109 425	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		14/10/2008	13.00						735m	North West
GW109 410	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		19/05/2004	10.00						736m	North West

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW109 423	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		14/02/2006	14.50						739m	North West
GW109 415	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		12/05/2005	14.00						741m	North West
GW114 750	10BL604 824	Bore	Private	Monitoring Bore	Monitoring Bore		20/07/2011	10.00	10.00					744m	North West
GW109 413	10BL602 459	Bore	Private	Monitoring Bore	Monitoring Bore		11/05/2005	14.00						744m	North West
GW109 432	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		07/11/2007	9.50						747m	North West
GW109 427	10BL602 462	Bore	Private	Monitoring Bore	Monitoring Bore		08/09/2007	14.00						747m	North West
GW110 733	10BL603 372	Bore	Private	Test Bore	Test Bore		18/11/2009	7.20	7.20	930	2.30	0.900		835m	North East
GW072 340	10BL155 448	Bore	Private	Domestic, Stock	Domestic, Stock		25/10/1994	24.00	24.00					958m	East
GW114 547	10BL605 220	Bore	Private	Monitoring Bore	Monitoring Bore		11/08/2012	8.00	8.00		3.00	0.050		1082m	North West
GW114 548	10BL605 220	Bore	Private	Monitoring Bore	Monitoring Bore		11/08/2012	5.00	5.00		3.00	0.010		1093m	North West
GW114 546	10BL605 220	Bore	Private	Monitoring Bore	Monitoring Bore		10/08/2012	12.00	12.00		3.00	0.020		1112m	North West
GW111 837	10BL604 660	Bore	Private	Monitoring Bore	Monitoring Bore		14/04/2011	5.90	5.90		1.76			1139m	North West
GW111 836	10BL604 660	Bore	Private	Monitoring Bore	Monitoring Bore		14/04/2011	5.10	5.10		1.70			1144m	North West
GW111 835	10BL604 660	Bore	Private	Monitoring Bore	Monitoring Bore		14/04/2011	5.00	5.00		2.33			1147m	North West
GW115 045	10BL157 718			Monitoring Bore	Monitoring Bore		01/07/1996	10.00	10.00		3.30			1194m	North East
GW114 344	10BL604 977	Bore	Private	Monitoring Bore	Monitoring Bore		28/09/2011	7.20	7.20		6.00			1275m	South West
GW115 050	10BL157 718			Monitoring Bore	Monitoring Bore		30/06/1996	10.00	10.00					1280m	North East
GW114 343	10BL604 977	Bore	Private	Monitoring Bore	Monitoring Bore		28/09/2011	7.50	7.50		6.00			1282m	South West
GW114 342	10BL604 977	Bore	Private	Monitoring Bore	Monitoring Bore		28/09/2011	7.10	7.10		6.00			1290m	South West
GW115 051	10BL157 718			Monitoring Bore	Monitoring Bore		29/06/1996	10.00	10.00					1391m	North East
GW114 405	10BL604 560	Bore	Private	Monitoring Bore	Monitoring Bore		17/05/2011	3.00	3.00		1.50			1483m	North West
GW114 404	10BL604 560	Bore	Private	Monitoring Bore	Monitoring Bore		17/07/2011	2.00	2.00		1.30			1490m	North West
GW114 406	10BL604 560	Bore	Private	Monitoring Bore	Monitoring Bore		17/05/2011	4.00	4.00		3.00			1494m	North West
GW113 425	10BL602 172	Bore	Private	Monitoring Bore	Monitoring Bore	Brickworks Quarry	01/01/2007	29.00	29.00					1587m	South West
GW115 049	10BL157 718			Monitoring Bore	Monitoring Bore		29/06/1996	10.00	10.00					1607m	North East
GW115 046	10BL157 718			Monitoring Bore	Monitoring Bore		30/06/1996	10.00	10.00					1633m	North East
GW109 971	10BL602 597	Bore	Other Govt	Monitoring Bore	Monitoring Bore		19/05/1998	3.30	3.30					1646m	North West
GW109 972	10BL602 597	Bore	Other Govt	Monitoring Bore	Monitoring Bore		19/05/2008	3.00	3.00					1661m	North West
GW112 970	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	29/10/2006	9.20	9.20					1667m	North West
GW112 971	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	29/10/2009	5.40	5.40					1668m	North West
GW109 973	10BL602 597	Bore	Other Govt	Monitoring Bore	Monitoring Bore		19/05/2008	3.70	3.70					1678m	North West
GW112 966	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	03/11/2009	8.50	8.50					1699m	North West

GW No.	Licence No	Work Type	Owner Type	Authorised Purpose	Intended Purpose	Name	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m bgl)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW112 967	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	03/11/2009	5.20	5.20					1700m	North West
GW112 968	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	03/11/2009	7.70	7.70					1710m	North West
GW112 973	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	28/10/2009	4.00	4.00					1712m	North West
GW112 972	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	28/10/2009	3.90	3.90					1719m	North West
GW112 969	10BL603 409	Bore	Local Govt	Monitoring Bore	Monitoring Bore	Shoalhaven CC - Bridge Rd	03/11/2009	7.70	7.70					1720m	North West
GW115 048	10BL157 718			Monitoring Bore	Monitoring Bore		29/06/1996	17.00	17.00					1839m	North East
GW113 426	10BL602 172	Bore	Private	Monitoring Bore	Monitoring Bore	Brickworks Quarry	01/01/2007	23.00	23.00					1850m	South West
GW101 695	10BL158 526, 10WA10 7476	Bore		Domestic	Domestic		21/04/1998	48.00	48.00					1927m	North West
GW110 451	10BL603 155	Bore	Other Govt	Monitoring Bore	Monitoring Bore		02/04/2009	9.00	9.00		3.20			1960m	West
GW115 047	10BL157 718			Monitoring Bore	Monitoring Bore		27/06/1996	17.00	20.00					1974m	North East
GW110 453	10BL603 155	Bore	Other Govt	Monitoring Bore	Monitoring Bore		02/04/2009	9.00	9.00		2.30			1984m	West
GW110 452	10BL603 155	Bore	Other Govt	Monitoring Bore	Monitoring Bore		02/04/2009	10.00	10.00		2.70			1985m	West
GW110 450	10BL603 155	Bore	Other Govt	Monitoring Bore	Monitoring Bore		02/04/2009	9.00	9.00		3.50			1996m	West

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Hydrogeology & Groundwater

Proposed Sewer Upgrade, South Nowra, NSW 2540

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

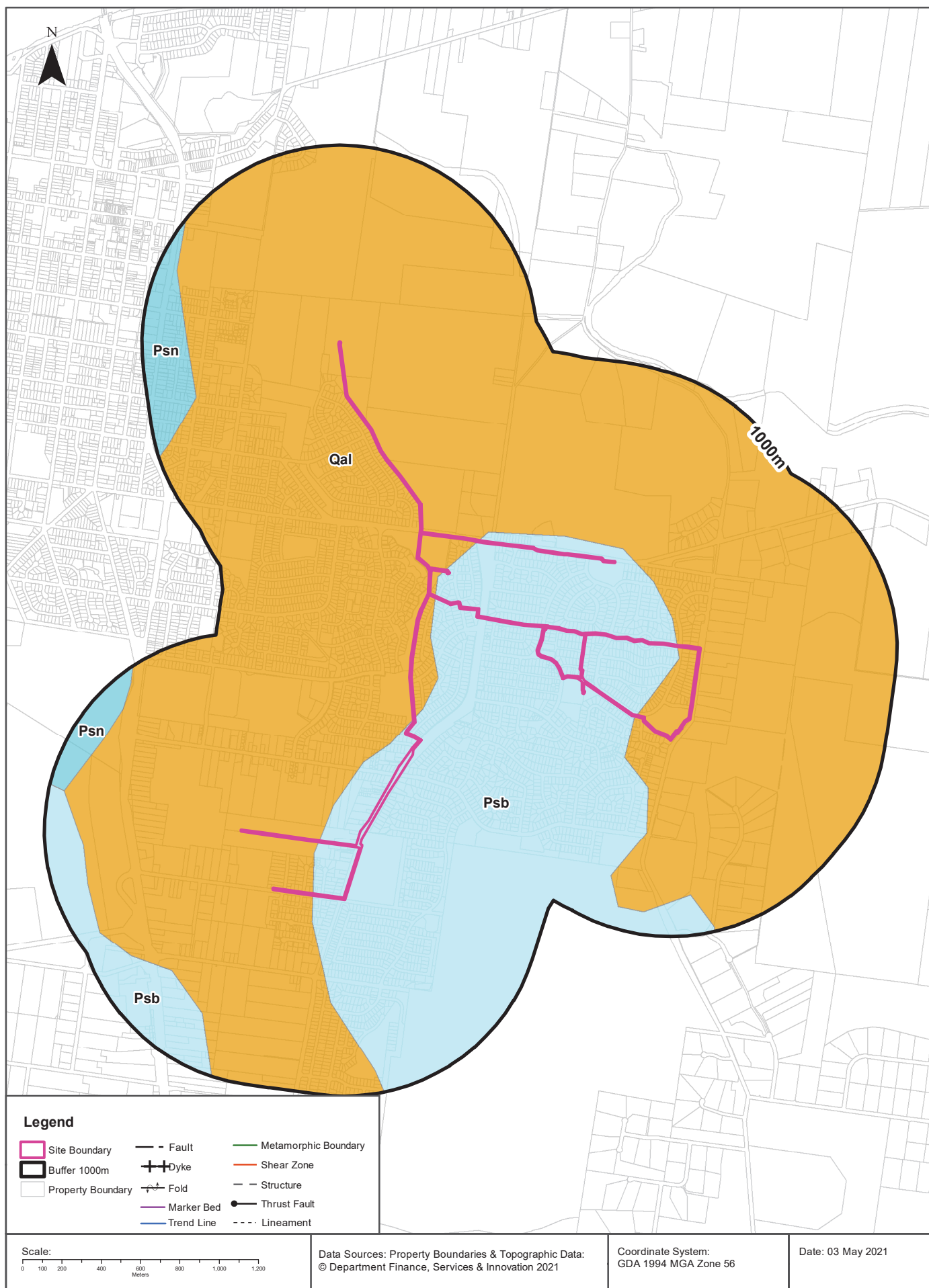
Groundwater No	Drillers Log	Distance	Direction
GW104352	0.00m-2.00m SOIL AND CLAY 2.00m-150.00m SILTSTONE 150.00m-195.00m GREY SANDSTONE 195.00m-210.00m SILTSTONE	251m	North East
GW107048	0.00m-7.00m shale, brown 7.00m-76.00m shale, black	566m	East
GW110948	0.00m-0.50m FILL.TOPSOIL,SAND,BROWN,LITTLE GRAVEL 0.50m-2.00m CLAY RED BROWN,SOME SAND,GRAVEL 2.00m-4.00m TUFF,LIGHT GREY 4.00m-13.00m TUFF,SANDY GREY,FIRM TO STIFF	676m	North West
GW110949	0.00m-1.00m FILL,SAND AND LITTLE GRAVEL 1.00m-2.50m CLAY,RED BROWN,DRY,FIRM,DENSE,SOME SND 2.50m-14.00m TUFF SANDY,SILTY,DARK GREY TO GREY	691m	North West
GW110947	0.00m-1.00m FILL,TOPSOIL BROWN,SAND,DRY 1.00m-2.00m CLAY LITTLE SAND,BROWN 2.00m-14.30m TUFF,Water level not apparent as drilling with water.	703m	North West
GW110946	0.00m-0.50m FILL.DRY SAND 0.50m-2.00m CLAY BROWN,DRY STIFF,L/PLASTICITY 2.00m-3.10m CLAY SOME SAND 3.10m-10.00m TUFF 10.00m-11.00m SANDSTONE 11.00m-12.60m TUFF CONSOLIDATED 12.60m-14.50m TUFF HETEROGENEOUS FROM SOFT,FIRM,HARD	722m	North West
GW114749	0.00m-0.15m PAVEMENT - CONCRETE 0.15m-1.50m FILL SILTY CLAY 1.50m-3.00m CLAYS YELLOW BROWN 3.00m-7.00m SANDSTONE WEATHERED, FINE GRAINED	728m	North West
GW114750	0.00m-0.15m PAVEMENT- CONCRETE 0.15m-1.50m FILL, SILTY CLAY 1.50m-3.00m CLAYS-YELLOW BROWN 3.00m-10.00m SANDSTONE WEATHERED,FINE GRAINE4D YELLOW BROWN	744m	North West
GW110733	0.00m-0.50m TOPSOIL 0.50m-1.00m SOIL DARK 1.00m-2.50m CLAY WHITE 2.50m-4.60m CLAY RED 4.60m-7.20m SAND DARK, CLAY	835m	North East
GW072340	0.00m-3.00m SHALE & CLAY 3.00m-24.00m BLUE SHALE	958m	East
GW114547	0.00m-0.50m GRAVEL / FILL 0.50m-1.50m SANDY CLAY, YELLOW,BROWN,RED 1.50m-8.00m SANDSTONE,YELLOW,BROWN,RED	1082m	North West
GW114548	0.00m-0.50m FILL MATERIAL,CLAY,BRICK,WASTE 0.50m-5.00m SANDY CLAY, YELLOW, GREY	1093m	North West
GW114546	0.00m-0.20m CONCRETE 0.20m-0.40m FILL SAND 0.40m-12.00m SANDY CLAY, YELLOW RED BROWN	1112m	North West
GW111837	0.00m-0.80m FILL,GRAVELLY SILTY CLAY,BROWN,IRONSTONE,GRAVEL 0.80m-1.20m FILL,SILT L/BROWN,CREAM,DRY 1.20m-2.30m SILTY CLAY,ORANGE,RED,BROWN,L/PLAST. 2.30m-3.30m CLAY,RED,ORANGE,GREY,MOTTLED,VERY STIFF 3.30m-3.90m SANDY CLAY,L/GREY,MOIST 3.90m-5.90m CLAY,RED ORANGE,GREY,QUARTZ GRAVELS	1139m	North West
GW111836	0.00m-1.20m FILL GRAVELLY SILTY CLAY,BROWN,ORANGE,IRONSTONE,GRAVEL 1.20m-3.20m CLAY SILTY,ORANGE,RED,BROWN,GREY 3.20m-5.10m CLAY SILTY,GREY,VERY STIFF,DRY L/PLASTICITY	1144m	North West
GW111835	0.00m-1.80m SILT,DADDRK BROWN,DRY,ROOTLETS 1.80m-5.00m CLAY SILTY YELLOW ORANGE BROWN	1147m	North West
GW115045	0.00m-3.00m SILTY CLAY ORANGE BROWN 3.00m-7.00m SANDY CLAY DARK BROWN FINE GRAINED 7.00m-10.00m CLAYEY SAND ORANGE BROWN	1194m	North East

Groundwater No	Drillers Log	Distance	Direction
GW114344	0.00m-0.30m GRAVELLY SAND,DARK BROWN,MG 0.30m-1.00m SANDY CLAY, BROWN SOFT 1.00m-1.30m CLAY RED/BROWN,VERY HARD 1.30m-4.00m CLAYEY SHALE FRAGMENTS,BROWN 4.00m-5.50m CLAYEY SHALE BROWN 5.50m-7.20m SILTY CLAY, RED/ GREY	1275m	South West
GW115050	0.00m-3.00m SANDY LOAM LIGHT BROWN 3.00m-6.00m SAND GREY WITH SHELLS 6.00m-8.00m SAND BROWN COARSE WITH GRAVELS 8.00m-9.00m SAND LIGHT GREY CLAYEY /GRAVELS 9.00m-10.00m CLAY VERY LIGHT GREY	1280m	North East
GW114343	0.00m-0.50m GRAVELLY SAND 0.50m-1.70m FILL, CLAY,RED BROWN 1.70m-5.50m CLAYEY SHALE FRAGMENTS 5.50m-7.50m SILTY CLAY,GREY , BROWN	1282m	South West
GW114342	0.00m-0.30m GRAVELLY SAND FILL,DARK BROWN MG 0.30m-0.50m SILTY CLAY,BROWN SOFT 0.50m-1.30m CLAY RED,BROWN, VERY HARD 1.30m-4.00m CLAYEY SHALE FRAGMENTS BROWN 4.00m-5.50m SILTY CLAY AND ROCKS ORANGE 5.50m-7.10m SILTY CLAY AND ROCKS SOFTER	1290m	South West
GW115051	0.00m-2.00m CLAYEY LOAM DARK BROWN 2.00m-3.00m SANDY CLAY BROWN 3.00m-7.00m SAND GREY MEDIUM GRAINED 7.00m-10.00m CLAY DARK GREY WITH 5% SHELLS	1391m	North East
GW114405	0.00m-0.70m FILL MIXED 0.70m-1.50m SILTY CLAY.MOIST ORANGE BROWN 1.50m-3.00m SILTY CLAY MOIST GREY RED BROWN	1483m	North West
GW114404	0.00m-1.00m FILL MIXED 1.00m-2.00m SILTY CLAY,YELLOW BROWN	1490m	North West
GW114406	0.00m-1.00m SILTY CLAY FINE GRAVEL 1.00m-3.00m SILTY CLAY WHITE GREY 3.00m-4.00m SAND SILTY CLAY WET ORANGE BROWN	1494m	North West
GW115049	0.00m-2.00m CLAY LOAMY DARK BROWN 2.00m-10.00m CLAY BROWNISH GREY AND SHELLS	1607m	North East
GW115046	0.00m-2.00m SANDY LOAM LIGHT BROWN 2.00m-3.00m CLAYEY AND SANDY LOAM 3.00m-4.00m SAND GREY AND COARSE 4.00m-8.00m GREY COARSE SAND 8.00m-9.00m GREY CLAYEY COARSE SAND 9.00m-10.00m GREY SANDY CLAY WITH 5% SHELLS	1633m	North East
GW115048	0.00m-2.00m CLAY GRADING INTO SAND DARK BROWN 2.00m-17.00m SILTY CLAY DARK GREY WITH 15-20 % SHELLS	1839m	North East
GW101695	0.00m-0.50m Soil 0.50m-3.00m Clay 3.00m-48.00m Grey Sandstone	1927m	North West
GW110451	0.00m-0.10m FILL,GRAVEL, TOP DRESSING 0.10m-1.20m SILTY CLAY,ORANGE BROWN AND GREY 1.20m-4.50m CLAYEY SILT,BROWN ORGANIC ODOUR 4.50m-6.00m SILTY CLAY,ORANGE,MOIST,SOME GRAVELS 6.00m-9.00m CLAYEY SILT,GREY,BROWN	1960m	West
GW115047	0.00m-3.00m CLAY LOAMY DARK BROWN 3.00m-4.00m CLAY DARK GREY 4.00m-13.00m SILTY CLAY DARK GREY WITH SHELLS 13.00m-20.00m SILTY CLAY DARK GREY	1974m	North East
GW110453	0.00m-0.30m CONCRETE,PAVEMENT SLAB 0.30m-0.40m ROADBASE,GREY CRUSHED ROCK 0.40m-3.00m SILTY CLAY,ORANGE,BROWN AND RED 3.00m-9.00m CLAYEY SILT.RED BRP.WM.SOME SAND	1984m	West
GW110452	0.00m-0.30m CONCRETE,PAVEMENT SLAB 0.30m-0.40m ROADBASE,GREY CRUSHED ROCK 0.40m-3.50m SILTY CLAY,ORANGE,GREY AND RED,MOIST 3.50m-7.50m CLAYEY SILT,ORANGE BROWN,OCCASIONAL GRAVELL CLAYEY SILT 7.50m-10.00m GRAVELL CLAYEY SILT,DARK BROWN	1985m	West
GW110450	0.00m-0.10m FILL,GRAVEL AND TOP DRESSING 0.10m-1.50m SILTY CLAY,ORANGE BROWN AND GREY,DRY 1.50m-6.00m CLAYEY SANDY SILT,ORANGE BROWN FINE GRAINED 6.00m-9.00m CLAYEY SILT,DARK GREY BRWON VERY MOIST	1996m	West

Drill Log Data Source: NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corp
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Geology

Proposed Sewer Upgrade, South Nowra, NSW 2540



Geology

Proposed Sewer Upgrade, South Nowra, NSW 2540

Geological Units 1:250,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dist	Dir
Psb	Bluish grey to light grey siltstone, shaly in part with bands of silty sandstone	Berry Siltstone	Shoalhaven Group		Palaeozoic	0m	On-site
Qal	Alluvium, gravel, sand silt and clay	undifferentiated			Cainozoic	0m	On-site
Psn	Quartzose sandstone, minor siltstone plus conglomerate beds	Nowra Sandstone	Shoalhaven Group		Palaeozoic	753m	North West

Geological Structures 1:250,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Distance	Direction
N/A	No records in buffer				

Geological Data Source : NSW Department of Industry, Resources & Energy

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Naturally Occurring Asbestos Potential

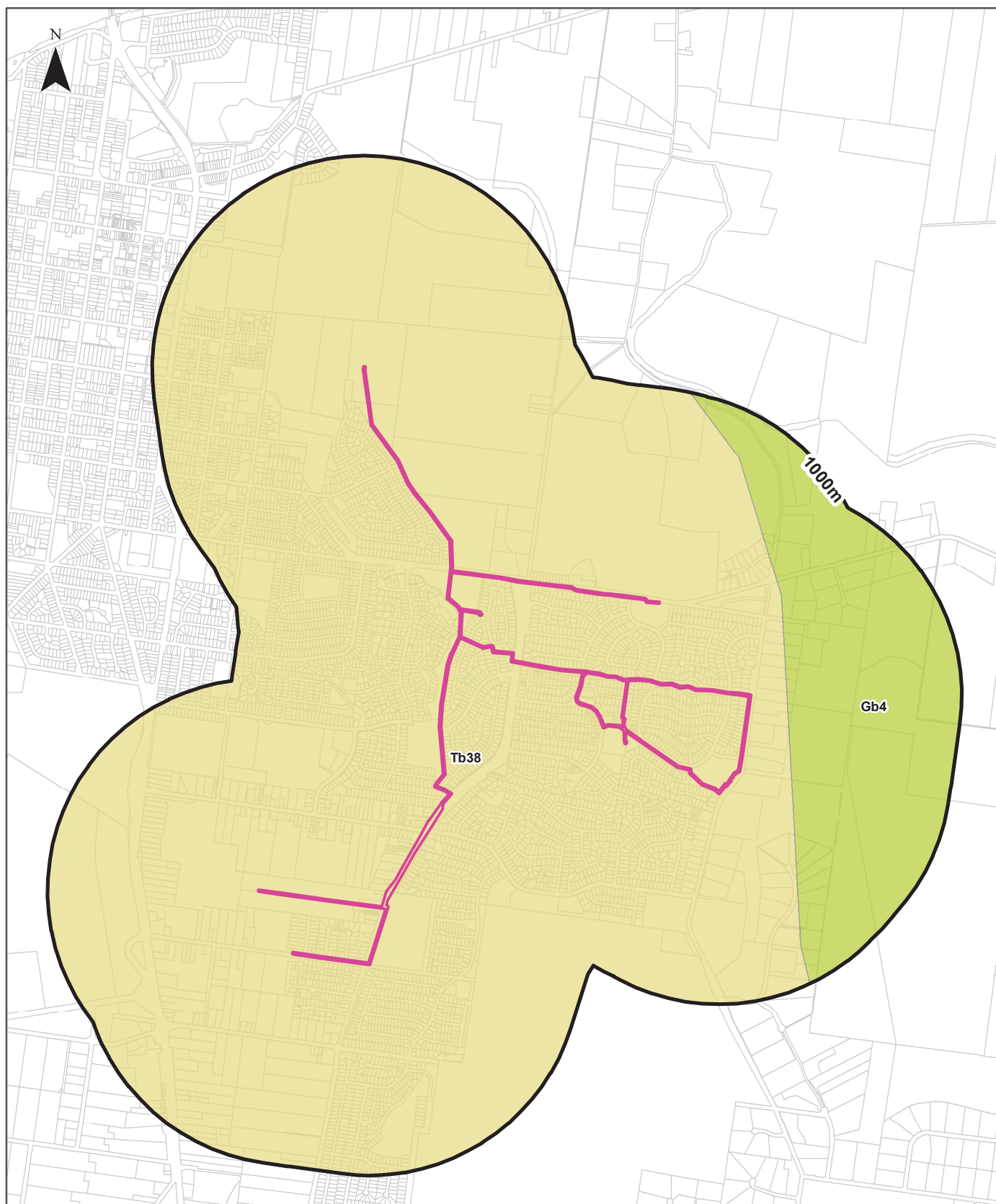
Proposed Sewer Upgrade, South Nowra, NSW 2540

Naturally Occurring Asbestos Potential

Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Naturally Occurring Asbestos Potential Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy



Legend		Australian Soil Classification Orders					
Site Boundary	Anthrosol	Dermosol	Kandosol	Podosol	Tenosol	No Data	
Buffer 1000m	Calcarosol	Ferrosol	Kurosol	Rudosol	Vertosol		
Property Boundary	Chromosol	Hydrosol	Organosol	Sodosol	Lake		

Scale:
0 100 200 400 600 800 1,000 1,200
Meters

Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2021

Coordinate System:
GDA 1994 MGA Zone 56

Date: 03 May 2021

Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540

Atlas of Australian Soils

Soil mapping units and Australian Soil Classification orders within the dataset buffer:

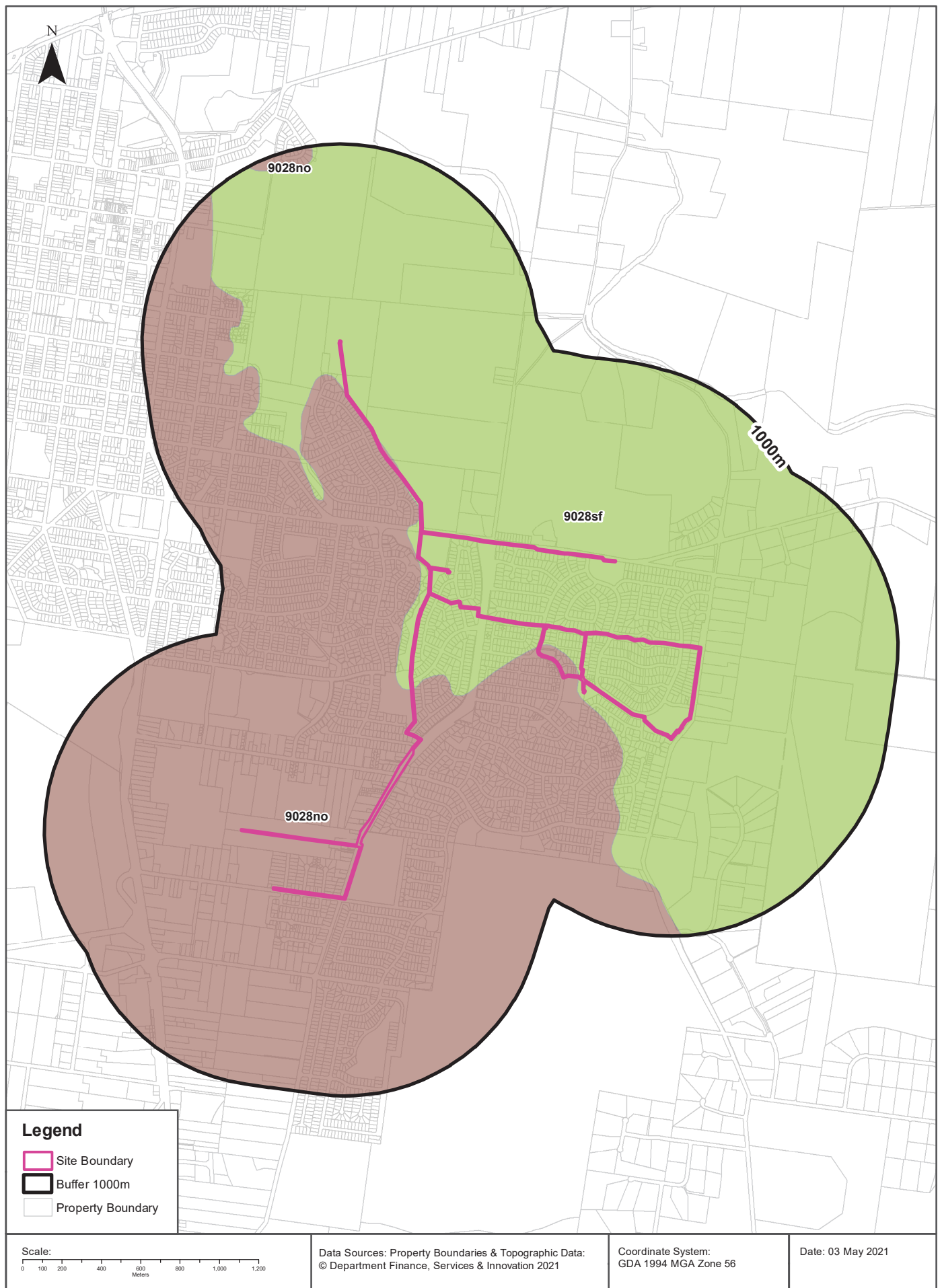
Map Unit Code	Soil Order	Map Unit Description	Distance	Direction
Tb38	Kurosol	Flat to undulating: chief soils are hard acidic yellow and yellow mottled soils (Dy2.41) and (Dy3.41) sometimes containing ironstone gravel. Associated are hard acidic red soils (Dr2.21, Dr2.41), and small areas of other soils, including (Gn2) and (Gn3.54).	0m	On-site
Gb4	Dermosol	River terraces: (1) lower of dark, porous, loamy soils (Um6.11), (2) middle of (Gn2.2 and Gn2.4),(3) upper of (Dy2.41 or Dy3.41 or Dy5.41), and (4) present floodplains of various (Uc1 and Um1) soils..	169m	East

Atlas of Australian Soils Data Source: CSIRO

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Soil Landscapes of Central and Eastern NSW

Proposed Sewer Upgrade, South Nowra, NSW 2540



Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540

Soil Landscapes of Central and Eastern NSW

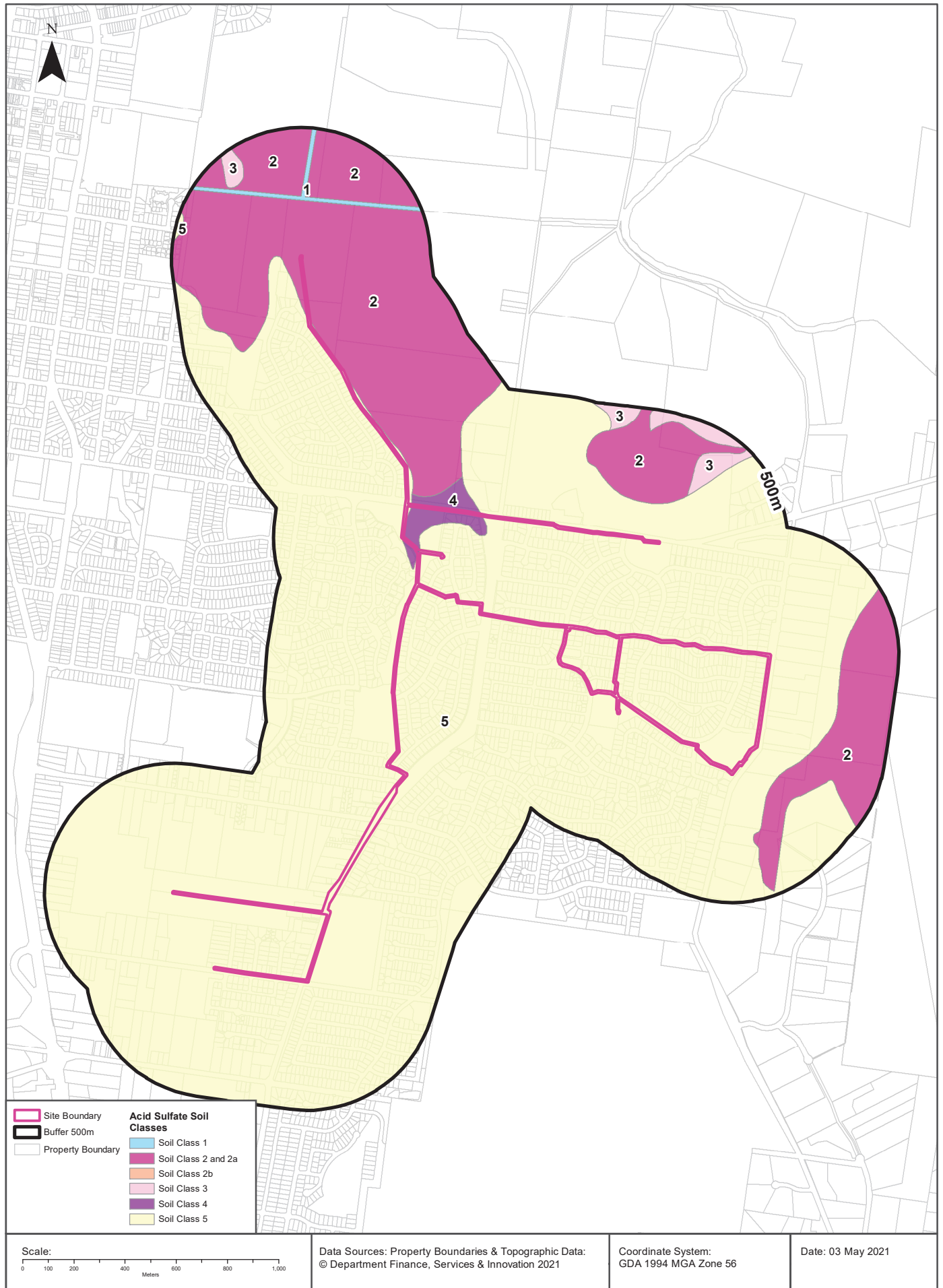
Soil Landscapes of Central and Eastern NSW within the dataset buffer:

Soil Code	Name	Distance	Direction
9028sf	Shoalhaven	0m	On-site
9028no	Nowra	0m	On-site

Soil Landscapes of Central and Eastern NSW: NSW Department of Planning, Industry and Environment
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Acid Sulfate Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540



Acid Sulfate Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
2	Works below natural ground surface present an environmental risk; Works by which the watertable is likely to be lowered present an environmental risk	Shoalhaven Local Environmental Plan 2014

If the on-site Soil Class is 5, what other soil classes exist within 500m?

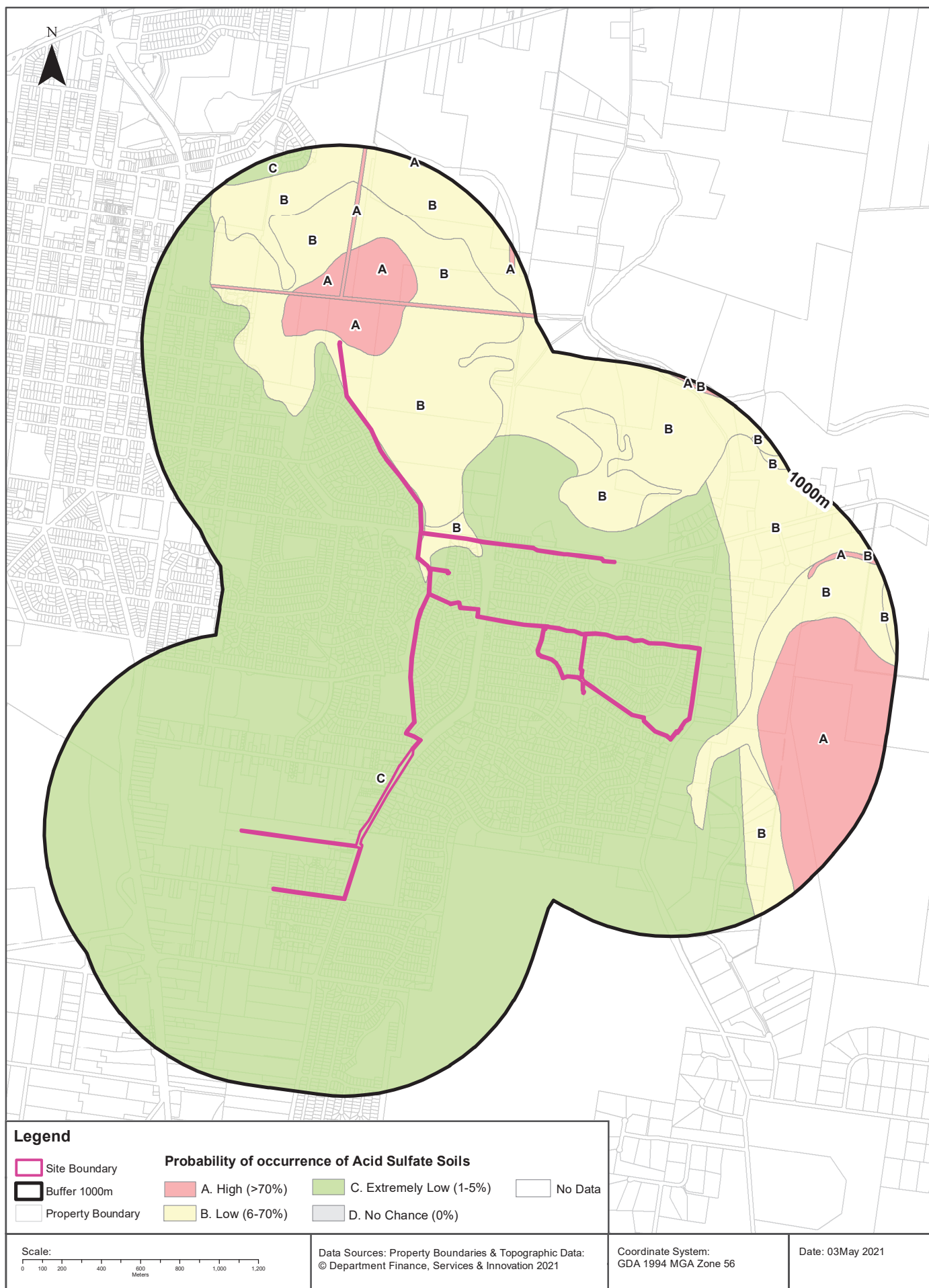
Soil Class	Description	EPI Name	Distance	Direction
N/A				

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Atlas of Australian Acid Sulfate Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540



Acid Sulfate Soils

Proposed Sewer Upgrade, South Nowra, NSW 2540

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance	Direction
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m	On-site
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m	On-site
A	High Probability of occurrence. >70% chance of occurrence.	232m	North

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO

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Dryland Salinity

Proposed Sewer Upgrade, South Nowra, NSW 2540

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A		

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Mining

Proposed Sewer Upgrade, South Nowra, NSW 2540

Mining Subsidence Districts

Mining Subsidence Districts within the dataset buffer:

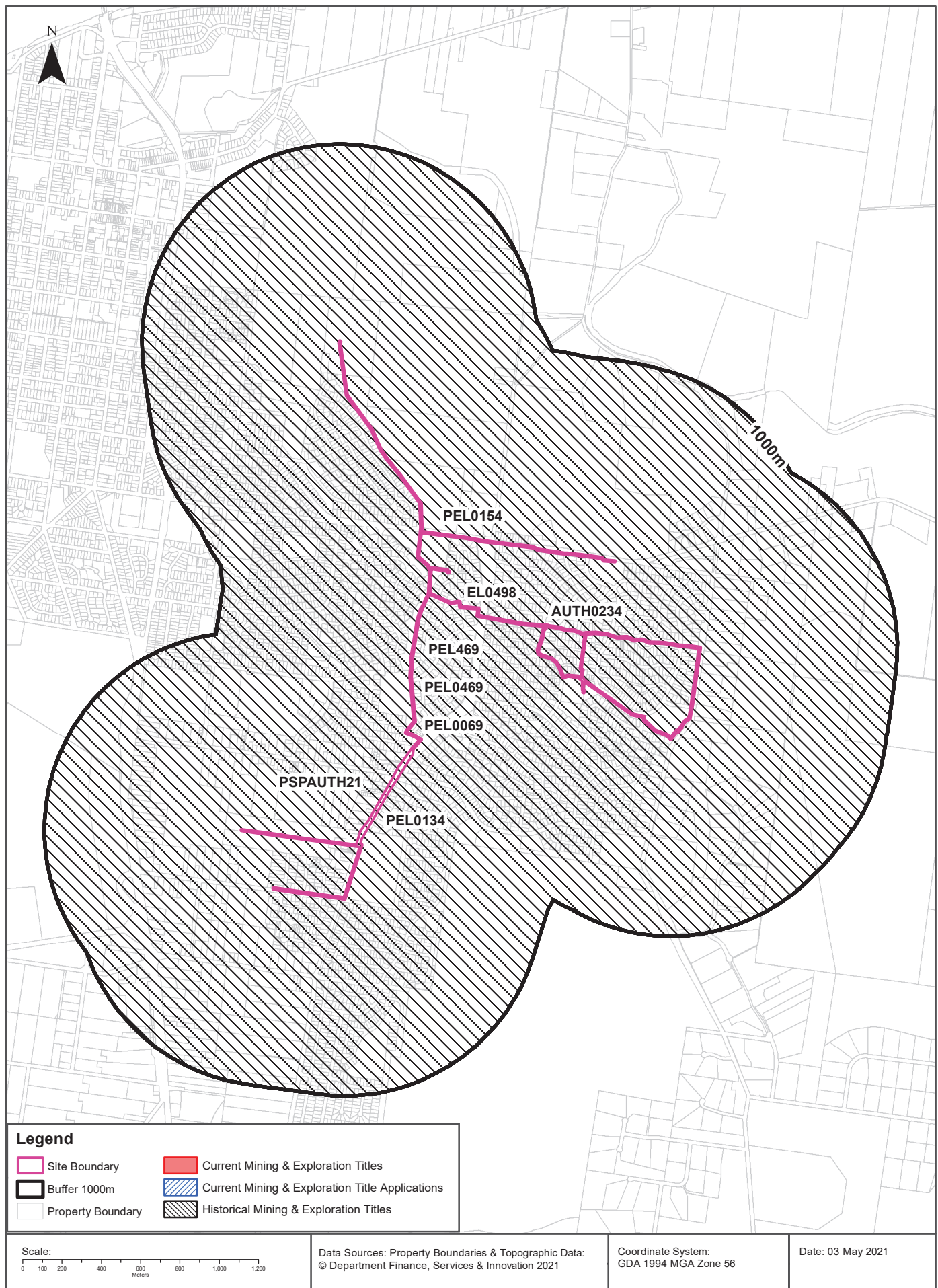
District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)

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Mining & Exploration Titles

Proposed Sewer Upgrade, South Nowra, NSW 2540



Mining

Proposed Sewer Upgrade, South Nowra, NSW 2540

Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer								

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

Mining

Proposed Sewer Upgrade, South Nowra, NSW 2540

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
PEL0134	CANADIAN AUSTRALIAN PETROLEUM NL			PETROLEUM	Petroleum	0m	On-site
AUTH0234	ELECTRICITY COMMISSION OF NSW	07 May 1981	07 May 1983	COAL	Coal	0m	On-site
PEL0469	LEICHHARDT RESOURCES PTY LTD	30/04/2009	13/10/2014	PETROLEUM	Petroleum	0m	On-site
PEL0069	ALLIANCE OIL DEVELOPMENT AUSTRALIA NL, OIL DEVELOPMENT NL			PETROLEUM	Petroleum	0m	On-site
PEL469	LEICHHARDT RESOURCES PTY LTD			MINERALS		0m	On-site
PEL0154	GENOA OIL NL, HARTOG OIL NL			PETROLEUM	Petroleum	0m	On-site
EL0498	DOWNES, C	01 Feb 1972	01 Oct 1976	MINERALS	Brick clay	0m	On-site
PSPAUTH21	LEICHHARDT RESOURCES PTY LTD	18/02/2008	18/02/2009	PETROLEUM	Petroleum	0m	On-site

Historical Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

State Environmental Planning Policy

Proposed Sewer Upgrade, South Nowra, NSW 2540

State Significant Precincts

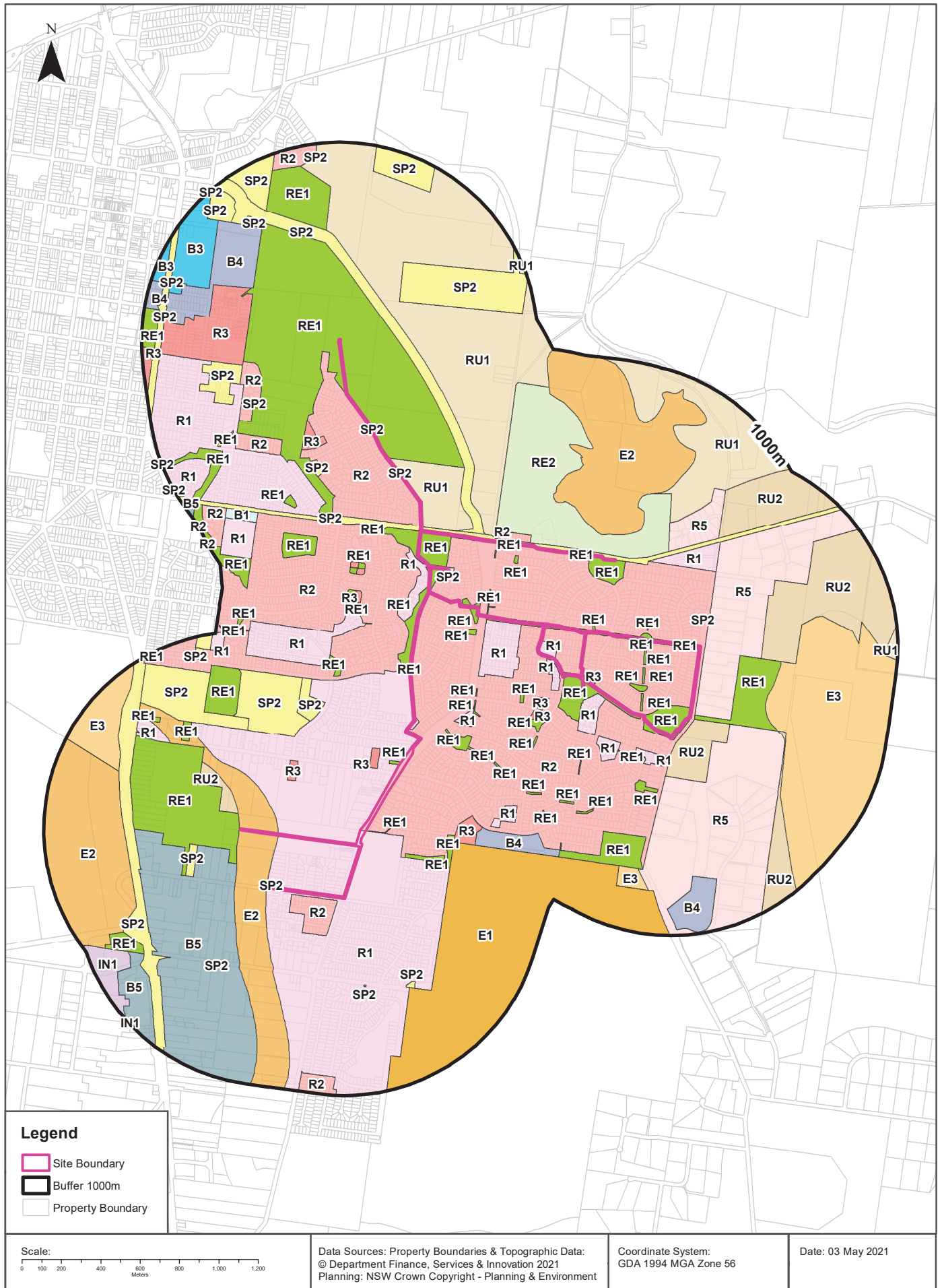
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No records in buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment
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EPI Planning Zones

Proposed Sewer Upgrade, South Nowra, NSW 2540



Environmental Planning Instrument

Proposed Sewer Upgrade, South Nowra, NSW 2540

Land Zoning

What EPI Land Zones exist within the dataset buffer?

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
E2	Environmental Conservation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
RU1	Primary Production		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		0m	On-site
SP2	Infrastructure	Road	Shoalhaven Local Environmental Plan 2014	27/09/2019	27/09/2019	09/04/2021	Amendment No 23	0m	On-site
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		3m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		5m	South West
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		7m	South West
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		8m	South East
RE2	Private Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		10m	North East
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		10m	North East
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		11m	South East
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		12m	South West
RU1	Primary Production		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		14m	North
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		14m	South West
R5	Large Lot Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		17m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		17m	East
RU2	Rural Landscape		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		18m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		18m	South East
SP2	Infrastructure	Road	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		19m	North
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		27m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		35m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		38m	North
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		41m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		54m	North East

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		70m	South
RU2	Rural Landscape		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		80m	South West
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		89m	South West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		95m	West
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		96m	South East
E2	Environmental Conservation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		106m	North East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		107m	South East
B5	Business Development		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		113m	South West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		116m	South
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		126m	East
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		129m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		131m	East
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		157m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		157m	South East
R5	Large Lot Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		160m	South East
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		165m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		187m	South East
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		188m	South
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		193m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		206m	North West
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		214m	North West
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		219m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		221m	South East
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		222m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		225m	South
SP2	Infrastructure	Residential Accommodation	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		231m	South West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		254m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		264m	West
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		270m	West
R5	Large Lot Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		271m	North East
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		277m	South West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		295m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		295m	South
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		296m	North West

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		296m	South
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		297m	West
SP2	Infrastructure	Place of Public Worship	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		303m	North West
RU2	Rural Landscape		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		308m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		316m	South
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		324m	South East
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		335m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		339m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		346m	West
SP2	Infrastructure	Sewage Treatment Plant	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		357m	North
E3	Environmental Management		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		362m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		369m	South
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		379m	North West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		388m	South
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		390m	South
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		395m	North West
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		409m	North West
E1	National Parks and Nature Reserves		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		417m	South
SP2	Infrastructure	Community Facility	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		432m	South West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		434m	North West
RU2	Rural Landscape		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		446m	South East
SP2	Infrastructure	Water Supply System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		448m	South
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		463m	North West
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		479m	South West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		485m	South West
B4	Mixed Use		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		486m	South
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		497m	North West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		501m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		501m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		503m	North West
B4	Mixed Use		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		508m	North West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		511m	South East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		511m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		514m	West

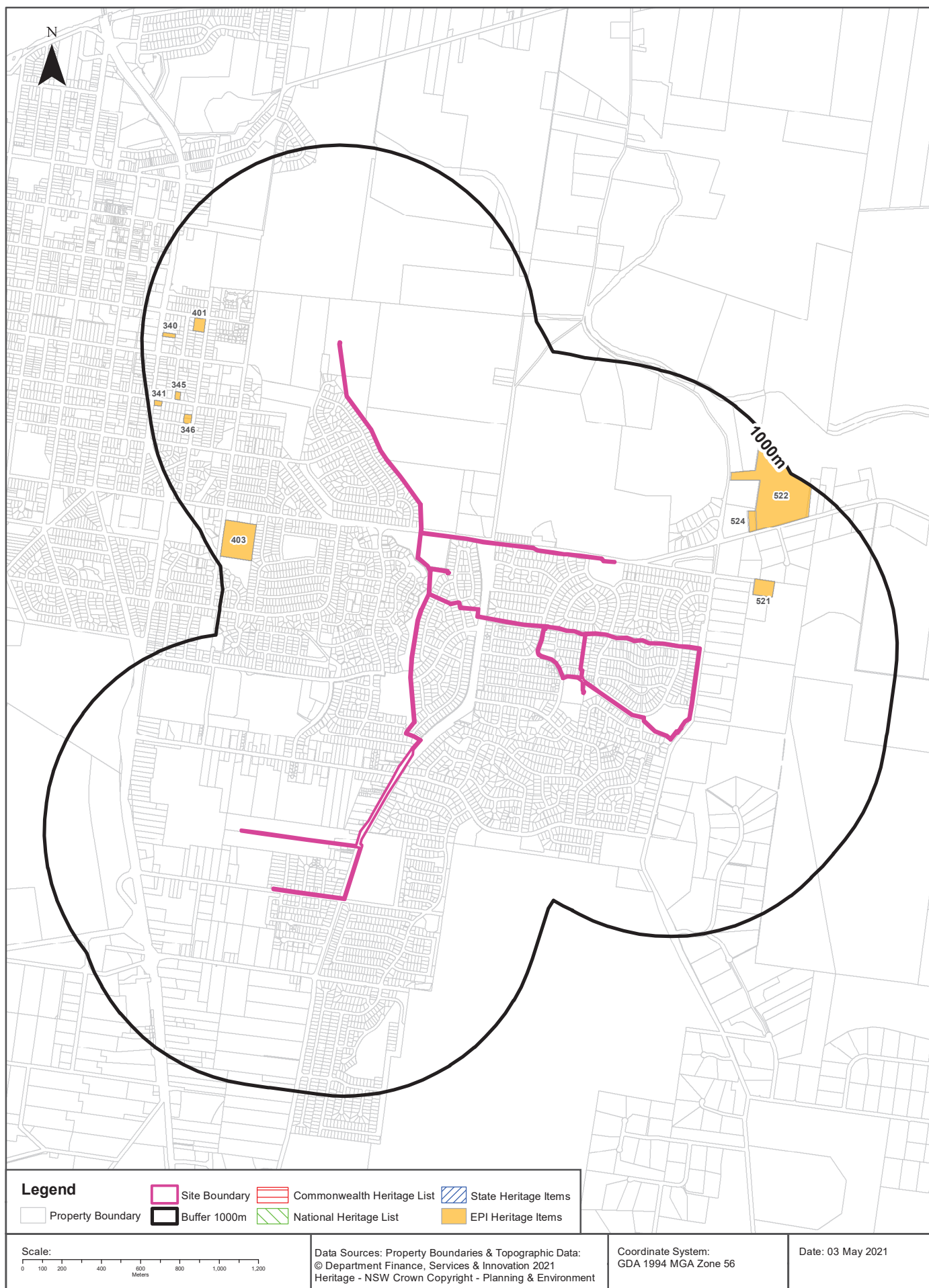
Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		526m	South
RU2	Rural Landscape		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		533m	East
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		534m	South East
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		540m	South
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		554m	South
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		556m	North West
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		561m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		573m	West
E2	Environmental Conservation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		582m	South West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		598m	North West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		631m	South
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		679m	West
E3	Environmental Management		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		680m	South East
E3	Environmental Management		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		683m	West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		683m	North West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		688m	North West
B1	Neighbourhood Centre		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		697m	North West
B4	Mixed Use		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		705m	South East
B3	Commercial Core		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		707m	North West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		717m	South West
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		727m	West
B5	Business Development		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		730m	South West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		751m	North West
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		760m	North West
IN1	General Industrial		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		798m	South West
SP2	Infrastructure	Educational Establishment	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		806m	North West
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		825m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		830m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		840m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		871m	West
SP2	Infrastructure	Childcare Centre	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		880m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		889m	West
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		892m	North West
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		897m	South

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
R2	Low Density Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		902m	North
R1	General Residential		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		902m	West
SP2	Infrastructure	Health Services Facilities	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		919m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	03/08/2018	03/08/2018	09/04/2021	Amendment No 19	920m	North West
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		921m	North
B4	Mixed Use		Shoalhaven Local Environmental Plan 2014	03/08/2018	03/08/2018	09/04/2021	Amendment No 19	923m	North West
R3	Medium Density Residential		Shoalhaven Local Environmental Plan 2014	20/03/2020	20/03/2020	09/04/2021	Amendment No 30	929m	North West
RU1	Primary Production		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		931m	East
B3	Commercial Core		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		933m	North West
B5	Business Development		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		942m	West
RE1	Public Recreation		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		983m	West
SP2	Infrastructure	Sewerage System	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		988m	North West
SP3	Tourist		Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	09/04/2021		995m	West

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Heritage Items

Proposed Sewer Upgrade, South Nowra, NSW 2540



Heritage

Proposed Sewer Upgrade, South Nowra, NSW 2540

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?

Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage
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Environmental Planning Instrument - Heritage

What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
521	Rubblestone School (former Worrige Schoolhouse)	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	382m	East
524	Worrige Cemetery	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	640m	East
522	"Congla" - (former Mackenzie Estate Manager's Residence)	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	664m	North East

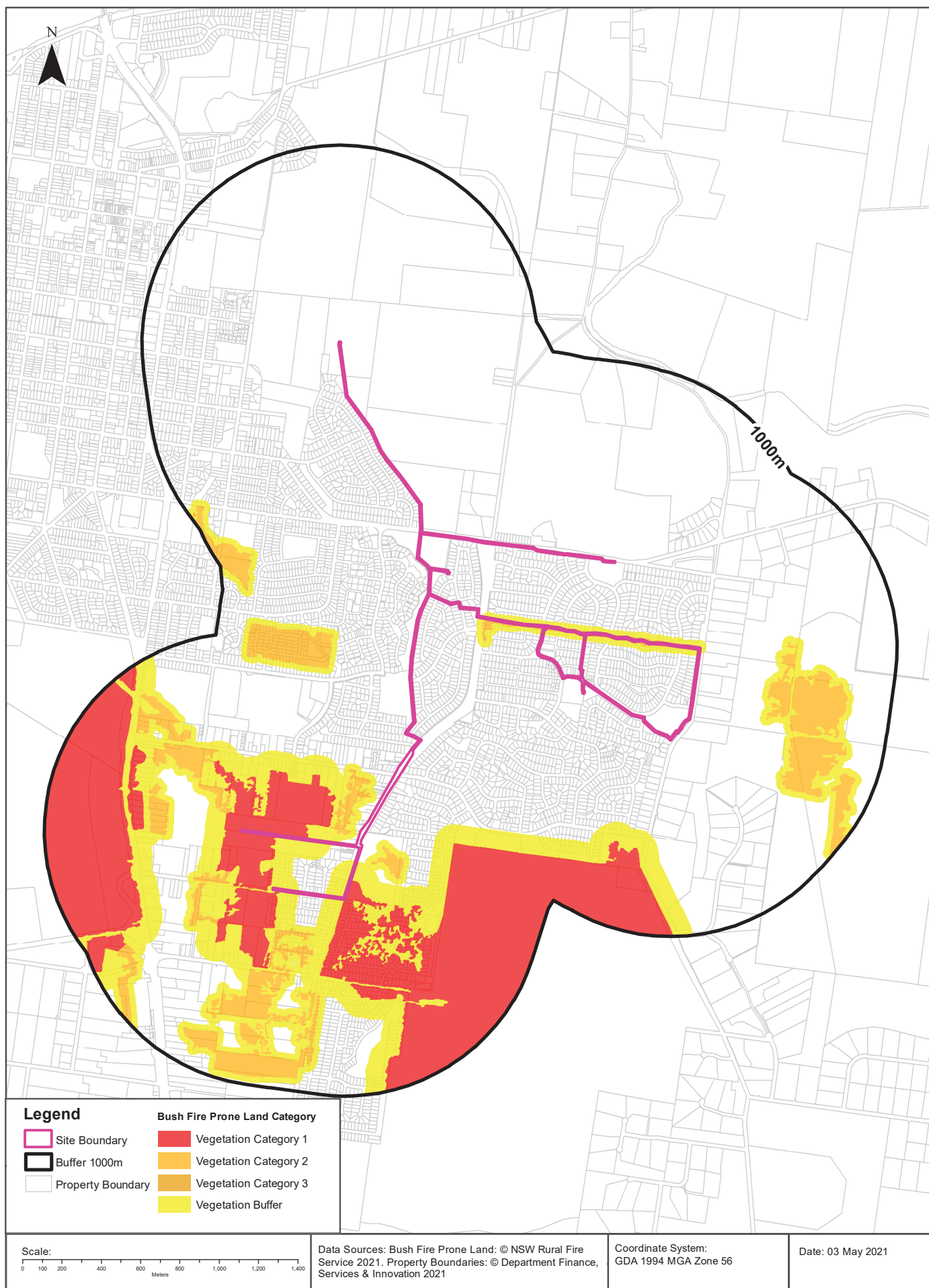
Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
401	"Myambah" - Federation Weatherboard Bungalow and garden	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	685m	North West
403	"Nowra Park" - Early Victorian Masonry Residence and garden	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	727m	West
346	"Roseville" - Federation Weatherboard Residence and figtree	Item - General	Local	Shoalhaven Local Environmental Plan 2014	05/03/2021	05/03/2021	05/03/2021	785m	North West
345	"Trelawney" - Victorian Georgian Weatherboard Residence	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	826m	North West
340	"The Pines" - late Victorian Weatherboard Residence and trees	Item - General	Local	Shoalhaven Local Environmental Plan 2014	05/03/2021	05/03/2021	05/03/2021	829m	North West
341	"Cudgerie" - Federation Weatherboard Residence	Item - General	Local	Shoalhaven Local Environmental Plan 2014	08/04/2014	22/04/2014	05/03/2021	926m	North West

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Natural Hazards - Bush Fire Prone Land

Proposed Sewer Upgrade, South Nowra, NSW 2540



Natural Hazards

Proposed Sewer Upgrade, South Nowra, NSW 2540

Bush Fire Prone Land

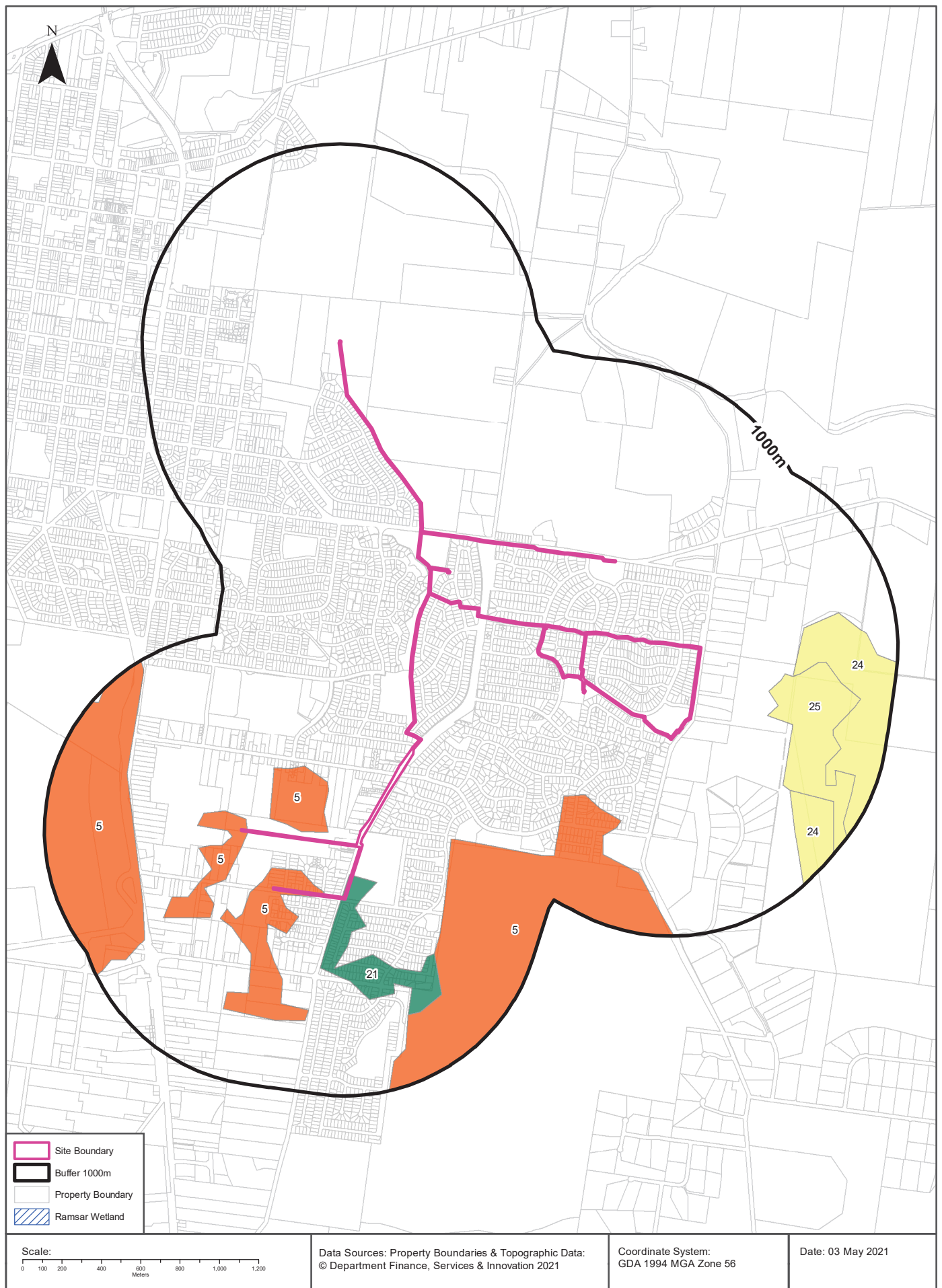
What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Category 1	0m	On-site
Vegetation Category 2	0m	On-site
Vegetation Buffer	0m	On-site

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Vegetation & Ramsar Wetlands

Proposed Sewer Upgrade, South Nowra, NSW 2540



Ecological Constraints

Proposed Sewer Upgrade, South Nowra, NSW 2540

Vegetation of the Southern Forests

What vegetation of the Southern Forests exists within the dataset buffer?

Veg Code	Formation	Class	Group	Distance	Direction
5	07 Dry Shrubby Forests	07c Coastal mixed species Dry Shrub forests	Jervis Bay Lowlands Dry Shrub-Grass Forest	0m	On-site
21	02 Wet Sclerophyll Forests	02c South Coast/Hinterland Layered Shrub Forests	South Coast Foothills Moist Shrub Forest	0m	On-site
25	14 Coastal Complex	14b Coastal Swamp Heath/Forest Complex	South Coast Swamp Forest Complex	369m	East
24	14 Coastal Complex	14b Coastal Swamp Heath/Forest Complex	Coastal Wet Heath Swamp Forest	480m	East

Vegetation of the Southern Forests: NSW Office of Environment and Heritage
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Ramsar Wetlands

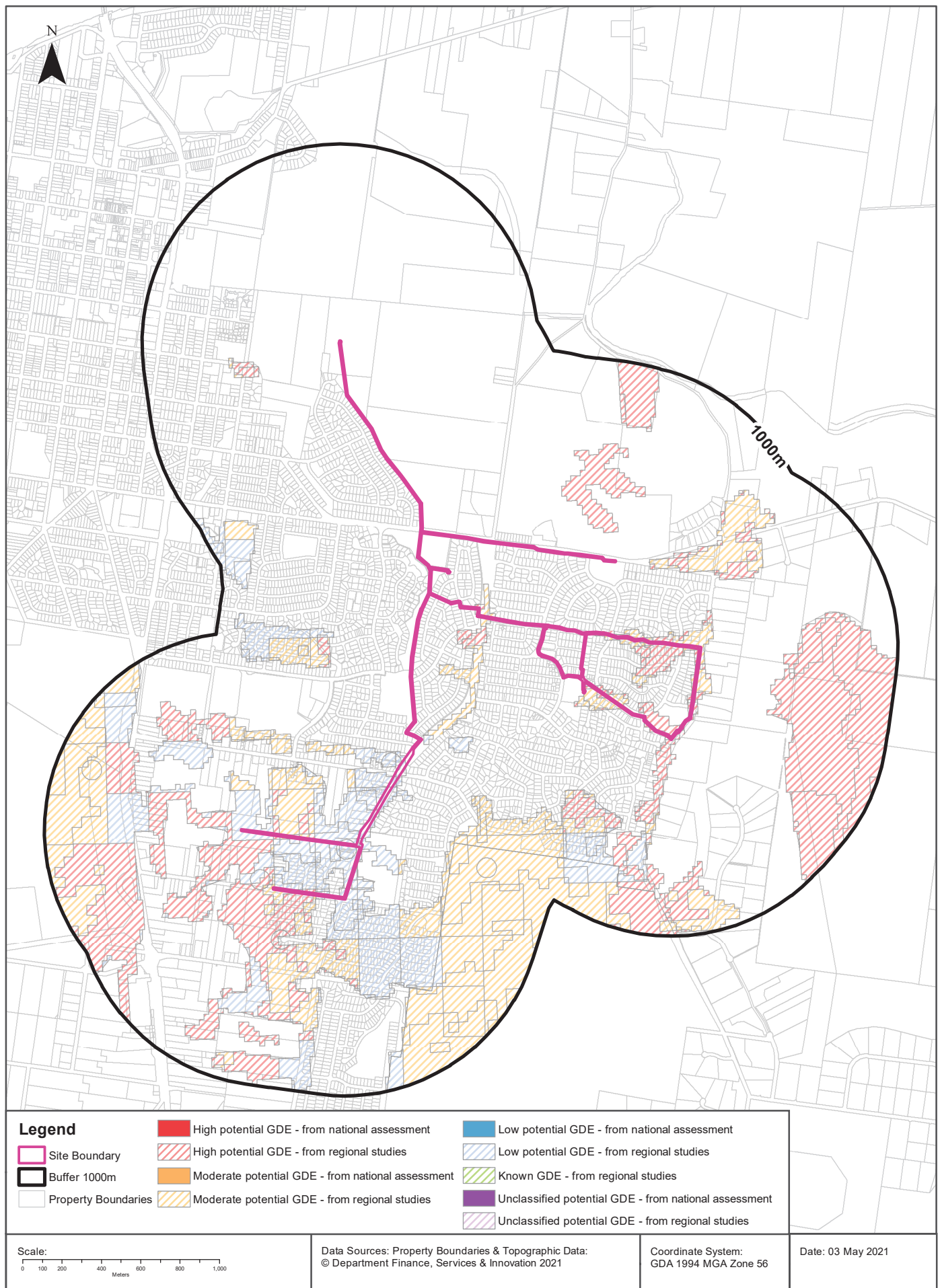
What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Agriculture, Water and the Environment

Ecological Constraints - Groundwater Dependent Ecosystems Atlas

Proposed Sewer Upgrade, South Nowra, NSW 2540



Ecological Constraints

Proposed Sewer Upgrade, South Nowra, NSW 2540

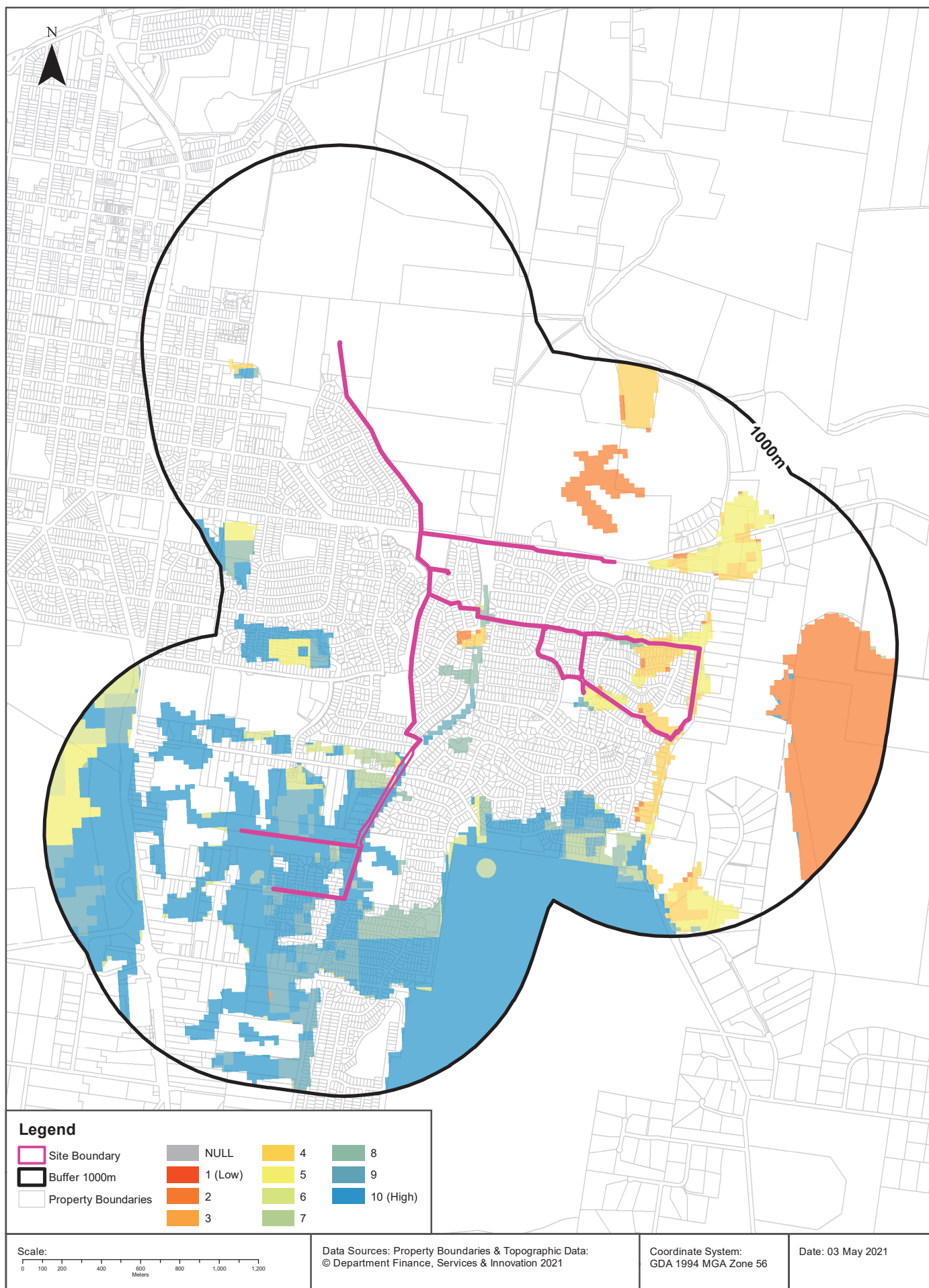
Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	High potential GDE - from regional studies	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	Moderate potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	Moderate potential GDE - from regional studies	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	High potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	Low potential GDE - from regional studies	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	Low potential GDE - from regional studies	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology
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Ecological Constraints - Inflow Dependent Ecosystems Likelihood

Proposed Sewer Upgrade, South Nowra, NSW 2540



Ecological Constraints

Proposed Sewer Upgrade, South Nowra, NSW 2540

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
Terrestrial	10	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	5	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	4	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	9	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	8	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	6	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	2	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	8	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	5	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	7	Deeply dissected sandstone plateaus.	Vegetation		0m	On-site
Terrestrial	7	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		0m	On-site
Terrestrial	6	Deeply dissected sandstone plateaus.	Vegetation		68m	South West
Terrestrial	10	Deeply dissected sandstone plateaus.	Vegetation		88m	South West
Terrestrial	9	Deeply dissected sandstone plateaus.	Vegetation		287m	South West
Terrestrial	4	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		357m	South
Terrestrial	3	Deeply dissected steeply sloping plateau margin in metamorphics and granite. Bounded in the west by the Great Escarpment.	Vegetation		458m	South West
Terrestrial	3	Deeply dissected sandstone plateaus.	Vegetation		697m	South East

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology
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Ecological Constraints

Proposed Sewer Upgrade, South Nowra, NSW 2540

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardenna pacifica	Wedge-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardenna tenuirostris	Short-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Botaurus poiciloptilus	Australasian Bittern	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris melanotos	Pectoral Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Charadrius mongolus	Lesser Sand-plover	Vulnerable	Not Sensitive	Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Circus assimilis	Spotted Harrier	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Epthianura albifrons	White-fronted Chat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Esacus magnirostris	Beach Stone-curlew	Critically Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Falco subniger	Black Falcon	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Gelochelidon nilotica	Gull-billed Tern	Not Listed	Not Sensitive	Not Listed	CAMBA
Animalia	Aves	Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Hydroprogne caspia	Caspian Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Category 3	Critically Endangered	
Animalia	Aves	Limnodromus semipalmatus	Asian Dowitcher	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Limosa limosa	Black-tailed Godwit	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Neophema pulchella	Turquoise Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox connivens	Barking Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Numenius madagascariensis	Eastern Curlew	Not Listed	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius minutus	Little Curlew	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Onychoprion fuscata	Sooty Tern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pandion cristatus	Eastern Osprey	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Petroica rodinogaster	Pink Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Rostratula australis	Australian Painted Snipe	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Sterna hirundo	Common Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sternula albifrons	Little Tern	Endangered	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stictonetta naevosa	Freckled Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Thalasseus bergii	Crested Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Thinornis cucullatus	Eastern Hooded Dotterel	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Tringa brevipes	Grey-tailed Tattler	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tringa stagnatilis	Marsh Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Xenus cinereus	Terek Sandpiper	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur-seal	Vulnerable	Not Sensitive	Not Listed	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Mammalia	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Dugong dugon	Dugong	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Isodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Macropus parma	Parma Wallaby	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petauroides volans	Greater Glider	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	Petaurus australis	Yellow-bellied Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petaurus norfolkensis	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Petrogale penicillata	Brush-tailed Rock-wallaby	Endangered	Not Sensitive	Vulnerable	
Animalia	Mammalia	Phascogale cinereus	Koala	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Potorous tridactylus	Long-nosed Potoroo	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pseudomys novaehollandiae	New Holland Mouse	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Sminthopsis leucopus	White-footed Dunnart	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Vespadelus baverstocki	Inland Forest Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Vespadelus troughtoni	Eastern Cave Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	Hoplocephalus bungaroides	Broad-headed Snake	Endangered	Category 2	Vulnerable	
Plantae	Flora	Acacia constablei	Narrabarba Wattle	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Acacia pubescens	Downy Wattle	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Callistemon linearifolius	Netted Bottle Brush	Vulnerable	Category 3	Not Listed	
Plantae	Flora	Cryptostylis hunteriana	Leafless Tongue Orchid	Vulnerable	Category 2	Vulnerable	
Plantae	Flora	Eucalyptus langleyi	Albatross Mallee	Endangered Population, Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Eucalyptus nicholii	Narrow-leaved Black Peppermint	Vulnerable	Not Sensitive	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Genoplesium baueri</i>	Bauer's Midge Orchid	Endangered	Category 2	Endangered	
Plantae	Flora	<i>Hibbertia puberula</i>		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Hibbertia stricta</i> subsp. <i>furcatula</i>		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Melaleuca deanei</i>	Deane's Paperbark	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Pomaderris cotoneaster</i>	Cotoneaster Pomaderris	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Pterostylis gibbosa</i>	Illawarra Greenhood	Endangered	Category 2	Endangered	
Plantae	Flora	<i>Pterostylis ventricosa</i>		Critically Endangered	Category 2	Not Listed	
Plantae	Flora	<i>Pterostylis vernalis</i>		Critically Endangered	Category 2	Critically Endangered	
Plantae	Flora	<i>Rhodamnia rubescens</i>	Scrub Turpentine	Critically Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Solanum celatum</i>		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	<i>Triplarina nowraensis</i>	Nowra Heath Myrtle	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Zieria baeuerlenii</i>	Bomaderry Zieria	Endangered	Not Sensitive	Endangered	
Plantae	Flora	<i>Zieria tuberculata</i>	Warty Zieria	Vulnerable	Not Sensitive	Vulnerable	

Data does not include NSW category 1 sensitive species.

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Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
Premise Match	Georeferenced to the site location / premise or part of site
Area Match	Georeferenced to an approximate or general area
Road Match	Georeferenced to a road or rail corridor
Road Intersection	Georeferenced to a road intersection
Buffered Point	A point feature buffered to x metres
Adjacent Match	Land adjacent to a georeferenced feature
Network of Features	Georeferenced to a network of features
Suburb Match	Georeferenced to a suburb boundary
As Supplied	Spatial data supplied by provider

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LOTSEARCH

LOTSEARCH AERIALS

Date: 14 May 2021

Reference: LS020057 AL

Address: Proposed Sewer Upgrade, South Nowra, NSW 2540

Aerial Imagery 2020

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 2009

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 2002

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 1993

Proposed Sewer Upgrade, South Nowra, NSW 2540



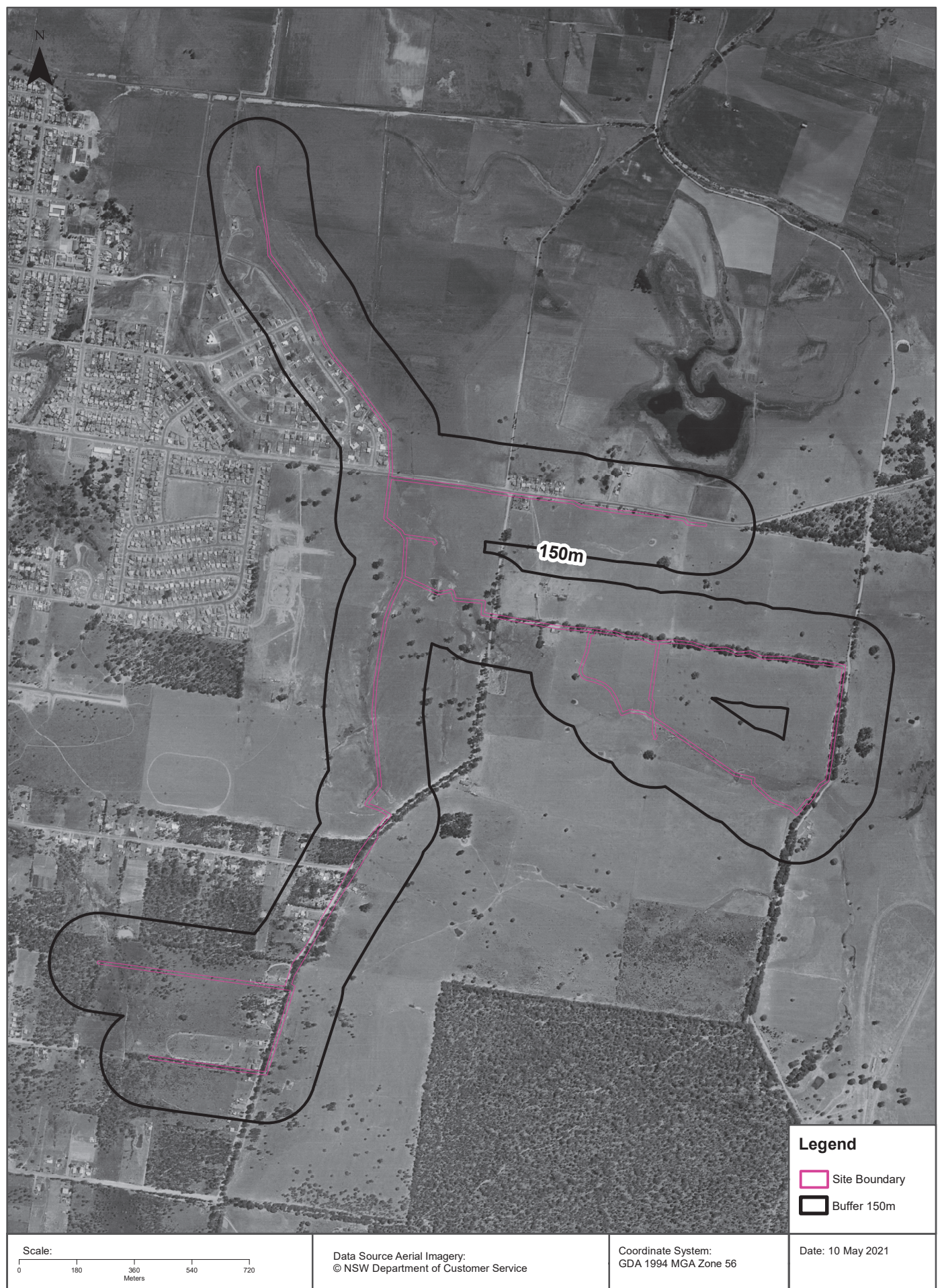
Aerial Imagery 1984

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 1974

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 1961

Proposed Sewer Upgrade, South Nowra, NSW 2540



Aerial Imagery 1949

Proposed Sewer Upgrade, South Nowra, NSW 2540



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