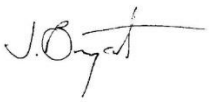
REVIEW OF ENVIRONMENTAL FACTORS (REF)
STORMWATER MANAGEMENT SYSTEM UPGRADE
BENDALONG BOAT HARBOUR
BENDALONG

Contents

Document control

Item	Details
Project	Stormwater management system upgrade – Bendalong Boat Harbour – Bendalong
Client/Proponent	Environmental Services - City Development - Shoalhaven City Council
Prepared By	Technical Services Department - City Services - Shoalhaven City Council

Document status

Version	Author / Reviewer*	Name	Signed	Date
V1.0	Author	Geoff Young		26/11/2024
	Review	Jeff Bryant		07/01/2025
	Review	Simon Slater		9/1/25

*Review and endorsement statement:

“I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation, and the information it contains is neither false nor misleading”.

Assessment and approvals overview

Item	Details
Assessment type	Division 5.1 (EP&A Act) - Review of Environmental Factors (REF)
Proponent	Shoalhaven City Council – City Development and City Services
Determining authority / authorities	Shoalhaven City Council – City Services
Required approvals (consents, licences and permits)	“Fisheries Permit” – Section 200 of the NSW *Fisheries Management Act 1994* *https://legislation.nsw.gov.au/view/html/inforce/current/act-1994-038#sec.200*
Required publication	Yes – Section 171(4)(b)(i) of the NSW *Environmental Planning and Assessment Regulation 2021* *https://legislation.nsw.gov.au/view/html/inforce/current/sl-2021-0759#sec.171*

1. BACKGROUND AND PURPOSE

1.1 Overview

The proposed activity is the upgrade of the stormwater management system at Bendalong Boat Harbour (Figure 1 and Figure 2). Details of the proposal can be found in Figure 3 below and Appendix A and include:

- the installation of approximately 100 metres of new stormwater reinforced concrete pipes (RCP) of various diameters (375mm to 675mm)
- installation of five pits of various configurations
- construction of a stormwater outlet structure comprised of pipeline (Iplex Black Max DN750 6M SN8 or equivalent), Rock Bags (e.g. https://www.geofabrics.co/products/aquarockbag) and geotextile (Elcomax 900R or equivalent)
- rock-lined drains
- kerb and gutter along Manta Ray Road[1]
- repair and reinstatement of the road pavement
- earthworks for the installation of the upgraded stormwater system and stabilisation of batters
- installation of rock logs to prevent vehicle access onto beach
- decommissioning of existing stormwater facilities (two outlet pipes and associated headwalls) that would be obsolete because of the upgrade
- associated vegetation clearing necessary to undertake the works.

The proposed activity would also involve the implementation of safeguards and mitigation measures prescribed in Section 7 of this Review of Environmental Factors (REF).

Shoalhaven City Council (SCC) is the proponent and the determining authority under Part 5 of the EP&A Act. The environmental assessment of the proposed activity and associated environmental impacts has been undertaken in the context of Clause 171 of the *Environmental Planning and Assessment Regulation 2021*. In doing so, this REF helps to fulfil the requirements of Section 5.5 of the Act that SCC examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

1.2 Purpose

The two existing stormwater outlets, that will become obsolete through this proposed activity, discharge onto the beach or onto unsealed carparks. Landward of Manta Ray Road is a steep embankment comprising clayey soils and road surfaces approximately 10 metres high, with the Bendalong Point Tourist Park occupying the land at the top of the embankment. Areas of this

[1] "Manta Ray Road" is not an official name for the beach access road subject of this assessment and works. It has also been referred to as "Red Point Road. However, to remain consistent with the plans (Figure 3 and Appendix A) it is referred to as "Manta Ray Road" throughout this REF.

embankment, road surfaces and the tourist park have been observed to be devoid of vegetation, with these areas coinciding with locations along the beach where significant scour due to overland flow has been observed. During intense rainfall events, runoff flows from the top of the embankment concentrating and scour at the beach face (Advisian 2013) and unsealed gravel carparks.

It is recommended in *Advisian (2013)* to address the beach and coastal dune erosion by:

- Providing kerb, guttering and formalised drainage on the landward side of Manta Ray Road. The system is to be designed for approximately 20% Annual Exceedance Probability (AEP) storm event, to reduce the existing erosion on the landward side of the road and reduce the volume of overland flows that occur over the road and onto the beach. The effect of this is to reduce scour on the beach and carpark for the more frequent rainfall events.
- Providing onsite detention in the form of a larger pit at the base of the embankment on the landward side of Manta Bay Road. The pit is to be sized for minor to moderate rainfall events. Runoff from the kerb and guttering on the steep portion of Manta Ray Road, as well as overland flows from the top of the embankment and tourist park will be conveyed into this pit. This measure would further reduce the risk of overland flow onto the road, reducing scour of the beach and at the existing stormwater outlet. The capacity of the proposed detention is constrained due to the geography of the site and the presence of ecologically significant vegetation.
- Conveying outflow from the onsite detention would be directed into a new stormwater pipe under Manta Ray Road, discharging at a new stormwater outlet on the beach.

The proposed activity is one of many projects undertaken by SCC at the location to reduce coastal erosion and increase the resiliency of the foreshore to coastal hazards.

1.3 Location

The proposed activity is located within the Bendalong Boat Harbour area, along Manta Ray Road, Bendalong as shown in Figure 1 and Figure 2 below and described in Table 1 below.

Table 1: Lands affected by the proposed activity

Location	Proposed Activity	Pertinent Information
1 Waratah Street Lot 1 DP 1187144	• Installation of new stormwater pipes and pits along Manta Ray Road. • Kerb and gutter, embankment stabilisation and associated	• Crown Land with SCC as the appointed Crown Land Manager. • Crown Land Reserve R61640. Gazetted for “public recreation” in 1930. • Has a Potential Contaminated Land record over it (PCL129) due to a sawmill operating within the lot historically.

Location	Proposed Activity	Pertinent Information
	vegetation removal works.	• Contains Aboriginal and non-indigenous heritage items. • Subject of the 2017 multiple and blanket Aboriginal Land Rights Claim. • Subject of a Commonwealth Native Title Claim. • Contains waterland and key fish habitat pursuant to the NSW *Fisheries Management Act 1994* although work would not be undertaken on waterland within this lot.
Red Point Road Lot 2 DP 1187144	• Installation of new stormwater pipes and pits along Manta Ray Road. • Installation of new stormwater pipe under the road and engineered outlet. • Kerb and gutter, embankment stabilisation and associated vegetation removal works.	• Comprises a small portion of the Tourist Park. • Crown Land with SCC as the appointed Crown Land Manager. • Crown Land Reserve R61640. Gazetted for “public recreation” in 1930. • Contains Aboriginal heritage objects. • Subject of the 2017 multiple and blanket Aboriginal Land Rights Claim. • Subject of Commonwealth Native Title Claim. • Contains waterland and key fish habitat pursuant to the NSW *Fisheries Management Act 1994.*

Figure 1 Location of the proposed activity

Figure 2 Approximate location of the proposed activity – refer to Appendix A for details

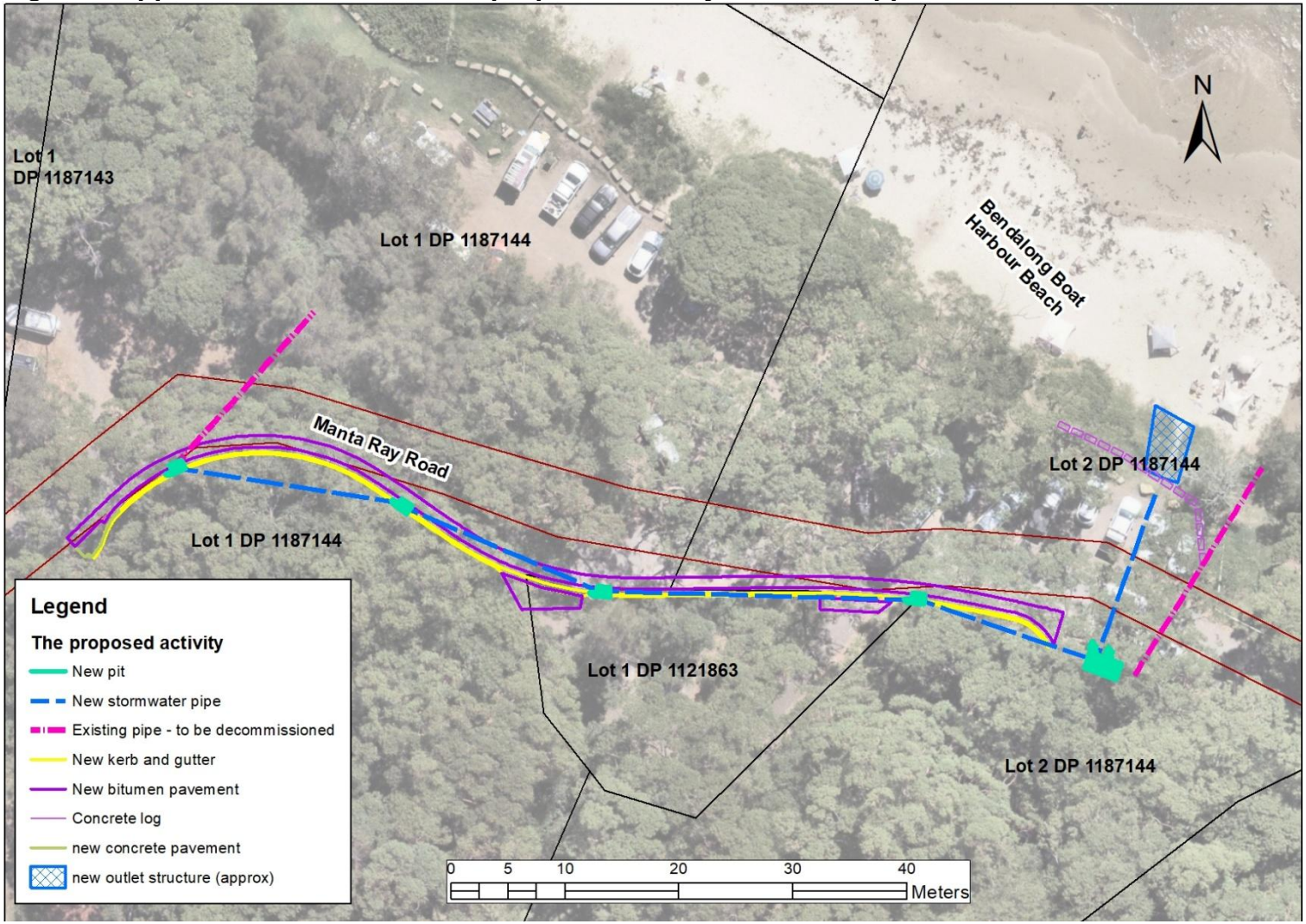


Figure 3 The proposed activity (refer to Figure 4 below for beach outlet structure plans - refer also to detailed plans in Appendix A)

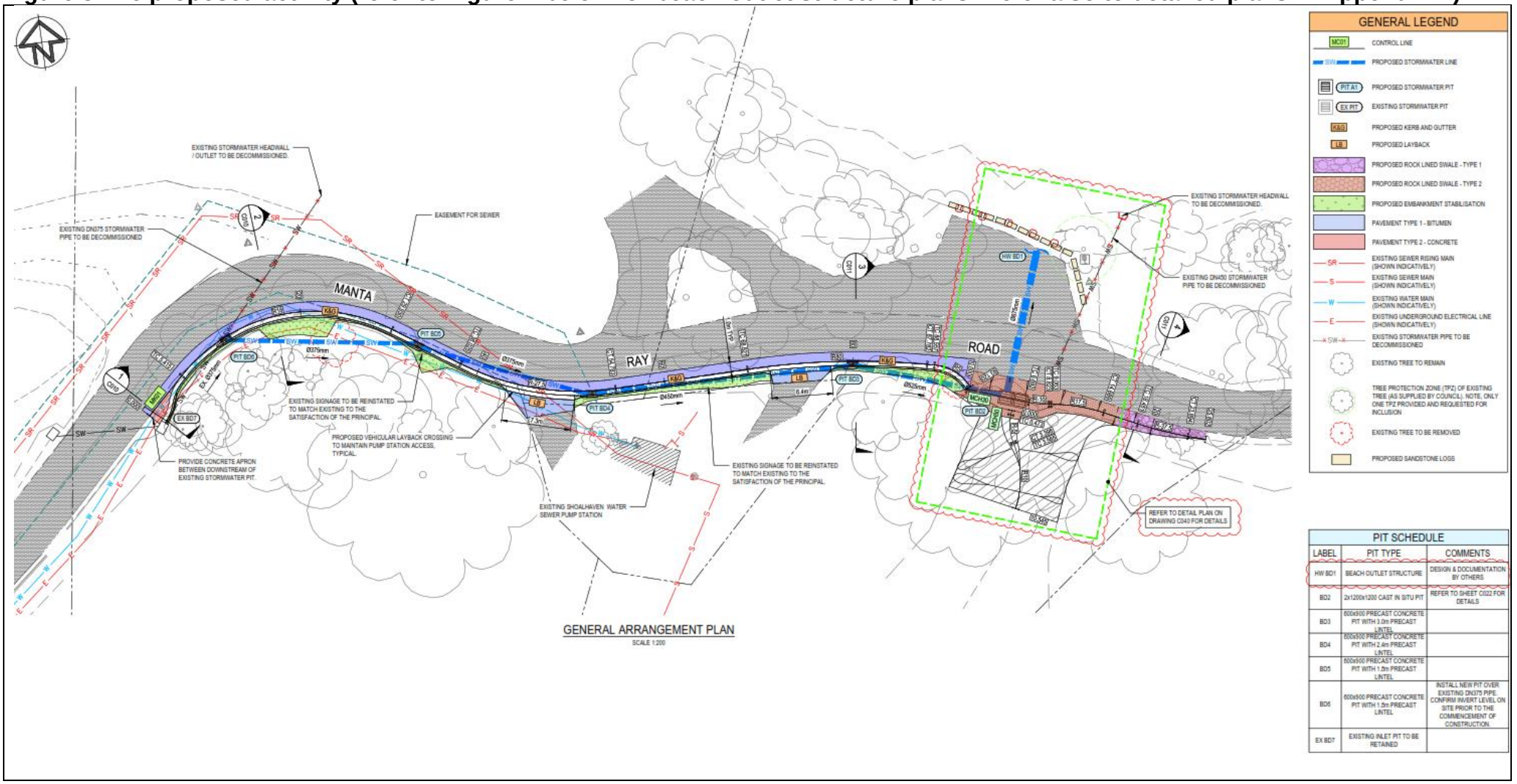
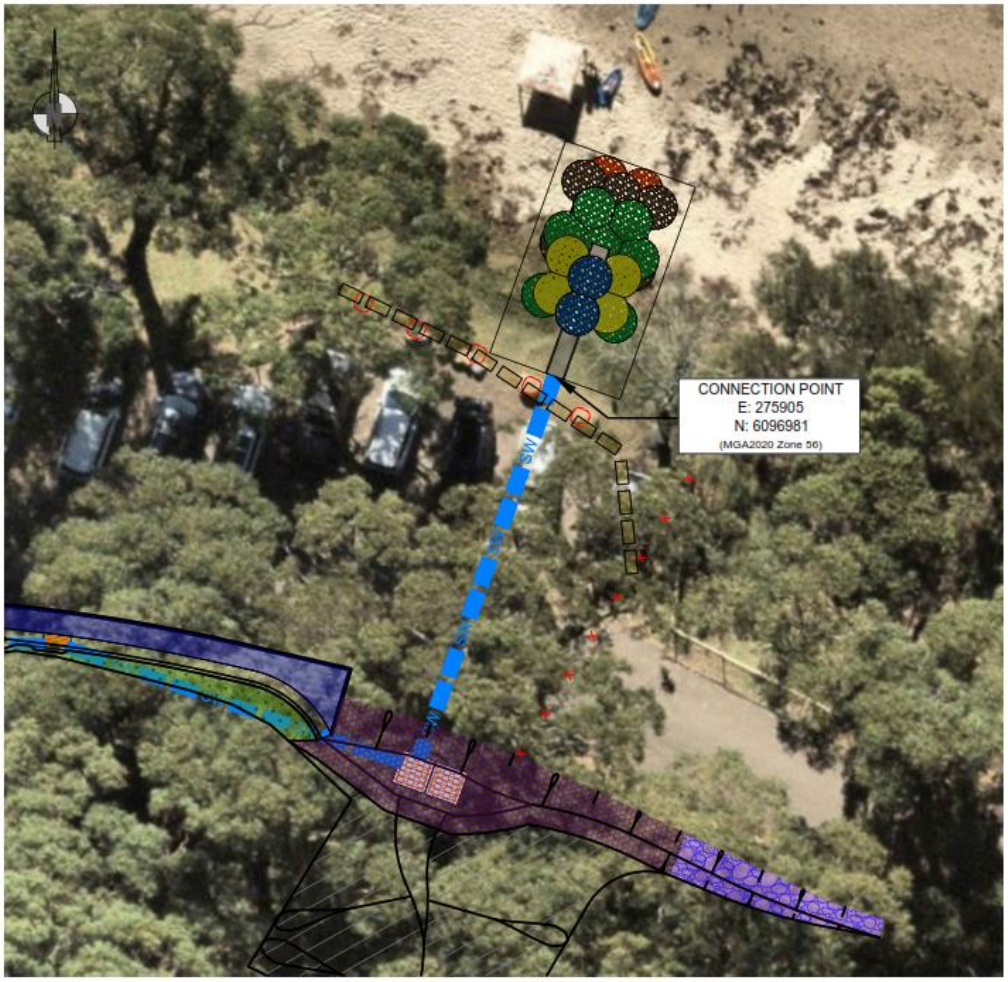


Figure 4 The proposed activity – beach outlet (refer to detailed plans in Appendix A)



SITE LOCATION PLAN
SCALE 1:200
0 2.0 4.0 6.0 8.0 10.0m
SCALE 1:200 (A3 SHEET)

BENDALONG BEACH STORMWATER
OUTFALL AND SCOUR PROTECTION

FOR THE
SHOALHAVEN CITY COUNCIL

DRAWING NUMBER	DRAWING TITLE
D00	TITLE SHEET
D01	NOTES AND SPECIFICATIONS
D02	PLAN VIEW
D03	SECTIONS AND DETAILS

FOR CONSTRUCTION

2. Site Description

2.1 General

Photos of the site are provided in Section 2.6 below.

Bendalong Boat Harbour Beach is located on the northern side of Red Point (Figure 1 above). The beach is approximately 300 metres long and is flanked by Red Point to the east and a rocky point on the west separating the embayment from Washerwomans Beach. The beach includes a range of facilities including the formed access road ("Manta Ray Road"), boat ramps, picnic areas, car parking, children's playground, amenities and is a very popular destination for tourists and locals.

The western end of the beach contains historic remains associated with early 20th Century silica mining and timber getting. Aboriginal shell middens and stone artefacts have been identified in the back-beach area (Feary 2017).

The beach is north facing and is largely protected from southerly and south-easterly swell waves. Easterly and east-north-easterly swell waves can, however, refract around Red Point and reach Bendalong Boat Harbour causing beach erosion (Advisian 2017).

Manta Ray Road runs immediately landward of the beach, with stormwater network, observed to be in very poor condition, discharging directly onto the beach or unsealed public carparks.

2.2 Terrestrial Habitat and Features

The area of vegetation that would be affected by the proposed works is mapped as SR512 Bangalay – Old Man Banksia Open Forest on Coastal Sands, Sydney Basin and South East Corner, which corresponds, floristically, with the *Bangalay Sand Forest in the Sydney Basin and South East Corner Bioregions* Endangered Ecological Community (EEC). The vegetation associated with the proposed activity is:

- moderately modified
- moderately to highly weed infested, and
- comprised of species suggesting intergrading or influence from different vegetation communities.

The site contains Swamp Oak *Casuarina glauca* and over-storey *Eucalyptus botryoides,* while the under- and mid-storey is generally dominated by mesophyllous species including Lilly Pilly *Acmena smithii, Pittosporum undulatum,* Bolwarra *Eupomatia laurina,* Sandpaper Fig *Ficus coronata* and Guioa *Guioa semiglauca.* A list of species growing in the vicinity of the proposed works is shown in Table 2 below.

Table 2 Flora growing in the vicinity of the proposed works

Native flora species
Canopy and overstorey
Bangalay *Eucalyptus botryoides* Swamp Oak *Casuarina glauca*

Lilly Pilly *Acmena smithii*
Sweet Pittosporum *Pittosporum undulatum*
Sandpaper Fig *Ficus coronata*
Coast Banksia *Banksia integrifolia*
Mid-storey
Guioa *Guioa semiglauca*
Notelaea longifolia
Synoum glandulosum
Eupomatia laurina
Pittosporum revolutum
Acacia implexa
Breynia oblongifolia
Myoporum boninense
Homolanthus populifolius
Trema tomentosa
Lower-storey
Lomandra longifolia
Gahnia melanocarpa
Dichondra repens
Stephania japonica
Eustrephus latifolius
Smilax australis
Geitonoplesium cymosum
Pseuderanthemum variabile
Tetragonia tetraganoides
Morinda jasminoides
Solanum stelligerum
Doodia aspera
Carex longebrachiata
Pteridium esculentum
Viola hederacea
Exotic flora species
Dolichos Pea *Dipogon lignosus*
Cape Ivy *Delairea odorata*
Cassia *Senna pendula* var. *glabrata*
Ribbon plant *Hypoestes aristata*
Lantana *Lantana camara*
Farmer's Friends *Bidens pilosa*
Asparagus fern *Asparagus aethiopicus*
Turkey rhubarb *Acetosa sagittata*
Japanese Honeysuckle *Lonicera japonica*
Spider Lily *Chlorophytum comosum*
Madeira Vine *Anredera cordifolia*
Monsteria *Monstera deliciosa*
Moth Vine *Araujia sericifera*
Common Passionflower *Passiflora edulis*
Blue Passionflower *Passiflora caerulea*
Fleabane *Conyza* sp.
Black-Eyed Susan *Thunbergia alata*

Norfolk Island Hibiscus *Lagunaria patersonia* Common Sowthistle *Sonchus oleraceus*

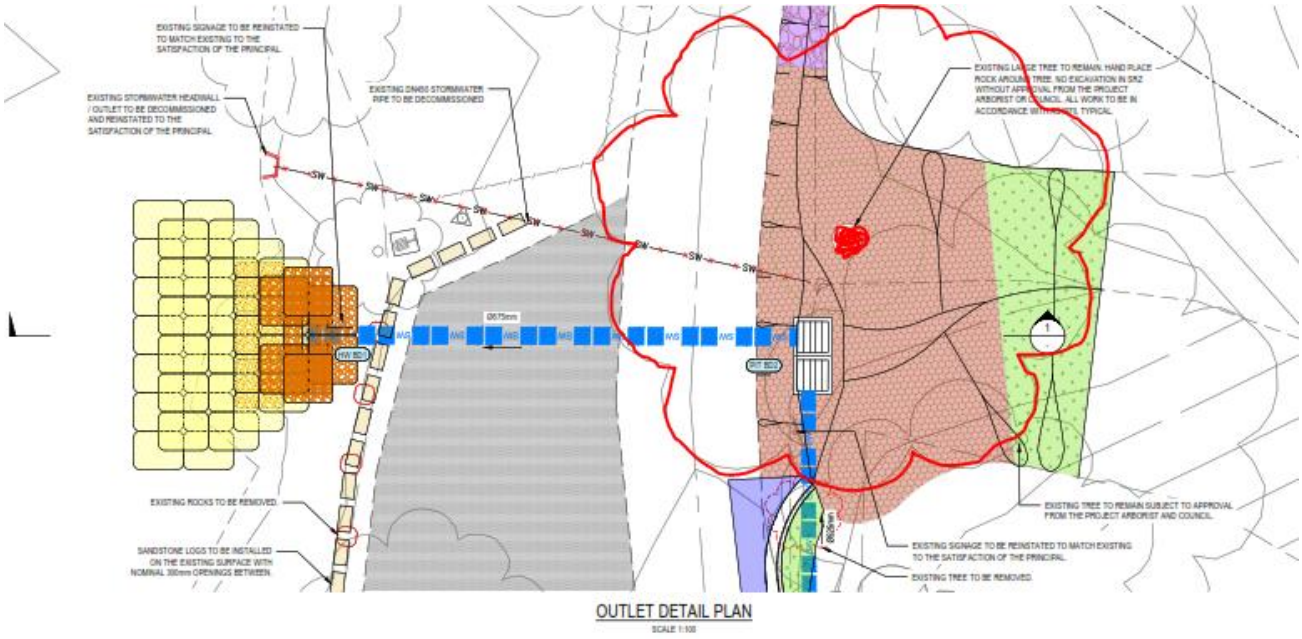
Habitat assessments for threatened fauna species and cryptic threatened flora, and targeted surveys for non-cryptic threatened species were conducted on 1 November 2024. The assessment / survey indicated that, in the area of the proposed activity:

- Magenta Lilly Pilly *Syzygium paniculatum,* and Scrub Turpentine *Rhodamnia rubescens* are not present,
- there are no trees displaying glider incision scars, and
- there is no evidence of feeding by Glossy Black Cockatoos (*i.e.* chewed *Allocasuarina* cones).

Due to the level of disturbance and modification of groundcover through the footprint of the site, no suitable habitat for threatened terrestrial orchids (including *Rhizanthella slateri* and *Cryptostylis hunteriana*) was considered to occur. Targeted survey for locally occurring threatened orchids was therefore not warranted and not undertaken.

A potential hollow-bearing tree exists next to the pit BD2 at CH20.30 (Photo 1 in Section 1.1 below and Figure 5 below). It is also a large canopy tree and therefore steps will be in place to retain the tree if possible, including the engagement of an arborist to provide oversight during excavation works and use of auger for the pit instead of excavator. In the event that the arborist recommends removal due to damage of significant roots, fauna removal procedures would be undertaken prior and / or during the removal of the tree (refer to environmental impact mitigation measures in Section 7 of this REF).

Figure 5 Location of potential hollow-bearing tree (outlined in red)



2.3 Heritage

Several Aboriginal and non-Indigenous heritage items are in the vicinity of the proposed activity. Notably this includes Aboriginal shell middens and scattered stone artefacts on the boat harbour foreshore. Refer to Section 3.4 of this REF for assessment of impact.

The proposed activity would also be undertaken near the *Red Head Timber Mill and Wharf Archaeological Site* which is listed in the schedules of the *Shoalhaven Local Environmental Plan 2014.* The site consists of the former wharf which served both the timber and silica industries. Evidence exists in the form of concrete abutments and terracing.

The physical evidence of the site would not be impacted by the proposed activity as the stormwater works would be at least 80 metres from the nearest concrete abutment. No further assessment of this heritage item is necessary.

2.4 Potentially Contaminated Land

Lot 1 DP 1187144 has a Potential Contaminated Land layer over the entire lot. This is due to the operation of the Red Head Timber Mill and Wharf in the northwestern part of the lot and the potential associated use of timber preservatives at the site. Literature in relation to timber preservation indicates that its usage did not commence in NSW until the 1930s[2]. As the Red Head Timber Mill operated from 1901 to 1925[3] the use of preservatives is unlikely. The site of the proposed activity is also not within the Mill's area of operation. Because of this, no further assessment of land contamination is necessary.

2.5 Geology and Geomorphology

The site of the proposed activity is predominantly comprised of unconsolidated alluvial gravel, sand and clay deposits which are closely associated with basalts of similar age near Ulladulla.

The outlet structure would be installed on coastal deposits of beach facies comprised of marine-deposited sand and shell.

[2] *Timber Preservation in the Shoalhaven City Council* D01/36070 - Documents - PCL129
[3] *Red Head Timber Mill and Wharf Archaeological Site* Sate Heritage Inventory https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2390259

2.6 Photos

Photo 1: Bangalay that may contain hollow/s that shall have tree protection measures in place

Photo 2: Manta Ray Road at corner where the stormwater pipe would be constructed with tree protection measures in place to protect the significant canopy tree

Photo 3: Manta Ray Road where the stormwater pipe and kerb and guttering is porposed (left side of the photo)

Photo 4: location of the proposed detention pit and pit to direct water under the road towards the beach

Photo 5: The new pipe under the road will be located to the left of the exposed existing pipe and discharge onto the beach.

3. ASSESSMENT OF LIKELY IMPACTS ON THE ENVIRONMENT

3.1 Impacts associated with the proposed activity

The proposal would involve the following disturbances and direct impacts:

- Impact (including removal) to approximately 200m^2 of predominantly native vegetation.
- Potential removal of one hollow-bearing tree.
- Impact to access during construction works.

Other impacts on the environment, including indirect impacts have been considered, including:

- indigenous heritage
- threatened species

Each potential impact is discussed in detail in the following sections.

3.2 Vegetation Removal

The proposed activity would involve the removal of approximately 200m^2 of native vegetation (Figure 6 below). A description of the vegetation is provided in Section 2.2 of this REF.

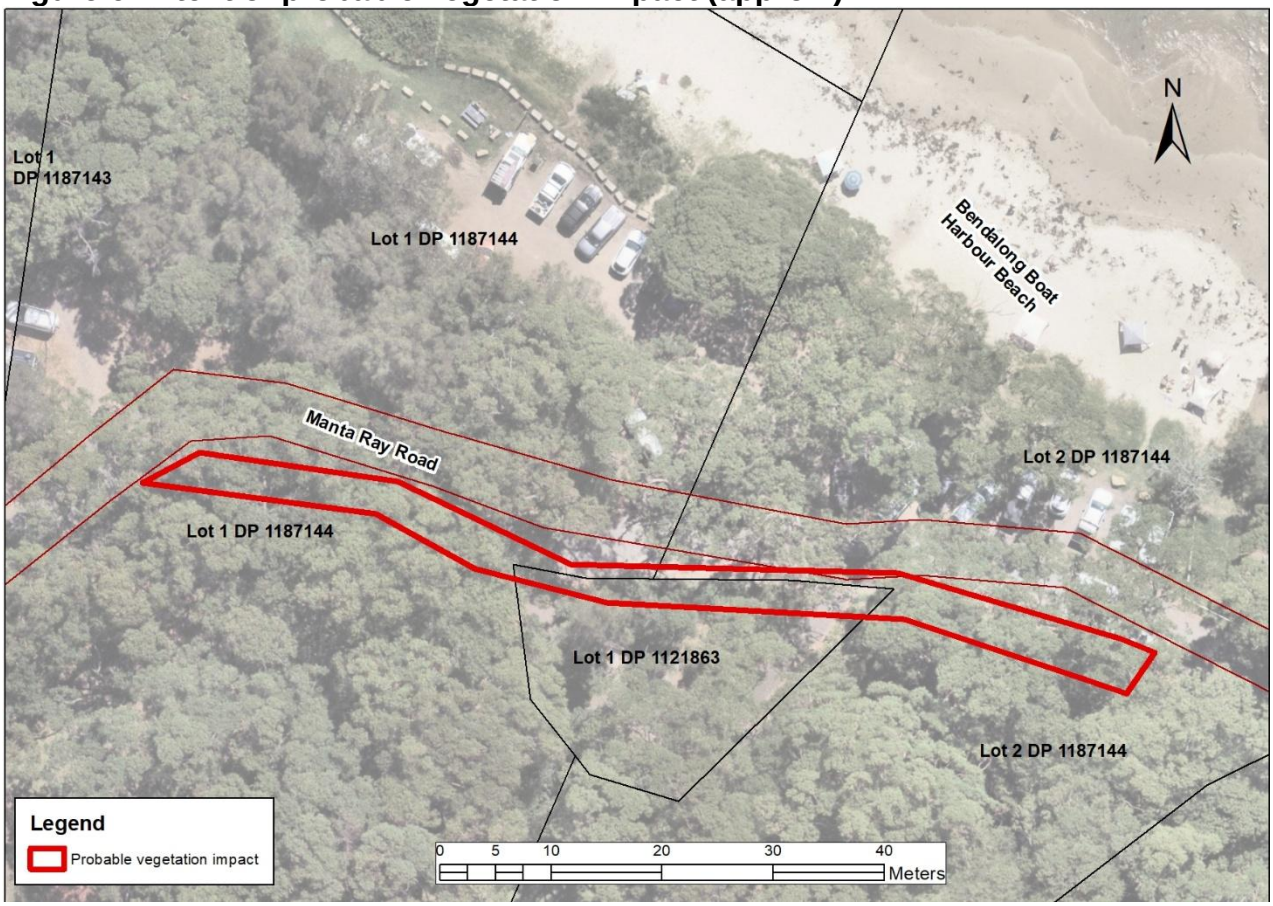
The removal of the vegetation is not considered a significant impact for the following reasons:

- The species to be impacted are common and are not on the threatened species schedules of the NSW *Biodiversity Conservation Act 2016* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
- Measures will be in place to retain the hollow-bearing tree, or if not feasible, safely remove any resident fauna prior to its removal (refer to measures listed in Section 7).
- The trees do not provide significant fauna habitat or food or breeding resources, particularly for threatened fauna.

The vegetation is unlikely to have a significant impact on Threatened Ecological Communities. Refer to Section 3.3.2 of this REF for details.

Environmental impact mitigation measures and safeguards listed in Section 7 of this REF do, however, apply to limit clearing and off-site impacts.

Figure 6 Extent of probable vegetation impact (approx.)



3.3 Threatened species impact assessment (NSW)

Section 1.7 of the EP&A Act 1979 applies the provisions of Part 7 of the NSW *Biodiversity Conservation Act 2016* and Part 7A of the *NSW Fisheries Management Act 1994* that relate to the operation of the Act in connection with the terrestrial and aquatic environment. Each are addressed below.

3.3.1 Part 7A *Fisheries Management Act 1994*

The proposed activity would involve the excavation and subsequent reclamation of water land, being beach habitat below High Water Solstice Spring Tide levels. Section 200 of the Act has the effect of requiring SCC to obtain a Fisheries Permit to undertake the work.

The works are not anticipated to harm threatened species, endangered populations, endangered ecological communities and critical habitat listed in the Act. Nor does it comprise a listed Key Threatening Process.

Further consideration of the threatened species assessment criteria is not warranted.

3.3.2 Part 7 Biodiversity *Conservation Act 2016*

Section 7.3 of the Act provides a 'five-part' test to determine whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Each Part is addressed below.

Part A - In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

A search on Council's and the Office of Environment and Heritage's database and a site investigation / survey / assessment (Appendix B) indicates that the following species warrant further assessment:

- White-bellied Sea-eagle *Haliaeetus leucogaster*
- Little Eagle *Hieraeetus morphnoides*
- Square-tailed Kite *Lophoictinia isura*
- Eastern Osprey *Pandion cristatus*
- Gang-gang Cockatoo *Callocephalon fimbriatum*
- Powerful Owl *Ninox strenua*
- Masked Owl *Tyto novaehollandiae*
- Varied Sittella *Daphoenositta chrysoptera*
- Yellow-bellied Glider *Petaurus australis*
- Grey-headed Flying-fox *Pteropus poliocephalus*
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
- Eastern Freetail-bat *Mormopterus norfolkensis*
- *Eastern False Pipistrelle* Falsistrellus tasmainiensis
- Southern Myotis *Myotis macropus*
- Greater Broad-nosed Bat *Scoteanax rueppellii*
- Large Bent-winged Bat *Miniopterus orianae oceanensis*

An assessment of each is provided below:

<u>White-bellied Sea-eagle, Little Eagle, Eastern Osprey, and Square-tailed Kite</u>

The habitat for the White-bellied Sea-eagle is characterised by the presence of open water including rivers, swamps, lakes and the sea. It occurs at sites near the sea or seashore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include forests and woodlands. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.

Similarly, the Eastern Osprey favours coastal areas, especially the mouths of large rivers, lakes and lagoons. The species feeds on fish over clear, open water. Nests are made

high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.

The Square-tailed Kite can be found in a variety of timbered habitats including open forest but has a preference for timbered watercourses. Stick nests are generally located along or near watercourses, in a fork or on large horizontal limbs.

The Little Eagle can be found in open eucalypt forest, woodland or open woodland. It nests in tall living trees within a remnant patch where pairs build a large stick nest in winter.

Although all four species have been recorded within ten kilometres of the proposed activity and the site comprises suitable foraging/hunting habitat:

- there are no actual populations known to occur at the site
- there are no stick nests visible in the trees that would be affected by the proposed activity
- the species are highly mobile, have large home ranges and would leave the site in the unlikely event of the species being present in the area during construction works
- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site.
- the area does not contain resources critical for the species for food, shelter, or breeding
- the stormwater system would not impact the species' ability to forage for food or breed.

The presence of these species at the proposed activity site is possible from time to time as they are highly mobile with large home ranges. The site however is not considered useful or important or critical to the survival of the species. As a result, a species impact statement or entry into the Biodiversity Offset Scheme (BOS) is not required for these species.

Gang-gang Cockatoo

In spring and summer, the Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species however often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. It favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are ten centimetres in diameter or larger and at least nine metres above the ground in eucalypts.

Although the species has been recorded within five kilometres of the proposed activity and the site comprises suitable habitat:

- there are no actual populations known to occur at the site

- the removal of hollow-bearing trees/limbs will be avoided and if they cannot be avoided there will be steps in place to avoid harm to resident animals. The hollows are also unsuitable for use by this species.
- the species is highly mobile and would leave the site in the unlikely event the species is present during construction
- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site
- The area does not contain resources critical for the species for food, shelter, or breeding
- The stormwater system, would not impact the species' ability to forage for food and breed elsewhere

The presence of this species at the proposed activity site is possible from time to time as they are highly mobile with large home ranges. The site however is not considered useful or important or critical to the survival of the species. As a result, a species impact statement or entry into the BOS is not required for these species.

Powerful Owl and Masked Owl

The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 hectares can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 hectares. Powerful Owls nest in large tree hollows (at least 0.5 metres deep), in large eucalypts (diameter at breast height of 80-240 centimetres) that are at least 150 years old. While the female and young are in the nest hollow, the male Powerful Owl roosts nearby guarding them, often choosing a dense grove of trees that provide concealment from other birds.

The Masked Owl lives in dry eucalypt forests and woodlands from sea level to 1100 m. It is a forest owl, but often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

Although both species have been recorded within five kilometres of the proposed activity and the site comprises suitable habitat:

- there are no actual populations known to occur at the site
- the removal of hollow-bearing trees/limbs will be avoided and if they cannot be avoided there will be steps in place to avoid harm to resident animals. It is noted that the hollows observed on site are unsuitable for use by this species.
- the species are highly mobile and would leave the site in the unlikely event the species is present during construction
- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site

- the area does not contain resources critical for the species for food, shelter, or breeding
- the stormwater system would not impact the species' ability to forage for food and breed elsewhere.

The presence of these species at the proposed activity site is possible from time to time as they are highly mobile with large home ranges. The site however is not considered useful or important or critical to the survival of the species. As a result, a species impact statement or entry into the BOS is not required for these species.

Varied Sittella

The Varied Sittella inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The species feeds on arthropods collected from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.

Although the species has been recorded within five kilometres of the site and the site comprises suitable (albeit marginal) habitat:

- there are no actual populations known to occur at the site; there is only potential low-quality habitat
- the loss of a small amount of vegetation would be inconsequential to the species use of the area
- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site.

As a result, a species impact statement or entry into the BOS is not required this species.

Yellow-bellied Glider

The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. They usually occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils.

The species feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. They extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive v-shaped scar.

They are very mobile and occupy large home ranges between 20 to 85 hectares to encompass dispersed and seasonally variable food resources.

Although both species have been recorded within five kilometres of the proposed activity and the site comprises suitable habitat:

- there are no actual populations known to occur at the site
- the removal of hollow-bearing trees/limbs will be avoided and if they cannot be avoided there will be steps in place to avoid harm to resident animals. It is noted that the hollows observed on site are unsuitable for use by this species.
- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site
- the area does not contain resources critical for the species for food, shelter, or breeding
- the stormwater system would not impact the species' ability to forage for food and breed elsewhere.
- The eucalypt species that occurs over the site (Bangalay *Eucalyptus botryoides*) do not generally comprise preferred species and do not exhibits signs of sap feeding.

The presence of this species at the proposed activity site is possible from time to time as they are highly mobile with large home ranges. The site however is not considered useful or important or critical to the survival of the species. As a result, a species impact statement or entry into the BOS is not required for this species.

Grey-headed Flying-fox

The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century.

The species can travel up to 50 kilometres from the camp to forage; commuting distances are more often to less than 20 kilometres. It feeds on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines.

Although the species has been recorded within five kilometres of the site and the site comprises suitable (albeit marginal) habitat:

- there are no actual populations known to occur at the site and there is only potential, low-quality habitat.
- the loss of a small amount of vegetation would be inconsequential to the species use of the area
- there are no camps currently or historically recorded in the area
- the species was not detected during site surveys undertaken as part of this RE

- the area that would be affected by the proposal is insignificant to the area of available habitat in the immediate vicinity of the site.

As a result, a species impact statement or entry into the BOS is not required for this species.

Eastern Freetail-bat, Eastern False Pipistrelle, Eastern Bentwing-bat/Large Bent-wing Bat, Southern Myotis, and Greater Broad-nosed Bat

The Eastern Freetail-bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species roost mainly in tree hollows but will also roost under bark or in man-made structures.

The Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 metres. The species generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings.

The Large Bent-wing Bat roosts primarily in caves, but the species also use derelict mines, storm-water tunnels, buildings and other man-made structures. The species form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. At other times of the year, populations disperse within about 300-kilometre range of maternity caves. They hunt in forested areas, catching moths and other flying insects above the treetops.

The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. The species generally roosts in tree hollows. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.

The Southern Myotis is found in the coastal band form the north-west of Australia, across the top-end and south to western Victoria. The species generally roost in groups of 10 to 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.

Although these species have been recorded within five kilometres of the site and the site comprises suitable foraging/hunting habitat:

- no caves or artificial sites that could provide roosting or maternity sites would be removed.
- the removal of hollow-bearing trees/limbs will be avoided and if they cannot be avoided there will be steps in place to avoid harm to resident animals.
- All bat species have been recorded over a wide area near the site. The impact resulting from the loss of a small amount of vegetation to construct the proposal is unlikely to have a significant impact to these mobile species
- The amount of disturbance is considered insignificant in comparison to the amount of potential habitat available in the immediate vicinity of the site.

- The proposed activity would not impact on the species' ability to forage for food, hunt, and breed

The presence of these species at the proposed activity site is possible from time to time. The site, however, is not considered useful or important or critical to the survival of the species and, because of the lack of suitable roosting trees or caves, are unlikely to be present during construction works.

Part 2 - In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

A thin strip of vegetation along the Boat Harbour Beach has been mapped by Hunt and Associates (2010) as the endangered ecological community Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions, hereafter referred to as Bangalay Sand Forest (Figure 7 below). Hunt (2010) describes the site as follows:

> "*Pockets of Bangalay and Swamp Oak in a thin strip along the edge of Washerwomans and Boat Harbour beaches and toward the E end of the headland caravan park. Lantana infested with native mesic species present…Poor condition…Thin remnant strip but does provide some fauna habitat and connectivity*."

Bangalay Sand Forest is the name given to the ecological community associated with coastal sand plains of marine or aeolian origin (NSW Scientific Committee 2011). It occurs on deep, freely draining to damp sandy soils on flat to moderate slopes within a few kilometres of the sea and at altitudes below 100 metres (NSW Scientific Committee 2011). Bangalay Sand Forest is characterised by the assemblage of species listed in the Determination (NSW Scientific Committee 2011).

Although the area contains many species listed in the Determination of the EEC (*e.g. Acmena smithii, Casuarina glauca, Eucalyptus botryoides, Banksia integrifolia*) the vegetation that would be affected by the proposed stormwater works, i.e. south of the access road, does not occur on sand. Rather the works will be on alluvial gravel, as well as sand and clay deposits which are closely associated with basalts. The sand is presumably confined to the beachfront and the flat benched area above the beach where vegetation would not be impacted. As a result, no EEC would be affected by the proposed activity and entry into the Biodiversity Offset Scheme or Species Impact Statement is not required.

Figure 7 Area mapped as Bangalay Sand Forest EEC by Hunt and Associates 2010

Part 3 - In relation to the habitat of a threatened species of ecological community:

- ***(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity***
- ***(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and***
- ***(iii)the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.***

Refer to responses in Part 1 and Part 2 above. A species impact statement is not required for this Part.

Part 4 – Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

No "*areas of outstanding biodiversity values"* have been declared in the City of Shoalhaven.

Part 5 – Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Key threatening processes listed in the NSW *Biodiversity Conservation Act 2016* considered relevant to the proposed activity include:

- Clearing native vegetation

Clearing of native vegetation is listed as a key threatening process, defined by the Scientific Committee's determination (OEH 2021) as:

> *the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long-term modification, of the structure, composition and ecological function of a stand or stands.*

Clearing of native vegetation has been shown to:

- cause widespread fragmentation of ecological communities
- reduce the viability of ecological communities by disrupting ecological functions
- result in the destruction of habitat and loss of biological diversity
- lead to soil and bank erosion, increased salinity and loss of productive land.

The proposed activity may involve the clearing of approximately 200 m^2 (canopy extent) native vegetation.

All vegetation removal would occur along a linear, existing disturbed roadside edge and would not result in increased fragmentation.

The impact of the proposal with regard to clearing of native vegetation, is not considered to be significant as it is unlikely to lead to:

- destruction of habitat causing a loss of biological diversity and extinction of species or loss or local genotypes.
- fragmentation of populations resulting in limited gene flow between small, isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species.
- riparian zone degradation such as bank erosion leading to sedimentation that affects aquatic communities – the riparian corridor would be stabilised as a result of the works.
- disturbance of habitat which may permit the establishment and spread of exotic species which may displace native species.
- loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates.
- significant reduction of habitat for threatened species or ecological communities.

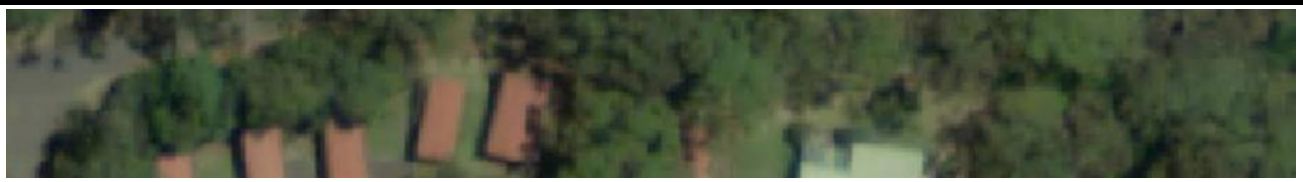
3.4 Indigenous heritage

Under Section 86 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) it is an offence to disturb, damage, or destroy any Aboriginal object without an Aboriginal Heritage Impact Permit (AHIP). The Act, however, provides that if a person who exercises 'due diligence' in determining that their actions will not harm Aboriginal objects has a defence against prosecution if they later unknowingly harm an object without an AHIP (Section 87(2) of the Act). To effect this, the NSW Department of Environment, Climate Change and Water have prepared the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wale*s (hereafter referred to as the 'Due Diligence Code') (DECCW 2010) to assist individuals and organisations to exercise due diligence when carrying out activities that may harm Aboriginal objects and to determine whether they should apply for an AHIP.

An Aboriginal Heritage Due Diligence Assessment (Feary 2017) identified the presence previously recorded sites in the vicinity of the proposed activity – both shell middens located on the beach. Additional field study by an archaeologist (Feary 2017) revealed no additional objects other than those associated with previously recorded sites 58-2-0231, 58-2-0400 and 58-2-0220, with an assessed low potential for additional objects to be present.

The site would not be impacted by the proposed activity.

[redacted]



[redacted]

Site investigations conducted on 23 December 2024 did not find any Aboriginal heritage objects within the footprint of the proposed activity and it is assumed that the previous water and stormwater works has effectively destroyed that site, and it no longer exists.

The archaeological evidence suggests that Aboriginal people inhabited the subject area, from after 5,000 years ago when the sea level stabilised (Feary 2017). The presence of extensive rocky shore platforms, and an abundance of fish, edible molluscan and crustacean species, would have been a strong drawcard for Aboriginal occupation on a seasonal basis.

The area has been highly disturbed not only through natural processes but also a long history of land-use the evidence of which is still present including:

- Jetty to service timber getting and silica mining
- Ore crushing plant
- Loading operations

After the First World War, the south coast became popular for holiday makers. The photos below show numerous shacks and structures built on the fore dunes. The area has since become a Council managed reserve for the purposes of recreation with roads, stormwater systems, toilets, carparks, and boat ramps. The likelihood of other Aboriginal sites still in existence in such a highly disturbed area is considered low. An AHIP is therefore not required for the works and the proposed activity can proceed with caution. Cautionary measures are provided in Section 7 of this REF.

Photo 13: Boat Harbour Beach, date unknown showing old jetty and loading infrastructure as well as numerous structures (Feary 2017).

Photo 14: Extensive beach shacks fronting Boat Harbour Beach (c.1956) (Feary 2017)

3.5 Non-indigenous heritage

The proposed activity will be undertaken near to the *Red Head Timber Mill and Wharf Archaeological Site* which is listed in the schedules of the SLEP 2014. The site consists of the former wharf which served both the timber and silica industries. Evidence exists in the form of concrete abutments and terracing.

The physical evidence of the site will not be impacted by the proposed activity as the stormwater works will be at least 80 metres from the nearest concrete abutment. No further assessment is required.

3.6 Traffic impact

Bendalong Boat Harbour is a popular visitor and tourist destination. The proposed activity would temporarily restrict or hinder access to the site. This will need to be managed through a carefully considered traffic management plan and monitoring.

Community engagement would also need to provide regular updates on the progress of the works to assure the community of the temporary nature of any access restrictions.

3.7 EP&A Regulation – Section 171 matters of consideration

Section 171(2) of the *Environmental Planning and Assessment Regulation 2021* lists the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment under Part 5 of the EP&A Act. The following assessment in Table 3 below deals with each of the factors in relation to the proposed activity.

Table 3: Section 171(2) Factors

Does the proposal:	Assessment	Reason
a) Have any environmental impact on a community?	Positive – long term Low adverse – short term	The proposed activity would reduce the erosion of the foreshore and increase the resiliency of the foreshore to coastal hazards which would extend the life of community recreational facilities and areas, and access roads. The proposed activity is also anticipated to reduce the impact on the amenity caused by the existing, frequent erosional events currently occurring at the site. The proposed activity would however cause temporary access restrictions or hindrances to visitors to the poplar Boat Harbour area. This would only be temporary. The proposed activity would not have any impact on other community services and infrastructure such as water, waste management, educational, medical or social services.
b) Cause any transformation of a locality?	Negligible	The locality is a beachfront recreational area, coastal forest and Tourist Park. The proposed activity would not change the nature and existing use of the site. Nor will it seek to create any permanent changes to the usage of the area.
c) Have any environmental impact on the ecosystem of the locality?	Low adverse	An assessment provided in Section 3 of this REF concludes that the proposed activity would not have a significant impact upon threatened species or endangered ecological communities. No significant habitat features would be removed or otherwise impacted. No food resources critical to the survival of a particular species would be removed. Aquatic ecosystems are not likely to be significantly affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem. The proposed activity would be conducted within a highly disturbed environment. Environmental safeguards and mitigation measures (Section 7) would be employed to minimise risk of impacts.

Does the proposal:	Assessment	Reason
d) Cause a diminution of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Low adverse / positive	The locality is beach, dune, coastal forest, access road, tourist park and existing stormwater system. The proposal aims to reduce the impacts the impacts of run off scouring out adjacent dunes and the subsequent impacts to aesthetics and recreational areas. The locality affected by the proposed activity is a local road and roadside within a rural landscape. The locality would essentially remain the same. The site of the proposed activity has very little recreational or scientific value. It has no access to any viewing or recreational nodes. The proposed activity would therefore not cause significant diminution of these values.
e) Have any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, or social significance or other special value for present or future generations?	Negligible	The proposal would occur in a previously disturbed and modified area. The proposed activity would not affect a site listed on the State Heritage List or a site listed in the heritage schedules of the SLEP 2014. Underground 'relics' (as defined in the NSW Heritage Act) are also not anticipated. The site is not within an Aboriginal Place declared under the *National Parks and Wildlife Act 1974*. In accordance with the NSW Department of Environment, Climate Change and Water's Due Diligence Code of Practice, the proposed activity does not require an Aboriginal Heritage Impact Permit as the activity is unlikely to harm an Aboriginal artefact (refer to Section 3.4). Unexpected Finds Protocol would be in place (refer to Section 7).
f) Have any impact on the habitat of protected fauna (within the meaning of the Biodiversity Conservation Act 2016)?	Low adverse	No important habitat would be removed or otherwise impacted. The potential impact is therefore considered to be insignificant or inconsequential. The hollow-bearing tree shall be retained if feasible. If not, measures would be in place to safely relocate any resident fauna (refer to Section 7). The proposed activity would not have a significant impact upon threatened fauna (refer to Section 3.3 of this REF). The specified environmental mitigation measures (Section 7) would mitigate indirect impacts to fauna and habitat.
g) Cause any endangering of any species of animal, plant or	Negligible	There are no species likely to rely on the site of the proposed works to the extent that modification would put them further in danger.

Does the proposal:	Assessment	Reason
other form of life, whether living on land, in water or in the air?		The prescribed environmental safeguards and mitigation measures (Section 7 of this REF) would minimise the risk of impact on resident fauna, fish, and flora.
h) Have any long-term effects on the environment?	Negligible	Works would be relatively short-term and the noise generated would occur during normal working hours. The proposed activity would not use hazardous substances or use or generate chemicals which may build up residues in the environment. In the long-term, the construction area would stabilise and revegetate and long-term effects are considered unlikely. The possible impacts have been discussed in detail under Section 3. Refer also to the conclusions and recommendations in Section 7.
i) Cause any degradation of the quality of the environment?	Low-adverse	Aquatic ecosystems are not likely to be significantly affected by the proposed activity and there is not likely to be any long-term or long-lasting impact through the input of sediment and nutrient into the ecosystem. The proposal would not intentionally introduce noxious weeds, vermin, or feral animals into the area or contaminate the soil. Environmental safeguards and mitigation measures (Section 7) would be employed to minimise risk of impacts.
j) Cause any risk to the safety of the environment?	Negligible	The proposed activity would not involve hazardous wastes and would not lead to increased bushfire or landslip risks. The activity is not anticipated to adversely affect flood behaviour or exacerbate flooding risks.
k) Cause any reduction in the range of beneficial uses of the environment?	Positive	The site and local environment would remain relatively unchanged. The site and local environment would remain relatively unchanged. The proposal is consistent with the existing land use. The proposal is not anticipated to result in further degradation of the site or surrounding land. The proposed activity would assist in the protection of the foreshore and its respective beneficial uses, such as access and recreation. The works would also contribute to reduce the impact of erosion on Aboriginal heritage at the site.
l) Cause any pollution of the environment?	Low adverse	The proposal would involve a temporary and local increase in noise during the construction phase due to the use of machinery. However, this would not affect any sensitive receivers such as schools, childcare centres and hospitals.

Does the proposal:	Assessment	Reason
		Sediment and erosion control in accordance with the Blue Book would be implemented to minimise movement of sediment into waterways. It is unlikely that the activity (including the environmental impact mitigation measures) would result in water or air pollution, spillages, dust, odours, vibration or radiation. The proposal does not involve the use, storage or transportation of hazardous substances or the generation of chemicals which may build up residues in the environment.
m) Have any environmental problems associated with the disposal of waste?	Negligible	The waste that would be disposed off-site can be recycled or re-used in accordance with resource recovery exemptions or taken to a licensed waste facility. There would be no trackable waste, hazardous waste, liquid waste, or restricted solid waste as described in the NSW *Protection of the Environment Operations Act 1997*.
n) Cause any increased demands on resources (natural or otherwise) which are, or are likely to become, in short supply?	Negligible	The amount of resources that would be used are not considered significant and would not increase demands on current resources such that they would become in short supply.
o) Have any cumulative environmental effect with other existing or likely future activities?	Negligible	The assessed low adverse or negligible impacts of the proposal are not likely to interact. Mitigation measures (Section 7) shall be implemented to minimise the risk of cumulative environmental effects. The current proposal would not significantly affect habitat connectivity or reduce any significant vegetation. No further construction activities are planned for this location.
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	Negligible	The proposed activity would have no effect on coastal processes including those projected under climate change conditions. The proposed activity would contribute to reducing the impact of stormwater erosion on the coastal foreshore.
q) applicable local strategic planning statements, regional strategic plans or district	Positive	The proposed activity is consistent with the *Shoalhaven 2040* Strategic Land-use Planning Statement, including Planning Priority 2 *Delivering infrastructure*, Planning Priority 10 *Protecting the Environment,* and Planning Priority 11 *Adapting to natural hazards through building*

Does the proposal:	Assessment	Reason
plans made under the Act, Division 3.1		*resilience* https://doc.shoalhaven.nsw.gov.au/displaydoc.aspx?record=D20/437277. The activity is not inconsistent with the Illawarra Shoalhaven Regional Plan 2041 https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/Plans-for-your-area/Regional-plans/Illawarra-Shoalhaven-Regional-Plan-05-21.pdf
r) other relevant environmental factors	n/a	Environmental factors have been addressed in Section 3 of this REF.

4. PERMISSIBILITY AND APPROVALS

4.1 NSW Environmental Planning & Assessment Act 1979

Section 4.1 (Development that does not need consent) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) states that:

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

In this regard, Section 2.137(1) of the NSW *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) states that "*Development for the purpose of stormwater management systems may be carried out by or on behalf of a public authority without consent on any land" (https://legislation.nsw.gov.au/view/html/inforce/current/epi-2021-0732#sec.2.137).* As the proposed activity would for the purposes of stormwater management by a public authority, *i.e.* SCC, Section 2.137(1) of the T&I SEPP applies, and the proposed activity does not require development consent.

As the proposed activity does not require development consent, and as it constitutes an 'activity' for the purposes of Part 5 of the EP&A Act, being carried out by (or on behalf of) a public authority, environmental assessment under Part 5 of the EP&A Act is required. This REF provides this assessment.

4.2 NSW *Fisheries Management Act 1994*

The construction of the outlet structure would comprise dredging and reclamation as defined in the Act.

Section 200 of the Act prescribes circumstances where a local government can carry out dredging and reclamation, *i.e.*:

- Under the authority of a permit ("Fisheries Permit"), or
- Work authorised under the Crown Land Management Act 2016, or
- Work authorised by a relevant public authority (other than a local government authority).

Under the *Policy and guidelines for fish habitat conservation and management* (DoPI 2013), DoPI Fisheries focuses the application of the Act and Regulations and associated policies and guidelines on "key fish habitats". Issue of a Fisheries Permit is typically required for activities constituting dredging or reclamation within or with potential to impact areas identified as Key Fish Habitat. As the site is mapped as Key Fish Habitat, a Fisheries Permit will be required for the construction of the outlet structure.

With regard to other provisions of the Act The proposed activity would not:

- affect declared aquatic reserves (Part 7, Division 2 of the Act)
- involve blocking the passage of fish within KFH (s.219)
- impact mangroves and certain other marine vegetation (Part 7, Division 4)

- involve disturbance to gravel beds where salmon or trout spawn (s.208 of the Act)
- involve the release of live fish (Part 7, Division 7)
- involve the construction of dams and weirs (s.218)
- use explosives in a watercourse (Clauses 70 and 71 of the *Fisheries Management (General) Regulation 2019).*

A Fisheries Permit would therefore only be required for the dredging and reclamation work (outlet structure).

4.3 NSW *Crown Lands Management Act 2016* and the *Local Government Act 1993*

The activity would be undertaken on Crown Land reserves to which SCC is the appointed manager. Under Section 3.21 of the Act, a Council manager is authorised to classify and manage its dedicated or reserved Crown Land as it it were public land within the meaning of the *Local Government Act 1993.* Section 3.22 of the Act also provides that a council manager must manage the land as it it were community land under the NSW *Local Government Act 1993*.

Part 2 Division 3 of the *Local Government Act 1993* regulates the management of community land:

- Section 35 provides that Community Land is required to be used and managed in accordance with the plan of management.
- In circumstances where there is no plan of management, Section 44 of the Act states "*pending the adoption of a plan of management for community land, the nature and use of the land must not be changed."*

Although there is currently no plan of management of the subject reserves, the proposed activity involves only an upgrade or modification of existing stormwater facilities and the nature and use of the land would not be changed. A Crown Land Licence is therefore not required.

4.4 Other

A summary of other relevant legislation and permissibility is provided in Table 4 below.

Table 4: Summary of other relevant legislation and permissibility

NSW STATE LEGISLATION
Environmental Planning and Assessment Act 1979 **(EP&A Act)**
Permissible √ Not permissible ☐
Justification: The T&I SEPP provides for the proposed works to be undertaken without development consent (refer above). In circumstances where development consent is not required, the environmental assessment provisions outlined in Part 5 of the Act are required to be complied with. This REF fulfils this requirement.

State Environmental Planning Policy (Hazards and Resilience) 2021
Permissible √ Not permissible ☐
Justification: The proposed activity is not mapped as comprising coastal wetlands or littoral rainforest for the purpose of this SEPP. Other considerations of the SEPP are not applicable to the proposed activity.
Protection of the Environment Operations Act 1997
Permissible √ Not permissible ☐
Justification: The proposed activity does not constitute scheduled development work or scheduled activities as listed in Schedule 1 of the Act. The proposed activity therefore does not require an environmental protection licence.
Local Land Services Act 2013
Permissible √ Not permissible ☐
Justification: Any clearing of vegetation would be of a kind authorised under Section 60O(b)(ii) of the Local Land Services Act 2016 ("an activity carried out by a determining authority within the meaning of Part 5 of the Act after compliance with that Part."). No separate authorisation under the Act is required.
***National Parks and Wildlife Act 1974* (NP&W Act)**
Permissible √ Not permissible ☐
Justification: • The proposed activity would not encroach into National Park estate. • The Act provides the basis for the legal protection and management of Aboriginal sites in NSW. Under Sections 86 and 90 of the Act it is an offence to disturb an Aboriginal object or knowingly destroy or damage, or cause the destruction or damage to, an Aboriginal object or place, except in accordance with a permit of consent under section 87 and 90 of the Act. • As there are no recorded sites or visible objects and as the site is on 'disturbed land' and not in a landscape that would have a higher propensity for heritage objects, the Due Diligence Guidelines (DECCW 2010) requires no further assessment as it is reasonable to conclude that there is a low probability of objects occurring in the area of the proposed activity and an AHIP is not required. Refer to Section 3.4 of this REF for more information.
Biodiversity Conservation Act 2016
Permissible √ Not permissible ☐
Justification:

- The proposed activity is unlikely to have a significant impact on species and communities listed in the schedules of the Act (refer to Section 3.3.2 of this REF).
- The proposed development is not within an area declared to be of "outstanding biodiversity value" as defined in the Act.
- The design and mitigation measures (Section 7) would ensure that no *serious and irreversible impacts on biodiversity values* (as defined by the BC Act) occur at the site of the proposed activity.

The proposed activity therefore is not deemed to be *likely to significantly affect threatened species* and an environmental impact statement (EIS) or a Biodiversity Development Assessment Report (BDAR) is not required.

It is also a defence to a prosecution for an offence under Part 2 of the Act (harming animals, picking plants, damaging the habitat of threatened species or ecological communities *etc*) if the work was essential for the carrying out of an activity by a determining authority within the meaning of Part 5 of the *Environmental Planning and Assessment Act 1979* after compliance with that Part. The activity will not remove vegetation that is listed under Schedule 1 Threatened Species, Schedule 2 Threatened ecological communities and Schedule 6 Protected Plants. The activity is considered permissible as this REF has been prepared and determined in accordance with the EP&A Act.

Aboriginal Land Rights Act 1983

Permissible √ Not permissible ☐

Justification:

- The individual allotments associated with the proposed activity are subject to at least one undetermined Aboriginal land claims being;
  - the 7/2/2017 blanket and multiple claim, and
  - Claim 41090 lodged in 2016
- These claims were made after the gazettal of the subject reserve for public recreation (1930).
- The proposed activity areas have been lawfully used as stormwater management systems and roads prior the lodgement of the land claims.
- There is nothing in the Act the precludes the activity taking place on the subject lands.

The area of the proposed activity is therefore unlikely to be claimable land as defined in Section 4 of the Act https://legislation.nsw.gov.au/view/html/inforce/current/act-1983-042#sec.4. No consultation or concurrence from the claimants is considered necessary.

Water Management Act 2000

Permissible √ Not permissible ☐

Justification:

- Local councils are exempt from s.91E(1) of the Act in relation to all controlled activities that they carry out in, on or under waterfront land by virtue of clause 41 of the *Water Management (General) Regulation 2018.*

- The proposal would not interfere with the aquifer and therefore an interference licence is not required (s.91F).

COMMONWEALTH LEGISLATION

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EP&BC Act)

Permissible √ Not permissible ☐

Justification:

The proposed activity would not be undertaken on Commonwealth land and no matters of National Environmental Significance are likely to be significantly impacted by the proposed activity. The proposed activity is therefore not a controlled action and does not require Commonwealth referral.

Commonwealth *Native Title Act 1993*

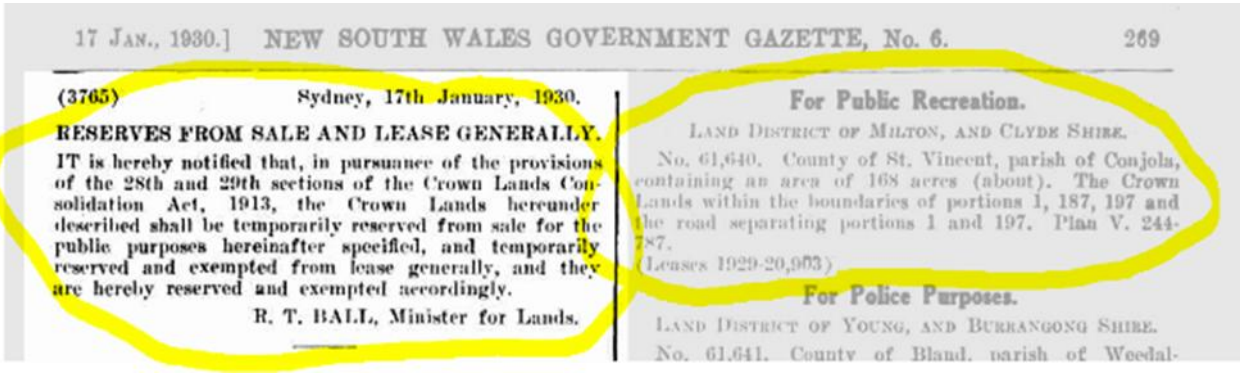
Permissible √ Not permissible ☐

Justification:

The proposed works may affect Native Title. The applicable Future Action Option for the proposed activity was assessed to be Subdivision J (Reserves and Leased Land) for the following reasons:

- The reserve for public recreation was created on the 17/01/1930 (see gazette extract below)
- An amendment of part of the Reserve purpose to "Access and public requirements, tourism purposes and environmental and heritage protection" in 2006 has no bearing on the validity of the Future Act and can be disregarded.
- The proposal will be undertaken in good faith and in accordance with the purpose of the reserve's purpose as the proposed stormwater would serve the Tourist Park and reduce erosion at the beach and adjacent recreational areas.

To make the Future Act valid, notification and request for comment was sent to the South Coast People Native Title claimants (via NTSCorp) on the 27 September 2019 (D19/337445). The comment period will be complete on the 25 October 2019, after which the "future act" (the stormwater works) would be valid.



17 JAN., 1930.] NEW SOUTH WALES GOVERNMENT GAZETTE, No. 6. 269

(3765) Sydney, 17th January, 1930.

RESERVES FROM SALE AND LEASE GENERALLY.

IT is hereby notified that, in pursuance of the provisions of the 28th and 29th sections of the Crown Lands Consolidation Act, 1913, the Crown Lands hereunder described shall be temporarily reserved from sale for the public purposes hereinafter specified, and temporarily reserved and exempted from lease generally, and they are hereby reserved and exempted accordingly.

R. T. BALL, Minister for Lands.

For Public Recreation.

LAND DISTRICT OF MILTON, AND CLYDE SHIRE.

No. 61,640. County of St. Vincent, parish of Conjola, containing an area of 168 acres (about). The Crown Lands within the boundaries of portions 1, 187, 197 and the road separating portions 1 and 197. Plan V. 244-787.
(Leases 1929-20,903)

For Police Purposes.

LAND DISTRICT OF YOUNG, AND BURRANGONG SHIRE.

No. 61,641. County of Bland, parish of Weedal-

5. CONSULTATION WITH GOVERNMENT AGENCIES

5.1 Transport and Infrastructure SEPP 2021 requirements

Section 2.10 – Consultation with councils - development with impacts on council-related infrastructure or services

The proposed activity would:

(a) have an impact on stormwater management services

(b) unlikely generate traffic to an extent that it would strain the capacity of the road system

(c) not involve connection to, or have a substantial impact on the capacity of the sewerage system

(d) not involve connection to, and use of a substantial volume of water from the water supply system

(e) not involve the installation of a temporary structure on, or the enclosing of, or a public place that is under a council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential

(f) involves the excavation of, or a footpath adjacent to, a road for which the proponent is not responsible for the maintenance of the road or footpath.

The proponents of the proposed activity are City Services and City Development who are asset custodians of the foreshore reserve, stormwater infrastructure, and roads. No consultation with other departments of SCC is therefore required.

Section 2.11 – Consultation with councils - development with impacts on local heritage

There would be no heritage objects or places affected by the proposed activity (refer to Section 3.5 of this REF for more information).

Section 2.12 – Consultation with councils - development with impacts on flood liable land

The proposed activity would not be undertaken on flood liable land. Consultation with Shoalhaven City Council is therefore not required.

Section 2.13 – Consultation with State Emergency Service (SES) - development with impacts on flood liable land

The proposed activity would not be undertaken on flood liable land. Consultation with SES is therefore not required.

Section 2.14 – Consultation with councils - development with impacts on certain land within the coastal zone

The proposal would not occur within a coastal vulnerability area as defined in the Coastal Management Act 2016. Consultation is therefore not required.

Section 2.15 – Consultation with public authorities other than councils

In consideration of the other consultation requirements specified under Section 2.15 of the Transport and Infrastructure SEPP, the proposed activity:

- would not be undertaken adjacent to land reserved under the *National Parks and Wildlife Act 1974* or land acquired under that Act
- would not be undertaken on land in Zone E1 National Parks and Nature Reserves on in an equivalent land use zone.
- does not comprise a fixed or floating structure in or over navigable waters
- would not increase the amount of artificial light in the night sky and located on land within the dark sky region as identified on the dark sky region map
- would not be undertaken within Defence communications facility buffer (only relevant to the defence communications facility near Morundah)
- would not be undertaken on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*
- would not have an impact on the Willandra Lakes Region World Heritage Property
- would not occur in a Western City operational area specified in the *Western Parkland City Authority Act 2018.*

These prescribed consultation requirements therefore do not apply.

Section 2.16 – Consideration of Planning for Bush Fire Protection (PBP)

The proposed activity would not be undertaken on Bushfire Prone Land and is not a development prescribed in this section (health services facilities, correctional centres, residential accommodation). Consideration of PBP is therefore not required.

6. COMMUNITY ENGAGEMENT

With regards to SCC's community engagement policy (http://doc.shoalhaven.nsw.gov.au/Displaydoc.aspx?Record=POL12/31) the proposed activity is considered to be a "local area/low impact" development. There are no mandatory engagement activities specified in the Policy's Engagement Matrix for this type of development. However, notification to the local Community Consultative Body (CCB), Red Head Villages Association is recommended.

On Friday 17th November 2017, a meeting was held between Red Head Village Association Executive Committee, The Hon Shelley Hancock MP, the Mayor, Ward 3 Councillors Proudfoot, Kitchener, Gartner and White, the SCC General Manager, Phil Costello, Cathy Bern, and Peter Knill to discuss ongoing issues at the site including the issue of stormwater management.

In addition, a landscape Master Plan for the area has been in development with extensive community consultation. Although the stormwater proposal was not detailed and not a main feature of the Landscape Master Plan, numerous submissions highlighted the need to improve stormwater management at the site.

Stormwater management improvements therefore have community consensus. No further formal community engagement is considered necessary. Red Head Villages Association shall, however, be provided with the details of the proposal, and the local community shall be kept informed with social media releases and project updates on Council's website.

7. ENVIRONMENTAL SAFEGUARDS AND MEASURES TO MINIMISE IMPACTS

Note that safeguards / measures are prescribed unless otherwise stated.

Safeguard / Measure	Responsibility
Works planning, approvals, consultation and notification	
1. This REF shall be published on the NSW Planning Portal.	SCC Environmental Officer (EO)
2. A Fisheries Permit shall be obtained for the outlet structure.	SCC Project Manager (PM), SCC EO, and Construction Contractor
3. A traffic management plan shall be prepared and submitted to SCC's Project Manager and Traffic Engineer for review.	Construction Contractor
4. Community engagement of the proposed activity shall continue and be extended to: • social media releases • project updates / items on Council's website • information notices to the Community Consultative Body for the area Information to be conveyed shall include the name of the company undertaking the works, what is proposed, the commencement and anticipated finishing dates, and traffic arrangements.	SCC Project Manager
5. Variable Message Boards (VMS) shall also be in place at the western end of the proposed activity at least two weeks prior to the commencement of works to inform users of Manta Ray Road of the works, period of works and of potential traffic delays/restrictions.	
6. Emergency services (State Emergency Service, Ambulance, Rural Fire Service, and Police), through the Local Emergency Management Committee, shall be notified of any closure of the Manta Ray Road.	SCC Project Manager and SCC representative on the Local Emergency Management Committee
Site establishment	
7. Any machinery, vehicles and stockpiles utilised during construction shall be stored and / or operated within the project footprint and existing cleared areas only. Works, machinery and vehicles shall not encroach into the canopies of trees that are to be retained and protected.	Construction Contractor

Safeguard / Measure	Responsibility
8. A Construction Environmental Management Plan (CEMP) for the proposed activity shall be prepared / amended to address the prescribed safeguards and measures within this REF.	Construction Contractor
9. Erosion and sediment controls in accordance with the 'Blue Book' (Landcom 2004) shall be installed and maintained to prevent the entry of sediment into waterways i.e. water diversion, minimising disturbance, erosion control, sediment capture and rapid re-establishment.	Construction Contractor
10. In the event that any wildlife be significantly disturbed or injured during works, Council's Environmental Officers are to be contacted or if unavailable, Wildlife Rescue – South Coast should be contacted on 0418 427 214, to rescue and relocate the animal(s).	Construction Contractor
Construction works	
11. Vegetation removal shall be undertaken only to the extent required to carry out the works.	Construction Contractor
12. Staff working at the site will be instructed to stop work immediately on identification of any suspected Aboriginal heritage artefact. If any objects are found, NSW Environment and Heritage (ph:131 555) shall be contacted.	Construction Contractor
13. All conditions of the Fisheries Permit shall be complied with.	Construction Contractor
14. The approved Traffic Management Plan shall be implemented.	Construction Contractor
15. The potential hollow-bearing tree next to pit BD2 at CH20.30 shall be retained if possible, through the engagement of an arborist to provide oversight during works and through the use of an auger to excavate for the pit.	Construction Contractor
16. If the potential hollow-bearing tree (HBT) next to pit BD2 at CH20.30 cannot be retained, the following procedure shall be adopted to minimise harm to any residing fauna: a. Suitably qualified and experienced wildlife handlers (e.g. Wildlife Rescue South Coast or Council environmental staff) shall be onsite during the removal of the HBT (or hollow limbs).	Construction Contractor

Safeguard / Measure	Responsibility
b. An elevated work platform shall be utilised to inspect each hollow for residing fauna. Each hollow shall be inspected visually with the aid of a torch and/or inspection camera if available. c. In consultation with the wildlife handler, the contractor shall prepare a plan specific to the circumstance of the tree, hollow, and animal if known. Generally: i. If the full hollow cannot be searched and confirmed not to contain any fauna, the hollow section can be removed up to the solid section of the limb. ii. If the hollow cannot be fully inspected (*e.g.* a bend in the limb preventing visual inspection) the visible section of the hollow can be cut to allow further inspection of the hollow. Repeat this process until the whole limb or hollow section is searched. It is important to note that when the hollow limb is cut, it is only to be cut where it can be determined that there is no chance an animal could be residing in that section. Stuffing of the limb just past the cut point may be considered to prevent fauna movement during chainsaw cutting operations. d. If fauna are found to be residing in the hollow, a management strategy shall be prepared by the wildlife carer in collaboration with the tree removal contractor. This would dement on the species present. Generally: i. Tree frogs or reptiles can be caught and relocated immediately outside the development area into a suitable shelter site (such as hollow log or tussock) ii. Nocturnal possums and gliders can be removed from their hollows and placed into cloth pouches and taken into care until suitable release into a nest box or similar.	

Safeguard / Measure	Responsibility
17. An emergency spill kit shall be always kept on-site with procedures to contain and collect any leakage or spillage of fuels, oils, greases, *etc* .	Construction Contractor
18. No major equipment maintenance works shall be undertaken on-site.	Construction Contractor
19. To avoid the risk of pollution from machinery, refuelling shall generally be done off site, however if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray shall be used to catch any accidentally spilt fuel.	Construction Contractor
20. Stockpiles of any excavated earthen material shall be in existing cleared areas and more than 10 metres from the waterway and any trees that are to be retained.	Construction Contractor
21. Any waste shall be managed, transported, stored, collected and disposed of in an environmentally satisfactory manner pursuant to NSW *Protection of the Environment Operations Act 1997*, and that all reasonable measures regarding the control and prevention of pollution and waste from being introduced into the waterway are implemented.	Construction Contractor
22. Upon completion of works, disturbed land shall be stabilised with jute mush, turf, hydromulch, seeding or similar.	Construction Contractor
23. All parties shall comply with any direction given by authorised officers of the NSW Department of Primary Industries and NSW Environment Protection Authority with regard to the prevention of pollution.	Construction Contractor and Project Manager.
Post construction	
24. An asset form shall be trimmed to file 44574E on commissioning of the stormwater system in accordance with POL15/8 Asset Accounting Policy section 3.1.4 and POL16/79 Asset Management Policy section 3.3.	Construction Contractor
25. To offset the environmental impact of the works: a. primary weed control should be undertaken in the bushland between the Tourist Park, north to the new stormwater system. b. Revegetation activities should be undertaken on the foreshore area. The extent of which should be comparable to the area of vegetation impacted by the proposed activity.	Construction Contractor and SCC Project Manager
26. Any post-construction conditions of the Fisheries Permit shall be completed.	SCC Project Manager and Construction Contractor

8. SIGNIFICANCE EVALUATION & DECISION STATEMENT

This Review of Environmental Factors has assessed the likely environmental impacts, in the context of Part 5 of the *Environmental Planning and Assessment Act 1979*, of a proposal by Shoalhaven City Council for the upgrade of the stormwater management system along Manta Ray Road Boat Harbour, Bendalong.

In consideration of the proposal as described in Section 1, and assuming the implementation of all proposed safeguards and mitigation measures (Section 7), it is determined that:

1. It is unlikely that there will be any significant environmental impact as a result of the proposed work and an Environmental Impact Statement is not required for the proposed works.
2. The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats and a Species Impact Statement / BDAR is not required.
3. A Fisheries Permit shall be obtained for the dredging / reclamation for the outlet structure on the beach. No additional statutory approvals, licences, permits and external government consultations are required.
4. The proposed activity may proceed.

In accepting and adopting this REF, Shoalhaven City Council commits to ensuring the implementation of the proposed safeguards and mitigation measures identified in this report (Section 7) to minimise and/or prevent detrimental environmental impacts.

Determined by:

Craig Exton
Manager – Technical Services
Shoalhaven City Council Date: 1/05/2025

9. REFERENCES

Advisian 2017 *Bendalong Coastal Hazard Mapping: Preliminary Draft Report.* Unpublished report for Shoalhaven City Council.

Advisian 2023 *Bendalong Stormwater Outlet Coastal Advice.* Unpublished report for MI Engineers D24/424737 - Bendalong, Boat Harbour - Stormwater Upgrade (Advisian Technical Advice to MI Engineers)

DECCW (Department of Environment, Climate Change and Water, NSW) 2010 Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales. Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/due-diligence-code-of-practice-for-the-protection-of-aboriginal-objects-in-new-south-wales

DoPI (Department of Primary Industries, NSW) 2013 *Policy and Guidelines for Fish Habitat Conservation and Management.* ISBN 978 1 74256 283 https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/634694/Policy-and-guidelines-for-fish-habitat.pdf

Feary, Sue 2016 *Proposed erosion control works at Boat Harbour Beach, Bendalong, NSW. Aboriginal Cultural Heritage Due Diligence Assessment.* Unpublished report for Shoalhaven City Council.

Feary, Sue 2017 *Landscape Master Plan for Boat Harbour Beach, Bendalong: Aboriginal Cultural Heritage Assessment for proposed works.* Unpublished report for Shoalhaven City Council.

Hunt and Associates 2010 *Endangered Ecological Community Mapping.* Unpublished report prepared by Shoalhaven City Council.

Landcom 2004 *Managing Urban Stormwater: Soils and Construction – Volume 1.* Published by Landcom ISBN 0-97520-3037 https://www.environment.nsw.gov.au/research-and-publications/publications-search/managing-urban-stormwater-soils-and-construction-volume-1-4th-editon

APPENDIX A – THE PROPOSED ACTIVITY

DO NOT SCALE

MIENGINEERS

SYDNEY OFFICE
Suite 206/68 York Street, Sydney NSW 2000
Tel (02) 8396 6565

SOUTH COAST OFFICE
49 Berry Street, Nowra NSW 2541
Tel (02) 4423 0566

WOLLONGONG OFFICE
Suite 3, 128/134 Crown Street, Wollongong NSW 2500
Tel (02) 4423 0566

www.miengineers.com

BENDALONG BOAT HARBOUR STORMWATER UPGRADE

MANTA RAY ROAD, BENDALONG NSW 2539

-

APPROXIMATE AREA OF WORKS

LOCALITY PLAN
N.T.S.

DRAWING INDEX

DIAL BEFORE YOU DIG www.1100.com.au

REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

MIENGINEERS
SYDNEY OFFICE
Suite 206/68 York Street, Sydney NSW 2000
Tel (02) 8396 6565
SOUTH COAST OFFICE
49 Berry Street, Nowra NSW 2541
Tel (02) 4423 0566
WOLLONGONG OFFICE
Suite 3a, 128-134 Crown Street, Wollongong NSW 2500
Tel (02) 4423 0566
MIENGINEERS.COM

PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: COVER SHEET

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C001
PROJECT No.: DN220019
REVISION: 3

DO NOT SCALE

GENERAL NOTES:

G1 THE NOTES CONTAINED ON THIS DRAWING ARE TYPICAL STANDARDS ONLY. ANY SPECIFIC DETAILS PROVIDED ELSEWHERE ARE TO TAKE PRECEDENCE.

G2 THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE RELATED SOIL EROSION CONTROL NOTES, RELATED ROAD AND DRAINAGE PLANS, SPECIFICATION AND STANDARD DRAWINGS AS APPLICABLE.

G3 ALL WORK IS SUBJECT TO STATUTORY REQUIREMENTS, INCLUDING BUT NOT LIMITED TO WORK HEALTH AND SAFETY REQUIREMENTS, & APPROPRIATE TRAFFIC CONTROL REQUIREMENTS.

G4 THE CONTRACTOR IS TO PROVIDE ALL NECESSARY LABOUR, PLANT, MATERIALS AND ANYTHING ELSE REQUIRED TO COMPLETE THE INTENT OF THE DESIGN.

G5 IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SET OUT IN BOTH LINE AND LEVEL FOR THE WORKS IN ACCORDANCE WITH THE DESIGN.

G6 THE CONTRACTOR IS TO ALLOW FOR THE COST OF TESTING. ALL TESTING IS TO BE DONE BY A NATA REGISTERED LABORATORY, TEST RESULTS ARE TO BE SUBMITTED TO THE PRINCIPAL FOR APPROVAL PRIOR TO WORK PROCEEDING.

G7 THE CONTRACTOR SHALL ENSURE THAT THE ADJOINING PROPERTY OWNERS ARE NOT DEPRIVED OF ALL WEATHER ACCESS NOR ARE SUBJECTED TO ADDITIONAL STORMWATER RUNOFF.

G8 THE CONTRACTOR SHALL ENSURE THAT ALL EROSION AND SEDIMENTATION CONTROL STRUCTURES ARE IN PLACE PRIOR TO COMMENCING.

G9 THE CONTRACTOR SHALL NOT ENTER UPON ADJOINING PROPERTY WITHOUT THE PERMISSION OF THE OWNER/OCCUPIER.

G10 THE SITE IS TO BE LEFT CLEAN AND TIDY, AND TO THE SATISFACTION OF THE PRINCIPAL.

G11 WHERE MIENGINEERS RELIES ON THE INFORMATION SUPPLIED BY OTHERS TO PRODUCE THE DESIGNS, WE ACCEPT NO LIABILITY FOR ERRORS, TO THE EXTENT THAT THE DESIGN HAS MADE RELIANCE ON THIS INFORMATION

CLEARING AND GRUBBING:

CG1 THE CONTRACTOR SHALL GIVE COUNCIL & THE PRINCIPAL AT LEAST THREE FULL WORKING DAYS NOTICE OF INTENTION TO COMMENCE CLEARING OPERATIONS.

CG2 THE CONTRACTOR SHALL AVOID UNWARRANTED DAMAGE TO ALL NATURAL FLORA ON SITE AND ON THE ADJACENT LAND.

CG3 ONLY TREES IDENTIFIED TO BE REMOVED ON THE DRAWINGS ARE TO BE FELLED OR DAMAGED IN ANY WAY. SURPLUS SOIL IS TO BE KEPT WELL CLEAR OF EXISTING TREE TRUNKS. CARE MUST BE TAKEN TO PROTECT THE ROOTS OF TREES TO BE RETAINED.

CG4 NO TREES SHALL BE CLEARED WITHOUT OBTAINING THE WRITTEN APPROVAL OF THE COUNCIL.

CG5 ALL MATERIAL CLEARED OR GRUBBED SHALL BE DISPOSED OF BY THE CONTRACTOR TO AN APPROVED SITE. THE CONTRACTOR SHALL PAY ALL FEES. BURNING IS NOT PERMITTED.

CG6 ANY HOLES OR DEPRESSION CAUSED BY THE CLEARING OR GRUBBING WORK SHALL BE INSPECTED BY THE PRINCIPAL. HOLES ARE TO BE BACKFILLED WITH APPROVED MATERIAL, AND COMPACTED TO AT LEAST 98% OF STANDARD MAXIMUM DRY DENSITY.

TOPSOIL:

T1 TOPSOIL INCLUDING ALL GRASS COVER SHALL BE STRIPPED FROM THE WHOLE OF THE AFFECTED AREA TO THE DEPTH SPECIFIED IN THE DRAWINGS OR AS REQUIRED OR, WHERE NO DEPTH IS SPECIFIED, TO A MINIMUM DEPTH OF 100mm.

T2 STRIPPED SURFACES WILL NEED TO BE INSPECTED BY THE PRINCIPAL OR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO THE COMMENCEMENT OF EARTHWORKS TO ENSURE THE AREAS HAVE BEEN ADEQUATELY STRIPPED.

T3 THE STRIPPED TOPSOIL IS TO BE STOCKPILED IN THE LOCATIONS SHOWN ON THE SOIL AND WATER MANAGEMENT PLAN. IF STOCKPILE LOCATIONS ARE NOT INDICATED THEY ARE TO BE PLACED GENERALLY IN ACCORDANCE WITH MUS AND TO THE SATISFACTION OF THE PRINCIPAL. THE SURFACE OF STOCKPILES IS TO BE COVERED WITH GEOFABRIC TO PREVENT SEDIMENT LOSS.

T4 THE STOCKPILED TOPSOIL IS TO BE RE-SPREAD OVER THE FINISHED SURFACE (IN THE LOCATIONS INSTRUCTED BY THE PRINCIPAL) IMMEDIATELY FOLLOWING COMPLETION OF EARTHWORKS. DEPTHS OF TOPSOIL SHALL BE A MINIMUM OF 75mm BUT SHALL NOT EXCEED 250mm.

T5 SURPLUS TOPSOIL SHALL NOT BE SPREAD OVER THE SITE WITHOUT THE WRITTEN PERMISSION OF THE PRINCIPAL.

T6 NEWLY TOPSOILED AREAS ARE TO BE IMMEDIATELY REVEGETATED IN ACCORDANCE WITH THE APPROVED SOIL AND WATER MANAGEMENT PLAN & MUS.

FILL AND COMPACTION:

FC1 FILL IS TO BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS.

FC2 FILL IS TO BE COMPACTED TO AT LEAST 100% OF STANDARD MAXIMUM DRY DENSITY AS DETERMINED BY AS1289-5.1.1.

FC3 COMPACTION TESTING SHALL OCCUR AT THE RATE OF AT LEAST ONE TEST PER 500mm THICKNESS, 300m2 AREA OR 150m3 VOLUME, WHICHEVER GIVES MAXIMUM NUMBER OF TESTS.

FC4 ALL COMPACTION TESTING IS TO BE PERFORMED BY A NATA REGISTERED LABORATORY UNDER THE CONTROL OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER WHO SHALL SUPERVISE THE WORKS TO AT LEAST LEVEL 2 CONTROL AS DEFINED BY AS3798.

FC5 ALL COMPACTION TEST RESULTS SHALL BE SUBMITTED TO THE PRINCIPAL AS THEY BECOME AVAILABLE, BUT NO LATER THAN 48hrs AFTER TESTING.

SOIL/WATER MANAGEMENT AND PROTECTION OF THE ENVIRONMENT :

SWM1 ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AND STRUCTURES SHALL BE LOCATED, CONSTRUCTED & MAINTAINED IN ACCORDANCE WITH THE GUIDELINES AND PRINCIPLES AS OUTLINED IN LANDCOM'S "SOILS AND CONSTRUCTION" VOLUME 1 (MANAGING URBAN STORMWATER 4TH EDITION, MARCH 2004),(MUS).

SWM2 THE CONTRACTOR IS RESPONSIBLE FOR CARRYING OUT ALL EARTHWORKS, ROAD AND DRAINAGE CONSTRUCTION GENERALLY IN ACCORDANCE WITH MUS AND TO THE SATISFACTION OF COUNCIL, THE SOIL CONSERVATION SERVICE AND THE PRINCIPAL.

SWM3 CONSTRUCTION SEQUENCE SHALL BE PLANNED SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF MANAGEABLE SIZE. STABILISATION MEASURES SHALL BE APPLIED TO THE FIRST DISTURBED SECTION PRIOR TO COMMENCING ON THE NEXT SECTION.

SWM4 BEFORE STRIPPING TOPSOIL ALL AREAS TO BE EXPOSED SHALL BE CLEARED AND GRUBBED OF ALL EXCESSIVE VEGETATION.

SWM5 ALL WORK SHALL BE CARRIED OUT IN SUCH A MANNER AS TO AVOID NUISANCE AND/OR DAMAGE TO THE ENVIRONMENT. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL IMPOSED BY THE COUNCIL, THE ENVIRONMENTAL PROTECTION AUTHORITY, THE CLEAN WATERS ACT, THE CLEAN AIR ACT AND THE NOISE CONTROL ACT. THE CONTRACTOR IS TO ALLOW FOR THIS IN THEIR TENDER.

SWM6 HERBICIDES AND OTHER TOXIC CHEMICALS SHALL NOT BE USED ON THE SITE WITHOUT THE PRIOR WRITTEN APPROVAL OF THE PRINCIPAL.

SWM7 NO NOISE, SMOKE, OR OTHER NUISANCE WHICH IN THE OPINION OF THE PRINCIPAL IS UNNECESSARY OR EXCESSIVE SHALL BE PERMITTED BY THE CONTRACTOR IN THE PERFORMANCE OF THE WORKS UNDER THIS CONTRACT. SHOULD WORK OUTSIDE CUSTOMARY WORKING HOURS BE APPROVED, THE CONTRACTOR SHALL NOT USE, DURING SUCH PERIOD, ANY PLANT, MACHINERY OR EQUIPMENT WHICH IN THE OPINION OF THE PRINCIPAL IS CAUSING OR LIKELY TO CAUSE A NUISANCE TO THE PUBLIC. NO NOISY WORKS AND/OR WORKS LIKELY TO DISTURB NEARBY RESIDENTS SHALL BE UNDERTAKEN DURING THE HOURS PRECLUDING SUCH ACTIVITY AS SPECIFIED BY COUNCIL IN ACCORDANCE WITH THE REQUIREMENTS FOR DEVELOPMENT CONSENT AND BUILDING APPROVAL MADE UNDER THE LOCAL GOVERNMENT ACT AND THE NOISE CONTROL ACT.

SWM8 THE CONTRACTOR SHALL ENSURE THAT FUGITIVE DUST FROM DISTURBED AREAS IS MINIMISED BY A METHOD APPROVED BY THE PRINCIPAL.

SWM9 TOPSOIL REQUIRED TO BE RESPREAD ON SITE SHALL BE STOCKPILED CLEAR OF HAZARDS SUCH AS DRAINAGE AREAS, REMAINING TOPSOIL SHALL BE REMOVED AND STOCKPILED WHERE AGREED. STOCKPILED TOPSOIL IS TO BE RE-SPREAD LATER ON AREAS TO BE REVEGETATED AND STABILISED ONLY (ie. ALL FOOTPATHS, BATTERS, DRAINAGE RESERVE AND CHANNELS). TOPSOIL SHALL NOT BE SPREAD ON ANY OTHER AREAS UNLESS SPECIFICALLY APPROVED BY THE PRINCIPAL. STOCKPILES REMAINING LONGER THAN THREE MONTHS SHALL BE PROTECTED FROM EROSION BY COVERING WITH A MULCH AND HYDROSEEDING AND, IF NECESSARY, BY LOCATING BANKS OR DRAINS UPSLOPE TO DIVERT RUNOFF.

SWM10 THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL SEDIMENT AND EROSION CONTROL DEVICES AND REMOVE ACCUMULATED SILT ETC BEFORE NO MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL SILT REMOVED SHALL BE DISPOSED OF AS DIRECTED BY THE PRINCIPAL. CONTROL DEVICES SHALL BE MAINTAINED UNTIL ALL DISTURBED AREAS ARE REVEGETATED OR FURTHER AS MAY BE DIRECTED BY THE PRINCIPAL IN ACCORDANCE WITH THE CONTRACT.

SWM11 CUT AND FILL BATTERS SHALL BE:
a. FORMED AT MAXIMUMS OF 2:1 IN CUT AND 3:1 IN FILL U.N.O.
b. TOPSOILED AS SOON AS PRACTICABLE AFTER FORMATION WITH A:
i. MINIMUM DEPTH OF 75mm AND MAXIMUM OF 250mm.
ii. SCARIFIED BEFORE TOPSOILING.
iii. SEEDED WITHIN 7 DAYS OF TOPSOILING WITH AN APPROVED MIX.
c. WHERE LENGTH OF CUT BATTER SLOPES EXCEED 3m THE BATTER SHALL BE PROTECTED BY EITHER A CUT-OFF DRAIN 150mm DEEP OR A SOIL CUT-OFF BANK 150mm HIGH LEADING TO A SEDIMENT TRAP SO AS TO CONTROL RUNOFF OVER BATTERS PRIOR TO THEIR REVEGETATION.

SWM12 OUTLETS:
a. ALL WATER SHALL BE RELEASED IN A NON-SEDIMENT MANNER, GENERALLY IN ACCORDANCE WITH MUS.
b. ENERGY DISSIPATERS SHALL BE PROVIDED AS APPROVED BY THE PRINCIPAL WHEN DISCHARGE FLOW VELOCITIES ARE NOT IN ACCORDANCE WITH MUS.
c. SHALL HAVE CAPACITY TO DISCHARGE THE 5 YEAR CRITICAL STORM EVENT WITHOUT CAUSING FAILURE OF THE STRUCTURE.
d. AGGREGATE FOR OUTLETS SHALL BE CRUSHED BASALT OR EQUIVALENT APPROVED BY THE PRINCIPAL.

SWM13 EARTH OR HAY BALE BANKS:
a. SHALL BE PROVIDED WHERE REQUIRED.
i. TO DIVERT SEDIMENT LADEN RUNOFF TO A SEDIMENT TRAP OR BASIN, OR
ii. INCORPORATED AS PART OF A BARRIER OR DAM USED TO INTERCEPT AND RETARD SEDIMENT LADEN RUNOFF.
b. FREEBOARD: BANKS SHALL HAVE FIXED 300mm FREEBOARD WHEN USED AS A DIVERSION BANK.

SWM14 SLOPES LONGER THAN 80m ARE TO HAVE CHECK DAMS INSTALLED. REFER TO STANDARD DRAWING 5-4 (MUS) FOR DETAILS.

SWM15 WHERE PRACTICAL, MAINTAIN OR IMPROVE EXISTING CLEAN WATER DRAINS TO DIVERT WATER AROUND THE SITE.

SWM16 PERMANENT DRAINAGE FEATURES ARE TO BE INSTALLED AS EARLY AS POSSIBLE DURING THE CONSTRUCTION PERIOD.

SWM17 DRAINAGE CHANNELS AND CATCH DRAINS ARE TO BE STABILISED WITH MATERIAL SUCH AS JUTE MESH, GEOFABRIC, MEDIUM / HIGH PERFORMANCE TURF REINFORCEMENT MATS (TRMS).

SMOOTH JUNCTIONS:

SJ1 CONSTRUCTION WORK CARRIED OUT UNDER THIS CONTRACT ADJACENT TO ADJOINING WORKS, SHALL MAKE SMOOTH JUNCTIONS WITH EXISTING WORK, AS APPROPRIATE.

SUBGRADE:

SG1 PAVEMENT SUBGRADES SHALL BE PREPARED TO A WIDTH EXTENDING AT LEAST 150mm BEHIND THE REAR EDGE OF KERBING OR IF THERE IS NO KERBING THE OUTER EDGE OF THE ROAD SHOULDER OR AS SHOWN ON THE DRAWINGS.

SG2 THE SUBGRADE SURFACE SHALL BE TRIMMED TO A TOLERANCE OF +14mm TO -30mm OF THE DESIGN LEVEL.

SG3 THE TOP 150mm OF THE SUBGRADE MATERIAL IS TO BE COMPACTED TO A MINIMUM OF 100% OF STANDARD MAXIMUM DRY DENSITY (AS1289-5.1.1).

SG4 WHERE ROCK IS ENCOUNTERED IN THE SUBGRADE, IT SHALL BE RIPPED TO A MINIMUM DEPTH OF 150mm AND RECONSOLIDATED ABOVE.

SG5 THE SUBGRADE SHALL BE PROOF ROLLED IN THE PRESENCE OF THE PRINCIPAL TO ENSURE UNIFORM PREPARATION. SUCH PROOF ROLLING SHOULD BE PERFORMED USING A 3 POINT ROLLER OF NOT LESS THAT 9 TONNES MASS, OR APPROVED ALTERNATIVE. BENKELMAN BEAM TESTING MAY BE CARRIED OUT IN A REGULAR PATTERN OVER THE SUBGRADE AS AN ALTERNATIVE TO PROOF ROLLING.

SG6 SUBGRADE COMPACTION TESTING IS TO BE CARRIED OUT BY A NATA REGISTERED LABORATORY AT THE RATE OF ONE DENSITY TEST PER 500m² OF NEW PAVEMENT (OR PART THEREOF). PROOF ROLLING SHALL TAKE PLACE OVER THE ENTIRE SUBGRADE SURFACE.

SG7 COPIES OF COMPACT TEST RESULTS MUST BE SUBMITTED TO THE PRINCIPAL UPON RECEIPT FROM THE TESTING LABORATORY.

SG8 ALL SUBGRADE PREPARATION MUST BE INSPECTED AND APPROVED BY THE PRINCIPAL PRIOR TO PAVEMENT WORKS PROCEEDING.

SUBBASE:

SB1 ALL SUBBASE MATERIALS SHALL COMPLY WITH COUNCIL SPECIFICATION C242B.

SB2 THE SUBBASE SHOULD BE SPREAD AND COMPACTED IN LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS.

SB3 THE WHOLE OF THE SUBBASE SHALL BE COMPACTED TO A MINIMUM COMPACTION OF 98% MODIFIED (AS1289 - 5.2.1).

SB4 FINISHED LEVELS SHOULD BE WITHIN ± 20mm OF DESIGN LEVELS. THE SUBBASE SURFACE SHOULD NOT DEVIATE FROM A 3m STRAIGHT EDGE, LAID IN ANY DIRECTION, BY MORE THAN 25mm.

SB5 THE WHOLE OF SUBBASE SURFACE SHOULD BE PROOF ROLLED USING A 3 POINT ROLLER OF MINIMUM 9 TONNES MASS (OR APPROVED ALTERNATIVE) TO ENSURE UNIFORMITY. THERE SHALL BE NO VISIBLE DEFLECTION UNDER PROOF ROLLING.

SB6 BENKELMAN BEAM DEFLECTION TESTING MAY ALSO BE REQUIRED BY THE PRINCIPAL IN SOME CIRCUMSTANCES FOLLOWING THE COMPACTION OF THE SUBBASE. IF REQUIRED, THIS SHOULD BE PERFORMED AT 20m INTERVALS ALTERNATIVELY ALONG THE WHEEL PATHS. THE CO-EFFICIENT OF VARIATION IN RECORDED DEFLECTION READINGS SHOULD NOT EXCEED 50%.

SB7 ALL COMPACTION TESTING (AND BENKELMAN BEAM TESTING IF REQUIRED) SHALL BE PERFORMED BY A NATA REGISTERED LABORATORY UNDER THE CONTROL OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER. DENSITY TESTS SHOULD BE PERFORMED AT LEAST AT THE RATE OF 1 TEST PER 500m² OF NEW PAVEMENT OR PART THEREOF.

SB8 ALL TEST RESULTS MUST BE SUBMITTED TO THE PRINCIPAL UPON RECEIPT FROM THE TESTING LABORATORY.

SB9 ALL SUBBASE PREPARATION MUST BE INSPECTED AND APPROVED BY THE PRINCIPAL PRIOR TO BASE COURSE OR KERB AND GUTTER WORKS.

BASE COURSE:

BC1 ALL BASE COURSE MATERIALS SHALL COMPLY WITH COUNCIL SPECIFICATION C242B.

BC2 THE BASE COURSE SHALL BE SPREAD AND COMPACTED IN LAYERS NOT EXCEEDING 150mm COMPACTED THICKNESS.

BC3 THE WHOLE OF THE BASE COURSE SHALL BE COMPACTED TO A MINIMUM COMPACTION OF 98% MODIFIED (AS1289 - 5.2.1).

BC4 FINISHED LEVELS SHOULD BE WITHIN ± 10mm OF DESIGN LEVELS. THE BASE COURSE SURFACE SHOULD NOT DEVIATE FROM A 3m STRAIGHT EDGE, LAID IN ANY DIRECTION, BY MORE THAN 15mm.

BC5 THE WHOLE OF THE BASE COURSE SHOULD BE PROOF ROLLED USING A 3 POINT ROLLER OF MINIMUM 9 TONNES MASS (OR APPROVED ALTERNATIVE) TO ENSURE UNIFORMITY.

BC6 BENKELMAN BEAM TESTING MAY ALSO BE REQUIRED BY THE PRINCIPAL IN SOME CIRCUMSTANCES FOLLOWING THE COMPACTION OF THE BASE COURSE. IF REQUIRED, THIS SHOULD BE PERFORMED AT 20m INTERVALS ALTERNATIVELY ALONG THE WHEEL PATHS. THE CO-EFFICIENT OF VARIATION IN RECORDED DEFLECTION READINGS SHOULD NOT EXCEED 30%.

BC7 ALL COMPACTION TESTING (AND BENKELMAN BEAM TESTING IF REQUIRED) SHALL BE PERFORMED BY A NATA REGISTERED LABORATORY UNDER THE CONTROL OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER. DENSITY TESTS SHOULD BE PERFORMED AT THE RATE OF 1 TEST PER 500m² OF PAVEMENT OR PART THEREOF.

BC8 ALL TEST RESULTS MUST BE SUBMITTED TO THE PRINCIPAL UPON RECEIPT FROM THE TESTING LABORATORY.

BC9 ALL BASE COURSE PREPARATION MUST BE INSPECTED BY THE PRINCIPAL PRIOR TO SEALING OR KERB AND GUTTER WORKS.

MATERIALS:

M1 MATERIALS AND WORKMANSHIP SHALL BE THE BEST OF THEIR KIND AND UNLESS OTHERWISE SPECIFIED, SHALL CONFORM TO RELEVANT AUSTRALIAN STANDARDS.

WEARING COURSE:

WC1 SEALING OF ROADS WILL BE PERFORMED IN TWO STAGES. THE FIRST SEAL WILL PROTECT THE ROAD PAVEMENT AND PRODUCE A WEARING SURFACE DURING THE INSTALLATION OF SERVICES IN THE FOOTPATHS. ONCE ALL SERVICES ARE INSTALLED THE FINAL WEARING SURFACE MAY THEN BE LAID.

WC2 THE FOLLOWING PAVEMENT SEALS WILL BE ACCEPTABLE, UNLESS NOMINATED OTHERWISE ON THE DESIGN DRAWINGS:
a. 30mm AC10 FINAL WEARING SURFACE.
b. 5mm SINGLE COAT SPRAYED SEAL AS FIRST COAT, FOLLOWED BY ARRB GAP GRADED ASPHALT MIX MINIMUM 25mm CONSOLIDATED THICKNESS.
c. 15mm AC5 AS FIRST COAT, FOLLOWED BY ARRB GAP GRADED ASPHALT MIX MINIMUM 25mm CONSOLIDATED THICKNESS.

WC3 FINISHED LEVELS SHOULD BE WITHIN ± 10mm OF THE DESIGN LEVELS AND THE FINISHED PROFILE SHOULD NOT DEVIATE FROM THE BOTTOM OF A 3m STRAIGHT EDGE LAID IN ANY DIRECTION BY MORE THAN 7mm.

WC4 ROUGHNESS AS MEASURED BY NAASRA ROUGHNESS METER SHOULD NOT EXCEED 12 COUNTS/100m.

WC5 THE PRINCIPAL MAY REQUIRE THE ASPHALT TO BE TESTED TO ENSURE COMPLIANCE WITH THE ARRB SPECIFICATION.

SUBSURFACE DRAINAGE:

SD1 SUBSURFACE DRAINAGE IS TO BE INSTALLED ALONG THE EDGE OF ALL PAVEMENT AS DETAILED, OR AS DIRECTED BY THE PRINCIPAL.

SD2 SUBSURFACE LINE PIPES AND FITTINGS SHALL BE PERFORATED PLASTIC TO AS2439 PART 1. LAY PIPES ON 100mm OF FILTER MATERIAL GRADED AT MINIMUM 1% AND OVERLAY WITH FILTER MATERIAL EXTENDING TO UNDERSIDE OF PAVEMENT SUB-BASE. PROVIDE FILTER FABRIC AROUND TRENCH AS DETAILED.

SD3 TRENCHES SHALL BE MINIMUM 300mm IN WIDTH AND EXCAVATED TO AT LEAST 500mm BELOW SUBGRADE LEVEL.

SD4 BACKFILL FILTER MATERIAL SHALL MEET THE GRADING REQUIREMENTS AS SET OUT IN MR538. HOWEVER COARSER MATERIAL WILL BE PERMISSIBLE IF THE ENTIRE BACKFILL IS WRAPPED IN A GEOTEXTILE FABRIC (BIDIM A14 OR TERRAM 1000, OR EQUIVALENT).

SD5 "NYLEX STRIP DRAIN" OR EQUIVALENT MAY BE CONSIDERED AN ALTERNATIVE TO CONVENTIONAL SUBSURFACE DRAINS BUT WILL REQUIRE THE SPECIFIC PERMISSION OF THE PRINCIPAL IN EACH CASE.

SD6 ALL SUBSURFACE DRAINAGE IS TO DISCHARGE DIRECTLY TO A DESIGNATED STORMWATER SYSTEM.

EXISTING SERVICES:

ES1 THE CONTRACTOR IS TO INFORM THEMSELVES OF ALL EXISTING SERVICES. ATTEND TO EXISTING SERVICES AS FOLLOWS:
(a) IF THE SERVICE(S) IS/ARE TO BE CONTINUED, PROTECT, REPAIR, DIRECT OR RELOCATE AS REQUIRED. IF SUCH A SERVICE(S) CROSSES THE LINE OF A TRENCH, OR WILL LOSE SUPPORT WHEN THE TRENCH IS EXCAVATED, PROVIDE PERMANENT SUPPORT FOR THE EXISTING SERVICES.
(b) IF THE SERVICE IS TO BE ABANDONED, CUT AND SEAL OR DISCONNECT, AND MAKE SAFE.

ES2 THE CONTRACTOR'S PRICE IS TO ALLOW FOR HAND EXCAVATION AND BACKFILL NEAR ALL EXISTING SERVICES OR IN AREAS WHERE THERE MAY BE EXISTING SERVICES.

ES3 THE COST OF DEALING WITH ALL EXISTING SERVICES AS ABOVE, AND THE TIME ASSOCIATED WITH THE WORK, IS TO BE INCLUDED IN THE TENDER.

ES4 THE PRINCIPAL AND THE DESIGN CONSULTANT WILL NOT BE RESPONSIBLE FOR DAMAGES TO EXISTING SERVICES. THE CONTRACTOR IS TO TAKE ALL ACTION NECESSARY TO AVOID DAMAGE TO EXISTING SERVICES.

STANDARDS AND TEST METHODS:

SM1 UNLESS OTHERWISE SPECIFIED IN THE CONTRACT, AND WHERE APPLICABLE, MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT STANDARD OF THE STANDARDS ASSOCIATION OF AUSTRALIA.

SM2 A STANDARD APPLICABLE TO THE WORKS SHALL BE THE EDITION LAST PUBLISHED 14 DAYS PRIOR TO THE CLOSING DATE FOR TENDERS UNLESS OTHERWISE SPECIFIED.

SM3 OVERSEAS STANDARDS AND OTHER STANDARD DOCUMENTS NAMED IN THE SPECIFICATION SHALL BE APPLICABLE IN THE SAME MANNER AS AUSTRALIAN STANDARDS TO RELEVANT MATERIALS AND WORKMANSHIP.

SM4 COPIES OF ANY STANDARDS QUOTED OR REFERRED TO IN THE SPECIFICATION SHALL BE KEPT ON THE SITE IF SO SPECIFIED.

SM5 WHERE NO SUITABLE TEST METHODS ARE AVAILABLE, THOSE OF THE RMS OR PWD (AS APPROPRIATE) SHALL BE USED.

PROVISION FOR TRAFFIC:

PT1 THE CONTRACTOR SHALL ENSURE THE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS AROUND THE WORK SITE AT ALL TIMES TO STATUTORY REQUIREMENTS.

PT2 THE CONTROLS FOR VEHICULAR TRAFFIC MUST CONFORM TO THE RMS "TRAFFIC CONTROL AT WORK SITES MANUAL".

PT3 SIGNS OR BARRIERS USED FOR TRAFFIC CONTROL SHALL COMPLY WITH AS1742 "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" AND WITH RMS "GUIDELINES TO SIGNS AND MARKINGS MANUAL".

PT4 THE CONTRACTOR IS TO PROVIDE PROPER PROVISION FOR TRAFFIC ON ADJACENT ROADS, AND MAINTAIN EXISTING VEHICULAR ACCESS TO PROPERTIES IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARD AND STATUTORY REQUIREMENTS.

CONCRETE NOTES

1. ALL WORKMANSHIP AND MATERIALS SHALL COMPLY WITH THE CURRENT EDITION OF AS3600 AND AS2870 FOR RESIDENTIAL CONSTRUCTION.
2. CONCRETE STRENGTH SHALL BE AS FOLLOWS U.N.O.:

ELEMENT	STRENGTH	SLUMP	MAX. AGG. SIZE
BASE / WALLS	40 MPa	100mm	20mm

3. CLEAR CONCRETE COVER TO REINFORCEMENT SHALL BE AS FOLLOWS U.N.O.:

ELEMENT	TOP	BOTTOM	SIDE
BASE / WALLS	50	50	50

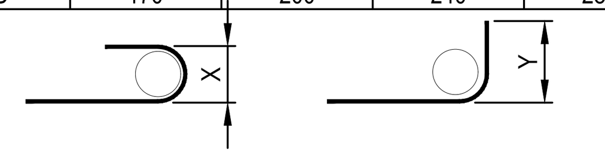
4. THE SIZES OF THE CONCRETE ELEMENTS DO NOT INCLUDE THICKNESSES OF ANY APPLIED FINISHES.
5. ALL CONCRETE SHALL BE COMPACTED ADEQUATELY IN ACCORDANCE WITH AS3600 BY THE USE OF A MECHANICAL VIBRATOR.
6. ALL CONCRETE SHALL BE CURED IN ACCORDANCE WITH AS3600.
7. BRICKWORK SHALL BE ARTICULATED CORRESPONDING TO THE LOCATIONS OF ANY KEYED JOINTS. REFER TO TECHNICAL NOTE 61 IN THE SPECIFICATION FOR DETAILS.
8. REINFORCEMENT SYMBOLS:
N - DENOTES GRADE 500 DEFORMED BARS TO AS4671
R - DENOTES GRADE 250 N PLAIN BARS TO AS4671
SL - DENOTES WELDED GRADE 500 REINFORCING FABRIC TO AS4671
9. REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION.
10. SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN OR OTHERWISE APPROVED IN WRITING BY THE ENGINEER. LAPS SHALL BE IN ACCORDANCE WITH AS3600 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR.

REINFORCEMENT LAP LENGTHS (LESS THEN 300mm OF CONCRETE BELOW THE BAR)			
BAR SIZE			
N12	N16	N20	N24
500	740	1000	1240

REINFORCEMENT LAP LENGTHS (MORE THEN 300mm OF CONCRETE BELOW THE BAR)			
BAR SIZE			
N12	N16	N20	N24
650	960	1300	1600

11. MINIMUM OVERALL DIMENSIONS OF 180° HOOKS AND 90° COGS MAY BE NO SMALLER THEN THE FOLLOWING TABLE:

180° HOOKS OVERALL DIMENSION (X)				
PIN DIA.	BAR NOMINAL SIZE (D)			
	12	16	20	24
3D	60	-	-	-
4D	70	100	120	140
90° COGS OVERALL DIMENSION (Y)				
PIN DIA.	BAR NOMINAL SIZE (D)			
	12	16	20	24
3D	160	-	-	-
4D	170	200	240	280



STORMWATER DRAINAGE NOTES

SWD1 STORMWATER DRAINAGE SHALL BE GENERALLY IN ACCORDANCE WITH AS3500.3

SWD2 PIPES OF 225mm DIA. AND UNDER SHALL BE uPVC TO AS1254.

SWD3 PIPES OF 300mm DIA. AND LARGER SHALL BE CONCRETE CLASS 4 TO AS4058, RUBBER RING JOINTED UNO.

SWD4 PIPES UP TO 150mm DIA. SHALL BE LAID AT A MINIMUM GRADE OF 1.0 %. PIPES 225mm DIA. AND OVER TO BE LAID AT A MINIMUM GRADE OF 0.5% U.N.O. BEDDING MATERIAL TO AS2032 OR AS3725 AS APPROPRIATE.

SWD5 MINIMUM COVER TO PIPES 300mm DIA. AND OVER GENERALLY SHALL BE 450mm IN CARPARK & ROADWAY AREAS UNO.

SWD6 BACKFILL TRENCHES WITH APPROVED FILL, SUCH AS SANDY LOAM, COMPACTED IN 200mm LAYERS TO 98% OF STANDARD DENSITY TO AS1289.5.1.1.

SWD7 ANY PIPES OVER 15% GRADE SHALL HAVE CONCRETE BULKHEADS AT ALL JOINTS.

SWD8 PITS SHALL BE OF REINFORCED CONCRETE CONSTRUCTION AS DETAILED U.N.O. METAL GRATES AT LEVELS INDICATED. ALL PITS DEEPER THAN 1200mm TO HAVE CLIMB IRONS.

SWD9 BUILD INTO UPSTREAM FACE OF ALL PITS A 3.0m SUBSURFACE LINE FALLING TO PITS TO MATCH PIT INVERT.

SWD10 DRAINAGE PITS MAY ONLY BE SUBSTITUTED WITH ALTERNATIVE PRECAST PITS WITH THE PRIOR APPROVAL OF THE PRINCIPAL OR AS INDICATED ON THE DRAWINGS.

WORK-AS-EXECUTED DRAWINGS:

WD1 THE CONTRACTOR SHALL SUPPLY THE PRINCIPAL WITH FULL MARKED-UP AND CERTIFIED WORK-AS-EXECUTED DRAWINGS FOR THE WHOLE OF THE CONTRACT PRIOR TO THE FINAL CERTIFICATE. PRINTS OR REPRODUCIBLES OF THE CONTRACT DRAWINGS WILL BE SUPPLIED BY THE PRINCIPAL FREE OF CHARGE FOR THIS PURPOSE.

WD2 WORK-AS-EXECUTED DRAWINGS FOR ROADWORKS OR CARPARKS SHALL SHOW IN RED INK, ALL CHANGES TO THE CONTRACT DRAWINGS AND ACTUAL VALUES OF ALL LEVELS SHOWN ON THE DRAWINGS. THE DRAWINGS SHALL BE SIGNED BY A REGISTERED SURVEYOR AND CERTIFIED BY THE CONTRACTOR.

WD3 WORK-AS-EXECUTED DRAWINGS FOR DRAINAGE AND SEWER WORKS WHERE APPLICABLE SHALL SHOW IN RED INK ALL CHANGES TO THE CONTRACT DRAWINGS, INCLUDING VARIATIONS TO LEVELS, DIMENSIONS, CONCRETE, REINFORCEMENT AND OTHER MATERIALS. THE DRAWINGS SHALL BE CERTIFIED BY THE CONTRACTOR.

WORKING AREA:

WA1 THE PRINCIPAL WILL NOT BE RESPONSIBLE FOR THE SAFE KEEPING OF ANY OF THE CONTRACTOR'S PLANT, EQUIPMENT, TOOLS, MATERIALS OR OTHER PROPERTY. THE CONTRACTOR MAY PROVIDE, AT THEIR OWN COST, ANY SECURITY FENCING CONSIDERED NECESSARY AROUND THE SITE OFFICE, WORKSHOPS OR STORAGE AREAS, SUBJECT TO THE PRINCIPAL'S PRIOR APPROVAL.

WA2 IF EXISTING FENCING IS CUT OR ALTERED BY THE CONTRACTOR, THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY FENCING TO THE SATISFACTION OF THE PRINCIPAL DURING THE CONTRACT TO PREVENT UNAUTHORISED ENTRY INTO THE PROPERTY, AND SHALL REINSTATE THE FENCING AND REMOVE TEMPORARY FENCING ON COMPLETION OF THE WORK.

LEGEND

— S —— S ——	EXISTING SEWER LINE
— SR —— SR ——	EXISTING SEWER RISING MAIN
— T —— T ——	EXISTING TELSTRA LINE
— G —— G ——	EXISTING GAS LINE
— E —— E ——	EXISTING ELECTRICITY LINE
— W —— W ——	EXISTING WATER MAIN
— C —— C ——	EXISTING COMMUNICATIONS LINE
— OP —— OP ——	EXISTING OVERHEAD POWER LINE
— OF —— OF ——	EXISTING OPTIC FIBER
— SW —— SW ——	EXISTING STORMWATER LINE
—— — — ——	BOUNDARY LINE
— — — — — —	EASEMENT
PP ○	EXISTING POWER POLE
EX. WM ⊗	EXISTING WATER METER
EX. HYD ○	EXISTING HYDRANT
EX. SV ✕	EXISTING STOP VALVE
Ex.SMH ◯	EXISTING SEWER MANHOLE
(hatched box)	EXISTING ROAD / CAR PARK

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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PROJECT:
BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: NOTES SHEET

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C002
PROJECT No.: DN220019
REVISION: 3

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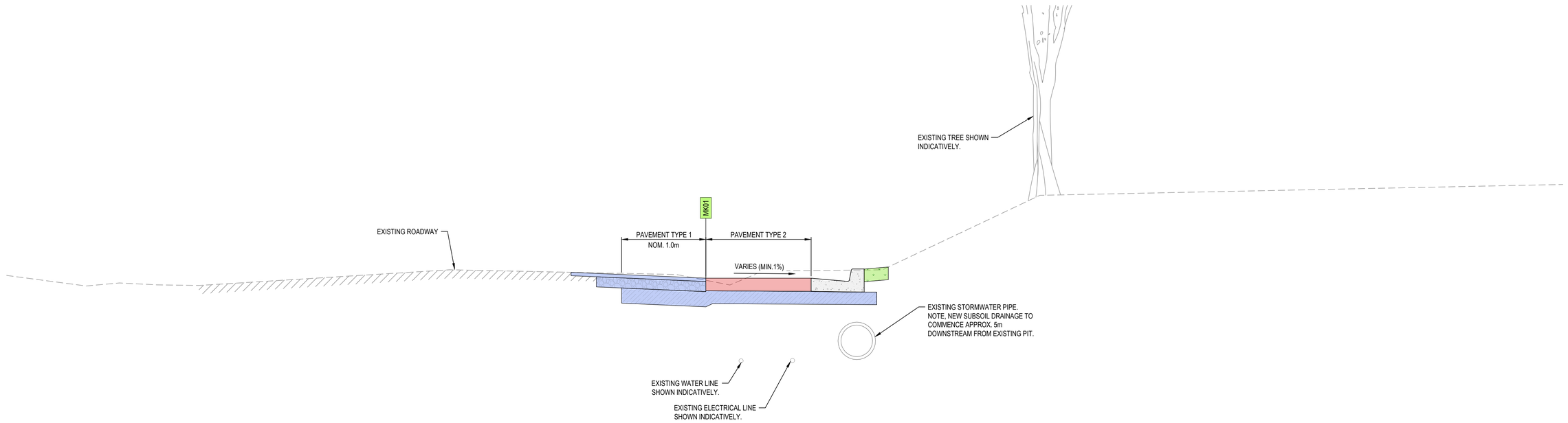
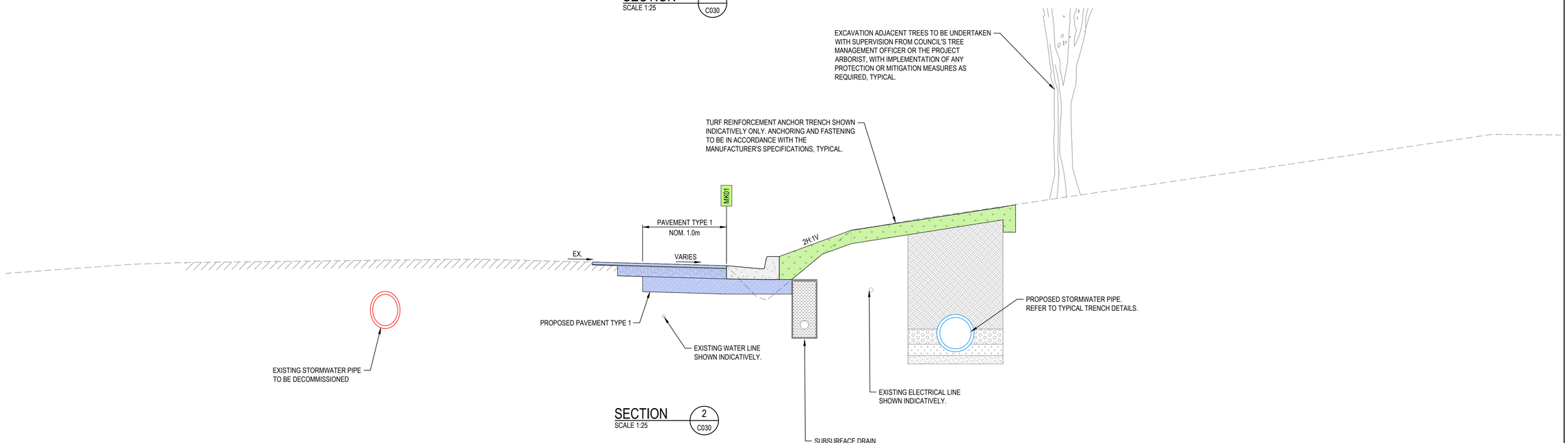


SECTION 1
SCALE 1:25
C030



SECTION 2
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C030

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
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PROJECT :
BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME:
TYPICAL CROSS SECTIONS SHEET 1

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C010
PROJECT No.: DN220019
REVISION: 3

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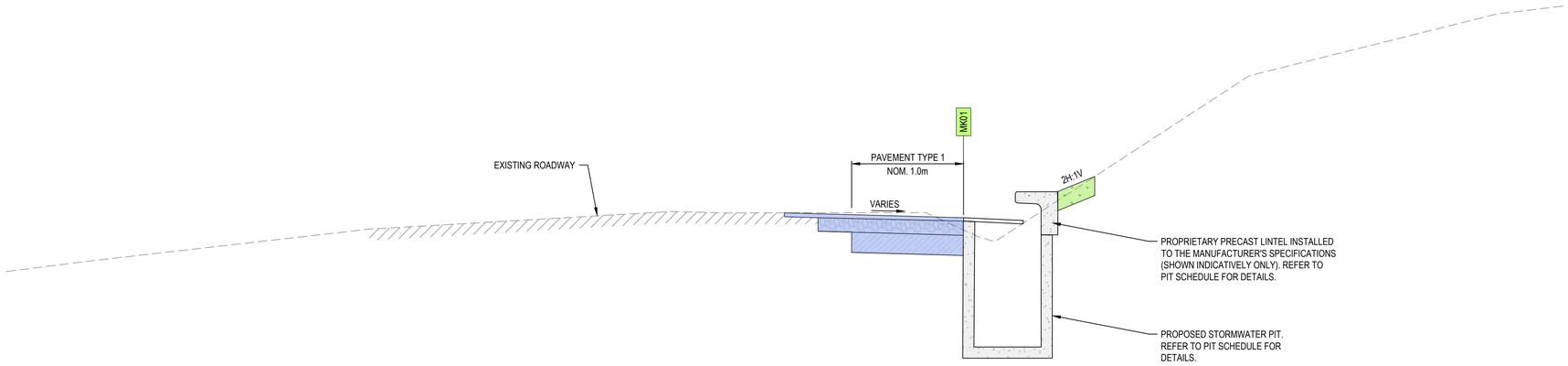

SECTION 3 C030
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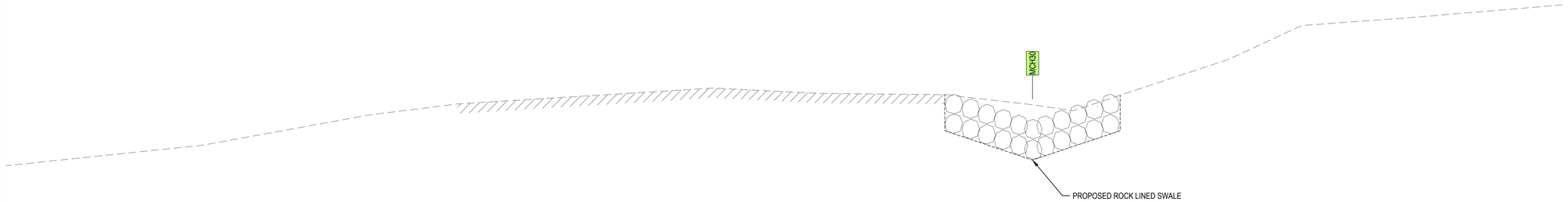

SECTION 4 C030
SCALE 1:25

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
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DATE OF SURVEY: -
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CLIENT: Shoalhaven City Council

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PROJECT : BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: TYPICAL CROSS SECTIONS SHEET 2

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	C011

PROJECT No.	REVISION:
DN220019	3

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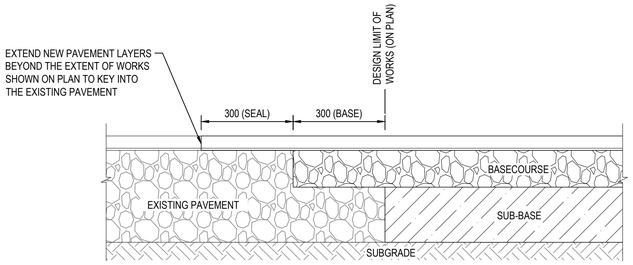
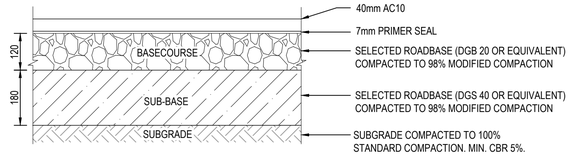


TYPICAL PAVEMENT INTERFACE

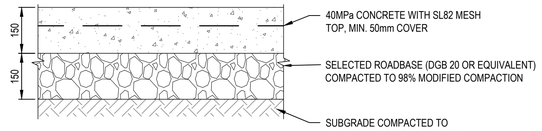
SCALE 1:10



TYPICAL SEALED PAVEMENT (TYPE 1) DETAIL

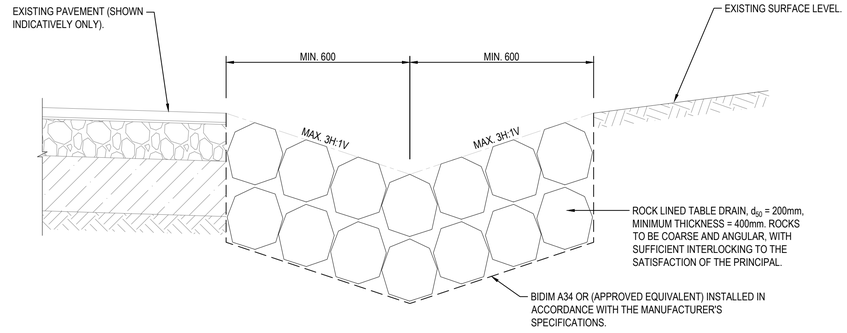
SCALE 1:10

SUBGRADE CBR AND PAVEMENT DESIGN TO BE CONFIRMED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.



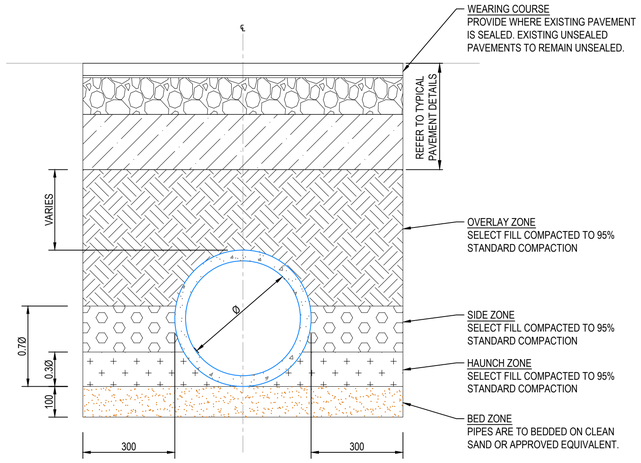
CONCRETE PAVEMENT (TYPE 2) DETAIL

SCALE 1:10



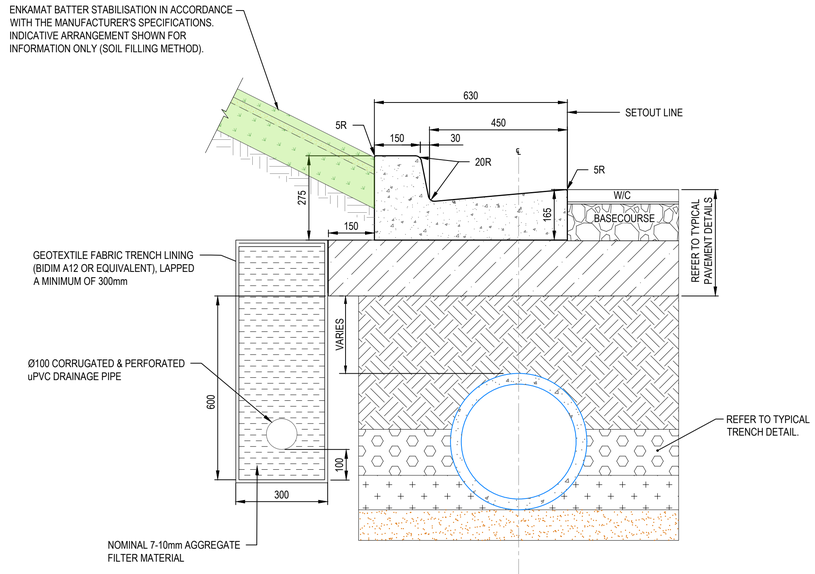
TYPICAL ROCK LINED TABLE DRAIN DETAIL - TYPE 1

SCALE 1:10



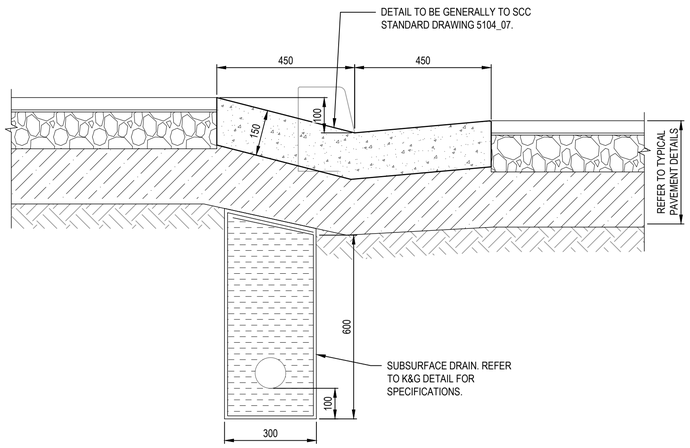
TYPICAL STORMWATER PIPE TRENCH DETAIL TRAFFICABLE

SCALE 1:10



TYPICAL KERB AND GUTTER (K&G) WITH STORMWATER DRAINAGE PIPE DETAIL

SCALE 1:10



TYPICAL LAYBACK DETAIL (VEHICULAR CROSSING)

SCALE 1:10

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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PROJECT : BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

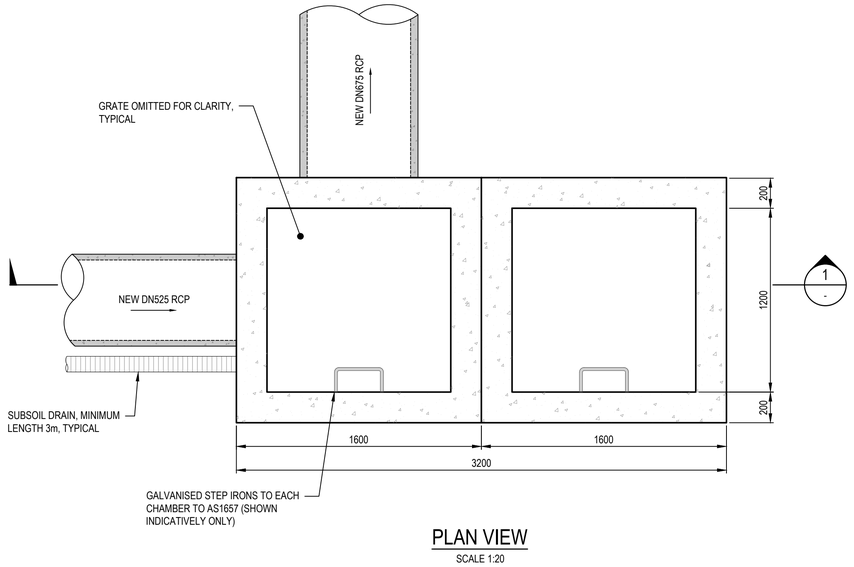
DRAWING NAME: TYPICAL DETAILS

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

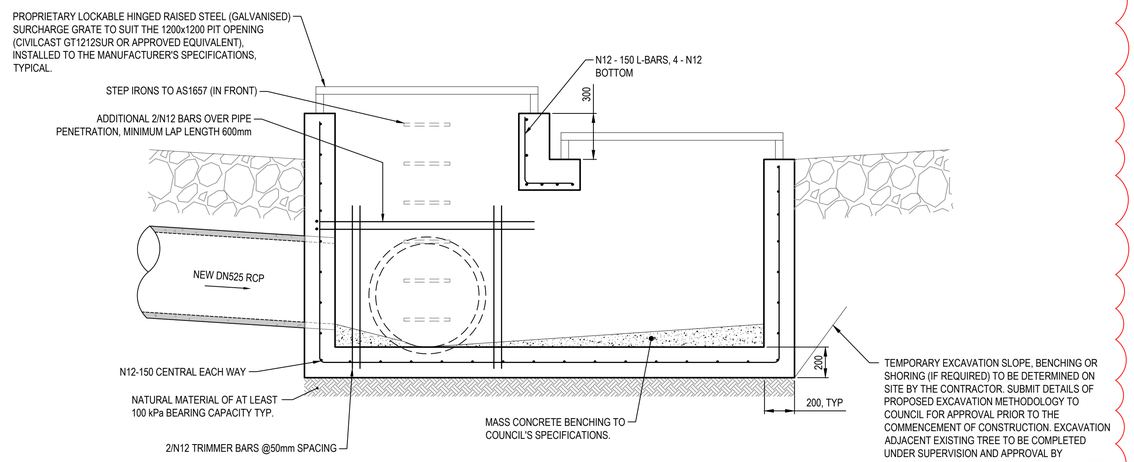
DRAWING STATUS	DRAWING No.
CONSTRUCTION	C020

PROJECT No.	REVISION:
DN220019	3

DO NOT SCALE



PLAN VIEW
SCALE 1:20



SECTION
SCALE 1:20
1
-

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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PROJECT :
BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

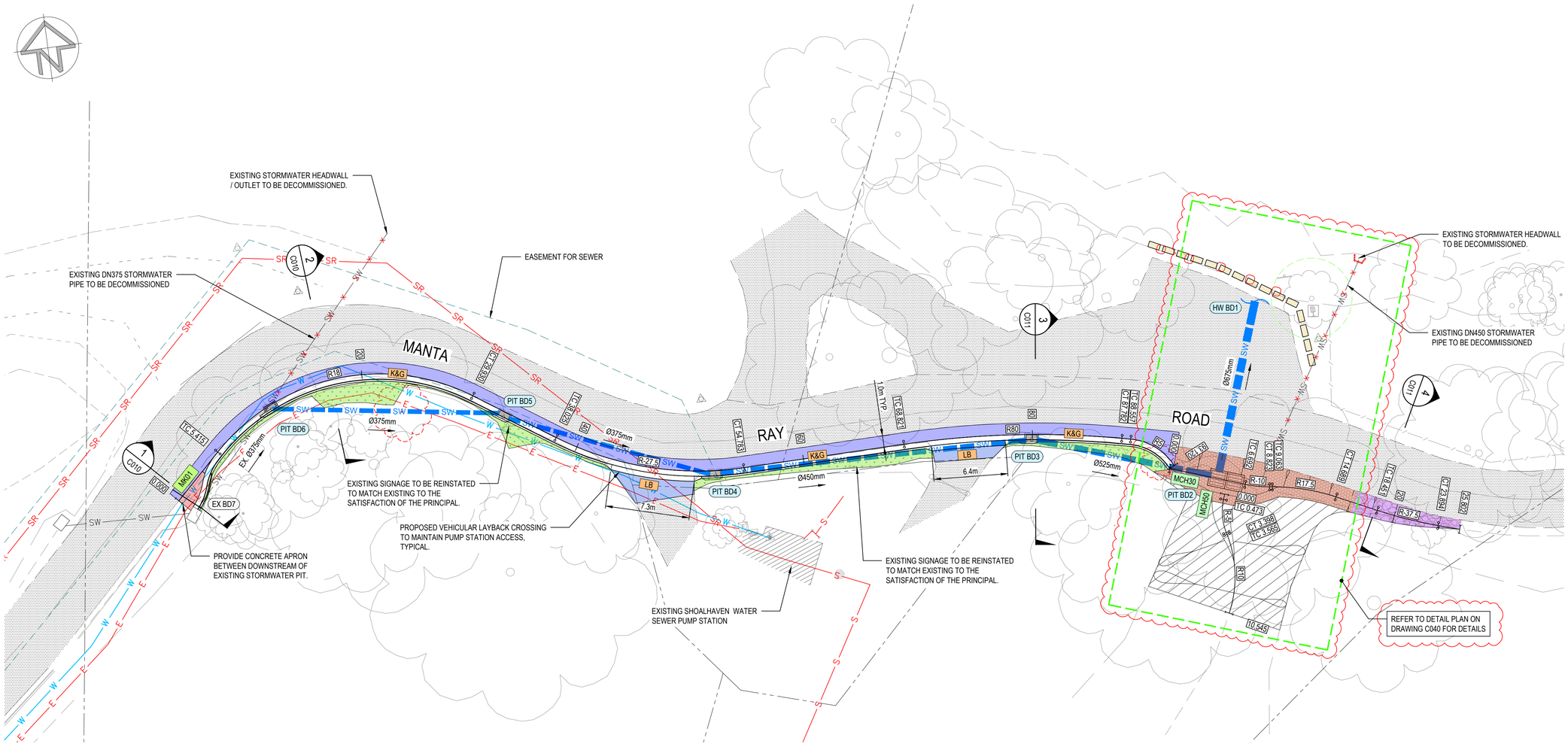
DRAWING NAME:
PIT BD2 DETAIL

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
AJ	JH	1:20	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	C022

PROJECT No.	REVISION:
DN220019	3

DO NOT SCALE



GENERAL ARRANGEMENT PLAN

SCALE 1:200

GENERAL LEGEND

- MC01 — CONTROL LINE
- SW — PROPOSED STORMWATER LINE
- PIT A1 — PROPOSED STORMWATER PIT
- EX PIT — EXISTING STORMWATER PIT
- K&G — PROPOSED KERB AND GUTTER
- LB — PROPOSED LAYBACK
- PROPOSED ROCK LINED SWALE - TYPE 1
- PROPOSED ROCK LINED SWALE - TYPE 2
- PROPOSED EMBANKMENT STABILISATION
- PAVEMENT TYPE 1 - BITUMEN
- PAVEMENT TYPE 2 - CONCRETE
- SR — EXISTING SEWER RISING MAIN (SHOWN INDICATIVELY)
- S — EXISTING SEWER MAIN (SHOWN INDICATIVELY)
- W — EXISTING WATER MAIN (SHOWN INDICATIVELY)
- E — EXISTING UNDERGROUND ELECTRICAL LINE (SHOWN INDICATIVELY)
- x SW x — EXISTING STORMWATER PIPE TO BE DECOMMISSIONED
- EXISTING TREE TO REMAIN
- TREE PROTECTION ZONE (TPZ) OF EXISTING TREE (AS SUPPLIED BY COUNCIL). NOTE, ONLY ONE TPZ PROVIDED AND REQUESTED FOR INCLUSION
- EXISTING TREE TO BE REMOVED
- PROPOSED SANDSTONE LOGS

PIT SCHEDULE

LABEL	PIT TYPE	COMMENTS
HW BD1	BEACH OUTLET STRUCTURE	DESIGN & DOCUMENTATION BY OTHERS
BD2	2x1200x1200 CAST IN SITU PIT	REFER TO SHEET C022 FOR DETAILS
BD3	600x900 PRECAST CONCRETE PIT WITH 3.0m PRECAST LINTEL	
BD4	600x900 PRECAST CONCRETE PIT WITH 2.4m PRECAST LINTEL	
BD5	600x900 PRECAST CONCRETE PIT WITH 1.8m PRECAST LINTEL	
BD6	600x900 PRECAST CONCRETE PIT WITH 1.8m PRECAST LINTEL	INSTALL NEW PIT OVER EXISTING DN375 PIPE. CONFIRM INVERT LEVEL ON SITE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
EX BD7	EXISTING INLET PIT TO BE RETAINED	

0 4 8 12 16 20m

4 3 2 1

SCALE 1:200

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
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1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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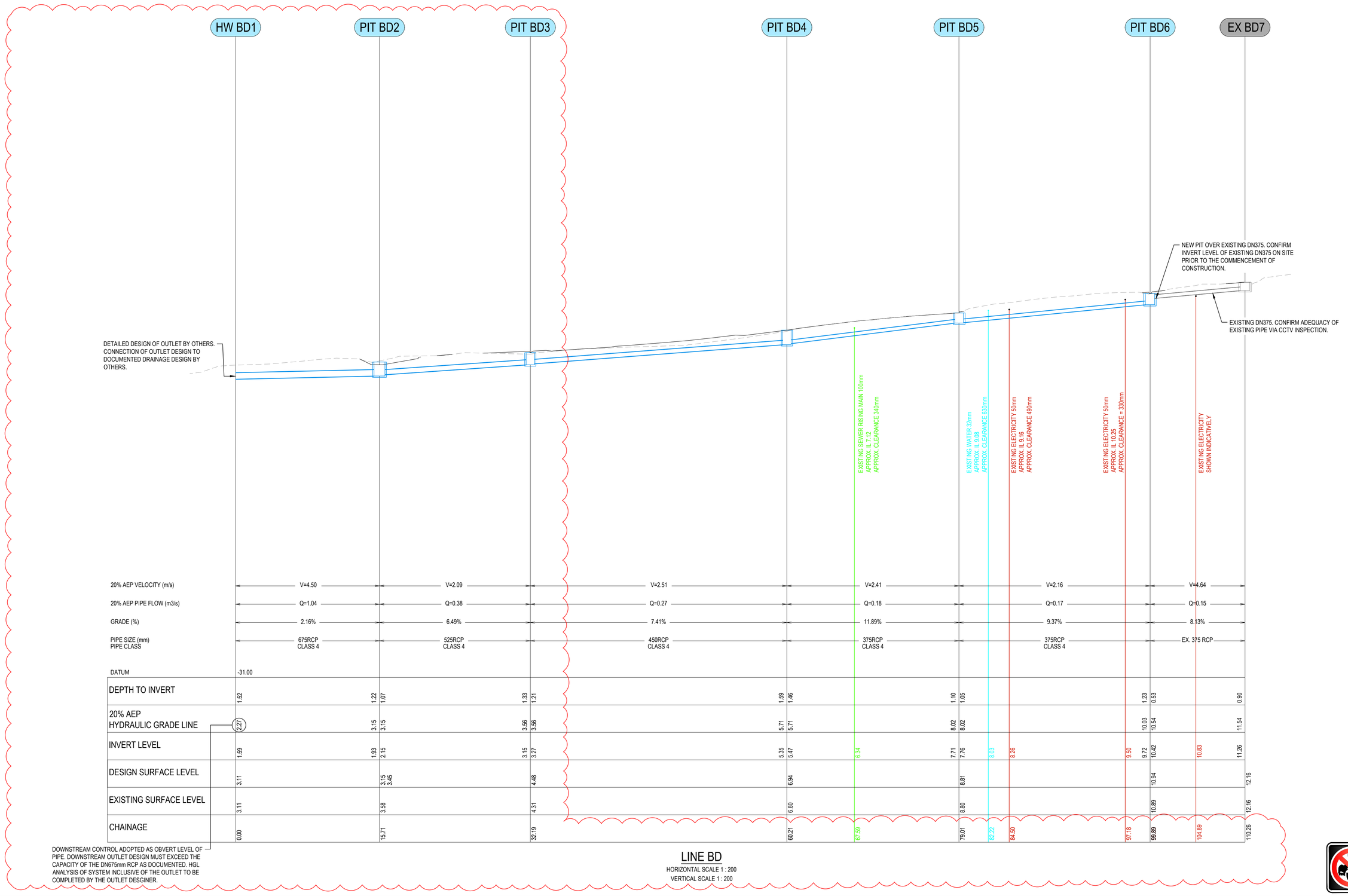
PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: GENERAL ARRANGEMENT PLAN

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	NOTED	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C030
PROJECT No.: DN220019
REVISION: 3

DO NOT SCALE



LINE BD

HORIZONTAL SCALE 1 : 200
VERTICAL SCALE 1 : 200

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

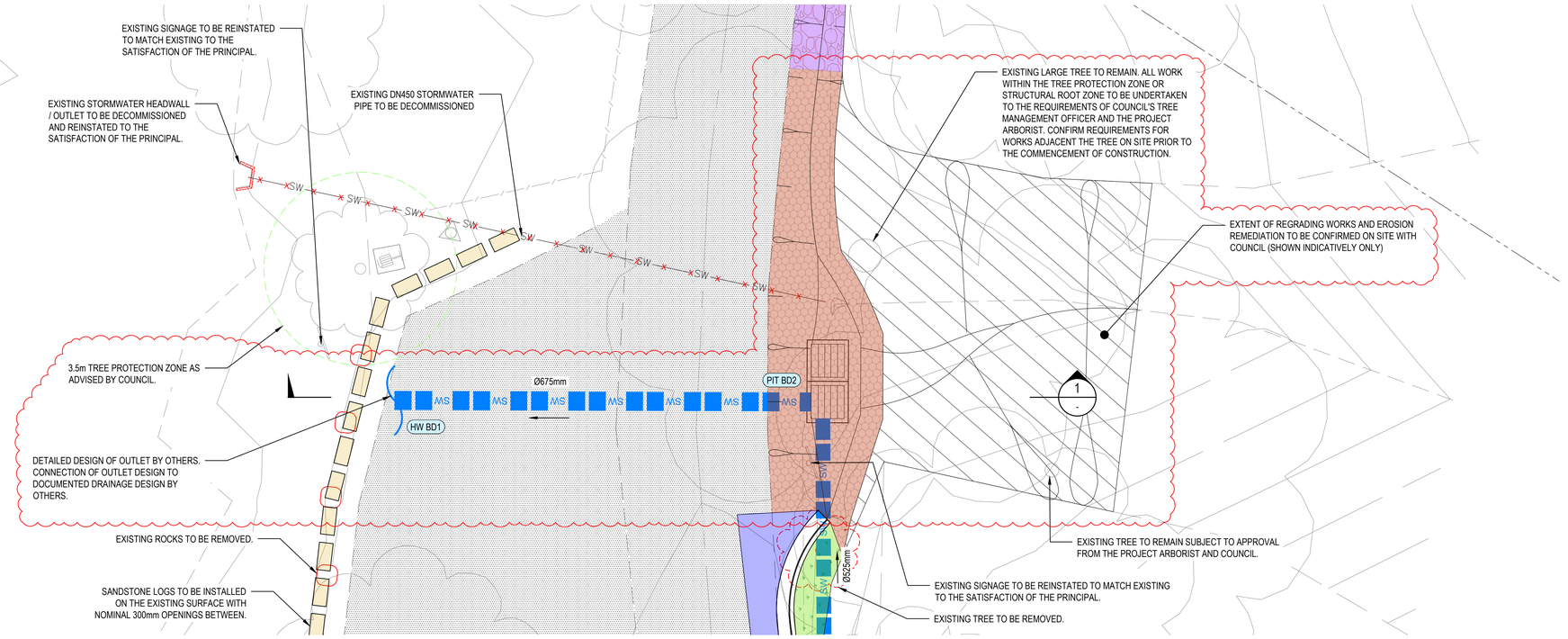
DRAWING NAME: STORMWATER LONGITUDINAL SECTION

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	1:100	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	C035

PROJECT No.	REVISION:
DN220019	3

DO NOT SCALE



OUTLET DETAIL PLAN

SCALE 1:100

GENERAL LEGEND

- MC01 — CONTROL LINE
- SW — PROPOSED STORMWATER LINE
- PIT A1 — PROPOSED STORMWATER PIT
- EX PIT — EXISTING STORMWATER PIT
- K&G — PROPOSED KERB AND GUTTER
- LB — PROPOSED LAYBACK
- PROPOSED ROCK LINED SWALE - TYPE 1
- PROPOSED ROCK LINED SWALE - TYPE 2
- PROPOSED EMBANKMENT STABILISATION
- PAVEMENT TYPE 1 - BITUMEN
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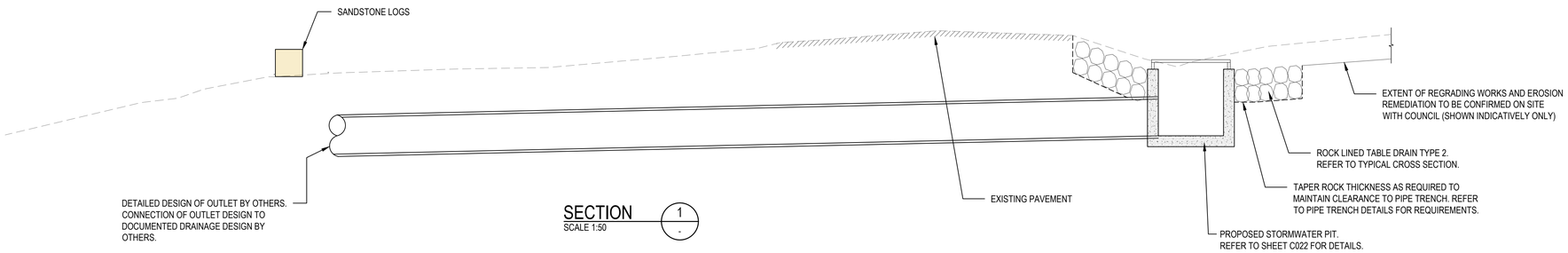
- SR — EXISTING SEWER RISING MAIN (SHOWN INDICATIVELY)
- S — EXISTING SEWER MAIN (SHOWN INDICATIVELY)
- W — EXISTING WATER MAIN (SHOWN INDICATIVELY)
- E — EXISTING UNDERGROUND ELECTRICAL LINE (SHOWN INDICATIVELY)
- SW — EXISTING STORMWATER PIPE TO BE DECOMMISSIONED
- EXISTING TREE TO REMAIN
- TREE PROTECTION ZONE (TPZ) OF EXISTING TREE (AS SUPPLIED BY COUNCIL). NOTE, ONLY ONE TPZ PROVIDED AND REQUESTED FOR INCLUSION
- EXISTING TREE TO BE REMOVED
- PROPOSED SANDSTONE LOGS



SECTION 1-1

SCALE 1:50

OUTLET DESIGN REMOVED FROM SCOPE

DIAL BEFORE YOU DIG www.1100.com.au

REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
E	ISSUED FOR REVIEW - OUTLET AMENDED	27.07.23	RM	AS
D	ISSUED FOR REVIEW - OUTLET AMENDED	23.06.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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PROJECT : BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

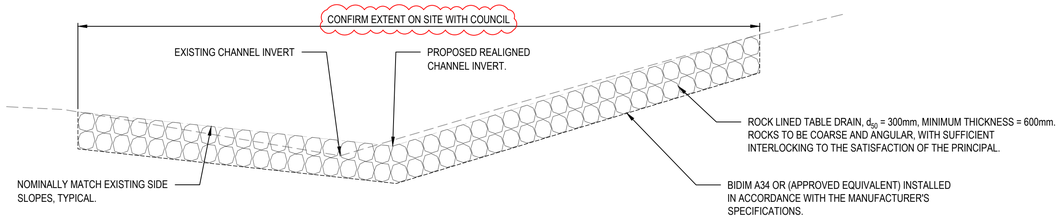
DRAWING NAME: OUTLET DETAIL PLAN

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
AJ/RM	JH	NOTED	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	C040

PROJECT No.	REVISION:
DN220019	3

DO NOT SCALE



TYPICAL ROCK LINED TABLE DRAIN DETAIL - TYPE 2

SCALE 1:50

OUTLET DESIGN REMOVED FROM SCOPE

DIAL BEFORE YOU DIG www.1100.com.au

REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
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1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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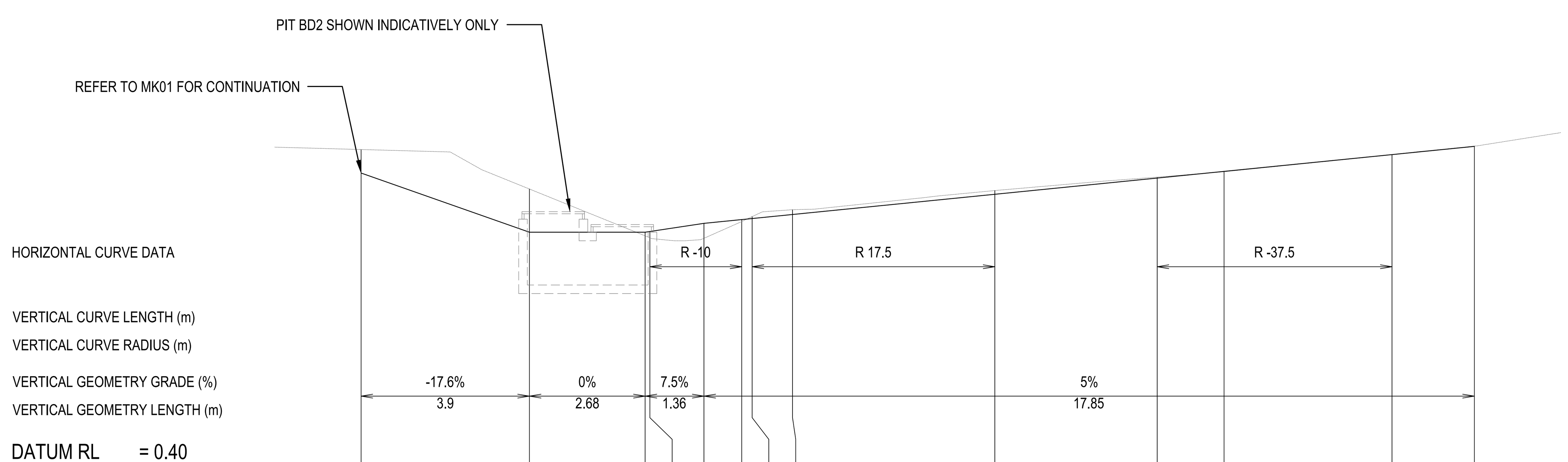
PROJECT : BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: OUTLET DETAILS SHEET

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
AJ/RM	JH	NOTED	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C041
PROJECT No.: DN220019
REVISION: 3

DO NOT SCALE

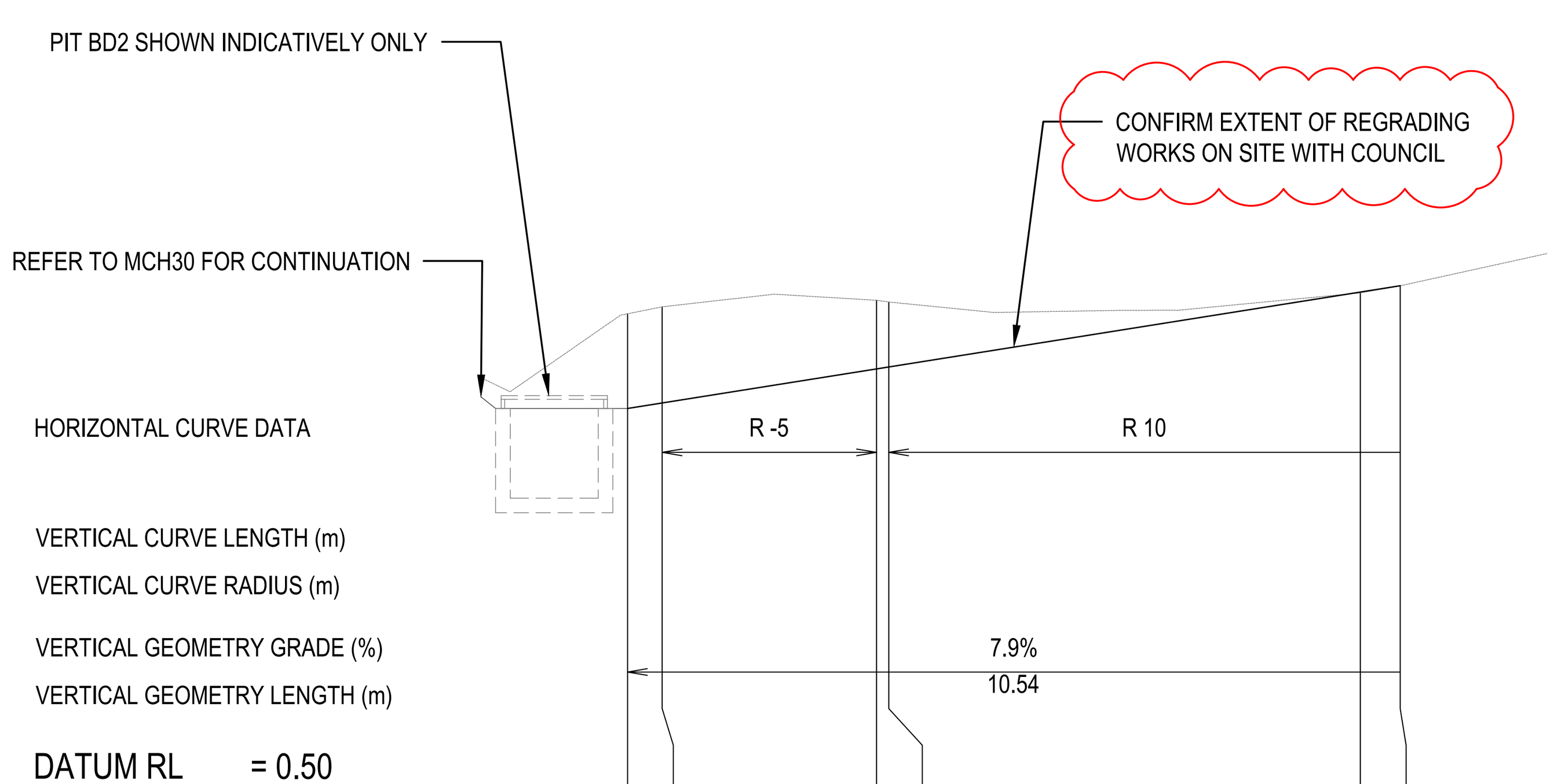


DATUM RL = 0.40

FINISHED SURFACE LEVEL	3.84	3.15	3.15	3.16	3.25	3.30	3.31	3.35	3.59	3.78	3.85	4.05	4.14
EXISTING SURFACE LEVEL	4.11	3.65	3.11	3.09	3.07	3.27	3.33	3.41	3.63	3.79	3.85	4.05	4.15
CUT / FILL DEPTH	-0.27	-0.50	0.04	0.07	0.18	0.02	-0.02	-0.06	-0.04	-0.01	0.00	0.00	-0.00
CONTROL LINE CHAINAGE	0	3.9	6.58	6.69	7.95	8.82	9.06	10	14.69	18.45	20	23.89	25.8

A1 SCALE: H 1:100, V 1:50

LONGITUDINAL SECTION MCH 30

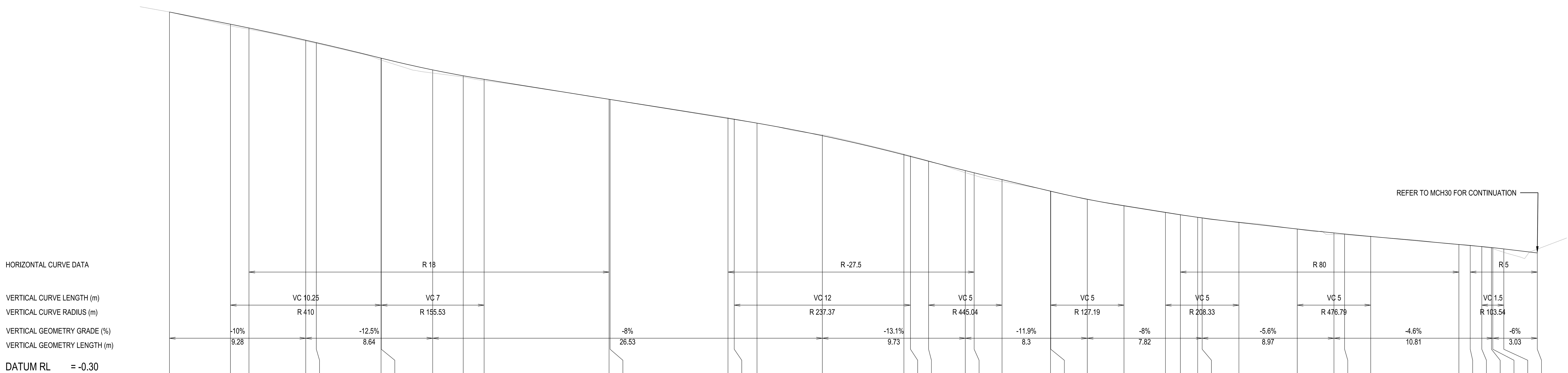


DATUM RL = 0.50

FINISHED SURFACE LEVEL	3.15	3.19	3.42	3.43	3.94	3.99
EXISTING SURFACE LEVEL	3.80	3.84	3.89	3.88	3.94	3.99
CUT / FILL DEPTH	-0.65	-0.66	-0.47	-0.44	0.01	0.00
CONTROL LINE CHAINAGE	0	0.47	3.4	3.56	10	10.54

A1 SCALE: H 1:100, V 1:50

LONGITUDINAL SECTION MCH 50



DATUM RL = -0.30

FINISHED SURFACE LEVEL	12.07	11.65	11.53	11.11	11.03	10.50	10.50	10.10	9.90	9.78	9.10	9.09	8.45	8.42
EXISTING SURFACE LEVEL	12.07	11.60	11.48	11.08	11.00	10.46	10.45	10.01	9.86	9.75	9.10	9.10	8.47	8.43
CUT / FILL DEPTH	-0.00	0.05	0.04	0.03	0.03	0.04	0.04	0.09	0.04	0.03	-0.00	-0.00	-0.02	-0.01
CONTROL LINE CHAINAGE	0	4.16	5.41	9.28	10	14.41	14.42	17.92	20	21.42	29.93	30	38.02	38.45

FINISHED SURFACE LEVEL	8.29	7.86	7.21	7.16	6.99	6.68	6.60	6.37	5.98	5.97	5.70	5.48	5.25	5.17
EXISTING SURFACE LEVEL	8.29	7.89	7.24	7.18	7.00	6.60	6.51	6.31	5.98	5.98	5.69	5.49	5.26	5.18
CUT / FILL DEPTH	0.00	-0.03	-0.02	-0.02	-0.01	0.07	0.09	0.06	-0.01	-0.01	0.01	-0.01	-0.01	-0.01
CONTROL LINE CHAINAGE	40	44.45	50	50.45	51.68	54.18	54.78	56.68	59.98	60	62.48	64.98	67.81	68.82

FINISHED SURFACE LEVEL	5.09	5.07	4.91	4.69	4.56	4.52	4.44	4.16	4.13	4.09	4.06	4.05	4.01	3.88
EXISTING SURFACE LEVEL	5.08	5.06	4.93	4.68	4.51	4.50	4.45	4.16	4.14	4.10	4.04	4.03	3.92	4.00
CUT / FILL DEPTH	0.00	0.01	-0.02	0.00	0.04	0.02	-0.01	-0.00	-0.01	-0.01	0.02	0.03	0.09	-0.13
CONTROL LINE CHAINAGE	70	70.31	72.81	76.78	79.28	80	81.78	87.78	88.56	89.34	90	90.09	90.84	93.12

A1 SCALE: H 1:150, V 1:75

LONGITUDINAL SECTION MK01

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REVISION	AMENDMENTS	DATE	CKD	APP
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1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
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CLIENT: Shoalhaven City Council

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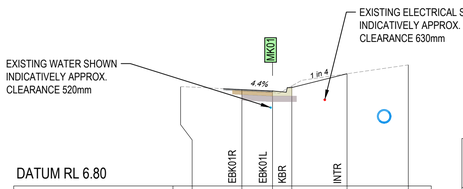
PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: LONGITUDINAL SECTIONS

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	NOTED	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: C045
PROJECT No.: DN220019
REVISION: 3

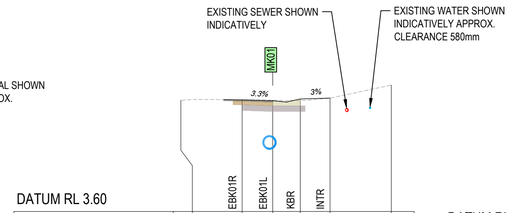
DO NOT SCALE



DATUM RL 6.80								
FINISHED SURFACE LEVEL		9.94	9.90	10.01	10.46			
CUT/FILL DEPTH		0.00	0.04	-0.05	0.00			
EXISTING SURFACE LEVEL	10.04	9.94	9.86	10.06	10.46	10.75		
OFFSET	-3.00	-1.00	0.00	0.63	2.43	4.43		

A1 SCALE H 1:100 V 1:100

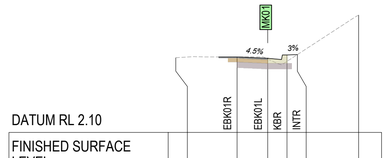
MK01 CH 20.00



DATUM RL 3.60								
FINISHED SURFACE LEVEL		7.25	7.21	7.27	7.30			
CUT/FILL DEPTH		0.00	-0.02	0.05	0.00			
EXISTING SURFACE LEVEL	7.23	7.25	7.24	7.22	7.30	7.73		
OFFSET	-3.00	-1.00	0.00	0.90	1.87	3.87		

A1 SCALE H 1:100 V 1:100

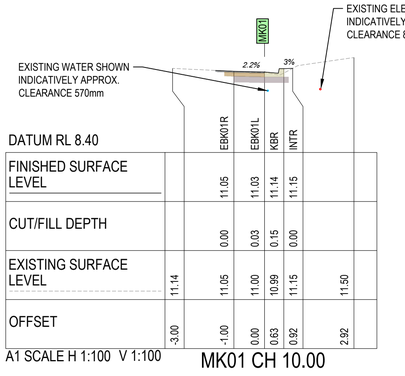
MK01 CH 50.00



DATUM RL 2.10								
FINISHED SURFACE LEVEL		4.56	4.52	4.63	4.64			
CUT/FILL DEPTH		0.00	0.02	0.21	0.00			
EXISTING SURFACE LEVEL	4.54	4.56	4.50	4.42	4.64	5.93		
OFFSET	-3.00	-1.00	0.00	0.63	0.97	2.97		

A1 SCALE H 1:100 V 1:100

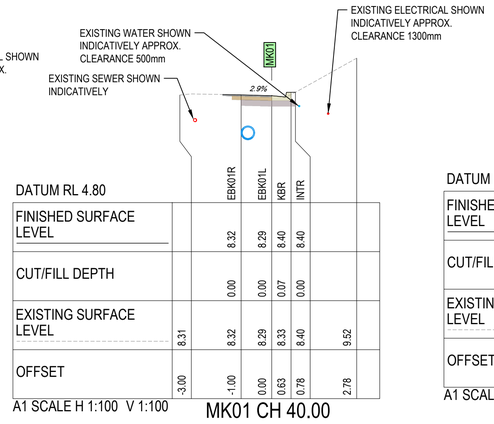
MK01 CH 80.00



DATUM RL 8.40								
FINISHED SURFACE LEVEL		11.05	11.03	11.14	11.15			
CUT/FILL DEPTH		0.00	0.03	0.15	0.00			
EXISTING SURFACE LEVEL	11.14	11.05	11.00	10.99	11.15	11.50		
OFFSET	-3.00	-1.00	0.00	0.63	0.92	2.92		

A1 SCALE H 1:100 V 1:100

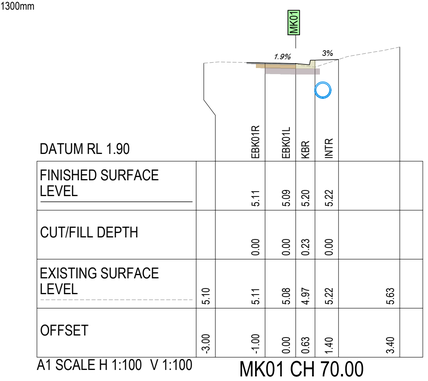
MK01 CH 10.00



DATUM RL 4.80								
FINISHED SURFACE LEVEL		8.32	8.29	8.40	8.40			
CUT/FILL DEPTH		0.00	0.00	0.07	0.00			
EXISTING SURFACE LEVEL	8.31	8.32	8.29	8.33	8.40	9.52		
OFFSET	-3.00	-1.00	0.00	0.63	0.78	2.78		

A1 SCALE H 1:100 V 1:100

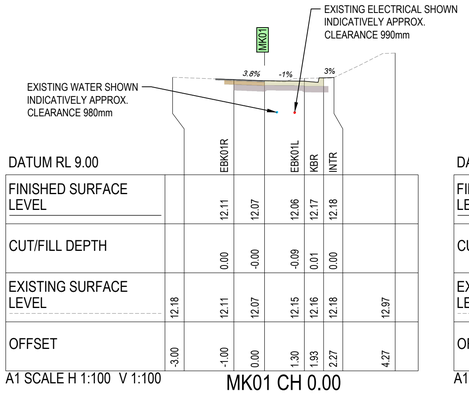
MK01 CH 40.00



DATUM RL 1.90								
FINISHED SURFACE LEVEL		5.11	5.09	5.20	5.22			
CUT/FILL DEPTH		0.00	0.00	0.23	0.00			
EXISTING SURFACE LEVEL	5.10	5.11	5.08	4.97	5.22	5.63		
OFFSET	-3.00	-1.00	0.00	0.63	1.40	3.40		

A1 SCALE H 1:100 V 1:100

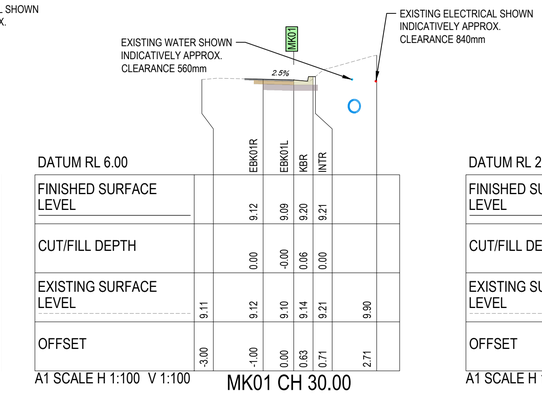
MK01 CH 70.00



DATUM RL 9.00								
FINISHED SURFACE LEVEL		12.11	12.07	12.06	12.17	12.18		
CUT/FILL DEPTH		0.00	-0.00	-0.09	0.01	0.00		
EXISTING SURFACE LEVEL	12.18	12.11	12.07	12.15	12.16	12.18	12.97	
OFFSET	-3.00	-1.00	0.00	1.30	1.93	2.27	4.27	

A1 SCALE H 1:100 V 1:100

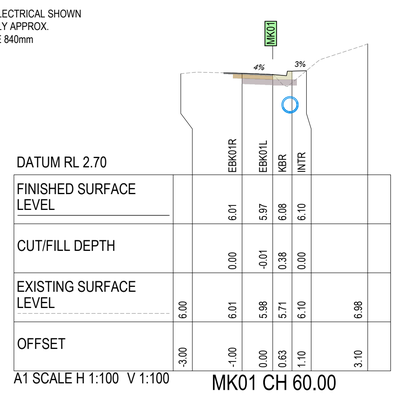
MK01 CH 0.00



DATUM RL 6.00								
FINISHED SURFACE LEVEL		9.12	9.09	9.20	9.21			
CUT/FILL DEPTH		0.00	-0.00	0.06	0.00			
EXISTING SURFACE LEVEL	9.11	9.12	9.10	9.14	9.21	9.90		
OFFSET	-3.00	-1.00	0.00	0.63	0.71	2.71		

A1 SCALE H 1:100 V 1:100

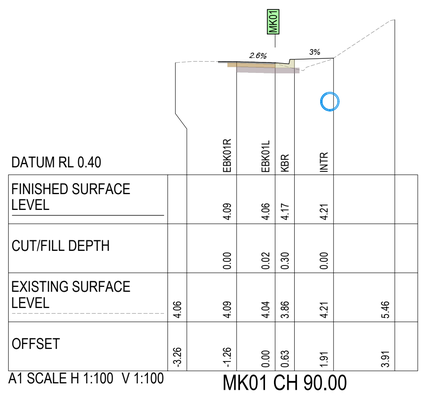
MK01 CH 30.00



DATUM RL 2.70								
FINISHED SURFACE LEVEL		6.01	5.97	6.08	6.10			
CUT/FILL DEPTH		0.00	-0.01	0.38	0.00			
EXISTING SURFACE LEVEL	6.00	6.01	5.98	5.71	6.10	6.98		
OFFSET	-3.00	-1.00	0.00	0.63	1.10	3.10		

A1 SCALE H 1:100 V 1:100

MK01 CH 60.00



DATUM RL 0.40								
FINISHED SURFACE LEVEL		4.09	4.06	4.17	4.21			
CUT/FILL DEPTH		0.00	0.02	0.30	0.00			
EXISTING SURFACE LEVEL	4.06	4.09	4.04	3.86	4.21	5.46		
OFFSET	-3.26	-1.26	0.00	0.63	1.91	3.91		

A1 SCALE H 1:100 V 1:100

MK01 CH 90.00

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

MIENGINEERS
SYDNEY OFFICE
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Tel (02) 4423 0566
WOLLONGONG OFFICE
Suite 3a, 128-134 Crown Street, Wollongong NSW 2500
Tel (02) 4423 0566
MIENGINEERS.COM

PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

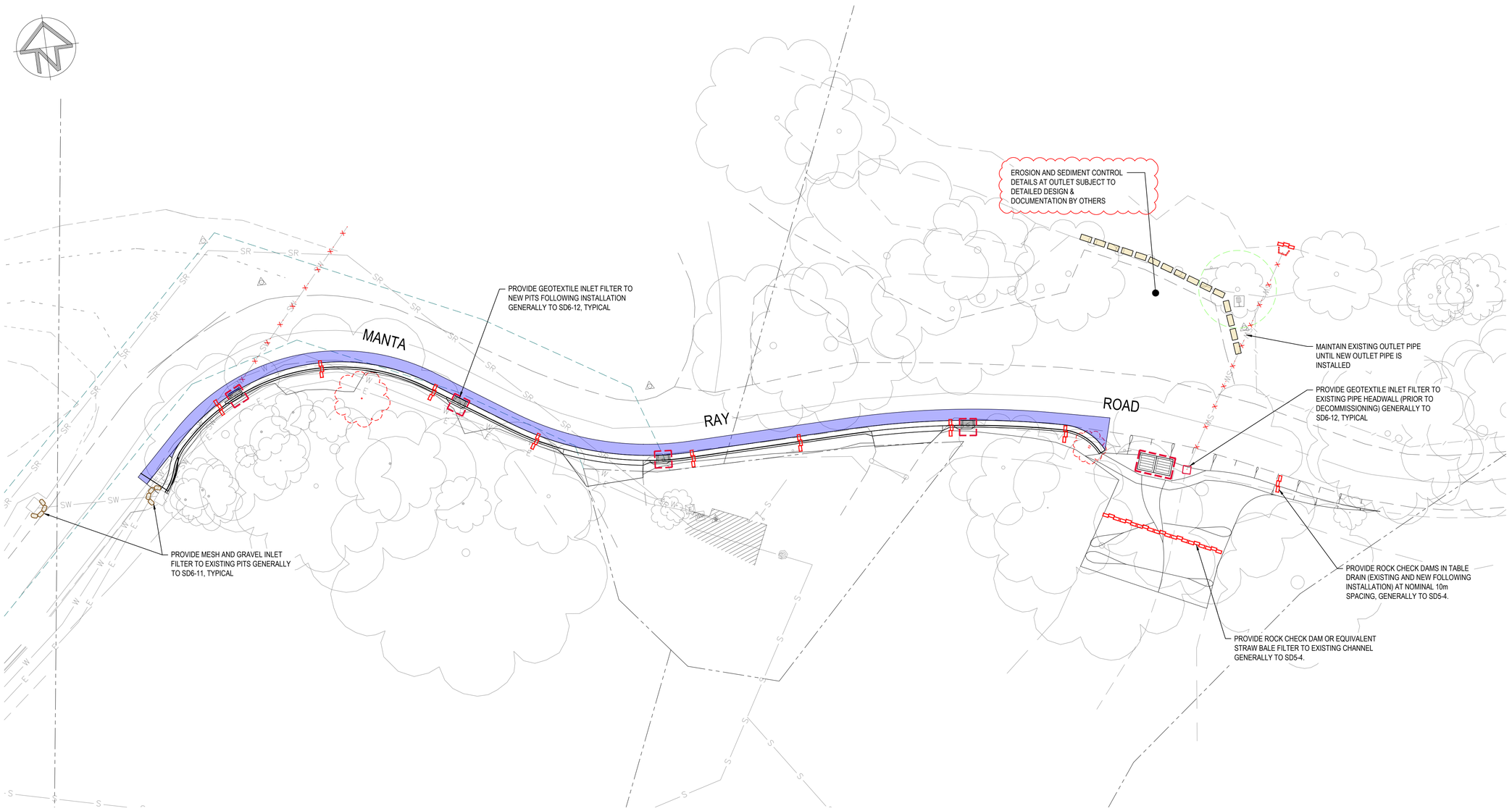
DRAWING NAME: CROSS SECTIONS SHEET

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	1:200	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	C050

PROJECT No.	REVISION:
DN220019	3

DO NOT SCALE



EROSION & SEDIMENT CONTROL LEGEND

- SF — SEDIMENT FENCE (SD6-8)
- STABALISED SITE ACCESS (SD6-14)
- DIVERSION BANK (SD5-5)
- GEOTEXTILE INLET FILTER (SD6-12)
- ROCK CHECK DAM (SD5-4)
- MESH AND GRAVEL INLET FILTER (SD6-11)

EROSION & SEDIMENT CONTROL NOTES

1. ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AND STRUCTURES SHALL BE LOCATED, CONSTRUCTED & MAINTAINED IN ACCORDANCE WITH THE GUIDELINES AND PRINCIPLES AS OUTLINED IN LANDCOM'S "SOILS AND CONSTRUCTION" VOLUME 1 (MANAGING URBAN STORMWATER 4TH EDITION, MARCH 2004),(MUS).
2. STOCKPILE SITES TO BE DETERMINED ON SITE AND APPROVED BY PRINCIPAL.

EROSION & SEDIMENT CONTROL PLAN

SCALE 1:200

0 4 8 12 16 20m
4 3 2 1
SCALE 1:200

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
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A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
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CLIENT: Shoalhaven City Council

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Suite 3a, 128-134 Crown Street,
Wollongong NSW 2500
Tel (02) 4423 0566
MIENGINEERS.COM

PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: EROSION & SEDIMENT CONTROL PLAN

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS	DRAWING No.
CONSTRUCTION	CE01

PROJECT No.	REVISION:
DN220019	3

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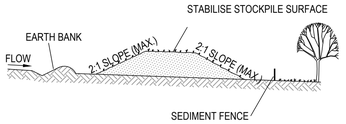
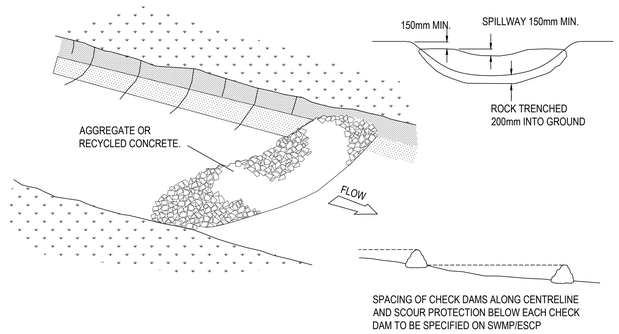


CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2 (PREFERABLY 5) METRES FROM EXISTING VEGETATION, CONCENTRATED WATER FLOW, ROADS AND HAZARD AREAS.
2. CONSTRUCT ON THE CONTOUR AS LOW, FLAT, ELONGATED MOUNDS.
3. WHERE THERE IS SUFFICIENT AREA, TOPSOIL STOCKPILES SHALL BE LESS THAN 2 METRES IN HEIGHT.
4. WHERE THEY ARE TO BE IN PLACE FOR MORE THAN 10 DAYS, STABILISE FOLLOWING THE APPROVED ESCP OR SWMP TO REDUCE THE C-FACTOR TO LESS THAN 0.10.
5. CONSTRUCT EARTH BANKS (STANDARD DRAWING 5-5) ON THE UPSLOPE SIDE TO DIVERT WATER AROUND STOCKPILES AND SEDIMENT FENCES (STANDARD DRAWING 6-8) 1 TO 2 METRES DOWNSLOPE.

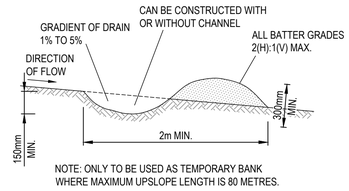
STOCKPILES SD 4-1



CONSTRUCTION NOTES

1. CHECK DAMS CAN BE BUILT WITH VARIOUS MATERIALS, INCLUDING ROCKS, LOGS, SANDBAGS AND STRAW BALES. THE MAINTENANCE PROGRAM SHOULD ENSURE THEIR INTEGRITY IS RETAINED, ESPECIALLY WHERE CONSTRUCTED WITH STRAW BALES. IN THE CASE OF BALES, THIS MIGHT REQUIRE THEIR REPLACEMENT EACH TWO TO FOUR MONTHS.
2. TRENCH THE CHECK DAM 200mm INTO THE GROUND ACROSS ITS WHOLE WIDTH. WHERE ROCK IS USED, FILL THE TRENCHES TO AT LEAST 100 MM ABOVE THE GROUND SURFACE TO REDUCE THE RISK OF UNDERCUTTING.
3. NORMALLY, THEIR MAXIMUM HEIGHT SHOULD NOT EXCEED 600 MM ABOVE THE GULLY FLOOR. THE CENTRE SHOULD ACT AS A SPILLWAY, BEING AT LEAST 150mm LOWER THAN THE OUTER EDGES.
4. SPACE THE DAMS SO THE TOE OF THE UPSTREAM DAM IS LEVEL WITH THE SPILLWAY OF THE NEXT DOWNSTREAM DAM.

ROCK CHECK DAM SD 5-4

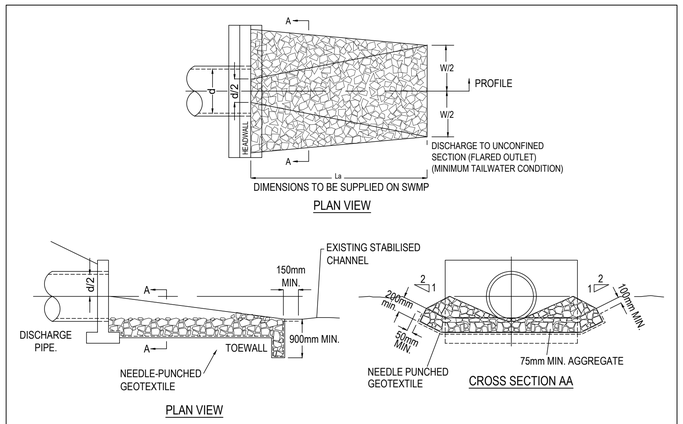


NOTE: ONLY TO BE USED AS TEMPORARY BANK WHERE MAXIMUM UPSLOPE LENGTH IS 80 METRES.

CONSTRUCTION NOTES

1. BUILD WITH GRADIENTS BETWEEN 1 PERCENT AND 5 PERCENT.
2. AVOID REMOVING TREES AND SHRUBS IF POSSIBLE - WORK AROUND THEM.
3. ENSURE THE STRUCTURES ARE FREE OF PROJECTIONS OR OTHER IRREGULARITIES THAT COULD IMPEDE WATER FLOW.
4. BUILD THE DRAINS WITH CIRCULAR, PARABOLIC OR TRAPEZOIDAL CROSS SECTIONS, NOT V SHAPED.
5. ENSURE THE BANKS ARE PROPERLY COMPACTED TO PREVENT FAILURE.
6. COMPLETE PERMANENT OR TEMPORARY STABILISATION WITHIN 10 DAYS OF CONSTRUCTION.

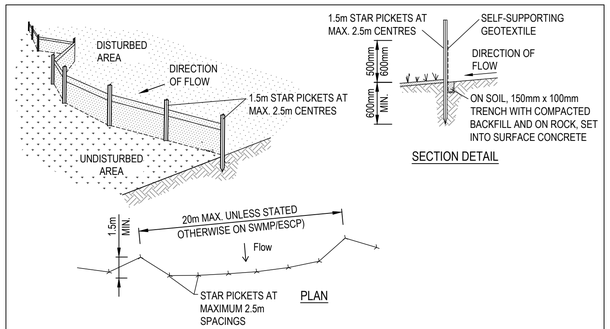
EARTH BANK (LOW FLOW) SD 5-5



CONSTRUCTION NOTES

1. COMPACT THE SUBGRADE FILL TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL.
2. PREPARE A SMOOTH, EVEN FOUNDATION FOR THE STRUCTURE THAT WILL ENSURE THAT THE NEEDLE-PUNCHED GEOTEXTILE DOES NOT SUSTAIN SERIOUS DAMAGE WHEN COVERED WITH ROCK.
3. SHOULD ANY MINOR DAMAGE TO THE GEOTEXTILE OCCUR, REPAIR IT BEFORE SPREADING ANY AGGREGATE. FOR REPAIRS, PATCH ONE PIECE OF FABRIC OVER THE DAMAGE, MAKING SURE THAT ALL JOINTS AND PATCHES OVERLAP MORE THAN 300mm.
4. LAY ROCK FOLLOWING THE DRAWING, ACCORDING TO TABLE 5.2 OF LANDCOM (2004) AND WITH A MINIMUM DIAMETER OF 75mm.
5. ENSURE THAT ANY CONCRETE OR RIPRAP USED FOR THE ENERGY DISSIPATER OR THE OUTLET PROTECTION CONFORMS TO THE GRADING LIMITS SPECIFIED ON THE SWMP.

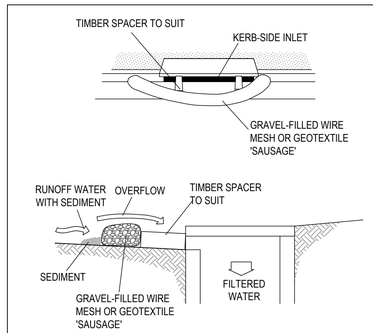
ENERGY DISSIPATER SD 5-8



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCES AS CLOSE AS POSSIBLE TO BEING PARALLEL TO THE CONTOURS OF THE SITE, BUT WITH SMALL RETURNS AS SHOWN IN THE DRAWING TO LIMIT THE CATCHMENT AREA OF ANY ONE SECTION. THE CATCHMENT AREA SHOULD BE SMALL ENOUGH TO LIMIT WATER FLOW IF CONCENTRATED AT ONE POINT TO 50 LITRES PER SECOND IN THE DESIGN STORM EVENT, USUALLY THE 10-YEAR EVENT.
2. CUT A 150-MM DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
3. DRIVE 1.5 METRE LONG STAR PICKETS INTO GROUND AT 2.5 METRE INTERVALS (MAX) AT THE DOWNSLOPE EDGE OF THE TRENCH. ENSURE ANY STAR PICKETS ARE FITTED WITH SAFETY CAPS.
4. FIX SELF-SUPPORTING GEOTEXTILE TO THE UPSLOPE SIDE OF THE POSTS ENSURING IT GOES TO THE BASE OF THE TRENCH. FIX THE GEOTEXTILE WITH WIRE TIES OR AS RECOMMENDED BY THE MANUFACTURER. ONLY USE GEOTEXTILE SPECIFICALLY PRODUCED FOR SEDIMENT FENCING. THE USE OF SHADE CLOTH FOR THIS PURPOSE IS NOT SATISFACTORY.
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150-MM OVERLAP.
6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE SD 6-8

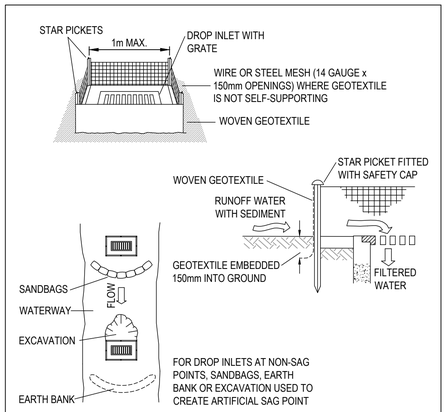


NOTE: THIS PRACTICE ONLY TO BE USED WHERE SPECIFIED IN AN APPROVED SWMP/ESCP.

CONSTRUCTION NOTES

1. INSTALL FILTERS TO KERB INLETS ONLY AT SAG POINTS.
2. FABRICATE A SLEEVE MADE FROM GEOTEXTILE OR WIRE MESH LONGER THAN THE LENGTH OF THE INLET PIT AND FILL IT WITH 25mm TO 5mm GRAVEL.
3. FORM AN ELLIPTICAL CROSS-SECTION ABOUT 150mm HIGH x 400mm WIDE.
4. PLACE THE FILTER AT THE OPENING LEAVING AT LEAST A 100mm SPACE BETWEEN IT AND THE KERB INLET. MAINTAIN THE OPENING WITH SPACER BLOCKS.
5. FORM A SEAL WITH THE KERB TO PREVENT SEDIMENT BYPASSING THE FILTER.
6. SANDBAGS FILLED WITH GRAVEL CAN SUBSTITUTE FOR THE MESH OR GEOTEXTILE PROVIDING THEY ARE PLACED SO THAT THEY FIRMLY ABUT EACH OTHER AND SEDIMENT-LADEN WATERS CANNOT PASS BETWEEN.

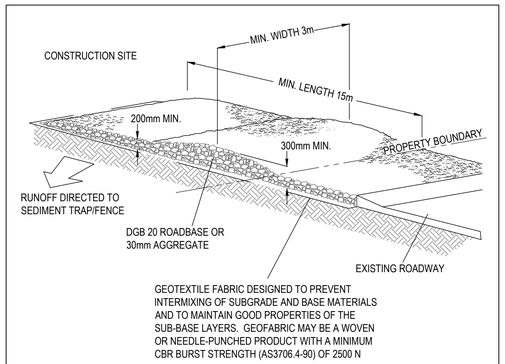
MESH AND GRAVEL INLET FILTER SD 6-11



CONSTRUCTION NOTES

1. FABRICATE A SEDIMENT BARRIER MADE FROM GEOTEXTILE OR STRAW BALES.
2. FOLLOW STANDARD DRAWING 6-7 AND STANDARD DRAWING 6-8 FOR INSTALLATION PROCEDURES FOR THE STRAW BALES OR GEOFABRIC. REDUCE THE PICKET SPACING TO 1 METRE CENTRES.
3. IN WATERWAYS, ARTIFICIAL SAG POINTS CAN BE CREATED WITH SANDBAGS OR EARTH BANKS AS SHOWN IN THE DRAWING.
4. DO NOT COVER THE INLET WITH GEOTEXTILE UNLESS THE DESIGN IS ADEQUATE TO ALLOW FOR ALL WATERS TO BYPASS IT.

GEOTEXTILE INLET FILTER SD 6-12



CONSTRUCTION NOTES

1. STRIP THE TOPSOIL, LEVEL THE SITE AND COMPACT THE SUBGRADE.
2. COVER THE AREA WITH NEEDLE-PUNCHED GEOTEXTILE.
3. CONSTRUCT A 200mm THICK PAD OVER THE GEOTEXTILE USING ROAD BASE OR 30mm AGGREGATE.
4. ENSURE THE STRUCTURE IS AT LEAST 15 METRES LONG OR TO BUILDING ALIGNMENT AND AT LEAST 3 METRES WIDE.
5. WHERE A SEDIMENT FENCE JOINS ONTO THE STABILISED ACCESS, CONSTRUCT A HUMP IN THE STABILISED ACCESS TO DIVERT WATER TO THE SEDIMENT FENCE

STABILISED SITE ACCESS SD 6-14

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REVISION	AMENDMENTS	DATE	CKD	APP
3	ISSUED FOR CONSTRUCTION - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	18.03.25	RM	AS
2	ISSUED FOR REVIEW - DESIGN OF OUTLET OMITTED, MINOR AMENDMENTS AS CLOUDED	24.02.25	RM	AS
1	ISSUED FOR CONSTRUCTION	08.12.23	RM	AS
C	ISSUED FOR REVIEW - KERB AND GUTTER ADDED	16.05.23	RM	AS
B	ISSUED FOR REVIEW - SERVICE LOCATING ADDED	21.10.22	RM	AS
A	ISSUED FOR REVIEW	26.05.22	RM	AS

SURVEYOR: AXIOM SPATIAL SURVEYORS
DATE OF SURVEY: -
ORIGIN: -
HEIGHT OF DATUM: -
HORIZONTAL DATUM: -

CLIENT: Shoalhaven City Council

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49 Berry Street, Nowra NSW 2541
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WOLLONGONG OFFICE
Suite 3a, 128-134 Crown Street, Wollongong NSW 2500
Tel (02) 4423 0566
MIENGINEERS.COM

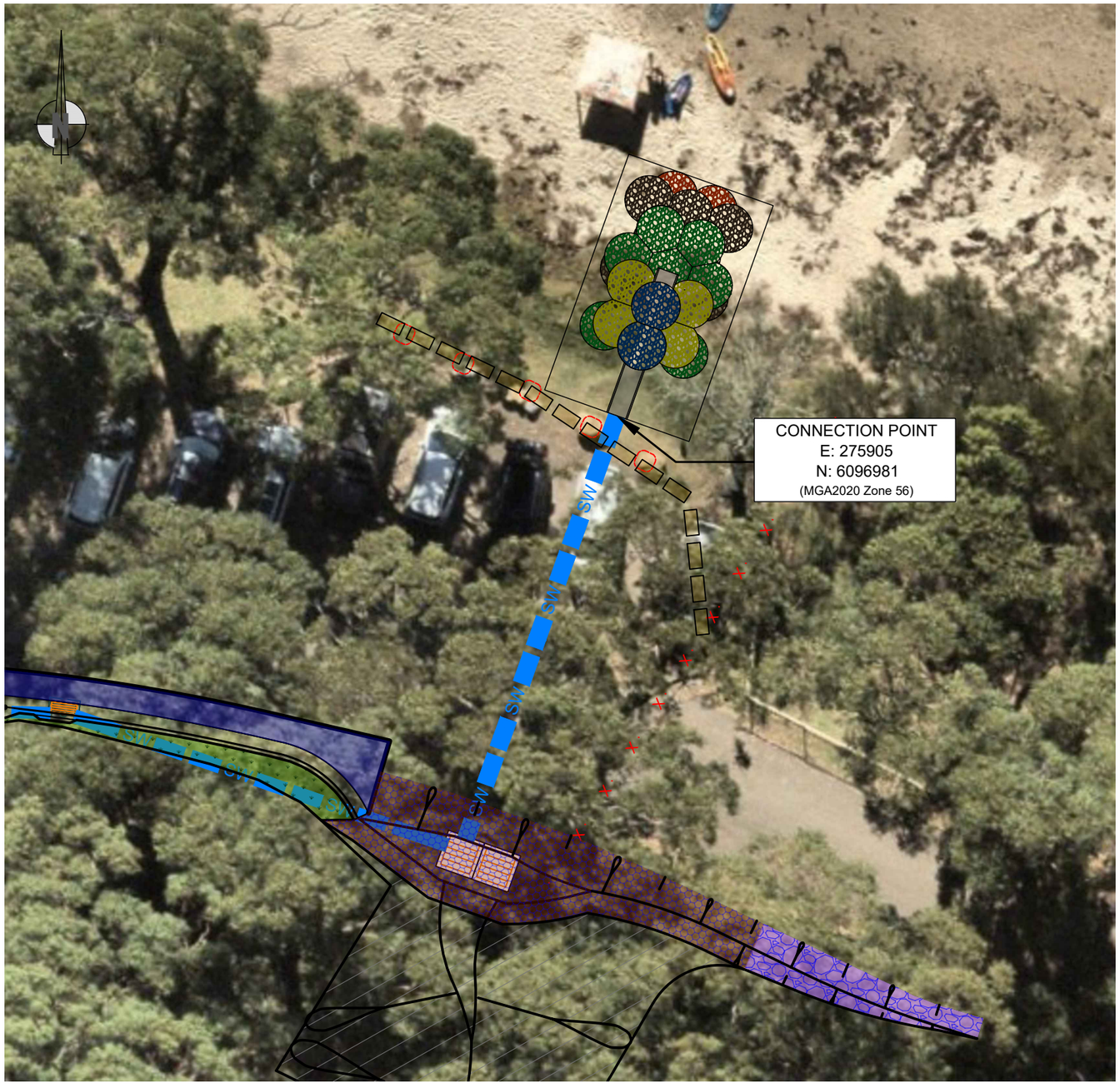
PROJECT: BENDALONG BOAT HARBOUR STORMWATER UPGRADE
MANTA RAY ROAD, BENDALONG NSW 2539
-

DRAWING NAME: EROSION & SEDIMENT DETAILS

DESIGNED:	DRAWN:	SCALE:	SHEET SIZE:
RM	JH	-	A1

DRAWING STATUS: CONSTRUCTION
DRAWING No.: CE02
PROJECT No.: DN220019
REVISION: 3

A3



SITE LOCATION PLAN

SCALE 1:200

0 2.0 4.0 6.0 8.0 10.0m

SCALE 1:200 (A3 SHEET)

BENDALONG BEACH STORMWATER OUTFALL AND SCOUR PROTECTION

FOR THE
SHOALHAVEN CITY COUNCIL

DRAWING NUMBER	DRAWING TITLE
D00	TITLE SHEET
D01	NOTES AND SPECIFICATIONS
D02	PLAN VIEW
D03	SECTIONS AND DETAILS

FOR CONSTRUCTION

C	09.04.2025	ISSUED FOR CONSTRUCTION
B	04.04.2025	ISSUED FOR CLIENT REVIEW
A	31.03.2025	ISSUED FOR CLIENT REVIEW

Amendments

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

CLIENT: Shoalhaven City Council

PROJECT: BENDALONG BEACH STORMWATER OUTFALL AND SCOUR PROTECTION SHOALHAVEN

DESIGNED BY: EDA	DRAWN BY: EDA
DRAWING DATE: 09.04.2025	CHECKED: CJB
SHEET: 1 OF 4	SCALE: AS SHOWN
FILE: 25050032_Bendalong_C.dwg	

WT-25050032-D00
TITLE SHEET

PROJECT No.	DRAWING No.	REV.
25050032	D00	C

A3

BENDALONG BEACH STORMWATER OUTFALL AND SCOUR PROTECTION

DRAWING NUMBER	DRAWING TITLE
WT-25050032-D00	TITLE SHEET
WT-25050032-D01	NOTES AND SPECIFICATIONS
WT-25050032-D02	PLAN VIEW
WT-25050032-D03	SECTIONS AND DETAILS

NOTES

1. DIMENSIONS ARE IN MILLIMETRES (MM) UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE RELATIVE TO AUSTRALIAN HEIGHT DATUM (mAHD).

MATERIALS - ROCK BAGS

ROCKBAGS UNIT SHALL BE BLUEMONT 2T ECOGREEN TYPE BAGS OR EQUIVALENT. ROCKBAGS SHALL BE FILLED AND PLACED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND INSTALLATION GUIDLINES. SPECIFIC GRAVITY OF FILLING STONES IS BETWEEN 2.6 TO 2.65 AND MAXIMUM DIAMETER OF THE FILLING IS 200mm.

EQUIVALENT ROCK BAGS MAY BE OFFERED FOR APPROVAL BY SUPERINTENDENT AS ALTERNATIVE.

THE DIMENSIONS OF INDIVIDUAL ROCK BAGS ARE NOT FIXED AND MAY VARY, WITH VERTICAL TOLERANCES OF UP TO ±0.1 M. PRIOR TO PLACEMENT, THE HORIZONTAL AND VERTICAL DIMENSIONS OF EACH BAG SHALL BE MEASURED AND RECORDED. PLACEMENT OF EACH BAG MUST BE UNDERTAKEN IN CONSULTATION WITH THE SUPERINTENDENT TO ENSURE THE CORRECT ALIGNMENT AND FIT WITHIN THE OVERALL STRUCTURE.

MATERIALS - FLEXIBLE PIPELINE

THE FLEXIBLE PIPLINE SHALL BE IPLEX BLACK MAX DN750 6M SN8 OR EQUIVALENT. THE PIPELINE SHALL BE PLACED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND INSTALLATION GUIDLINES.

EQUIVALENT PIPELINE MAY BE OFFERED FOR APPROVAL BY SUPERINTENDENT AS ALTERNATIVE.

MATERIALS - PIPELINES CONECTION

THE CONNECTION BETWEEN THE CONCRETE PIPELINE (675 RCP CLASS 4) AND THE FLEXIBLE PIPLINE SHALL BE DONE IN ACCORDANCE WITH FERNCO FLEXSEAL LARGE COUPLING PRODUCT CODE LC800WA OR EQUIVELANT. THE CONNECTION SHALL APPLY FERNCO BUSH (EPDM RUBBER RING) OF CUSTOMIZED PRODUCT CODE BC32/781 OR EQUIVELANT. THE CONNECTION BETWEEN PIPELINES SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND INSTALLATION GUIDLINES.

EQUIVALENT PIPELINE CONNECTION MAY BE OFFERED FOR APPROVAL BY SUPERINTENDENT AS ALTERNATIVE.

MATERIALS - GEOTEXTILE

THE GEOTEXTILE SHALL BE ELCOMAX 900R OR EQUIVALENT. THE GEOTEXTILE SHALL BE CAREFULLY PLACED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND INSTALLATION GUIDLINES TO ENSURE THAT IT IS NOT PUNCTURED OR TORN. ANY AREAS WHERE THE GEOTEXTILE IS PUNCTURED OR TORN SHALL BE REMOVED OR REPAIRED TO THE SATISFACTION OF THE SUPERINTENDENT AND IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE HANDLING AND STORAGE OF ALL GEOTEXTILE PRIOR TO INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND TO THE SATISFACTION OF THE SUPERINTENDENT.

EQUIVALENT NON-WOVEN GEOTEXTILE MAY BE OFFERED FOR APPROCAL BY SUPERINTENDENT AS ALTERNATIVE.

FOR CONSTRUCTION

C	09.04.2025	ISSUED FOR CONSTRUCTION
B	04.04.2025	ISSUED FOR CLIENT REVIEW
A	31.03.2025	ISSUED FOR CLIENT REVIEW

Amendments

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

CLIENT: Shoalhaven City Council

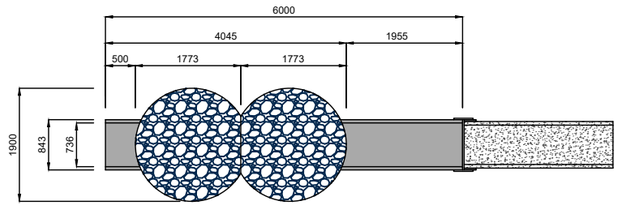
PROJECT: BENDALONG BEACH STORMWATER OUTFALL AND SCOUR PROTECTION SHOALHAVEN

DESIGNED BY: EDA	DRAWN BY: EDA
DRAWING DATE: 09.04.2025	CHECKED: CJB
SHEET: 2 OF 4	SCALE: AS SHOWN
FILE: 25050032_Bendalong_C.dwg	

WT-25050032-D01
NOTES AND SPECIFICATIONS

PROJECT No.	DRAWING No.	REV.
25050032	D01	C

A3



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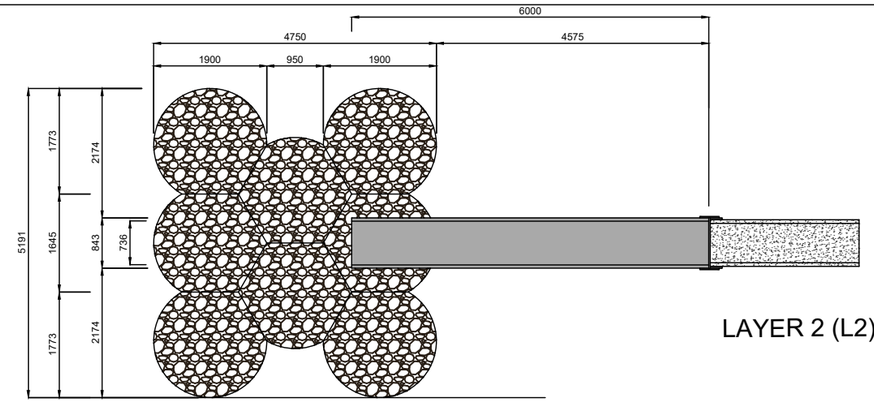

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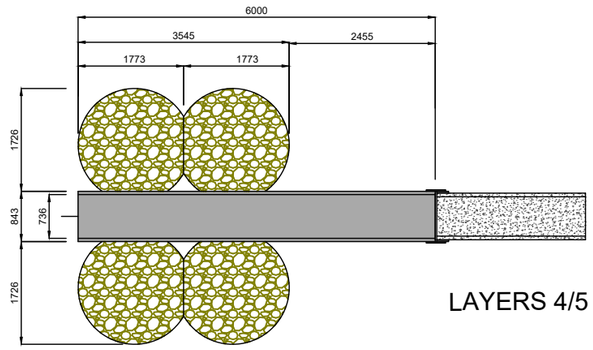
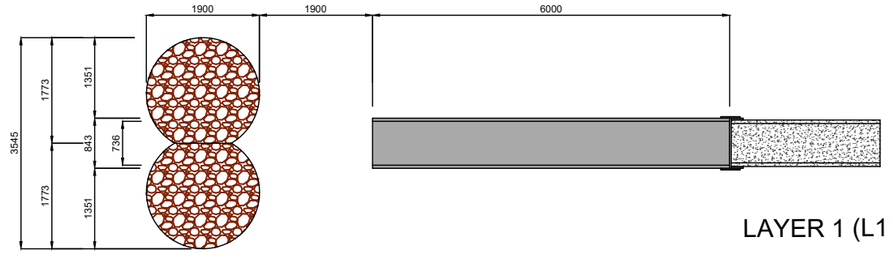


LAYERS 4/5 (L4/5)



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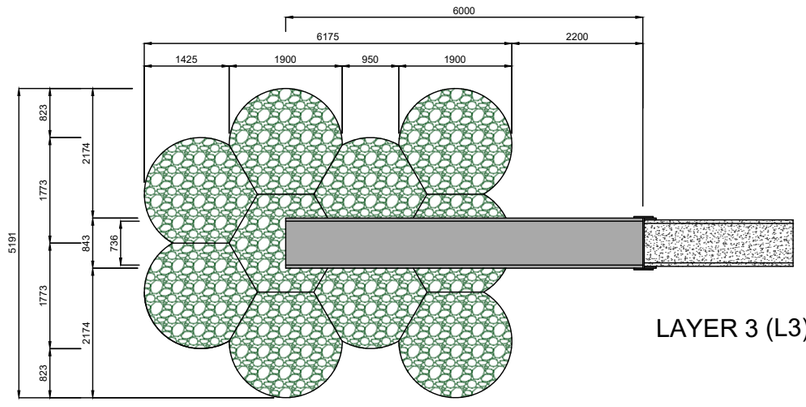

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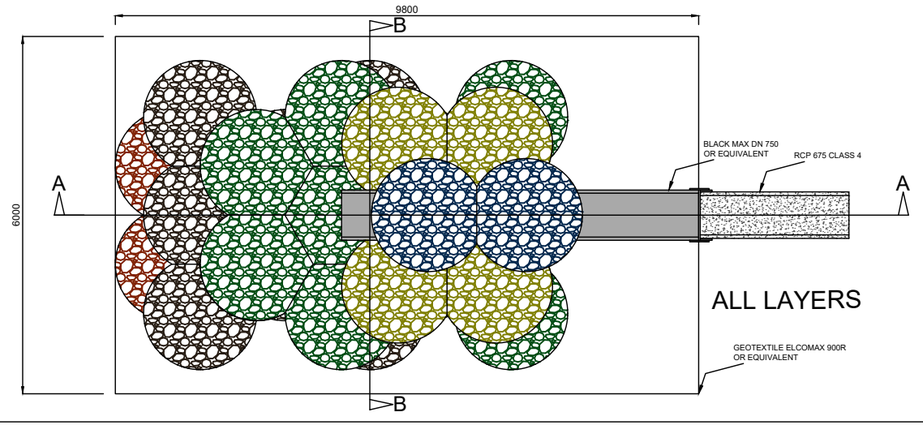

ALL LAYERS

FOR CONSTRUCTION

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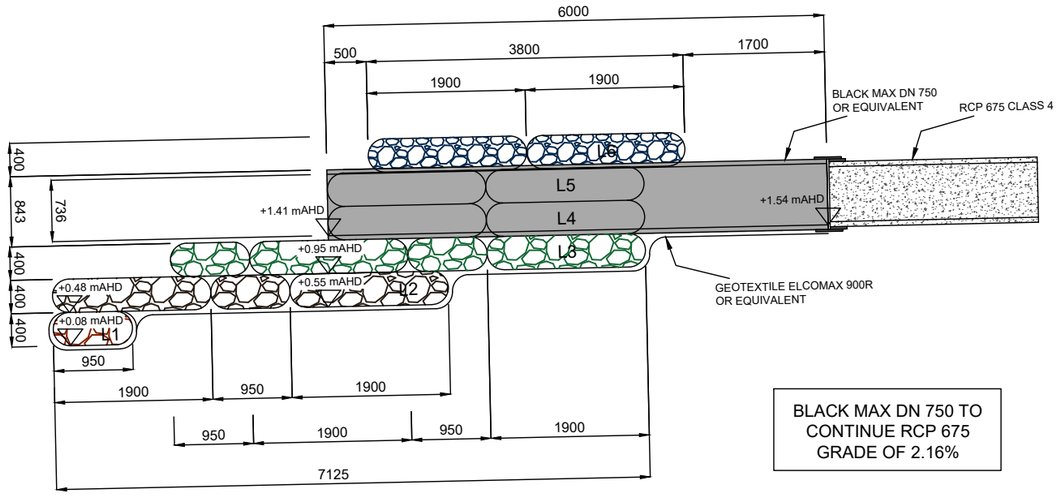
FILE: 25050032_Bendalong_C.dwg	

WT-25050032-D02
PLAN VIEW

PROJECT No.	DRAWING No.	REV.
25050032	D02	C

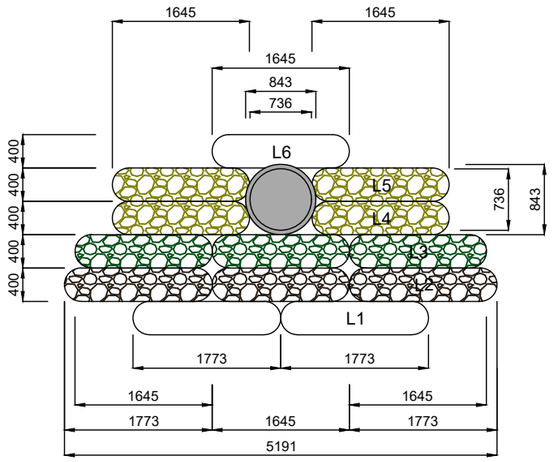
A3

SCOUR PROTECTION PROFILE (A-A)

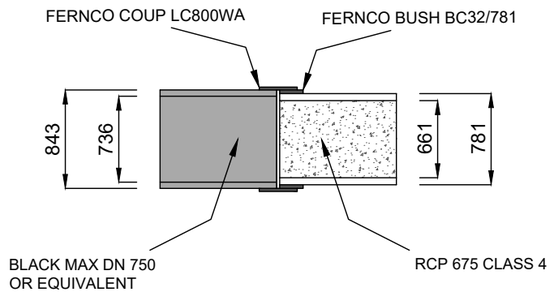


BLACK MAX DN 750 TO
CONTINUE RCP 675
GRADE OF 2.16%

SCOUR PROTECTION CROSS SECTION (B-B)



PIPELINES CONNECTION DETAIL



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WT-25050032-D03
SECTIONS AND DETAILS

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25050032	D03	C

APPENDIX B – NSW THREATENED SPECIES LIKELIHOOD OF OCCURRENCE TABLE

The table of likelihood of occurrence (below) evaluates the likelihood of threatened species to occur on the subject site. This list is derived from previously recorded species within a 5 km radius (taken from Office of Environment and Heritage (OEH) Wildlife Atlas) around the subject site (search undertaken on 02 December 2024). Ecology information has been obtained from the Threatened Species Profiles on the NSW OEH website (www.threatenedspecies.environment.nsw.gov.au).

Likelihood of occurrence in study area

1. Unlikely – Species, population or ecological community is not likely to occur. Lack of previous recent (<25 years) records and suitable potential habitat limited or not available in the study area.
2. Likely – Species, population or ecological community could occur and study area is likely to provide suitable habitat. Previous records in the locality and/or suitable potential habitat in the study area.
3. Present – Species, population or ecological community was recorded during the field investigations.

Possibility of impact

1. Unlikely – The proposal would be unlikely to impact this species or its habitats. No EP&A Act 5-Part Test or EPBC Act significance assessment is necessary for this species.
2. Likely – The proposal could impact this species, population or ecological community or its habitats. An EP&A Act 5-Part Test and/or EPBC Act significance assessment is required for this species, population or ecological community.

Endangered Ecological Community name	***Status***	***Likelihood of presence within areas impacted by the activity***
Bangalay Sand Forest of the Sydney Basin and South East Corner Bioregions	Endangered - *NSW* BC *Act*	Mapped as occurring approximately 450m from the site, but site surveys confirmed that this EEC does not occur in close proximity such that it is at risk of being impacted by the proposal. No vegetation removal will occur in proximity to this EEC. No indirect impacts including erosion and sediment movement will affect this EEC.
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions	Endangered - *NSW* BC *Act* Vulnerable - Commonwealth *EPBC Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site
Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered - *NSW* BC *Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site.
Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Endangered - *NSW* BC *Act* Critically Endangered - Commonwealth *EPBC Act*	Does not occur on-site and is not mapped as occurring in close proximity to the site.

Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Endangered - NSW BC Act Critically Endangered - Commonwealth EPBC Act	Does not occur on-site and is not mapped as occurring in close proximity to the site.
Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered - *NSW* BC *Act* Endangered - Commonwealth *EPBC Act*	Mapped as occurring approximately 280m from the site, but site surveys confirmed that this EEC does not occur in close proximity such that it is at risk of being impacted by the proposal. No vegetation removal will occur in proximity to this EEC. No indirect impacts including erosion and sediment movement will affect this EEC.
Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Endangered - NSW BC Act	Does not occur on-site and is not mapped as occurring in close proximity to the site.

Species name	***Status***	***Habitat requirements (www.environment.nsw.gov.au)***	***Likelihood of presence within areas impacted by the activity***
FLORA			
Narrow-leafed Wilsonia *Wilsonia backhousei*	Vulnerable NSW BC Act	This is a species of the margins of salt marshes and lakes.	No – no habitat present.
Leafless Tongue Orchid *Cryptostylis hunteriana*	Vulnerable BC Act Vulnerable EPBC Act	The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas	No – no habitat present.

		in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	
AMPHIBIANS			
Green and Golden Bell Frog *Litoria aurea*	Endangered BC Act Vulnerable EPBC Act	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha spp.*) or spikerushes (*Eleocharis* spp.).	No – no habitat present.
REPTILES			
Green Turtle *Chelonia mydas*	Vulnerable BC Act Vulnerable EPBC Act	Ocean-dwelling species spending most of its life at sea.	No – no habitat present.
Hawksbill Turtle *Eretmochelys imbricata*	Vulnerable EPBC Act	Ocean-dwelling species spending most of its life at sea.	No – no habitat present.
MICRO-CHIROPTERAN BATS			
BIRDS			
White-throated Needletail *Hirundapus caudacutus*	Vulnerable BC Act Vulnerable EPBC Act	In Australia, the White-throated Needletail is mostly aerial. Although the species appears to primarily roost aerially, it has been recorded roosting in trees in forest and woodlands. Does not breed in Australia	Possibly occurring transiently within / over the site. No important habitat will be removed or otherwise affected.
Gibson's Albatross *Diomedea gibsoni*	Vulnerable BC Act Vulnerable EPBC Act	Essentially endemic to the Auckland Islands of New Zealand. The non-breeding range is poorly known however the species probably disperses across the southern Pacific. The species is regularly encountered on trans-Tasman shipping routes and at seas off Sydney, and regularly occurs off the NSW coast usually between Green Cape and Newcastle. This species is known only to breed on the	No – no habitat present.

		Adams, Disappointment and Auckland Islands in the subantarctic Auckland Island group. Breeds bienially in colonies among grass tussocks on isolated subantarctic islands, using the wind to travel great distances both during and between breeding seasons	
Shy Albatross *Thalassarche cauta*	Endangered BC Act Endangered EPBC Act	This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea.	No – no habitat present.
Black-browed Albatross *Thalassarche melanophris*	Vulnerable BC Act Vulnerable EPBC Act	Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents.	No – no habitat present.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Vulnerable BC Act	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.	Possibly occurring transiently within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Little Eagle *Haliaeetus morphnoides*	Vulnerable NSW BC Act	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland.	Possibly occurring transiently within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Square-Tailed Kite *Lophoictinia isura*	Vulnerable NSW BC Act	Summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses large hunting ranges of more than 100km^2 Nest within large hollow bearing trees generally within 200m of riparian areas.	Possibly occurring transiently over or within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.

Eastern Osprey *Pandion cristatus*	Vulnerable BC Act	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Possibly occurring transiently over or within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Beach Stone-curlew *Esacus magnirostris*	Endangered BC Act	Beach Stone-curlews are found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Sooty Oystercatcher *Haematopus fuliginosus*	Vulnerable *NSW* BC *Act*	Shore bird – breeds in sand or coral scrapes on offshore islands	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Pied Oystercatcher *Haemotopus longirostris*	Endangered BC Act	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Lesser Sand-plover *Charadrius mongolus*	Vulnerable BC Act Endangered EPBC Act	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Individuals are rarely recorded south of the	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.

		Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	
Eastern Hooded Dotterel *Thinornis cucullatus cucullatus*	Endangered BC Act Vulnerable EPBC Act	In south-eastern Australia Hooded Plovers prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally Hooded Plovers are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Little Tern *Strenula albifrons*	Endangered BC Act	Almost exclusively coastal, preferring sheltered environments; however may occur several kilometres from the sea in harbours, inlets and rivers (with occasional offshore islands or coral cay records). Nests in small, scattered colonies in low dunes or on sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Gang-gang Cockatoo *Callocephalon fimbriatum*	Vulnerable NSW BC Act	Tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. preferring	Possibly occurring transiently within the site. Highly mobile species. No important habitat will be removed or otherwise affected.

		more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting	Assessment provided in Section 3.3.2 of this REF.
South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami lathami*	Vulnerable BC Act Vulnerable EPBC Act	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, Allocasuaraina diminuta, and A. gymnathera. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (Casuarina cristata). Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill.	Possibly occurring transiently over or within the site. Highly mobile species. No important habitat will be removed or otherwise affected. No sign of feeding from Black Sheoaks in the vicinity of the proposed activity.
Little Lorikeet *Glossopsitta pusilla*	Vulnerable NSW BC ACT	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Allocasuarina	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.

Swift Parrot *Lathamus discolour*	Endangered *EPBC Act* Endangered *NSW* BC *Act*	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (E. albens). Commonly used lerp infested trees include Inland Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum Eucalyptus globulus.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Eastern Ground Parrot *Pezoporus wallicus wallicus*	Vulnerable BC Act	The Ground Parrot occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). These habitats provide a high abundance and diversity of food, adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. When flushed, birds fly strongly and rapidly for up to several hundred metres, at a metre or less above the ground.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Powerful Owl *Ninox strenua*	Vulnerable NSW BC Act	Coastal Woodland, Dry Sclerophyll Forest, wet sclerophyll forest and rainforest- Can occur in fragmented landscapes Roosts in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda,* Cherry Ballart Exocarpus cupressiformis and a number of eucalypt species. requires old growth elements-hollow bearing tree resources for nesting and prey resource. Nests in large tree	Possibly occurring transiently over or within the site outside of construction hours. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.

		hollows in large eucalypts that are at least 150yrs old. Often in riparian areas. Large home range	
Masked Owl – *Tyto novaehollandiae*	Vulnerable *NSW* BC *Act*	Dry eucalypt forests and woodlands from sea level to 1100 m. Inhabits forest but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Requires old growth elements-hollow bearing tree resources for nesting and prey source.	Possibly occurring transiently over or within the site outside of construction hours. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Sooty Owl *Tyto tenebricosa*	Vulnerable *NSW* BC *Act*	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Regent Honeyeater *Anthochaera Phrygia*	Endangered BC Act Critically Endangered EPBC Act	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Varied Sittella *Daphoenositta chrysoptera*	Vulnerable *NSW* BC *Act*	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland	Possibly occurring transiently within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
MAMMALS			

Spotted-tailed Quoll *Dasyurus maculatus*	Endangered *EPBC Act* Vulnerable *NSW* BC *Act*	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Southern Brown Bandicoot (eastern) *Isoodon obesulus obesulus*	Endangered EPBC Act Endangered NSW BC Act	Southern Brown Bandicoots are largely crepuscular (active mainly after dusk and/or before dawn). They are generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They feed on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees Xanthorrhoea spp., blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.

Koala *Phascolarctos cinereus*	Vulnerable NSW BC Act	Eucalypt woodland and forest Home range sizes vary with quality of habitat ranging from less than two ha to several hundred ha. Preferred tree species on the south coast are *Eucalyptus amplifolia, E. viminalis, & E .tereticornis* but numerous other species also known food trees.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Eastern Pygmy-possum *Cercatetus nanus*	Vulnerable NSW BC Act	Rainforest, sclerophyll forest & woodland to heath – but heath & woodland preferred. Forages on banksias, eucalypts & bottlebrushes.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.
Yellow-bellied Glider *Petaurus australis*	Vulnerable NSW BC Act Vulnerable EPBC Act	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	Possibly occurring transiently within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Squirrel Glider *Petaurus norfolcensis*	Vulnerable NSW BC Act	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	No - No suitable habitat occurs on site. No important habitat will be removed or otherwise affected.

Southern Greater Glider *Petauroides volans*	Vulnerable EPBC Act	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha. Give birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. Usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. Can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees. Very loyal to their territory.	Unlikely to occur. No important habitat will be removed or otherwise affected.
Grey-headed Flying-fox *Pteropus poliocephalus*	Vulnerable *EPBC Act* Vulnerable *NSW* BC *Act*	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Possibly occurring transiently over or within the site. Highly mobile species. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	Vulnerable BC Act	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Possibly occurring transiently within the site outside of construction hours. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Eastern Coastal Freetail-Bat *Micronomus norfolkensis*	*Vulnerable NSW* BC *Act*	Small tree hollows/fissures in bark for roosting in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Possibly occurring transiently within the site outside of construction hours. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.

Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Vulnerable *NSW* BC *Act*	Prefers moist habitat that contains trees greater than 20 m high with a dense undertstorey. They are fast flyers. Roosts in hollow trunks of eucalyptus trees, in colonies of 3 – 80. Also may roost in caves and old wooden buildings. This species changes roost every night. Roosts on consecutive nights are usually less than 750 m apart. This species has a home range of up to 136 ha (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW). Although they prefer habitat with a dense understorey, they prefer to forage along flyways to avoid the thick understorey. They prefer continuous forest and avoid remnant vegetation. However, they have been recorded in open forests (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW).	Possibly occurring transiently within the site outside of construction hours. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Southern Myotis (Large-footed Myotis) *Myotis macropus*	Vulnerable *NSW* BC *Act*	This species is predominantly roosts in caves, however, is known to roost in trees and man- made structures close to water. Roosts are generally located close to water, where the bats forage in small groups of three or four. They have a strong association with streams and permanent waterways in areas that are vegetated rather than cleared (Churchill, S 2008, Australian Bats, Jacana Books, Crows Nest, NSW They feed on small fish, prawns and aquatic macroinvertebrates. They have a preference towards large still pools, rather than flowing streams. They will also forage an aerial insects flying over water. They use their large feet to capture prey items (Churchill 2008).	Possibly occurring transiently within the site outside of construction hours. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.

Greater Broad-nosed Bat *Scoteanaux ruepelli*	Vulnerable *NSW* BC *Act*	Found mainly in gullies and river systems that drain the Great Dividing Range, it utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, below 500m, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m	Possibly occurring transiently within the site outside of construction hours. No important habitat will be removed or otherwise affected. Assessment provided in Section 3.3.2 of this REF.
Large Bent-winged Bat *Miniopterus orianae oceanensis*	Vulnerable NSW BC Act	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Unlikely to occur. No important habitat will be removed or otherwise affected.