Stantec

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Mains Program – WP2 & WP3 Review of Environmental Factors

Shoalhaven City Council

9 October 2023

Mains Program – WP2 & WP3
Review of Environmental Factors

9 October 2023

Prepared for:

Shoalhaven City Council

Prepared by:

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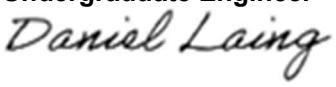

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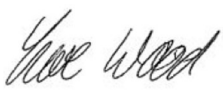

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Executive Summary

As part of a regular program of repairs, Shoalhaven City Council (Council) proposes to install multiple sections of water mains and some small sections of sewer mains (mains program) across the Council Local Government Area (Shoalhaven LGA). The original scope of works including 77km of watermain pipelines across 7 works packages has been reduced to 3 works packages with this REF addressing the concluding WP2 and WP3. These Works Packages will include 5.7 and 9.8 (km) of water mains replacement and one discrete sewer main (only alignment 3E). Individual alignments within the packages will commence on a priority basis.

The objectives of the works are to replace water and sewer mains which are at risk of failure, to ensure continuity of water supply to customers, and to prevent damage, potential environmental harm and wastage of water or sewer from uncontrolled failure.

An environmental management system (EMS) was prepared for the mains program (Appendix A). The EMS considers proposed works at a regional scale, identifying the potential environmental impacts associated with the typical method of placing mains within the context of environmental constraints in the Shoalhaven region. The EMS is to be supplemented with a site-specific REF for each of the works packages, which would assess the potential impact of proposed works in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979.*

This Review of Environmental Factors (REF) is for works package two and three (WP2 and WP3) of the mains program. WP2 contains 12 separate alignments, which are named based on their relevant works package number and an alphabetical order. The alignments assessed in this REF include 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K-1 and 2K-2[1]. WP3 contains 11 separate alignments, which are named based on their relevant works package number and an alphabetical order. The alignments assessed in this REF include 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J and 3K.

The purpose of this REF is to assess the potential impact of proposed works for each alignment in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979.* An environmental assessment checklist is completed for each alignment (Appendix B) with findings for each alignment summarised in Section 4. Where additional impact assessment is required based on the findings of the checklist, this is undertaken and summarised in Section 5.

The mitigation measures based on the findings of the checklist and additional impact assessment are summarised in Section 6 and are also listed in the next page of this document. These are to be incorporated into the construction environmental management plan (CEMP) for WP2 and WP3 prior to works being undertaken.

[1] Part of alignment 2K-2 falls within land managed by the NSW National Parks and Wildlife Service (NPWS) and has been assessed in a separate REF for NPWS determination.

Regarding Aboriginal heritage, the REF identified that most alignments occur in areas of low potential archaeological significance and can proceed without further investigation provided the appropriate mitigation measures outlined herein are implemented. However, some alignments (specifically 2K-2, and part of alignment 3E [near the water's edge] and part of alignment 3D [Hill Crest]) occur in areas of moderate potential archaeological significance. These areas require further investigations in the form of testing under the *Code of practice for archaeological investigation of Aboriginal objects in New South Wales* (DECCW 2010) and the potential securing of an Aboriginal Heritage Impact Permit (AHIP) before works can commence.

Items of Non-Aboriginal heritage within proximity to the alignments have been determined to be limited to alignments 2I, 2J, 3A and 3D. A Statement of Heritage Impact (SoHI) will be required for alignments 2I, 2J, 3A and 3D in relation to the Colonial Road – remnants (former Wool Road). In addition, alignment 3D is adjacent to several local heritage sites (Tomerong School of Arts, the Tomerong Union Church, the Victorian Schoolmasters Residence and grounds and the Tomerong Cemetery). Works adjacent to these sites will need to be managed carefully to avoid impacts and to comply with the specific mitigation measures outlined in Section 6.2.

The ecology assessment has found that while the project has the potential to result in clearing of 2.015ha of native vegetation (including 0.113ha of threatened ecological communities), with the implementation of the mitigation measures in Section 6 the project is unlikely to result in a significant impact on ecology. In addition, controlled installation of the pipelines in already cleared areas will reduce the amount of clearing even further.

This REF has assessed that, with the adoption of appropriate mitigation measures identified in Section 6, and any measures subsequently identified through the additional archaeological investigation noted above, WP2 and WP3 of the mains program would be unlikely to cause significant impacts to the environment and so an Environmental Impact Statement (EIS) is not required. Approval of this REF by Council, the determining authority, will allow works to proceed in a timely manner.

It is noted that subsequent works packages of the mains program have not been assessed by this REF, and would be subject to future assessment.

Abbreviations and Glossary

AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASS	Acid Sulphate Soils
BC Act	*Biodiversity Conservation Act 2016*
BFMC	Bush Fire Management Committee
CAMBA	China-Australia Migratory Bird Agreement
Cardno	Cardno (NSW/ACT) Pty Ltd
CEMP	Construction Environmental Management Plan
Contractor	Party contracted by Council to carry out the proposed works
Council	Shoalhaven City Council/Shoalhaven Water
DAWE	Australian Government Department of Agriculture, Water and Environment
dB	Decibel. A scale used in sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure
dB(A)	A value used for 'A-weighted' sound pressure levels. 'A' frequency weighted is an adjustment made to sound-level measurement to approximate the response of the human ear
DECC	Former NSW Department of Environment, Climate Change (now DPIE)
DPIE	NSW Department of Planning, Infrastructure and Environment
DPI	NSW Department of Primary Industries
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulations	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence, issued under the POEO Act
ERSED	Erosion and Sedimentation
FM Act	*NSW Fisheries Management Act 1994*
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
LEP	Local Environment Plan
LGA	Local Government Area
MNES	Matter of National Environmental Significance. Matters of NES are listed under the EPBC Act

OEH	Office of Environment and Heritage
Owner	The owner of the land on which the works will occur
PASS	Potential Acid Sulphate Soils
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Service
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SEPP	State Environmental Planning Policy

1.0 Introduction

This Review of Environmental Factors (REF) has been prepared by Stantec on behalf of Shoalhaven City Council (Council) to assess the potential environmental impacts associated with works package two (WP2) and three (WP3) of the proposed works to replace or install new water supply mains (mains program) and one small section of sewer mains within the Shoalhaven region.

This REF has been prepared in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed works, for most alignments (excluding 3E) meet the definition of a 'water reticulation system' development carried out on behalf of a public authority, and therefore are permitted without consent under Division 24, Section 2.159 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TI SEPP). The proposed works for 3E meet the definition of a 'sewage reticulation system' in which works may be carried out without consent on any land in the prescribed circumstances under Division 24, Section 2.216 of the TI SEPP.

1.1 Background

As part of a regular program of repairs Council propose to install water and sewer mains across the City of Shoalhaven Local Government Area (Shoalhaven LGA). These works will take place within two discrete works packages, works package two (WP2) and works packages three (WP3) that will commence on a priority basis. The planned scope of works is to install approximately 5.7km (in WP2) and 9.8km (in WP3) of water mains and one sewer main (alignment 3E).

An environmental management system (EMS) was prepared for the mains program (Appendix A). This REF is to be read alongside the EMS. The Contractor undertaking the works for WP2 & WP3 will be required to adopt the mitigation measures outlined in the EMS, as well as any additional site-specific measures identified within this REF, into its Construction Environmental Management Plan (CEMP).

1.2 Purpose

The purpose of this REF is to assess the potential impact of proposed works for each alignment in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). An environmental assessment checklist is completed for each alignment (Appendix B) with findings for each alignment summarised in Section 4.0. Where additional impact assessment is required based on the findings of the checklist, this has been undertaken and summarised in Section 0.

This REF has been prepared in accordance with Part 5 of the EP&A Act. The proposed works are permitted without consent under Division 24, Section 2.159, and Section 2.216 of the TI SEPP.

In doing so, the REF helps to fulfil the requirements of Part 5.5 of the EP&A Act, namely that Council 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 REF will be considered when assessing whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement (EIS) to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act.

1.3 Proposed Works

This REF is for WP2 and WP3 of the mains program. WP2 and WP3 contain 12 and 11 separate alignments respectively which are named based on their relevant works package number and an alphabetical order. The alignments assessed in this REF include 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K-1, 2K-2 for WP2 and 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J and 3K for WP3. Alignment 3E is the only sewer line whereas all other alignments are potable water mains.

The proposed alignments are in the suburbs of Basin View, Erowal Bay, Old Erowal Bay, Sanctuary Point, St Georges Basin, Tomerong Creek and Worrowing Heights.

The applicable zoning for WP2 and WP3 sites as per the Shoalhaven Local Environmental Plan (2014) (Shoalhaven LEP) is presented below in Table 1-1 and Table 1-2 and is shown on Appendix E.

Table 1-1 Works Package 2 Alignments

Alignment	Location	Approximate length of works (m)	Zoning (Shoalhaven LEP)
2A	Paradise Beach Road, Sanctuary Point	70	E1
2B	Macleans Point Road, Sanctuary Point	690	E1, RE1, R2
2C	Kerry Street, Sanctuary Point	375	E1, RE1, R2
2D	Links Avenue, Sanctuary Point	35	R2
2E	Macleans Point Road, Sanctuary Point	505	R2, R3
2F	Cammaray Drive, St Georges Basin	290	RE1, R2
2G	Naval Parade, Erowal Bay	670	RE1, R2, SP2, E1
2H	Second Ave, Erowal Bay	590	R2
2I	MacGibbon Parade and McGowen Street, Old Erowal Bay	940	R2, SP2
2J	Park Way, Old Erowal Bay	940	RE1, R2, SP2
2K-1	Worrowing Heights, NSW	200	RE1, R2, W1
2K-2[2]	Worrowing Heights, NSW	410	C2, SP2, W1

[2] Part of alignment 2K-2 falls within land managed by the NSW National Parks and Wildlife Service (NPWS) and has been assessed in a separate REF for NPWS determination.

Table 1-2 Works Package 3 Alignments

Alignment	Location	Approximate length of works (m)	Zoning (Shoalhaven LEP)
3A	Tallyan Point Road, Basin View	455	RE1, R2. SP2
3B	Second Ave, Erowal Bay	235	R2
3C	Grandview Street, Erowal Bay	310	R2
3D	Hawken Road and Grange Road, Tomerong	5120	RU2, RU5, SP2
3E[3]	Naval Parade, Erowal Bay	1030	RE1, R2
3F	Kingsford Smith Crescent and Warrego Drive, Sanctuary Point	1070	R2
3G	Sanctuary Point Road, Sanctuary Point	350	RE1, R2, SP2
3H	Sanctuary Point Road, Sanctuary Point	600	RE1, R2
3I	The Park Drive, Sanctuary Point	745	R2, RE1, R3
3J	Clifton Street, Sanctuary Point	720	RE1, R2, SP2
3K	The Wool Lane, Sanctuary Point	230	RE1, R2

Table 1-3 Shoalhaven City Council LEP (2014) Land Zoning

Zoning reference	Zoning Description
C2	Environmental Conservation
R2	Low Density Residential
R3	Medium Density Residential
RE1	Public Recreation
RU2	Rural Landscape
RU5	Village
SP2	Infrastructure
W1	Natural Waterways

1.4 Additional Environmental Assessment Methodology

The additional environmental impact assessment detailed in **Section 5** of this report considers the results of the site-specific environmental checklists completed for each of the approved alignments (Appendix B).

[3] Alignment 3E is the only sewer main.

The additional environmental impact assessment is based on a 5m wide construction corridor/works extent centred along each alignment (the alignment corridor). The alignment corridor is conservative to allow for minor inaccuracies in design / global position systems (GPS), and to allow for the laydown of construction vehicles and material. The actual direct ground disturbance associated with the construction works will vary based on the construction method used for the alignment but will often be less than the 5m corridor assessed.

The construction method varies for each alignment, but all will be constructed adopting one or more of the following techniques:

- Open trench
- Trenchless technology.

An open trench construction method is adopted for at least portions of all alignments. The diameter of the pipe across all alignments does not exceed an outside diameter of 280mm. Therefore, based on standard trench details, the total minimum width of the widest trench is not expected to exceed 0.6m.

Trenchless technology has been adopted for portions of alignments and includes pipe bursting, thrust boring and horizontal directional drilling. The following alignment corridors include sections assessed considering trenchless technology: 2K-2, 3A, 3C, 3D and 3E.

The location of entry and exit pits for these locations have been considered within the extent of the 'trenched' sections of the alignment corridor. Sections in between the entry and exit pits have been broadly identified as 'underbored' sections of the alignment corridor. The alignment corridors are shown on Appendix C.

Ecology

Plant Community Types (PCTs) within the study area were assigned through the use of the BioNet Vegetation Classification's Formation Key. A shortlist of potential PCTs was produced based on search criteria, including vegetation formation, vegetation class, IBRA region and subregion and species. PCT selection was undertaken by comparing PCT descriptions with characteristics of the vegetation such as landform location, species composition and other landscape features relevant to the vegetation community. When the vegetation community under assessment was likely to conform to more than one PCT, the decision on a given PCT over other options was based on presence of characteristic species, species richness and other aspects of the PCT description. Where native species occurred within the study area but did not conform to any known PCT (i.e. planted native street trees), these were assigned to the vegetation type of 'Native Vegetation'. Areas of non-native vegetation within the study area consisted of areas of cultivated lawn with no canopy cover and were classed as cleared/exotic. It should be noted that these areas were not mapped and the extent of impact for each alignment relates only to PCTs and Native Vegetation within the study area.

In accordance with the BAM (DPIE 2020a), native vegetation has the same meaning as in Section 1.6 of the BC Act and section 60B of the LLS Act, which states:

- (1) For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:

– *(a) trees (including any sapling or shrub or any scrub),*

- *(b) understorey plants,*
- *(c) groundcover (being any type of herbaceous vegetation),*
- *(d) plants occurring in a wetland*.
  - *(2) A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible*.
  - *(3) For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if*:
- *(a) the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and*
- *(b) it would be native vegetation for the purposes of this Part if it were native to New South Wales*.
  - *(4) For the purposes of this Part, native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). A declaration under Section 14.7 of the BC Act that specified vegetation is or is not marine vegetation also has effect for the purposes of this Part*.

Opportunistic flora and fauna sightings within the study area were recorded. Potential fauna habitat features within the study area were investigated during field surveys undertaken. Habitat features including creeks, and hollow bearing trees (HBT) were identified within the study area, and are shown on Appendix I. Appendix H ground truthed features native trees, native plantings and PCTs.

Heritage

Austral Archaeology (Austral) undertook the Aboriginal and non-Aboriginal heritage assessments for the REF and provided Strategic Heritage Advice ('SHA', see Appendix J). The methodology and findings are summarised in this REF however the report should be read in full and is available in Appendix J. Austral's investigations involved desktop research to assess the potential heritage significance across the study area[4] associated with the proposed alignments including:

- A search of the Heritage NSW Aboriginal Heritage Information management System (AHIMS) database for registered Aboriginal sites and relevant prior studies near the study area.
- A search of the Local Environmental Plan for Aboriginal or historic heritage places on or near the study area.
- A search of items or places on Commonwealth and non-statutory databases. This includes the Commonwealth and National Heritage Lists, the Register of the National Estate, and the National Trust.
- Literature review summary.

[4] It is noted that while Austral's report refers to findings and impact assessment in relation to *alignments*, the assessment was undertaken on the basis of the full *study areas* as shown on Appendix J and Appendix O.

- Assessment of potential for the study area to exhibit Aboriginal objects or places.
- Assessment of potential for the study area to exhibit Historic archaeological potential.
- Recommendations for further investigations that are required to support the REF.

The report is underpinned by the philosophy of the International Council on Monuments and Sites (ICOMOS) and the Burra Charter: Australia ICOMOS Charter for Places of Cultural Significance, 2013 (Burra Charter), the practices and guidelines of Heritage NSW.

From this preliminary investigation recommendations for further investigations required to support this REF were undertaken. Visual inspections of the study area were undertaken between November 2022 and July 2023. The visual inspections consisted of a systematic 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 2010).

The site inspections were undertaken with the objective to:

- Identify and record any Aboriginal archaeological heritage sites visible on the surface, potential landforms or (Potential Archaeological Deposits) PADs for the Aboriginal heritage and cultural sensitivity areas.
- Assess ground surface conditions within the study area including visibility and exposure levels.
- Record landform types and associated soil types within the study area.
- Assessing the level of disturbance within the study area.
- Inspect all mature trees along the alignment for potential cultural scars.
- Assist in determining areas where works can proceed with caution, what areas require further research to investigate, assess and report on the harm that may be caused by the activity, which may take the form of an Aboriginal Cultural Heritage Assessment (ACHA), and what areas may require Aboriginal Heritage Impacts Permits (AHIP) where harm is unavoidable to Aboriginal cultural heritage (DECCW 2010).

The archaeological survey for the alignments commenced on the most eastern side of the study area which included the entirety of 3D and 3A before moving westerly. The survey consisted of a vehicular survey along the proposed works areas and undertaking pedestrian surveys in undisturbed or areas that are sensitive landforms, such as within 200 metres of water. The results of the heritage assessment are included in full in Appendix J and summarised in the relevant sections of this REF.

2.0 Statutory and Planning Framework

This section summarises key planning instruments and legislation relevant to WP2 and WP3 that are departures/additions from the statutory and planning framework overview detailed in Section 3 of the EMS.

2.1 Commonwealth Legislation

Environmental Protection and Biodiversity Conservation Act 1999

The proposed works will not require activities to take place on Commonwealth land. The proposed works are also unlikely to result in a significant impact on matters of national significance under Chapter 2, Part 3, Division 1 of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The proposed actions are unlikely to have a significant impact on EPBC Act listed threatened species or endangered communities. This is supported further by the relevant ecology sub-sections of Section 5 of this REF. In addition, a likelihood of occurrence table is attached as Appendix M and ecology desktop searches are attached as Appendix N.

2.2 State Legislation

State Environmental Planning Policy (Resilience and Hazards) 2021

The permissibility and requirements of the proposed realignment works were assessed upon their relevance under the *State Environmental Planning Policy (Resilience and Hazards) 2021* (RHSEPP). The key summary of the findings is provided in this section of the REF.

All the proposed alignments packaged in both WP2 and WP3 (2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K-1, 2K-2, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J and 3K) lie partially or entirely within area's designated as either 'coastal use' and or 'coastal environment' management areas of the coastal zone. The RHSEPP identifies considerations for works proposed to be undertaken in these management areas in Clause 2.10 (for development within the 'coastal environment' area) and in Clause 2.11 (for development within the 'coastal use' area).

The SEPP addresses the range of factors that must be considered for work being done within these coastal areas. The environmental considerations include matters such as the biophysical, hydrological, or ecological integrity of any adjacent coastal wetland or littoral rainforest, or the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest. Matters to be considered also include the coastal environmental values and natural coastal processes, water quality, marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, existing public open space, and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability, Aboriginal cultural heritage, practices and places, and the use of the surf zone.

Consideration of these matters have been given in the mitigation measures provided in Section 6 of this REF. It is therefore considered unlikely that the proposed works would not appropriately and reasonably either avoid or mitigate adverse impacts referred to in the considerations for the management areas. Adverse impacts to environmental matters have

been considered throughout Section 5 of this report, and appropriate mitigation measures have been recommended in Table 6-1.

Roads Act 1993

Road occupancy licences (ROL) are required under Section 138 of the *Roads Act 1993* for works in road corridors. A list of the alignments with works proposed within road corridors is provided as Table 2-1. The roads identified in Table 2-1 are those directly impacted by proposed works, and do not include roads which may be indirectly impacted i.e., by additional traffic due to detours. Full road closures will be avoided wherever possible. In addition, where additional roads are required to safely undertake construction, these will be also subject to a Section 138 and captured in a Traffic Management Plan (TMP). Full road closures will be avoided wherever possible.

Further details of the location of corridor within each road reserve is provided in the 'Traffic and Access' component of the environmental checklist. Additional mitigation measures required for alignments proposed within road corridors is provided in Section 6 of this REF.

Table 2-1 Roads subject to potential closure (full or partial)

Alignment	Road	Authority
2B	Frederick Street	Council
2D	Kerry Street	Council
2H	Killarney Road	Council
3A	Tallyan Point Road	Council
3A	Collingwood Street*	Council
3B	Grandview Street	Council
3C	Naval Parade	Council
3D	Hawken Road*	Council
3D	William Bryce Road*	Council
3D	McGuire Way	Council
3D	Island Point Road*	Council
3D	The Wool Road*	Council
3E	Naval Parade*	Council
3F	Allen Street	Council
3F	Ridgelands Drive	Council
3F	Warrego Drive	Council
3F	Kingfisher Avenue	Council
3F	Nirimba Avenue	Council
3F	Flamingo Avenue	Council
3G	Mustang Drive	Council
3I	Kerry Street	Council

Alignment	Road	Authority
3I	Idlewild Avenue	Council
3I	Penguin Street	Council
3I	Leumeah Street*	Council
3I	Frederick Street	Council
3J	Sanctuary Point Road*	Council
3J	Warrego Drive	Council

**Denotes where a road will be underbored and therefore likely subject to lesser traffic disturbance.*

Fisheries Management Act 1994

General requirements for permits under the FM Act are identified in Section 3 of the EMS and are summarised in Table 2-2 below.

Table 2-2 Permit Type's under FM Act

Permit Types under FM Act
▪ s 200 – a permit is required for dredging or reclamation work carried out by a local government authority, unless these works are authorised by a relevant public authority (other than a local government authority) under the Crown Land Management Act 2016
▪ s 205 - permit to harm (cut, remove, damage, destroy, shade etc) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds)
▪ s 219 – permit to obstruct the free passage of fish

The need for permits under the FM Act will be dependent on the final construction methods proposed at the waterway crossing locations. The permit requirements based on proposed works at the time of writing are summarised in Table 2-3. Should underboring (existing or additional) not be possible, additional environmental impact assessment of an alternative construction methodology would be required, and it is expected that additional Fisheries permits would also be needed as described in Table 2-2. It is recommended that further consultation is undertaken with DPI Fisheries to confirm permit requirements at these locations prior to construction works commencing.

Table 2-3 Fisheries permit requirements for KFH zoned alignments and proposed construction method

Alignment [Waterbody]	Construction Method	Required permits under Part 7 of the FM act for the proposed works		
		s 200	s 205	s 219
2K-1 [Worrowing Creek]	Minor works within the mapped area of Key Fish Habitat to connect the replacement pipe to the existing watermain that was installed in the past via	Yes – due to technically working within	No	No

Alignment [Waterbody]	Construction Method	Required permits under Part 7 of the FM act for the proposed works		
		s 200	s 205	s 219
	underbore across Worrowing Creek	'mapped' KFH		
2K-2 [Worrowing Creek]	Minor works within the mapped area of Key Fish Habitat to connect the replacement pipe to the existing watermain that was installed in the past via underbore across Worrowing Creek	Yes – due to technically working within 'mapped' KFH	No	No
3D [Suffolk Creek]	Underboring	No	No	No
3D [Tomerong Creek]	Underboring	Yes – due to technically working within 'mapped' KFH	No	No
3E [St Georges Basin]	Trenching of the proposed alignment which exhibits minimum encroachment on the banks of St Georges Basin which is designated as Key Fish Habitat	Yes – due to technically working within 'mapped' KFH	No	No

Biodiversity Conservation Act 2016

Under Part 5 of the EP&A Act a Species Impact Statement (SIS) is required if the activity is likely to significantly affect threatened species, or, if the proponent chooses, a Biodiversity Development Assessment Report (BDAR), must be prepared.

For Part 5 activities, an activity is "likely to significantly affect threatened species" if it is carried out in an area of outstanding biodiversity value or likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in Section 7.3 of the BC Act 2016.

Based on the ecology assessment in Section 5, an SIS and/or BDAR are not required.

Shoalhaven LEP 2014

The Shoalhaven Local Environmental Plan (LEP) provides a framework that guides planning decisions for development in the Shoalhaven Local Government Area through land zoning. Proposed alignments within WP2 (2G, 2K-1 and 2K-2) either intersect or are adjacent to lands marked as conservation zones (C2 Environmental Conservation) in the Shoalhaven

LEP. The potential impact to these areas has been assessed in the appropriate alignment sections within Section 5.0. The impact to these areas has been determined to be minimal assuming that the relevant mitigation measures are abided by as outlined in management and mitigation measures section of this REF (Table 6-1).

National Parks and Wildlife Act 1974

The broad objects of the *National Parks and Wildlife Act 1974* (NPW Act) are the conservation of nature, the conservation of cultural value within the landscape, and providing for the management of land reserved (or acquired) under the Act.

Required approvals under the NPW Act to be obtained prior to construction works commencing include: approval under section 90 of the Act is required for an Aboriginal heritage impact permit. Areas of moderate archaeological potential are identified for alignment corridors for alignment 2K-2, 3E and 3D (refer Appendix J for locations). Further investigation in the form of testing under the *Code of practice for archaeological investigation of Aboriginal objects in New South Wales* (DECCW 2010) is required for these areas, and an Aboriginal heritage impact permit may be required prior to constructions works commencing in these areas (pending the findings of the further investigation).

In addition, part of alignment 2K-2 is in land acquired (however not reserved) under part 11 of the NPW Act. A separate REF has been prepared for that portion of alignment 2K-2 for NPWS approval prior to works commencing.

Heritage Act 1977

The *Heritage Act 1977* (the Heritage Act) aims to protect of items of State and local heritage significance. Works associated with the locally listed Colonial Road – remnants (former Wool Road) (Alignments 2I, 2J, 3A and 3D) require further assessment in the form of a statement of Heritage Impact (SoHI) to determine the potential impact of the proposed ground disturbance works on this item. This assessment must detail whether the tangible remains of the item are considered to be relics under the NSW Heritage Act 1977 and whether any exceptions need to be followed or if an approval under Section 139 is required prior to construction commencing.

The heritage items located adjacent to Alignment 3D [Tomerong School of Arts, the Tomerong Union Church, the Victorian Schoolmasters Residence and grounds and the Tomerong Cemetery] will not require heritage additional investigation, however the works will need to be managed in accordance with the mitigation measures outlined in Section 6.2.

3.0 Stakeholder Consultation

Consultation with key stakeholders will be undertaken by Council as required prior to and during construction of each alignment. Key stakeholders will include private landowners, Crown Lands and NSW State Emergency Services (SES). No state roads will be directly affected during alignment works therefore Transport for NSW (TfNSW) is not a key stakeholder.

Council is to notify private landowners, Crown Lands, National Park and Wildlife Services, and the SES about the proposed works prior to construction works commencing for

alignments likely to impact these stakeholders (as identified in this section of the REF). The notification is to include sufficient detail regarding the timing and duration of construction activities.

3.1 Private Landowners

Proposed Works on Private Property

Desktop assessment of the alignments has identified several private properties that will be intersected by the proposed works footprint. The Lot/DPs and addresses of these properties are listed in Table 3-1. Council are to undertake consultation with private landowners 7 days prior to undertaking works located in the properties listed, noting that all other construction works will take place within the road reserve. Council are to also confirm through detailed on-site survey the extent of private property encroachment by the alignments and if the acquisition of an easement under Section 186 of the *Local Government Act 1993* is required.

Table 3-1 Private property intersections per alignment

Alignment	Lot/DP	Postal Address
3D	58//DP816150	510 Hawken Rd, Tomerong 2540
3D	2//DP607327	450B Hawken Rd, Tomerong 2540
3D	57//DP816150	450B Hawken Rd, Tomerong 2540
3D	1//DP862400	Shire Park Rd, Nowra 2541
3D	3//DP616916	408 Hawken Rd, Tomerong 2540
3D	3//DP615545	377 Hawken Rd, Tomerong 2540
3D	37//DP925270	106 Church St, Tomerong 2540
3D	11//DP1072525	15 Torbin Pl, Tomerong 2540
3D	1522//DP1233681	10 Torbin Pl, Tomerong 2540
3D	161//DP1245125	4 Torbin Pl, Tomerong 2540
2F	33/DP730378	Across the road from 6 Cammaray Dr, St Georges Basin

Residential Access

Residential access would be impacted by the proposed works, and the addresses of the impacted residents are listed in the 'Traffic and Access' component of the environmental checklist. Council is to undertake consultation with private landowners 7 days prior to undertaking works which impact their access.

3.2 NSW Department of Planning and Environment – Crown Lands

The proposed alignments will where possible avoid crossing crown lands and be placed on areas of road reserve, however alignments 2G, 2K-1 and 2K-2 will intersect areas of Crown land as shown in Appendix E. Council is to identify if works located within Crown land will be ongoing i.e. for ongoing maintenance of the main. If ongoing access to the Crown land is

required, then Council are to consult with the NSW Department of Planning and Environment – Crown Lands to seek an easement under s 5.50 of the *Crown Land Management Act 2016*.

Table 3-2 Crown Land Intersected by Alignments

Alignment	Lot/DP	Postal address
2G	7303//DP1163797	Kallaroo Rd, Erowal Bay 2540
2K-1	39/C/DP12958	Park Way, Old Erowal Bay 2540
2K-1	7302//DP1163797	Fitzpatrick St, Old Erowal Bay 2540
2K-2[5]	1//DP625153	St George Ave, Worrowing Heights 2540
2K-2	7301//DP1163797	Erowal Bay Rd, Erowal Bay 2540

3.3 National Park and Wildlife Services (NPWS) Land's

The proposed works footprint for alignment 2K-2 is located within lands "acquired, not gazetted" by the NSW National Parks and Wildlife Service (NPWS). NPWS has requested a separate REF that will address any potential impacts associated with the section of alignment 2K-2 which traverses through NPWS land.

Table 3-3 NPWS Land intersected by Alignments

Alignment	Lot/DP	Postal address
2K-2	Lot 1/DP 625153	Erowal Bay Rd, Erowal Bay 2540

3.4 State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) Consultation

Chapter 2, Part 2.2, Division 1 of the TISEPP contains provisions for Council to consult with other public authorities prior to the commencement of certain types of development. In addition to public authorities consulted during the preparation of the EMS, this REF identified an additional requirement to consult with the State Emergency Service (SES) due to the proposed works being located on flood liable land. Therefore, the SES needs to be consulted in relation to the project to confirm any relevant requirements.

3.5 Publication Requirements

Publication of this REF is required under clause 171 (4) of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation). Publication is required under clause

[5] Part of alignment 2K-2 falls within land managed by the NSW National Parks and Wildlife Service (NPWS) and has been assessed in a separate REF for NPWS determination.

171(4)(b)(i) of the EP&A Regulation due to the activity requiring approval under section 200 of the *Fisheries Management Act* (refer Table 2-3). An additional requirement for publication may also be triggered if approval under section 90 of the NPW Act is required (if an Aboriginal heritage impact permit is required).

The REF is to be published prior to construction works commencing if practicable. If publication prior to construction works is not practicable, then the REF is to be published no later than 1 month following the commencement of works (as per clause 171 (5)(a-b) of the EP&A Regulation).

The REF document was placed on public exhibition on Council's website for a period of three weeks, from 11 September to 3 October 2023. A notice was placed in the South Coast Register on 13 and 20 September 2023 to notify the local community of the public exhibition period.

An email was sent to NSW State Emergency Services (SES) and letters were sent out by Council to directly impacted properties to inform them of the public exhibition and invite them to make a submission.

By the close of the exhibition period, zero responses were received.

4.0 Environmental Checklist Findings

4.1 Environmental Checklist Summary

A site-specific environmental checklist was undertaken for each alignment (Appendix B) to identify where additional mitigation measures and/or assessment is required. The checks were determined considering the mitigation measures identified in the EMS. Table 4-1 and Table 4-2 identify the alignments with WP2 and WP3 respectively where additional mitigation measures need to be included in the CEMP, and Table 4-3 and Table 4-4 identify alignments which require additional assessment in this REF.

The orange fill in Table 4-1 and Table 4-2 identify where the checklist question was 'Yes' for the proposed works.

Table 4-1 WP2 Environmental Checklist Summary

Check	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J	2K-1	2K-2
Are the proposed works likely to impact residential access?												
Are the works likely to disturb waterbodies												

Check	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J	2K-1	2K-2
(natural or constructed)?												
Are the works likely to impact mapped Key Fish Habitat?												
Are the works likely to require a partial or complete road closure?												
Are the works located in areas associated with high erosion potential?												
Are there any known previous land uses that influence the suitability of the site for installation of the water mains? Any other previous land use considerations? (e.g., contamination or previous Defence land may have unexploded ordinances)												
Does the project cross any private land?												
Does the project impact, or is the project adjacent to, any Crown Land?												
Will acid sulphate soils be												

Check	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J	2K-1	2K-2
potentially disturbed?												
Will any conservation zones, as identified by the Local Environment Plan, be potentially impacted?												
Will excavation and/or ground disturbance be required? If 'No', proceed to the next section.												
Will recreational areas be potentially impacted?												
Will the proposal be located within land subject to the RHSEPP?												
Will the proposed works be carried out within, or in proximity to, any areas identified as a local heritage site as designated by the relevant NSW environmental planning instrument (EPI) under the Environmental Planning and Assessment Act 1979?												
Will the proposed works												

Check	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J	2K-1	2K-2
potentially impact any land reserved under the National Parks and Wildlife Act 1974?[6]												
Will the works be located in bushfire prone land?												
Will the works have the potential to result in the generation of dust, air pollution, or the generation of offensive odours?												
Will the works impact any businesses in the area?												

For each alignment in Table 4-1 identified by the checklist, site-specific measures are required in addition to the measures identified in the EMS. Additional mitigation measures for each alignment are detailed in Table 6-1.

Table 4-2 WP3 Environmental checklist summary

Check	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K
Are the proposed works likely to impact residential access?											
Are the works likely to disturb waterbodies (natural or constructed)?											
Are the works likely to impact mapped Key Fish Habitat?											

[6] Part of alignment 2K-2 falls within land (Lot1 / DP625153) managed by the NSW National Parks and Wildlife Service (NPWS) and has been assessed in a separate REF for NPWS determination.

Check	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K
Are the works likely to require a partial or complete road closure?	■	■	■	■	■	■	■	■	■	■	■
Are the works located in areas associated with high erosion potential?				■	■					■	
Are there any known previous land uses that influence the suitability of the site for installation of the water mains? Any other previous land use considerations? (e.g. contamination or previous Defence land may have unexploded ordinances)	■						■				
Does the project cross any private land?				■							
Does the project impact, or is the project adjacent to, any Crown Land?	■			■	■						
Will acid sulphate soils be potentially disturbed?								■			
Will any conservation zones, as identified by the Local Environment Plan, be potentially impacted?				■	■						
Will excavation and/or ground disturbance be required? If 'No', proceed to the next section.	■	■	■	■	■	■	■	■	■	■	■
Will recreational areas be potentially impacted?	■				■		■	■			■
Will the proposal be located within land subject to the RHSEPP?				■	■		■				■
Will the proposed works be carried out within, or in proximity to, any areas identified as a local heritage site as designated by the relevant NSW environmental planning instrument (EPI) under the Environmental Planning and Assessment Act 1979?	■			■							
Will the proposed works potentially impact any land reserved under the National Parks and Wildlife Act 1974?											
Will the works be located in bushfire prone land?	■	■	■	■	■			■		■	■
Will the works have the potential to result in the generation of dust, air pollution, or the generation of offensive odours?	■	■	■	■	■	■	■	■	■	■	■

Check	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K
Will the works impact any businesses in the area?											

For each alignment in Table 4-2 identified by the checklist, site-specific measures are required in addition to the measures identified in the EMS. Additional mitigation measures for each alignment are detailed in Table 6-1.

4.2 Summary of potential impact(s) not previously assessed in the EMS

Many of the potential environmental impacts associated with the matters identified in the environmental checklist in Section 4.1 of this report have previously been addressed in the EMS. This section therefore focuses on the matters which trigger the need for additional assessment, beyond that included in the EMS, as listed in the leftmost column of Table 4-3 (for WP2) and Table 4-4 (for WP3). The orange fill in subsequent columns indicate where additional assessment of the relevant environmental matter is required for each alignment. The right-hand columns of these tables indicates where the additional assessment is included within this REF document. Mitigation measures identified through the assessment are included in Table 6-1.

Table 4-3 WP2 Summary of additional assessment requirements

Check	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J	2K-1	2K-2	Section Referenced
Are the works likely to impact mapped Key Fish Habitat?											■	■	Section 2.2
Will the proposal be located within land subject to the RHSEPP?	■	■	■	■	■	■	■	■	■	■	■	■	Section 5.24
Will the proposed works be carried out within, or in proximity to, any areas identified as a **local heritage site** as designated by the relevant ***NSW environmental planning instrument (EPI)*** under the ***Environmental Planning and Assessment Act 1979?***									■	■			Section 5.9, 5.10
Will the proposed works have the potential to require the clearance or trimming of vegetation?	■	■	■	■	■	■	■	■	■	■	■	■	Section 5.25
Will the works result in cumulative environmental impacts?													Section 5.25
Are the works likely to disturb waterbodies (natural or constructed)?											■	■	Section 2.2

Table 4-4 WP3 Summary of additional assessment requirements

Check	3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K	Section Referenced
Are the works likely to impact mapped Key Fish Habitat?				■	■							Section 2.2
Will the proposal be located within land subject to the RHSEPP?				■	■		■				■	Section 5.24
Will the proposed works be carried out within, or in proximity to, any areas identified as a local heritage site as designated by the relevant NSW environmental planning instrument (EPI) under the ***Environmental Planning and Assessment Act 1979?***	■			■								Section 5.0.13, 5.16
Will the proposed works have the potential to require the clearance or trimming of vegetation?	■	■	■	■	■	■	■	■	■	■	■	Section 5.25
Will the works result in cumulative environmental impacts?												Section 5.25
Are the works likely to disturb waterbodies (natural or constructed)?				■								Section 2.2

5.0 Additional Environmental Impact Assessment

5.18 Alignment 3F, Kingsford Smith Crescent and Warrego Drive, Sanctuary Point

Ecology

Existing Environment

The extent of each vegetation type located within the impact area for alignment 3F is provided in Table 5-17 and illustrated in Appendix H. A description of ground-truthed characteristics for each vegetation type within the study area is provided in the sections below.

Table 5-17 Vegetation Types within alignment 3F

Vegetation Type	Name	TEC	Area within 3F Impact Area (ha)
NA	Native Trees	NA	0.012
Total 3F Impact			**0.012**

Native Trees

There are portions within the study area along alignment 3F that are populated by street trees (*Eucalyptus* spp.) that do not conform to any known local PCT.

Cleared/Exotics

Portions of the study area along alignment 3F have been classified as cleared/exotic which constitutes residential lawn/garden areas within the study area of alignment 3F. These areas do not conform to any known locally occurring native PCT.

Photo 32 Example Native Tree within the Study Area of Alignment 3F

Photo 33 Example Cleared Area within the Study Area of Alignment 3F

Potential Impacts

The construction of alignment 3F requires the direct removal of 0.012ha of native trees. The required vegetation removal is conservative as it assumes a 5m clearance corridor for the alignment however the actual construction footprint will often be narrower than 5m and will avoid vegetation clearance where possible.

Provided the general mitigation measures for the project (Table 6-1) are implemented, potential impacts to native flora and fauna are expected to be negligible.

Heritage

Existing Environment

The SHA from Austral indicated that soils within alignment 3F are comprised of loose silty, sand with low visibility due to erosion. This alignment is located in a residential area with high levels of disturbance including residential development, roads, landscaping, installation of power lines, fibre optic cables, the previous water main and sewerage. Tributaries intersect alignment 3F.

Potential Impacts

Non non-Aboriginal heritage items were identified by Austral in within the study area for this alignment and therefore no impacts are expected, and no further investigation is required. The CEMP is to include an unexpected finds protocol to manage the risk of unexpected archaeological finds.

No Aboriginal archaeological material was recorded on the site surface during the survey of alignment 3F, as detailed in the SHA (Appendix J). In consideration of the significant level of ground disturbance within the alignment (pipes, culverts, roads and residential development), advice provided by Austral suggest there is low archaeological potential for

Aboriginal cultural heritage, and as such works can proceed with caution (refer Appendix J of the SHA), provided measures identified in Section 6.2 are adhered to.

5.22 Alignment 3J, Clifton Street, Sanctuary Point

Ecology

Existing Environment

The extent of each vegetation type located within the impact area for alignment 3J is provided in Table 5-20 and illustrated in Appendix H. A description of ground-truthed

characteristics for each vegetation type within the study area is provided in the sections below.

Table 5-20 Vegetation Types within Alignment 3J

Vegetation Type	Name	Potential TEC	Area within 3J Impact Area (ha)
NA	Native Trees	NA	0.018
Total 3J Impact			**0.018**

South Coast Lowland Shrub-Grass Forest (PCT 3273)

South Coast Lowland Shrub-Grass Forest (PCT 3273) is present within the study area of alignment 3J. The canopy is dominated by Blackbutt (*Eucalyptus pilularis*). Other species present within this patch include Yellow Pittosporum (*Pittosporum revolutum*) and Spiky-headed mat-rush (*Lomandra longifolia*). The understorey within this patch has been modified and the groundcover consists of cultivated grass.

Alignment 3J has been situated outside of this mapped vegetation community and is not likely to have a direct impact on PCT 3273.

Native Trees

There are portions within the study area along alignment 3J that are populated by street trees (*Eucalyptus* spp.) that do not conform to any known local PCT.

Cleared/Exotics

Portions of the study area along alignment 3J have been classified as cleared/exotic which constitutes residential lawn/garden areas within the study area of alignment 3J. These areas do not conform to any known locally occurring native PCT.

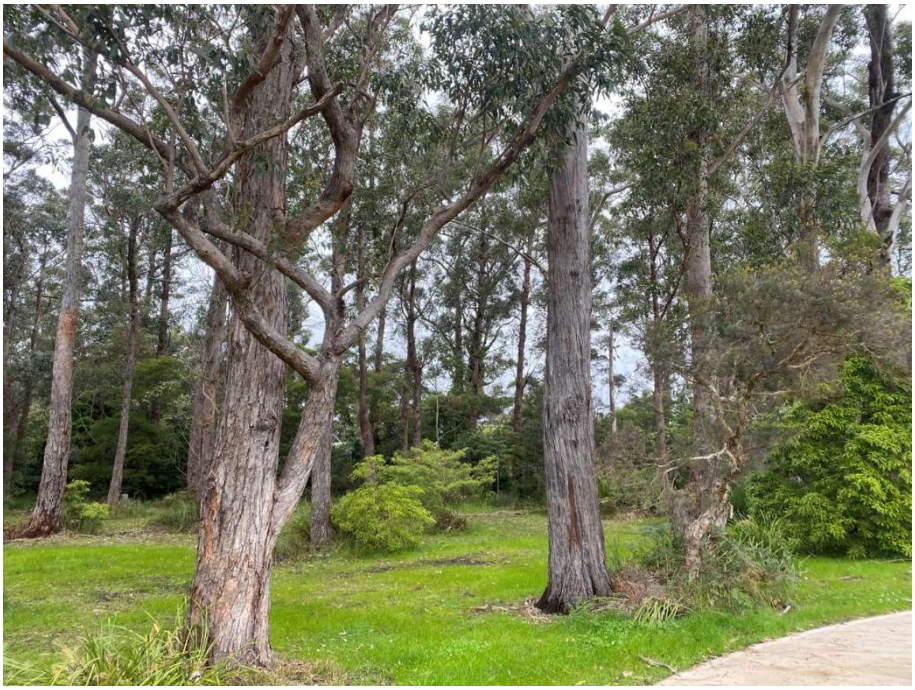

Photo 37 Example PCT 3273 within the Study Area of Alignment 3J

Potential Impacts

The construction of alignment 3J requires the direct removal of 0.018ha of native trees. The required vegetation removal is conservative as it assumes a 5m clearance corridor for the alignment however the actual construction footprint will often be narrower than 5m and will avoid vegetation clearance where possible.

Provided the general mitigation measures for the project are implemented (Table 6-1), potential impacts to the native flora and fauna are expected to be negligible.

Heritage

Existing Environment

The SHA from Austral indicated that soils within alignment 3J are comprised of loose silty, sand with low visibility due to erosion. This alignment is located in a residential area with high levels of disturbance including residential development, roads, landscaping, installation of power lines, fibre optic cables, the previous water main and sewerage.

Potential Impacts

Non non-Aboriginal heritage items were identified by Austral in within the study area for this alignment and therefore no impacts are expected, and no further investigation is required. The CEMP is to include an unexpected finds protocol to manage the risk of unexpected archaeological finds.

No Aboriginal archaeological material was recorded on the site surface during the survey of alignment 3J, as detailed in the SHA (Appendix J). In consideration of the significant level of ground disturbance within the alignment (pipes, culverts, roads and residential development), advice provided by Austral suggest there is low archaeological potential for

Aboriginal cultural heritage, and as such works can proceed with caution (refer Appendix J of the SHA), provided measures identified in Section 6.2 are adhered to.

6.0 Summary

6.1 Environmental Management Plans

A CEMP will be prepared by the construction contractor to include all the mitigation measures listed in this REF and the EMS, as well as any relevant conditions under any permits, licences or other approvals obtained for the project.

6.2 Summary of Mitigation Measures

Site specific environmental mitigation measures relating to each of the aspects considered in this REF are summarised in Table 6-1.

Table 6-1 Summary of Environmental Mitigation Measures to be Implemented

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Air	Cover vehicles transporting materials likely to generate dust
All	EMS	Air	Maintain stockpiles to a maximum height of 2 m and place stockpiles in areas protected from the wind where possible
All	EMS	Air	Monitor work areas for dust and water and use dust suppression as required. Where dust suppression is ineffective and creates a safety or unacceptable nuisance hazard, works to be altered or cease
All	EMS	Air	Once construction is completed, all exposed soils must be replanted as required
All	EMS	Air	Staging of works to reduce surface area of exposed soils
All	EMS	Air	Stop works likely to generate dust or airborne particulates during high winds or inclement weather
All	EMS	Air	Use vacuum systems to capture dust from concrete or other saw-cutting
All	EMS	Air, Noise and Vibration	Do not idle plant and vehicles
All	EMS	Bushfire	An emergency response plan for hazards and risks during construction is to be incorporated into the CEMP

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Bushfire	Construction works are to be undertaken in accordance with any relevant Council bushfire management plans.
All	EMS	Bushfire	No hot work is to be undertaken during extreme hot weather events or on Total Fire Ban days
All	EMS	Bushfire	Worker instruction in fire safety and use of designated smoking areas
All	EMS	Cumulative	Prior to commencement of each Stage of construction, the Contractor shall consult with Council to review the potential for other construction projects in the general area to coincide with the proposed works. If there are coincident construction projects that would result in cumulative impacts on the community, the Contractor will demonstrate they have considered the appropriate measures to manage these cumulative impacts, such as coordination of noisy works and disruptions to traffic and access with the other relevant proponents so as to minimise impacts to the community, in so far as is reasonable and feasible.
All	EMS	Cumulative	The scheduling of construction activities would seek to avoid or minimise cumulative impacts from the co-occurrence of construction activities, where reasonable and feasible
All	EMS	Ecology	All roots ≤60 mm diameter encountered during excavation to be cleanly cut. Roots greater than 60 mm diameter are not to be cut without authorisation from the Superintendent, underboring to be considered
All	EMS	Ecology	Areas of ecological value to be demarcated on site prior to construction and access restricted to prevent accidental ingress, with details of these protections provided in the CEMP for the site. Ground truthed TEC's illustrated in Appendix I and explored in ecology sections of individual alignments, section 5.0.
All	EMS	Ecology	Bagging of weed species to occur during clearing and to be disposed at an EPA-licensed facility. Weed species previously

Alignment(s)	Document	Environmental component	Mitigation Measures
			recorded on site are provided in the flora list within Appendix M.
All	EMS	Ecology	Cleaning of machinery is to occur between works locations.
All	EMS	Ecology	Damaged and cut roots and branches to be immediately trimmed back with a sharp saw to achieve a clean cut, and an approved fungicide or mastic tar to be applied to reduce the likelihood of infection
All	EMS	Ecology	Should subsequent site risk assessment by the contractor consider the works would require impact to a tree which has not been addressed in the REF (from unknown ground conditions or unidentified service etc.), the Council is to be informed for approval before continuing works.
All	EMS	Ecology	Stockpiles of construction materials and fill to be restricted to existing cleared areas and not to be located within areas of adjoining native vegetation
All	EMS	Ecology	The CEMP is to include any specific mitigation measures outlined in the REF for protection of ecology, including vegetation trimming or clearing
All	EMS	Ecology	The CEMP prepared for the works is to detail suitable controls in an erosion and sedimentation (ERSED) control plan to protect downstream aquatic habitats from sediment migration.
All	EMS	Ecology	Trees and shrubs on or adjacent to the construction area not to be removed without obtaining prior written permission from the Owner (and, where appropriate, Council) and to be replaced as required or agreed
All	EMS	Ecology	Trees, shrubs and grasses outside the construction area to be protected through the use of appropriate site management and fencing, including tying back of stems and branches to keep them out of the path of machinery.
All	EMS	Ecology	Trimming of vegetation by pruning or lopping to be carried out in a professional manner using appropriate tools to Australian Standards to the extent authorized by the relevant Owner before

Alignment(s)	Document	Environmental component	Mitigation Measures
			construction begins. Any trimming is to be carried out in accordance with best practice or by a qualified arborist.
All	EMS	Ecology	Vegetation trimmed or removed to be suitably disposed of
All	EMS	Ecology	Where avoidance of vegetation is not possible, undertake an environmental impact assessment of the proposed clearing or trimming impacts unless already assessed as part of the REF for the specific works package
All	EMS	Ecology	Where mature trees are present in the alignment of the pipeline, underboring or realignment to be considered to reduce the potential for their harm
All	EMS	Ecology	Where possible, removal or trimming of vegetation to be avoided unless essential to construction work
All	EMS	Ecology	Where removal or trimming of vegetation is deemed to be required, follow Council's Tree Management Policy
All	EMS	Strategic Heritage Advice	All construction workers to be informed of their responsibilities in relation to Aboriginal and non-Aboriginal cultural heritage under the relevant legislation
All	EMS	Strategic Heritage Advice	Areas of moderate archaeological potential are to be delineated by temporary fencing 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
2I, 2J, 3A, 3D	REF	Strategic Heritage Advice (Non-Aboriginal heritage)	A Statement of Heritage Impact (SoHI) will be required for alignments 2I, 2J, 3A and 3D in relation to the Colonial Road – remnants (former Wool Road) (see areas mapped as moderate heritage sensitivity on Figures 35 and 37 in Appendix J).
3D	REF	Strategic Heritage Advice (Non-Aboriginal heritage)	The works adjacent to the following heritage items (mapped on Figure 10 in Appendix J): - Tomerong School of Arts - Tomerong Union Church - Victorian Schoolmasters Residence and grounds

Alignment(s)	Document	Environmental component	Mitigation Measures
			- Tomerong Cemetery need to be managed in accordance with the following recommendations: 1. Works associated with alignment 3D that are adjacent to the identified heritage items Tomerong School of Arts, the Tomerong Union Church, the Victorian Schoolmasters Residence and grounds and the Tomerong Cemetery can proceed without the need for further assessment. This is subject to the following recommendations: a. All works must remain outside the heritage curtilage, demarcation of the curtilage either by fencing or flagging will be required to be installed prior to the commencement of works. The location of the heritage items and their associated curtilages must be identified as no go areas on all construction plans and be identified to contractors as part of their site inductions. b. If potential historical archaeological relics are found during the works, all works in the immediate vicinity are to cease immediately and a qualified archaeologist must be contacted to assess the nature, extent and significance of the item. Where the item is determined to be a relic, NSW Heritage must be notified in accordance with Section 146 of the *NSW Heritage Act 1977*. An application under Section 139 of the NSW Heritage Act may be required before works can recommence. c. To avoid visual impacts to the items, care must be taken to ensure that above ground installations (i.e., signs, infrastructure) are not placed in the vicinity of these items and that any surface treatments must be consistent with the existing ground surface. d. Should the proposed works be altered significantly from those specified within this assessment or the above recommendations are not be able to be adhered to then a

Alignment(s)	Document	Environmental component	Mitigation Measures
			reassessment of the heritage impact may be required in the form of a SoHI.
All	REF	Strategic Heritage Advice (Aboriginal heritage)	An unexpected finds procedure in regard to Aboriginal cultural material should be prepared and implemented prior to works commencing. Before any groundworks related to the proposed works commence, all contractors and/or employees of contractors involved in ground disturbance works must attend a cultural heritage induction. The cultural heritage induction should include a general cultural awareness training consisting of an explanation of the heritage material that may be present within the study area.
2K-2, 3E[9], 3D	REF	Strategic Heritage Advice (Aboriginal heritage)	Areas of moderate archaeological potential within alignments 2K-2, 3E[10] and 3D (as shown on Figure 30, Figure 31 and Figure 33 in Appendix J) require further investigations in the form of testing under the *Code of practice for archaeological investigation of Aboriginal objects in New South Wales* (DECCW 2010) and the potential securing of an Aboriginal Heritage Impact Permit (AHIP) before works can commence. Identification and consultation must be undertaken with Aboriginal stakeholders in accordance with the Consultation Requirements, which includes statutory timeframes in order to demonstrate adequate time has been provided to allow stakeholders to review and comment on the information provided. In the event that no Aboriginal cultural material is identified as a result of the test excavation program, no further works are required in terms of Aboriginal cultural material.

[9] Alignment 3E is called “3C-SWR” within Appendix J.

[10] Alignment 3E is called “3C-SWR” within Appendix J.

Alignment(s)	Document	Environmental component	Mitigation Measures
			In the event that Aboriginal cultural material is identified as a result of the test excavation program, an application must be made for an AHIP prior to works proceeding, and archaeological salvage excavations may be required.
2K-2, 3D	REF	Strategic Heritage Advice (Aboriginal heritage)	If works around the previously recorded sites AHIMS# 58-2-0275 or AHIMS# 58-2-0237 cannot be avoided, then an AHIP for the destruction of the site will be required.
All	REF	Strategic Heritage Advice (Aboriginal heritage)	While not currently considered to be a constraint on site, where significant sites such as middens or burials may be present, testing can only be undertaken following the preparation of an ACHA and the approval of an AHIP. A second AHIP application will be required if testing confirms the presence of Aboriginal cultural material.
All	EMS	Heritage	If any relics thought to be older than 50 years are uncovered, Council and DPIE must be notified within 24 hours
All	EMS	Heritage	The CEMP is to include an unexpected finds protocol to manage the risk of unexpected archaeological finds. In the event works uncover any items of suspected heritage significance, all activity in the immediate area must cease and the area be cordoned off. Council and the DPIE must be notified on Enviroline 131 555 within 24 hours. Where the artefact/remains are thought to be of Aboriginal cultural heritage significance, the Local Aboriginal Land Council are to be notified, so that the object can be adequately assessed and managed. Where the find comprises human remains, NSW Police must be contacted in the first instance
All	EMS	Noise and Vibration	Construction works to be undertaken during standard construction hours
All	EMS	Noise and Vibration	Limit vehicle speeds and movement to minimise noise emissions
All	EMS	Noise and Vibration	Maintain vehicles and plants to ensure they are in good working order and if necessary, fitted with noise suppressing equipment.

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Noise and Vibration	Notify sensitive receivers of works before commencing construction and advise of the period of works, hours of work. Provide contact name and number for queries
All	EMS	Noise and Vibration	Respond to any noise emissions complaints and implement corrective actions as appropriate
All	EMS	Noise and Vibration	The Interim Construction Noise Guideline (DECC, 2009) is to be adhered to
All	EMS	Noise and Vibration	Where practicable, limit reversing alarm noise emissions
All	EMS	Socio Economic	Advise affected landholders, residents or businesses of the construction hours, duration of work, and supply with a contact number for any queries relating to the work
All	EMS	Socio Economic	Careful timing of works at sensitive locations, e.g. avoiding excavations near schools during school term
All	EMS	Socio Economic	Clearly communicate periods of service shutdowns to those impacted
All	EMS	Socio Economic	Implementing traffic and access mitigation measures
All	EMS	Socio Economic	Maintain a complaints register and respond to complaints quickly and appropriately.
All	EMS	Socio Economic	Prior to undertaking ground disturbance works carry out utility clearance
All	EMS	Socio Economic	Where practical, timing works to minimise impacts on scheduled significant events through access or traffic restrictions
All	EMS	Soils	Acid sulphate soil or potential acid sulphate soil is to be managed in accordance with Chapter G26 – Acid Sulphate Soils and Geotechnical (Site Stability) Guidelines (Shoalhaven City Council, 2021)
All	EMS	Soils	All contaminants encountered on site are to be contained, classified in accordance with Waste Classification Guidelines (EPA, 2014) and disposed at an EPA-licensed facility
All	EMS	Soils	An incident management plan is to be developed to detail procedures for on-site spills

Alignment(s)	Document	Environmental component	Mitigation Measures
			of fuel or chemicals and adopted within the CEMP
All	EMS	Soils	Any chemicals, fuels and hazardous liquids are to be stored in a bunded area with MSDS and spill kits maintained nearby on-site and personnel to be trained in their use. All spills to be reported immediately to Council
All	EMS	Soils	Cover stockpiles of excess fill or contaminated soil awaiting offsite removal or use other appropriate measures to contain erosion and runoff
All	EMS	Soils	Implementation of erosion and sediment control measures outlined in an ERSED for the site as part of the CEMP and to follow the guidelines in Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and in Managing Urban Stormwater – Soils and Construction Volume 2A (DECC, 2008).
All	EMS	Soils	Limit stockpile extent to designated area which should not be located on slopes >2:1 batter, or in or near drainage lines
All	EMS	Soils	Minimise the stockpile and open excavation period (preferably to same day of excavation works)
All	EMS	Soils	Removal of any hazardous materials prior to undertaking bulk earthworks activities
All	EMS	Soils	Stabilise long term stockpiles
All	EMS	Soils	The CEMP is to include an unexpected finds protocol. If unexpected contaminated material is discovered, or caused through construction activities, localised works are to shut down and proper assessment protocol, outlined in the CEMP should be followed. In the event contaminated material is confirmed, Council and the EPA are to be notified immediately
All	EMS	Soils	Use of contractors appropriately licensed in the removal of any hazardous materials identified including in residual infrastructure and site soils

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Soils	Where possible, separately stockpile topsoil to assist in restoration of the site
All	EMS	Soils	Where practicable, restoration of site to pre-existing topography and vegetation cover immediately after construction and as consistently as possible with the pre-existing landscape
All	EMS	Traffic and Access	A Traffic Management Plan is to be prepared in consultation with Council or RMS (as applicable to the subject road) where partial or full road closure is required, and included in the CEMP
All	EMS	Traffic and Access	Access to the site is to be via a controlled and stabilised route with suitable protection measures to prevent any damage to sensitive areas surrounding the site
All	EMS	Traffic and Access	All directly affected stakeholders to be informed about the works, their timing, and expected impacts prior to the commencement of the works
All	EMS	Traffic and Access	All roads, kerbs, gutters and footpaths damaged as a result of construction or site access are to be restored to their pre-construction condition according to Council or RMS requirements
All	EMS	Traffic and Access	All sealed roads are to be kept clean and free of dust and mud at all times. Where material is tracked onto sealed roads at any time, it would be removed immediately so that road pavements are kept safe and trafficable.
All	EMS	Traffic and Access	Any permits required from Council or RMS to be obtained and the Contractor will comply with any Council or RMS requirements regarding traffic control and access
All	EMS	Traffic and Access	Appropriate signage to be erected to inform users of any disruption to vehicle or pedestrian movements on local roads and any temporary area closures if required
All	EMS	Traffic and Access	No construction materials, equipment or vehicles are to encroach onto private property without prior arrangement with the landowner

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Traffic and Access	The CEMP is to include suitable access stabilisation and control measures to prevent the tracking of sediment from the site via vehicles accessing or leaving the site
All	EMS	Traffic and Access	Vehicles transporting spoil or waste from the site are be covered and filled to maximum capacity to minimise vehicle movements
All	EMS	Traffic and Access	Where feasible, driveways are to be underbored and residents consulted to ensure no loss of right-of-way during construction
All	EMS	Traffic and Access	Where practicable, parking of vehicles and storage of plant / equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant / equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees
All	EMS	Traffic and Access	Where practicable, vehicle and equipment movement is to be confined to existing designated roads and access tracks
All	EMS	Traffic and Access	Where vehicles may come within the vicinity of any tree root zones or areas of ecological importance, suitable barriers and ground protections are to be emplaced to further protect these items
All	EMS	Visual	Confine stockpiles and waste to a designated area as specified in the CEMP and ERSED.
All	EMS	Visual	Requirements for a tidy work site during construction to be included in CEMP
All	EMS	Visual	The landform is to be restored to a similar surface as prior to construction
All	EMS	Visual	Vegetation removal is to be minimised and site restoration to commence immediately after construction
All	EMS	Visual	Works to be contained within a defined work site boundary with fences to exclude general public
All	EMS	Waste	A hazardous waste management plan is to be put in place to appropriately collect, transport and dispose of redundant

Alignment(s)	Document	Environmental component	Mitigation Measures
			asbestos pipe. This plan would be prepared in consultation with the EPA and Council
All	EMS	Waste	Adequate bins with lids that prevent wind-blown litter and exclude pest and native animal scavenging are to be provided on site
All	EMS	Waste	All waste residues (concrete slurries etc) are to be washed out at an approved facility (not on site) and disposed of appropriately
All	EMS	Waste	All work areas to be maintained, kept free of rubbish and cleaned up at the end of each working day. Waste materials to be removed daily from the site, particularly food items and other general rubbish
All	EMS	Waste	EPA is to be notified of any incidents of pollution or environmental harm (as per part 5.7 of the POEO Act).
All	EMS	Waste	If unexpected contaminated material is discovered, or caused through construction activities, localised works to be shut down and proper assessment conducted. In the event contaminated material was confirmed, notification of Council and the EPA and clean up appropriate to the type of contamination is to be conducted
All	EMS	Waste	Provide, operate and maintain adequate facilities for the collection, transportation and disposal of liquid wastes including portable toilet wastes, fuels, lubricants, oils and grease
All	EMS	Waste	Soil to be assessed when excavated and stockpiled for any signs of contamination, such as odour, discolouration or visible contaminants, and classified and disposed at an EPA-licensed waste facility
All	EMS	Waste	Waste unable to be recycled onsite is to be disposed of or recycled where appropriate at an EPA-licensed facility
All	EMS	Water	Construction machinery and equipment not to be stored overnight in flood prone areas.
All	EMS	Water	Contractor set up areas should be located as far from drainage lines and water courses as practical.

Alignment(s)	Document	Environmental component	Mitigation Measures
All	EMS	Water	Induction of all site personnel to include awareness of potential environmental impacts to water, relevant water protection controls and responsibilities for managing controls
All	EMS	Water	Management of acid sulphate soils.
All	EMS	Water	Managing chemicals, fuels and hazardous liquids
All	EMS	Water	Minimise the duration of time where works extend into the groundwater table
All	EMS	Water	Minimising erosion from site
All	EMS	Water	Notification of Council and EPA as soon as possible of any event which has potential to result in pollution of waterways
All	EMS	Water	Record and report any construction activities that intercept with groundwater and monitor any groundwater discharge volumes
All	EMS	Water	Schedule works to avoid construction during predicted flood events or during heavy rainfall events and include a look ahead protocol within the CEMP to monitor weather conditions.
All	EMS	Water	Taking care not to discharge polluted water from works into stormwater
All	EMS	Water	Test any groundwater discharge. If the water is of a suitable quality as per ANZECC & ARMCANZ (2000), it is to be pumped into the sewerage treatment plant (STP). It the water is not of a suitable quality, an alternative treatment and disposal option will be assessed by the contractor and approved by Council.
All	REF	Bank erosion and potential collapse in riparian areas	Ancillary facilities and access are to be placed in already disturbed areas in demarcated restricted zones away from the riparian zone.
All	REF	Bank erosion and potential collapse in riparian areas	Strict erosion and sediment control measures should be implemented, monitored and maintained as part of an Erosion and Sediment Management Plan.
All	REF	Coastal	Ancillary sites, construction laydown areas, or any other proposed works characterised as

Alignment(s)	Document	Environmental component	Mitigation Measures
			'construction works' rather than 'routine maintenance works' are to be undertaken outside of mapped coastal management areas (Coastal use and Coastal environment area).
All	REF	Coastal (RHSEPP)	Preliminary site briefings undertaken by the contractor should acknowledge the coastal area in which the proposed works will be undertaken in. Area's marked as 'Coastal Use Area' and 'Coastal environment area' as outlined within the RHSEPP are explored within section 5.24. The implementation of the mitigation measures relating to sensitive coastal process's with in this REF will see the protection of the coastal environment and practises of the proposed works.
ALL	REF	Contamination	A written asbestos management plan and register is to be prepared for each worksite where AC pipe is identified (https://www.safework.nsw.gov.au/resource-library/asbestos-publications/asbestos-registers-and-management-plans-fact-sheet). This management plan is to identify appropriate tools and PPE used during removal, as well as any decontamination or ongoing monitoring requirements.
Currently Nil, however included in case of unexpected finds of asbestos	REF	Contamination	Any workers who are or may be involved in carrying out maintenance or repairs on AC pipes, must be trained in the identification of asbestos and ACM, the safe handling of asbestos and ACM, and suitable control measures for asbestos and ACM.
Currently Nil, however included in case of unexpected finds of asbestos	REF	Contamination	Asbestos waste transportation is to comply with requirements of cl 78 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation 2014). Which includes that: asbestos is covered and vehicles are leak-proof during construction, bonded asbestos is securely packaged, friable asbestos is kept in a sealed container, and any asbestos containing soil is wetted down.
Currently Nil, however included in case of unexpected	REF	Contamination	Existing decommissioned AC pipe is to be recorded in an asbestos register, and recorded in all asset information requests such as the dial before you dig service

Alignment(s)	Document	Environmental component	Mitigation Measures
finds of asbestos			
Currently Nil, however included in case of unexpected finds of asbestos	REF	Contamination	Prior to commencement of works, the contractor must source information from Council or others (if available) to quantify anticipated lengths of AC pipe for removal and engage the relevant licensed professional. If the proposed works require the removal of 10 m2 or more of non-friable asbestos, then a Class B licensed asbestos removalist is to undertake the removal. If any removal of friable asbestos is required, a Class A licensed asbestos removalist is to undertake the removal.
Currently Nil, however included in case of unexpected finds of asbestos	REF	Contamination	SafeWork NSW is to be notified by the Contractor five calendar days prior to any licenced asbestos removal works being undertaken (https://www.safework.nsw.gov.au/notify-safework/asbestos-notifications)
Nil	REF	Contamination	The proposed works will not be carried out where evidence of illegal dumping is observed. In the event unexpected contamination material is identified all works will stop in the vicinity of the find, Council will be notified and will engage a contamination specialist to assess the unexpected find. Council is to develop potential remediation options based on the NSW EPA remediation hierarchy in accordance with EPA guidelines on contaminated land management and requirements established in the CLM Act.
2K-1, 2K-2, 3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	A permit is required under Part 7, Section 219 of the FM Act if any works involve removing material from the riparian zone.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	All woody debris removed from creek must be placed immediately upstream.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	Care is to be taken when removing woody debris and vegetation to ensure no aquatic fauna are trapped on/in the woody debris.
3D	REF (Site Specific	Crossing of Suffolk and	Following the completion of instream works, riparian areas are to be revegetated and graded

Alignment(s)	Document	Environmental component	Mitigation Measures
	Biodiversity Measure)	Tomerong Creeks	with native species. Species selection is to consider those present instream and in the riparian zone.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	If 'in-stream' works are required, temporary blockages should not be placed in the months of September to March which is the key spawning months for fish.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	In-stream works should be designed and staged to avoid blocking the entire waterway. If the entire waterway is to be blocked, measures need to be implemented to maintain historic base flow conditions within the waterway (e.g. Diversion channel) for the duration of the proposed works.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	Strict project boundary fencing will be installed to avoid incidental impacts to areas outside of the works zone.
3D	REF (Site Specific Biodiversity Measure)	Crossing of Suffolk and Tomerong Creeks	Suffolk and Tomerong Creeks will be underbored to reduce the risk of impacts to aquatic habitat.
2J, 2K-1	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4019 – Riverflat Eucalypt Forest TEC	A site-specific induction would be completed where workers are made aware of the location of the TEC, associated significance and environmental controls.
2J, 2K-1	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4019 – Riverflat Eucalypt Forest TEC	All associated site works and vehicle movements are to remain within existing cleared areas where possible. TEC clearance is to be strictly limited to the extent identified in this REF.
2J, 2K-1	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4019 – Riverflat Eucalypt Forest TEC	Boundary fencing (i.e parra-webbing fencing) would be erected around the boundary of any retained TEC for the duration of the works.
2J, 2K-1	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4019 – Riverflat Eucalypt Forest TEC	Erosion and sediment controls would be established in the vicinity of the TEC in accordance with the Sediment and Erosion Control Plan for the project.
3I	REF (Site Specific	Direct impacts to PCT 4028 – Swamp Oak Forest TEC	A site-specific induction would be completed where workers are made aware of the

Alignment(s)	Document	Environmental component	Mitigation Measures
	Biodiversity Measure)		location of the TEC, associated significance and environmental controls.
3I	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4028 – Swamp Oak Forest TEC	The boundary of vegetation associated with PCT 4028 (Appendix X) in proximity of the 3I corridor is to be marked with high vis tape and or fencing prior to construction works being undertaken. All associated site works and vehicle movements, are to avoid the boundary of PCT 4028.
3I	REF (Site Specific Biodiversity Measure)	Direct impacts to PCT 4028 – Swamp Oak Forest TEC	Erosion and sediment controls would be established in the vicinity of the TEC in accordance with the Sediment and Erosion Control Plan for the project.
All	REF (General Biodiversity Measure)	Entrapment of fauna in excavation works. This can result in fauna death or injury through drowning, burial and compaction or through interaction with excavation plant.	Open sections of excavation to be covered overnight to prevent fauna becoming trapped. If fauna is trapped or injured, the Contractor is to notify WIRES and Council.
ALL	REF	Flooding	Chapter 2, Part 2.2, Division 1 of the TISEPP contains provisions for Council to consult with other public authorities prior to the commencement of certain types of development. In addition to public authorities consulted during the preparation of the EMS, this REF identified an additional requirement to consult with the State Emergency Service (SES) due to the proposed works being located on flood liable land. Therefore, the SES needs to be consulted in relation to the project to confirm any relevant requirements.
2B, 2C, 2F, 2K-1, 2K-2, 3A, 3D, 3E, 3H	REF (Site Specific Biodiversity Measure)	Impacts to identified hollow bearing trees within the impact zone	All hollow-bearing trees within the impact area would be identified and boundary fencing would be erected to prevent any impact to these trees. This will include establishing tree protection zones (TPZs) around trees in accordance with relevant standards. The boundary fencing is to

Alignment(s)	Document	Environmental component	Mitigation Measures
			be erected for the TPZ of the tree and is to follow the on-site advice of a qualified arborist.
2B, 2C, 2F, 2K-1, 2K-2, 3A, 3D, 3E, 3H	REF (Site Specific Biodiversity Measure)	Impacts to identified hollow-bearing trees within the impact zone	If construction works are unable to avoid the TPZ of the hollow bearing tree, an arborist is required to be on-site to guide construction works. This REF has only assessed the impact associated with the direct removal of one hollow bearing tree located within the 2K-2 alignment. If direct impact to any other hollow bearing tree cannot be avoided a qualified ecologist is to undertake a test of significance considering the cumulative assessment documented in this REF prior to construction works being undertaken.
2B, 2C, 2F, 2K-1, 2K-2, 3A, 3D, 3E, 3H	REF (Site Specific Biodiversity Measure)	Impacts to identified hollow-bearing trees within the impact zone	If the tree needs to be removed a qualified ecologist should be consulted and all hollows inspected for roosting fauna species.
2B, 2C, 2F, 2K-1, 2K-2, 3A, 3D, 3E, 3H	REF (Site Specific Biodiversity Measure)	Impacts to identified hollow-bearing trees within the impact zone	A fauna relocation plan should be discussed with Council prior to moving fauna species from hollow-bearing trees.
All	REF (General Biodiversity Measure)	Impacts to threatened flora species that were not detected during the field survey	An unexpected finds data sheet would be provided to all contractors of all flora species likely to occur.
All	REF (General Biodiversity Measure)	Impacts to threatened flora species that were not detected during the field survey	If a threatened plant is identified a flora relocation plan or alternative methodology would need to be discussed with Council prior to proceeding.
All	REF (General Biodiversity Measure)	Increased dust generation during works, reducing fauna utility of areas of nearby habitat	Dust minimisation through water suppression, avoiding works on high wind days and limiting dust generating activities to the extent possible
All	REF (General	Increased noise and light pollution on nearby areas of	Minimising the use of loud machinery whenever possible or containing such machinery within noise barriers

Alignment(s)	Document	Environmental component	Mitigation Measures
	Biodiversity Measure)	native vegetation, reducing fauna utility of this habitat	
All	REF (General Biodiversity Measure)	Increased noise and light pollution on nearby areas of native vegetation, reducing fauna utility of this habitat	Restricting works to daylight hours where practical
All	REF (General Biodiversity Measure)	Introduction of new weed species and pathogens and sediment into areas due to runoff from unconsolidated, exposed soil during works	All machinery should be cleaned of foreign soil and vegetative matter before entering the Study Area.
All	REF (General Biodiversity Measure)	Introduction of new weed species and pathogens and sediment into areas due to runoff from unconsolidated, exposed soil during works	Any exogenous soil and water used on site (e.g. for dust suppression) is to be appropriately treated to minimize the rise of the introduction of new pests and diseases
All	REF (General Biodiversity Measure)	Introduction of new weed species and pathogens and sediment into areas due to runoff from unconsolidated, exposed soil during works	Appropriate runoff controls such as sediment fencing can be installed prior to any soil disturbance works
2G, 2K-1, 2K-2	REF	Landuse	Prior to commencing proposed works on Crown Land, Council are to check the National Native Title Tribunal register. This REF does not provide advice regarding the legalities of native title claims that may be relevant to the subject land.

Alignment(s)	Document	Environmental component	Mitigation Measures
2K-2	REF	Landuse	Works proposed on land adjacent to National Parks are to consider Developments adjacent to National Parks and Wildlife Service lands – Guidelines for consent and planning authorities (NPWS, 2020). Where land involved in a proposal shares a common boundary with NPWS land, the boundary is to be denoted as an exclusion zone. NPWS land is not to be used to access work sites, store materials, equipment, workers' vehicles or machinery, or for maintenance access after completion of works.
All	REF (General Biodiversity Measure)	Removal of native vegetation	Following the completion of works, the impact areas must be restored to its original state and condition.
All	REF (General Biodiversity Measure)	Removal of native vegetation	If any habitat features are detected (hollow-bearing trees, nests, etc.) that have not been previously identified and require removal, please consult a suitably qualified arborist to inspect features before tree removal.
All	REF (General Biodiversity Measure)	Removal of native vegetation	Trees/native vegetation must be pruned rather than removed where applicable
All	REF (General Biodiversity Measure)	Removal of native vegetation	Vegetation that may require removal has been flagged in the design drawings. It is the Contractors responsibility to ensure tree removal is limited and contained within the impact area. No unnecessary native remnant vegetation is to be removed as a result of the project
All	REF (General Biodiversity Measure)	Sediment migration from areas of unconsolidated, exposed soil during works into waterbodies/drainage	Sediment fencing is to be installed below all areas of exposed soil during works

Alignment(s)	Document	Environmental component	Mitigation Measures
2C, 2D, 2E, 2F, 2G, 2K-1, 2K-2 and 3H	REF	Soils	An acid sulphate soils management plan is to be prepared in accordance with the Acid Sulfate Soils Manual 1998 (Acid Sulfate Soil Management Advisory Committee, 1998) for works in locations mapped as Class 1, Class 2, Class 3 or Class 4 on the Acid Sulfate Soils Map.
2K-2, 3D	REF (Site Specific Biodiversity Measure)	Threatened Flora Species	Threatened Flora in proximity of the 2K-2 and 3D corridors (Appendix H) is to be marked with high visibility tape and/or fencing prior to construction works being undertaken. All associated site works and vehicle movements are to avoid this boundary.
3D	REF (Site Specific Biodiversity Measure)	Threatened Flora Species	An arborist is required to be on site to ensure that entry and exit pits for the underbore are located outside of the tree protection zones established for threatened species.
2G, 2K-1 and 2K-2	REF	Traffic and Access	Council is to identify if works located within Crown land will be ongoing i.e. for ongoing maintenance of the main. If ongoing access to the Crown land is required, then Council are to consult with the NSW Department of Planning and Environment – Crown Lands to seek an easement under s 5.50 of the Crown Land Management Act 2016.
All	REF	Traffic and Access	Where the proposed alignments crossover private property works will only be conducted within areas of pre-existing easements. Additional private property easement acquisitions under Section 186 of the Local Government Act 1993 are not anticipated to be required as works will be contained to existing easements.
All	REF	Traffic and Access	Access to residences is to be maintained where possible. If access to residences cannot be maintained, a notification of works is to be letter box dropped 7 days prior to works being undertaken.
All	REF	Traffic and Access	Where possible, current traffic movements will be maintained during the proposed works. Any disturbance is to be minimised to prevent unnecessary traffic delays, and queue lengths are to be monitored and managed to comply with the ROL.

Alignment(s)	Document	Environmental component	Mitigation Measures
2K-1, 2K-2, 3D	REF	Water	Erosion and sediment control measures are to be implemented in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) (2004). Straw bale filters, sediment fences or equivalent would be deployed and maintained to: divert clean water around site; reduce water velocity and capture sediment on site; prevent sediment and sediment laden water entering any watercourse, drainage line, bushland or drain inlet; and minimise the amount of material transported from site to surrounding pavement surfaces.
2A, 2B, 2F, 2G, 2K-1, 2K-2, 3A, 3E, 3G, 3H, 3I and 3J	REF	Water	Stockpiles should be situated either above the highest astronomical tide or be secure from a 1 in 10-year flood and have effective sediment control measures in place to contain any runoff.
2K-1, 2K-2, 3D	REF	Water	Trenches and pits are to be backfilled immediately on completion of work at each site and erosion and sediment control measures maintained in place until the work in that location is complete and the site stabilised. Site stabilisation is to maintain existing topography and vegetation cover of works area where possible.
2K-1, 2K-2, 3D	REF	Water	Where it is not possible to work in the dry (out of the water), a sediment or silt screen may be required around the entire work area but should not extend across the waterway (as it may obstruct fish passage). Silt screens should be placed to isolate the works area and be attached to the same bank upstream and downstream of the work site. Sediment or silt screens should be inspected daily and maintained to prevent the escape of suspended sediments. Sediment control devices should not be removed until the risk of sedimentation and erosion is negligible, and the site has been stabilised or revegetated following construction. Screens or other guards should be carefully removed after the work is completed. Silt screens should generally only be used in still water conditions. When placed in higher flows, water either spills over the top or lifts the curtains.

Alignment(s)	Document	Environmental component	Mitigation Measures
2K-2, 3D, 3E and 3J	REF	Water	Any use of coffer dams or temporary access tracks is to keep disturbance to the substrate and blockages to fish passage to a minimum. The use of temporary dam materials such as sheet piling will reduce impacts on the substrate. Coarse rock confined by gabion baskets or mattresses should be used in preference to sand or soil.
2K-2, 3D, 3E and 3J	REF	Water	For any works located on sloped areas upstream of sensitive receivers defined above, works will not occur during high flow rain events.
2K-2, 3D, 3E and 3J	REF	Water	Program work to ensure that it takes place during low flow periods (freshwater habitats) or during the lower half of the tidal cycle (tidal waterways).
2K-2, 3D, 3E and 3J	REF	Water	Where it is not possible to work in the dry (out of the water), a sediment or silt screen may be required around the entire work area, but should not extend across the waterway (as it may obstruct fish passage). Silt screens should be placed to isolate the works area and be attached to the same bank upstream and downstream of the work site. Sediment or silt screens should be inspected daily and maintained to prevent the escape of suspended sediments. Sediment control devices should not be removed until the risk of sedimentation and erosion is negligible and the site has been stabilised or revegetated following construction. Screens or other guards should be carefully removed after the work is completed. Silt screens should generally only be used in still water conditions. When placed in higher flows, water either spills over the top or lifts the curtains.
All	REF	Water	Refuelling onsite is to be avoided where practicable. Any refuelling must occur in an impervious bunded area at least 50 metres away from waterways and drainage lines. All fuels, chemicals and liquids are to be stored in an impervious bunded area at least 50 metres away from waterways and drainage lines. Chemicals stored on vehicles are to be sealed and bunded. An emergency spill kit is to be kept on site at all times. All staff are to be made

Alignment(s)	Document	Environmental component	Mitigation Measures
			aware of the location of the spill kit and trained in its use.

6.3 Summary of Consideration of Environmental Factors

For the purpose of Part 5 of the EP&A Act, the factors to be taken into account when considering the likely impact of an activity on the environment include those matters listed in Section 171 (2) of the EP&A Reg, which the proposed development has been assessed against.

Table 6-2 Section 171 (2) Checklist Considerations

Clause 228 Factor	REF Finding
a) the environmental impact on the community	The proposed works are not likely to generate unacceptable impacts on vegetation and fauna communities. Mitigation measures have been identified to minimise potential noise and vibration, traffic and access and service interruption impacts, which would be temporary during construction. Mitigation measures have also been identified to minimise water quality and soil impacts, as well as to minimise clearing of or impacts to vegetation and fauna.
b) the transformation of the locality	The proposed works are not likely to transform a locality because the site would be restored and the land-use would remain the same after construction.
c) the environmental impact on the ecosystems of the locality	The proposed works are not likely to significantly impact on the ecosystems of the locality as discussed in Section 5.1 of the EMS, and Section 5.1 through to Section 5.23 of this REF. The total vegetation clearance required for the proposed works is summarised in **Section 5.24.** In a worst case scenario only 0.113 (ha) of TEC would need to be cleared with a far lesser extent likely to be impacted, of which all occurs in fringe habitat of the TEC, and may be avoided on site due to the conservative approach of the mapping estimates for clearance required.
d) reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposal is unlikely to reduce the aesthetic, recreational, scientific or other environmental quality or value of the locality. The proposal should only result in minor temporary impacts to amenity during the construction period. This is discussed in Section 5.8 of the EMS.
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***	The proposed works are not likely to have any significant effects on a locality, place or building which have aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other value for present or future generations. Potential impacts to local heritage and areas of moderate archaeological potential were identified through **Section 5**, however it was assessed that a significant impact would be unlikely. This is provided that the mitigations in **Table 6-1** are implemented, and that further assessment is undertaken by a heritage specialist where specified in the mitigation measures in Section 6.

present or future generations,	
f) *the impact on the habitat of protected animals (within the meaning of the Biodiversity Conservation Act 2016)*	Significant impacts on the habitat of protected fauna are unlikely with implementation of mitigation measures as discussed through **Section 5.1** to **Section 5.23** of this REF.
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 there will be endangering of any species of animal, plant or other form of life whether living on land, in water or in the air. This is discussed through **Section 5.1** to **Section 5.23** of this REF
h) long-term effects on the environment	It is unlikely that there will be long term effects on the environment, as discussed in **Section 5** of the EMS.
i) degradation of the quality of the environment	Degradation of the quality of the environment is unlikely. However, some minor temporary impacts may occur during the construction period. This is discussed in **Section 5** of the EMS, and **Section 5.1** through to **Section 5.23** of this REF..
j) risk to the safety of the environment	Significant risks to the safety of the environment are unlikely, however some minor temporary impacts may occur during the construction period. This is discussed in **Section 5** of the EMS, and **Section 5.1** through to **Section 5.23** of this REF..
k) reduction in the range of beneficial uses of the environment	The proposed works may cause a minor short-term reduction in beneficial uses of the environment through partial road or lane closures or exclusion of pedestrians. However, there would be no long-term reductions in beneficial uses as discussed in **Section 5** of the EMS.
l) pollution of the environment	Pollution of the environment is unlikely as discussed in **Section 5.3, Section 5.4, Section 5.7** and **Section 5.11** of the EMS, and **Section 5.1** through to **Section 5.23** of this REF...
m) environmental problems associated with the disposal of waste	Waste will be classified in accordance with the NSW EPA Waste Classification Guidelines (2014) and disposed of appropriately off site at licensed waste disposal facilities. Any potentially contaminated materials that are unexpectedly encountered will be managed by an unexpected finds protocol that will be incorporated into the CEMP. This is discussed in **Section 5.10** of the EMS. The checklist (Appendix B) identified alignments which may contain asbestos, additional mitigation measures for these alignments are identified in **Table 6-1**, and is therefore unlikely to be associated with an environmental problem.
n) increased demands on resources (natural or otherwise), that are, or are likely to become, in short supply	The proposal is not likely to increase the demand for resources or cause resources to become in short supply. A more reliable water supply should result in less waste of water through leaks or pipe failure.
o) the cumulative environmental effect with other existing or likely future activities	There are unlikely to be current or future cumulative effects with existing or future activities as discussed in **Section 5.13** of the EMS, and the cumulative impact of the works package is also summarised in **Section 5.24** of this REF.
p) the impact on coastal processes and coastal hazards, including those	There are no likely impacts on coastal process and coastal hazards including those under projected climate change conditions.

under projected climate change conditions	
q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	The proposal is aligned with the Shoalhaven Local Strategic Planning Statement and alternate key local strategies, providing critical infrastructure to accommodate the increasing regional population.
r) other relevant environmental factors.	There are no impacts to other environmental factors, beyond those outlined in (a) – (q).

7.0 Conclusion

This Review of Environmental Factors (REF) has been prepared by Stantec on behalf of Shoalhaven City (Council) to assess the potential environmental impacts associated with the proposed replacement of water mains at locations 2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K-1 and 2K-2[11] for WP2, and 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J and 3K for WP3. This REF has been guided by the mains program EMS, which considered potential environmental impact for the mains replacement program generally across the Shoalhaven LGA.

A number of site-specific factors were identified which have the potential to result in environmental impacts (including ecology, Aboriginal heritage, Non-Aboriginal heritage, coastal use and coastal environment management areas, watercourse crossings, and potential impact to mapped KFH) and these factors have been adequately assessed in the EMS and this REF.

The REF identified that most alignments occur in areas of low potential Aboriginal archaeological significance and can proceed without further investigation provided the appropriate mitigation measures outlined herein are implemented. However, some alignments (specifically 2K-2, 3D and 3E) occur in areas of moderate potential archaeological significance and further investigations and potentially securing of an Aboriginal Heritage Impact Permit (AHIP) will be required before works can commence. In addition, two alignments (2K-2 and 3D) are in close proximity to previously recorded AHIMS sites and works need to be undertaken with caution to avoid impacts, or if this is not possible, and AHIP would need to be secured prior to impacts occurring.

Items of Non-Aboriginal heritage within proximity to the alignments have been determined to be limited to alignments 2I, 2J, 3A and 3D. A Statement of Heritage Impact (SoHI) will be required for alignments 2I, 2J, 3A and 3D in relation to the Colonial Road – remnants (former Wool Road). In addition, alignment 3D is adjacent to several local heritage sites (Tomerong School of Arts, the Tomerong Union Church, the Victorian Schoolmasters Residence and grounds and the Tomerong Cemetery). Works adjacent to these sites will need to be managed carefully to avoid impacts and to comply with the specific mitigation measures outlined in Section 6.2.

The ecology assessment has found that while the project has the potential to result in clearing of 2.015ha of native vegetation (including 0.113ha of threatened ecological communities), with the implementation of the mitigation measures in Section 6 the project is unlikely to result in a significant impact on ecology. In addition, controlled installation of the pipelines in already cleared areas will reduce the amount of clearing even further.

This REF has established that, subject to the implementation of the mitigation measures as summarised in Section 6 above, in the EMS, and in further heritage assessment as noted above, there will likely be no significant impact on the environment as a result of the

[11] Part of alignment 2K-2 falls within land managed by the NSW National Parks and Wildlife Service (NPWS) and has been assessed in a separate REF for NPWS determination.

proposed works, and so an EIS is not required for the works. Approval of this REF by Council, the determining authority, will allow works to proceed in a timely manner.

It is noted that subsequent works packages of the mains program have not been assessed by this REF and would be subject to future assessment.

Council Determination

The 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 Design Services – Mains Program 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 shall be adopted and implemented.
2. The proposal is unlikely to significantly affect the environmental 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 of 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:09/10/2023

8.0 References

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