

MOUNT PENANG PARKLANDS REF

Prepared for Hunter and Central Coast
Development Corporation

Prepared by EPS

LOT 10

DP 1149050

1A CENTRAL COAST HIGHWAY KARIONG NSW 2250

EPS

Reference No. 11371 March 2020

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Declaration

I, Valentina Misevska, Acting Chief Executive of the Hunter and Central Coast Development Corporation, have examined and considered the Review of Environmental Factors for Mount Penang Parklands (EPS, March 2020) in accordance with the provisions of s5.5 of the *Environmental Planning and Assessment Act 1979* and the *State Environmental Planning Policy (Infrastructure) 2007*, under which the works are permissible and determine that the proposed development may be carried out as development without consent, subject to compliance with the conditions to manage environmental impacts outlined within the REF

Signed,

A handwritten signature in blue ink, appearing to read 'V. Misevska'.

Valentina Misevska

ACTING CHIEF EXECUTIVE

Hunter and Central Coast Development Corporation

Quality Assurance & Version Control Table				
Project	Mount Penang Parklands REF			
Client	Hunter & Central Coast Development Corporation (HCCDC)			
Rev No.	Date	Our Reference	Author	Reviewer
V01	30/07/2019	20190730_11317_Mount Penang REF_V01	S. Duffy	A. Tipper
V02	18/03/2020	20200318_11317_Mount Penang REF_V02	S. Duffy	A. Tipper
V03	27/03/2020	20200327_11317_Mount Penang REF_V03	A. Tipper	A. Tipper
V04	30/03/2020	20200327_11317_Mount Penang REF_V04	A. Tipper	A. Tipper
Checked by	A. Tipper			
Approved by	T. Kelly			
EPS	Hunter 9 Yacaaba Street, Nelson Bay NSW 2315 (02) 4981 1600		Sydney Level 33, 264 George Street, Sydney NSW 2000 (02) 9258 1985	
Website	www.enviroproperty.com.au			



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EXECUTIVE SUMMARY

OVERVIEW

Hunter and Central Coast Development Corporation (HCCDC) is both the proponent of the proposal (i.e. the body proposing to carry out the proposal) and the public authority determining authority. HCCDC must comply with the legal provisions relating to both. This means that HCCDC can both prepare and review any environmental assessment document required under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

HCCDC has completed this Review of Environmental Factors (REF) to consider the potential impacts and benefits of the construction and operation of road, sewer, water, stormwater, electrical infrastructure and associated infrastructure (the proposal) on Mount Penang Parklands and land adjacent, in the vicinity of Kangoo Road (Project area).


The REF has been prepared in accordance with the provisions of Part 5 of the EP&A Act and will be used to assist HCCDC to examine and take into account all matters affecting or likely to affect the environment by reason of the proposed activity, and to determine whether an Environmental Impact Statement is required. Feedback from key stakeholders will be considered when HCCDC makes the determination.

STRATEGIC CONTEXT FOR THE PROPOSAL

HCCDC is established by the *Growth Centres (Development Corporations) Act 1974* as an NSW Government Agency. HCCDC is responsible for promoting, co-ordinating, managing and securing the orderly and economic development of Mount Penang Parklands within the local government areas of Central Coast, Cessnock, Dungog, Lake Macquarie, Maitland, Mid-Coast, Muswellbrook, Newcastle, Port Stephens, Singleton and Upper Hunter Shire.

HCCDC owns and manages the Mount Penang Parklands. The site is situated adjacent to the M1 Sydney/ Newcastle on the Pacific Highway exit ramp to Gosford, about 70kms from the Sydney CBD and 10-minute drive west from the centre of Gosford.

HCCDC vision for the 152ha site features ecologically sustainable development that complements the existing heritage character and landscape setting. The Mount Penang masterplan comprises eight distinct precincts.



To drive economic growth in the region, HCCDC is facilitating the redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas in line with the Central Coast's regional strategic planning and the planning controls specific to Mount Penang Parklands (e.g. Part 5.3 of Gosford Development Control Plan 2013).

The proposal is a vital component for the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other Mount Penang Parklands precincts.

The Mount Penang Parklands is zoned SP1 Special Activities under the *Gosford Local Environmental Plan 2014* (GLEP 2014) with a number of prescribed purposes for the land. The location of the various prescribed purposes is refined in the Gosford Development Control Plan 2013 (GDCP 2013).

THE PROPOSAL

The proposal involves the construction and operation of road, sewer, water, stormwater, electrical infrastructure and associated infrastructure in the locations shown on the indicative proposal plans attached as Appendix 2, primarily being:

- The Avenue South road up to but excluding The Avenue South roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue intersection (The Avenue South);
- Festival Drive road including the Festival Drive road/Parkland road roundabout (Festival Drive);
- Land within the Festival/Gardens Precinct, Kangoo Road Commercial Precinct and Highway Commercial Precinct and land outside Mount Penang Parklands in the vicinity of the Kangoo Road and Central Coast Highway intersection (hereafter Kangoo Road south).

CONSTRUCTION TIMEFRAME

The proposal is forecast to start in approximately Q2 2020. The proposal will most likely be constructed in stages and take approximately 4 – 6 months to complete.



PERMISSIBILITY

Under the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) HCCDC as a public authority may carry out defined infrastructure works described under the Infrastructure SEPP without consent (subject to preconditions, if applicable) on the Project Area and other land. HCCDC's proposal falls within the following Infrastructure SEPP categories: Roads and traffic, Electricity transmission or distribution, Sewerage systems, stormwater management systems, Telecommunications and other communication facilities and Water supply systems.

ENVIRONMENTAL IMPACT ASSESSMENT

An environmental assessment has been completed to consider whether the proposal is likely to significantly affect the environment. The assessment included assessment of soils and geology, hydrology, water quality & flooding, ecology, noise and vibration, air quality, non-Indigenous heritage, Aboriginal heritage, visual amenity, traffic and access, services and utilities, land uses, waste and resources and cumulative and consequential impacts.


This REF identified the proposal would have potential beneficial environmental impacts with the water, sewer, road and utility/services upgrades facilitating the future sustainable economic growth in the Project area for the benefit of the Central Coast LGA. The proposal would have a positive impact through improved access to the site for the schools and other community uses.

This REF identified the key potential environmental adverse impacts associated with the proposal were:

- Noise emissions during construction;
- Visual impacts to nearby receivers during construction;
- Traffic and access impacts during construction; and
- Disruption to the use of land by some users of the Mount Penang Parklands.

The adverse impacts are confined to the construction period which is expected to be short term and within manageable limits. The adverse impacts would also be mitigated by construction management strategies implemented via a Construction Environmental Management Plan (CEMP) that would include specific plans for applicable environmental issues e.g.:

- Soil and Water Management Plan, including an acid sulphate soil management sub-plan, an erosion and sediment control sub-plan and groundwater and flood management sub-plan;

- 
- Vegetation Management Procedure;
 - Noise and Vibration Management Plan;
 - Traffic Management Plan;
 - Communication Management Plan; and
 - Utility/Services Management Plan.

Based on the assessment of the proposal, and the mitigation measures proposed, the proposal is not likely to significantly affect the environment and therefore does not require the preparation of an Environmental Impact Statement (EIS).

COMMUNITY AND STAKEHOLDER CONSULTATION

Community and stakeholder consultation for the proposal is being undertaken and will continue until the proposal is completed to minimise any impacts during the construction phase.

REF CONCLUSION

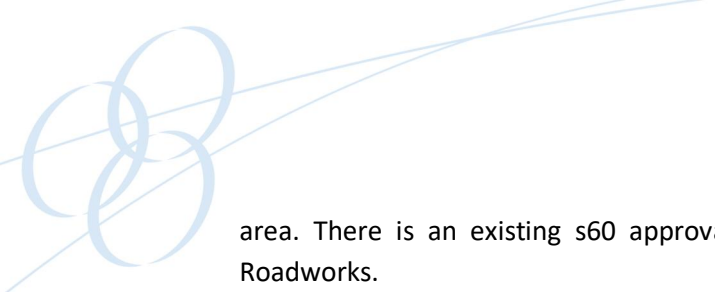
In accordance with the requirements of Part 5 of the EP&A Act and the EP&A Regulation the proposal has been fully assessed. Based on the assessment of the proposal, and the mitigation measures proposed, the proposal is not likely to significantly affect the environment and therefore does not require the preparation of an Environmental Impact Statement (EIS).

This REF includes an assessment of whether the proposal is likely to have a significant impact to matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal is not likely to have a significant impact on matters of national environmental significance and therefore referral to the Commonwealth Government under the EPBC Act would not be required.

As defined by the *Biodiversity Conservation Act 2016* the proposal is not expected to have significant impacts on threatened species, populations, ecological communities or their habitats consequently a species impact statement is not required.

The Aboriginal Heritage Due Diligence Assessment revealed the requirement for application and receipt of an Aboriginal Heritage Impact Permit for the sewer portion of the proposal prior to works on the sewer component commencing.

The Statement of Heritage Impact revealed approval under s60 of the *Heritage Act 1977* is required prior to works commencing in the Water, Sewer and Drainage Infrastructure Works



area. There is an existing s60 approval (S60/2018/054) for Avenue South/Festival Drive Roadworks.



1. INTRODUCTION

Hunter and Central Coast Development Corporation (HCCDC) is established by the *Growth Centres (Development Corporations) Act 1974* as an NSW Government Agency. HCCDC is responsible for promoting, co-ordinating, managing and securing the orderly and economic development of the Mount Penang Parklands within the local government areas of Central Coast, Cessnock, Dungog, Lake Macquarie, Maitland, Mid-Coast, Muswellbrook, Newcastle, Port Stephens, Singleton and Upper Hunter Shire.

HCCDC owns and manages Mount Penang Parklands legally described as Lot 10 DP1149050. The Mount Penang Parklands is situated adjacent to the M1 Sydney/ Newcastle on the Pacific Highway exit ramp to Gosford, about 70kms from the Sydney CBD and 10-minute drive west from the centre of Gosford.

HCCDC vision for the 152ha Mount Penang Parklands features ecologically sustainable development that complements the existing heritage character and landscape setting. The Mount Penang masterplan comprises the following distinct precincts:

1. Kangoo Road Commercial Precinct;
2. Festival/Gardens Precinct;
3. Highway Commercial Precinct;
4. Bushland Precinct;
5. Baxters Track Precinct;
6. Heritage/Sports Precinct; and
7. Phillip House Precinct.

A precinct plan is provided at Figure 1-1




Figure 1-1: Precinct Plan

The proposal involves works within the Festival/Gardens Precinct, Kangoo Road Commercial Precinct, and Highway Commercial Precinct.

To drive economic growth in the region, HCCDC is facilitating the redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas in line with the Central Coast's regional strategic planning and the planning controls specific to Mount Penang Parklands (e.g. Part 5.3 of Gosford Development Control Plan 2013).

To enable the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other Mount Penang precincts areas upgrading and installing road, sewer, water, stormwater, electrical infrastructure and associated services/utilities infrastructure is required.

HCCDC is both the proponent of the proposal (i.e. the body proposing to carry out the proposal) and the public authority determining authority. HCCDC must comply with the legal



provisions relating to both. This means that HCCDC can both prepare and review any environmental assessment document e.g. Review of Environmental Factors (REF), required under Part 5 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act)

The REF has been prepared in accordance with the provisions of Part 5 of the EP&A Act and will be used to assist HCCDC to examine and take into account all matters affecting or likely to affect the environment by reason of the proposed activity, and to determine whether an Environmental Impact Statement (EIS) is required.. Feedback from key stakeholders will be considered when HCCDC makes the determination.

1.1. PROPOSAL IDENTIFICATION

The proposal is comprised of:

- 1. The Avenue South/Festival Drive Roadworks** – this component of the proposal involves physical road upgrade works to The Avenue South and Festival Drive together with associated upgrades of services/utilities in The Avenue South road reserve and Festival Drive road reserve. The roads will be upgraded to meet Council requirements for a public road and dedicated to Council upon completion.
- 2. Water, Sewer and Drainage Infrastructure Works** – this component of the proposal involves the installation of water, sewer and drainage infrastructure to facilitate future servicing within the Kangoo Road Commercial Precinct.


The proposal has been assessed in relation to the following three defined areas:

- **Project area:** This is the wider area in which the proposal is located. It provides the geographic context of the proposal.
- **Study area:** This is the study area specifically considered in detail for on-the-ground assessments (e.g. ecology and heritage).
- **Disturbance area:** This is the area which will be directly physically impacted on by the proposal.

Further detail on each of these areas is provided below.

Project area

The proposal is located on Mount Penang Parklands land and land outside Mount Penang Parklands in the vicinity of the Kangoo Road and Central Coast Highway intersection.



The proposed works within Mount Penang Parklands are located within the Festival/Gardens Precinct, Kangoo Road Commercial Precinct and Highway Commercial Precinct.

The proposed works on land outside Mount Penang Parklands are located in the vicinity of the Kangoo Road and Central Coast Highway intersection, specifically within Kariong Commuter Carpark, the Kangoo Road road reserve and the Central Coast Highway road reserve.

These two areas combined are considered the 'Project area'.

Study area

The Study area considered as part of the on-the-ground investigations into relevant environmental attributes for this REF is identified in Figure 1-2.

The Study area is located within the following areas:

- The Avenue South road reserve up to but excluding The Avenue South roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue intersection (The Avenue south);
- Festival Drive reserve including the Festival Drive road/Parkland road roundabout (Festival Drive);
- Land within the Festival/Gardens Precinct, Kangoo Road Commercial Precinct and Highway Commercial Precinct and land outside Mount Penang Parklands in the vicinity of the Kangoo Road and Central Coast Highway intersection (hereafter Kangoo Road South).

Photographs of the Study Area are shown in Appendix 1.

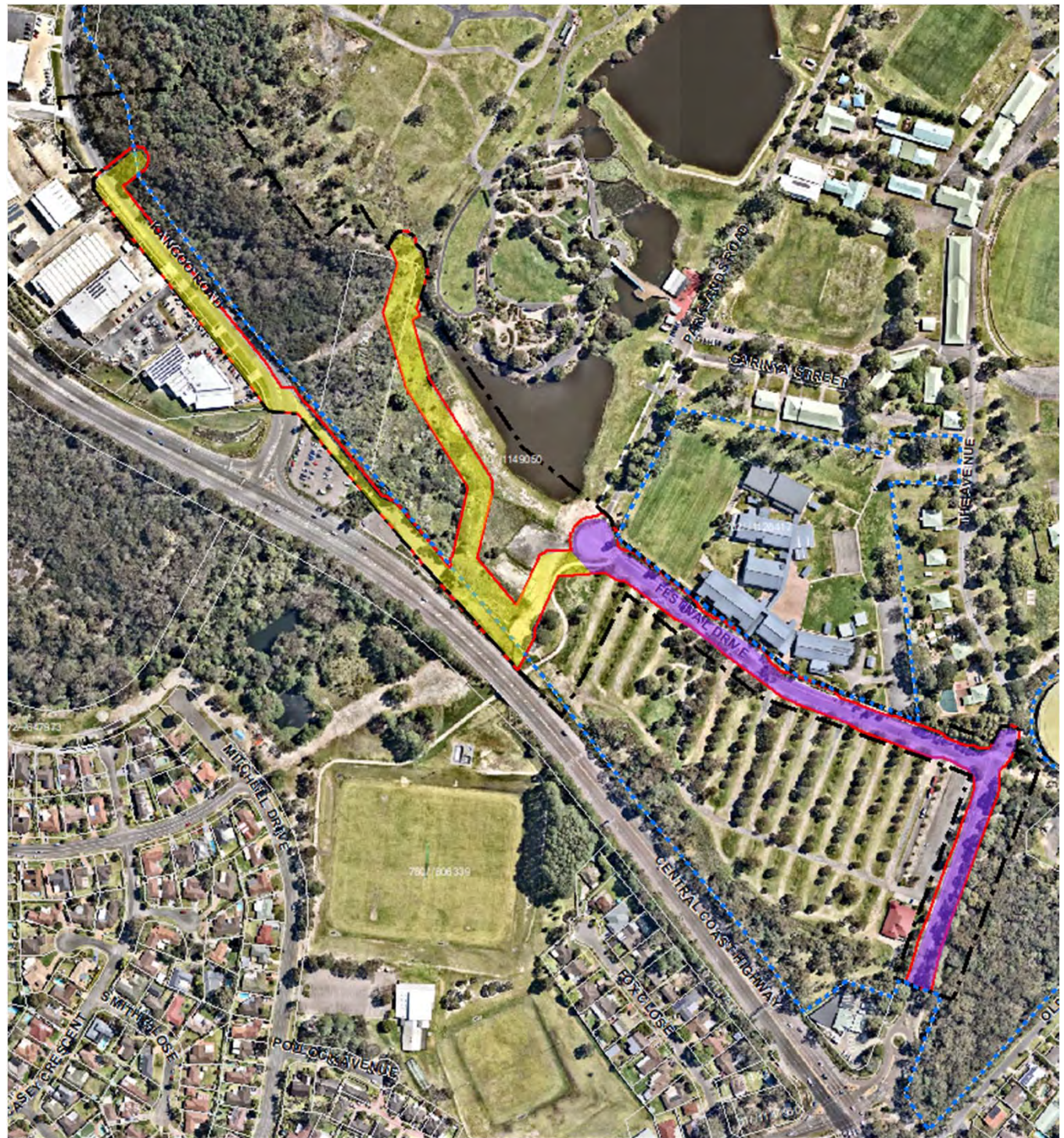
Disturbance area

Works for the proposal are primarily confined to disturbance areas i.e. the development footprint plus any anticipated ancillary construction impacts. The disturbance areas are identified in Figure 1-2.

Throughout this document the disturbances areas have been assessed with respect to the two components of the proposal:

1. The Avenue South/Festival Drive Roadworks – located in the Avenue South road reserve and Festival Drive road reserve. The works will be undertaken to existing private roads within the site, located within the Highway Commercial Precinct.

2. Water, Sewer and Drainage Infrastructure Works – located in the Festival/Gardens Precinct, Kangoo Road Commercial Precinct, and adjacent to the Highway Commercial Precinct and land outside the Mount Penang Parklands – Kangoo Road south.



Legend:

- Mt Penang Parklands
- Study area
- Disturbance area
- The Avenue South/Festival Drive Roadworks disturbance area
- Water, Sewer and Drainage Infrastructure Works disturbance area





1.2. PURPOSE OF THE REPORT

Environmental Property Services (EPS) has prepared this REF on behalf of Hunter and Central Coast Development Corporation (HCCDC), the proponent of the proposal.

The REF's purpose is to provide HCCDC, the determining authority, with the required information to assess, to the fullest extent possible, all matters affecting, or likely to affect the applicable environment by the proposal's construction and operation, and to determine whether an EIS is required.

The proposal does not include any further intensification of existing uses.

1.3. BACKGROUND TO THE REF

The Avenue South/Festival Drive Roadworks

The Avenue South/Festival Drive Roadworks including physical road upgrade works together with upgrades of other services/utilities in The Avenue South road reserve and Festival Drive road reserve, were originally approved as part of Central Coast Council's (CCC) DA/47433/2015 – a two (2) lot subdivision development consent i.e. one (1) lot for the Highway Commercial Precinct area and one (1) lot for the residue land.

HCCDC, as a public authority, has decided to facilitate the road and infrastructure works as development permitted without consent, pursuant to the Infrastructure SEPP.


Although the proposal does not require consent under Part 4 of the EP&A Act the proposal must be assessed under Part 5 of the EP&A Act subject to certain exceptions e.g. exempt development and Biodiversity certification, which do not apply to the proposal.

HCCDC is working closely with CCC on design requirements.

Water, Sewer and Drainage Infrastructure Works

CCC's DA/55215/2018 is a two (2) lot subdivision development application i.e. one (1) lot for the Kangoo Road Commercial Precinct area and one (1) lot for the residue land. The development proposal does not include any physical works, either the development of buildings or infrastructure on the site. However, CCC has confirmed that a condition of consent for the subdivision of the site will be for the installation of water and sewer servicing of the site.

HCCDC, as a public authority, will undertake these works as development permitted without consent under the ISEPP, including them in this consolidated REF to ensure that the potential



environmental issues are fully considered along with other proposed works. The works are key to the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas, and the continued effective operation of the other Mount Penang Parklands precincts. Although the proposal does not require consent under Part 4 of the EP&A Act the proposal must be assessed under Part 5 of the EP&A Act subject to certain exceptions e.g. exempt development and Biodiversity certification, which do not apply to the proposal.

HCCDC is working closely with CCC on design requirements.



2. PROPOSAL NEED AND JUSTIFICATION

2.1. OBJECTIVES OF THE PROPOSAL

The proposal's primary objectives are to provide essential infrastructure and services to enable the subdivision of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct and for the continued effective operation of the other Mount Penang Parklands precincts. The specific purpose of the roadworks is to provide public road frontage to the Kariong Mountain High School, and satisfy contractual obligation from sale of Highway Commercial Precinct.

2.2. OPTIONS CONSIDERED

Options considered included an alternative location for the proposal and the 'do nothing' option. These options are described in the following sections.

2.2.1. Alternative Location


The proposal includes The Avenue South/Festival Drive roadworks upgrade of existing roads. The existing road location has influenced the Mount Penang Parklands current urban design/layout and are key to the Mount Penang Parklands future development.

Relocating the existing The Avenue South/Festival Drive road to a nearby alternative location would have significant impacts on the Mount Penang Parklands current and future urban development, adjoining vegetation and built environment, including heritage items. As such, there is considered to be no alternative location for The Avenue South/Festival Drive Roadworks.

The proposal includes water, sewer and drainage infrastructure works. The location was primarily chosen to enable an efficient connection to Council's water and sewer infrastructure, to avoid other public infrastructure and minimise an adverse impact on the vegetation and heritage items in this part of Mount Penang Parklands. Alternative locations for water, sewer and drainage infrastructure works had the potential for adverse impacts on vegetation, heritage items and existing public infrastructure and consequently was not considered the preferred option. Specifically, the alignment of the water and sewer pipelines was amended to avoid the location of Endangered Ecological Communities (ecology value) and Aboriginal artefacts and culturally sensitive sandstone sheet areas (heritage value) achieving a good outcome by reducing the impact of the proposal.

2.2.2. Do Nothing

This option involves essential infrastructure and services. The 'do nothing' option does not provide sufficient infrastructure and services to effectively provide for the Mount Penang



Parklands existing development and future redevelopment of the Mount Penang Parklands precincts, in particular Kangoo Road Commercial Precinct and the Highway Commercial Precinct.



2.3. PREFERRED OPTION JUSTIFICATION

The proposal is the preferred option for the following reasons:

- HCCDC is established by the Growth Centres Act as an NSW Government Agency. Section 7(1) of the Growth Centres Act makes HCCDC responsible for promoting, co-ordinating, managing and securing the orderly and economic development of the Project Area;
- HCCDC vision for the 152ha Mount Penang Parklands includes ecologically sustainable development that complements the existing heritage character and landscape setting. The Mount Penang Parklands masterplan comprises distinct precincts for sports, bushland, heritage, Baxters Track and Philip House - and features the Festival / Gardens Precinct, Kangoo Road Commercial Precinct and the Highway Commercial Precinct. The proposal is consistent with HCCDC'S general powers prescribed by section 8(1) of the Growth Centres Act;
- To drive economic growth in the region, HCCDC is pursuing the development of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas in line with the Central Coast's regional strategic planning and the specific planning controls for the Project Area e.g. GDCP 2013, Part 5 Kariong, Mount Penang Parklands;
- The proposal provides essential infrastructure and services including water and sewerage required for the development of Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas consequently providing jobs, and improved tourism and cultural facilities;
- The proposal reflects relevant economic, environmental and social considerations. The majority of the proposal will either improve existing infrastructure and services in the same location or locate new infrastructure and services e.g. underground to facilitate the orderly and economic use of the site. The proposal will ensure the infrastructure and services are sufficiently protected to provide for the future development of specified Mount Penang Parklands precincts. The proposal is consistent with the protection of the existing natural environment.
- The proposal is consistent and supports the Mount Penang Parklands aims and objects set out in the GDCP 2013, Part 5.3 Kariong, Mount Penang Parklands and are required by CCC for the future development of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct.

The preferred alignment option for the water and sewer was selected to avoid ecologically and culturally sensitive areas to reduce the impacts of the proposal and achieve the best outcome for the site.

3. DESCRIPTION OF THE PROPOSAL

3.1. SCOPE OF CONSTRUCTION ACTIVITIES

Construction activities are required for the proposal i.e. The Avenue South/Festival Drive roadworks and the water, sewer and drainage infrastructure works.

The proposal's construction activities are primarily located in the:

- The Avenue South road reserve up to but excluding The Avenue South roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue intersection (The Avenue south);
- Festival Drive reserve including the Festival Drive road/Parkland road roundabout (Festival Drive);
- Land within the Festival/Gardens Precinct, Kangoo Road Commercial Precinct and Highway Commercial Precinct and land outside Mount Penang Parklands in the vicinity of the Kangoo Road and Central Coast Highway intersection (Kangoo Road South).

Table 3-1 provides key elements of the proposal's construction activities likely required for The Avenue South/Festival Drive roadworks and Table 3-2 provides the key details of the proposal's construction activities likely required for the sewer and drainage infrastructure works.

Table 3-1: Construction activities for The Avenue South/Festival Drive roadworks

Key Elements	Description
Pre-construction, construction and restoration physical works	<p>The works includes (but are not limited to) the following key elements:</p> <ul style="list-style-type: none">• Site establishment;• Removal of trees and vegetation;• Construction of a watermain;• Trench excavation• Full width new construction or upgrade of roads to council minimum standard subsoil drainage, footpath formation and drainage;• Changes to the Festival Drive/The Avenue South intersections to council minimum standard;• Signage and line marking to council's minimum standard;• Changes to pathways and footpaths;• Changes to roadside furniture and safety devices;• Changes to stormwater infrastructure including, kerbs, gutters, drainage pipelines, stormwater pits, gross pollutant trap;• Changes to communications utilities including cabling and conduits;• Changes to electrical utilities including cabling;• Removal of excavated material if not suitable for re-use; and• Restoration of the works area.
Plant and Equipment	<ul style="list-style-type: none">• Excavators;


Key Elements	Description
	<ul style="list-style-type: none"> • Tipper trucks; • Light vehicles; • Flat-bed delivery trucks; • Service vehicles; • Mobile cranes; • Rollers; • Skid steers; • Water carts; • Jackhammers; • Generators; • Pressure testing equipment; • Compactor; • Concrete agitators (or similar); • Concrete pumps; • Concrete saws; • Air compressors; and • Various hand tools and small machinery.
Construction workforce	Up to approximately 15 full time equivalents for the duration of the works. The appointed contractor will determine the number of workers.
Construction period	Construction works could commence mid to late 2020. Construction works will take approximately 16 weeks.
Construction hours	<p>Construction would generally occur during the standard working hours set out in the Interim Construction Noise Guideline (DECC, 2009):</p> <ul style="list-style-type: none"> • Mondays to Fridays between 7am and 6pm. • Saturdays between 8am and 1pm. • No work would normally occur on Sundays or public holidays.
Traffic Management & Access	The appointed contractor will prepare a construction traffic, transport and access management plan in consultation with relevant stakeholders and in accordance with relevant standards as part of the CEMP. The traffic and transport management plan would provide information on traffic flow, vehicle moments, site access and parking arrangements during construction, and the measures to minimise the impacts on the relevant road network.
Public Utilities	Existing public utilities/services exist in the vicinity of the works. It will be the contractor's responsibility to locate all services prior to commencement of works.
Operation & Maintenance	The relevant infrastructure authority will be responsible for the ongoing maintenance and operational obligations, including fault rectification in accordance with the terms of their operating license

The indicative plan for The Avenue South/Festival Drive Roadworks is attached as Appendix 2.

The Avenue South/Festival Drive Roadworks will occur in The Avenue South/Festival Drive Roadworks disturbance area identified in Figure 1-1. Access to The Avenue South/Festival Drive disturbance area will likely be through the Central Coast Highway / The Avenue intersection.

Table 3-2: Construction activities for water, sewer and drainage infrastructure works

Key Elements	Description
Pre-construction, construction and restoration physical works	<p>The works includes (but are not limited to) the following key elements</p> <ul style="list-style-type: none"> • Site establishment; • Vegetation and topsoil stripping; • Creation of an access track; • Trench excavation • Dewatering of open trench, if necessary • Construction of a watermain; • Construction of a gravity sewer main; • Under bored watermain beneath Kangoo Road to allow cross-connection to Council's existing watermain; • Construction of sewer maintenance structures; • Backfill using imported bedding material and existing spoil; • Pressure testing and commissioning; • Restoration of the works area.
Plant and Equipment	<ul style="list-style-type: none"> • Excavators; • Tipper trucks; • Light vehicles; • Flat-bed delivery trucks; • Service vehicles; • Mobile cranes; • Rollers; • Skid steers; • Water carts; • Boring machines; • Jackhammers; • Generators; • Pressure testing equipment; • Underboring equipment; • Compactor; • Concrete agitators (or similar); • Concrete pumps; • Concrete saws; • Air compressors; and • Various hand tools and small machinery.
Construction workforce	<p>Up to approximately 15 full time equivalents for the duration of the works. The appointed contractor will determine the number of workers.</p>
Construction period	<p>Construction works could commence Quarter 2 2020 and are anticipated to be completed by Q3 2020.</p> <p>Construction works will take approximately 16 weeks.</p>
Construction hours	<p>Construction would generally occur during the standard working hours set out in the Interim Construction Noise Guideline (DECC, 2009):</p> <ul style="list-style-type: none"> • Mondays to Fridays between 7am and 6pm. • Saturdays between 8am and 1pm. • No work would normally occur on Sundays or public holidays.
Traffic Management & Access	<p>The appointed contractor will prepare a construction traffic, transport and access management plan in consultation with relevant stakeholders and in accordance with relevant standards as part of the CEMP. The traffic and transport management plan would provide information on traffic flow, vehicle moments, site access and parking arrangements during</p>



Key Elements	Description
	construction, and the measures to minimise the impacts on the relevant road network.
Public Utilities	Existing public utilities/services exist in the vicinity of the works. It will be the contractor's responsibility to locate all services prior to commencement of works.
Operation & Maintenance	The relevant infrastructure authority will be responsible for the ongoing maintenance and operational obligations, including fault rectification in accordance with the terms of their operating license.

The indicative plan for the Water, Sewer and Drainage Infrastructure Works is attached as Appendix 2.

The Water, Sewer and Drainage Infrastructure Works will occur in the Water, Sewer and Drainage Infrastructure Works disturbance area identified in Figure 1 1. Access will likely be from Kangoo Road and/or Central Coast Highway / The Avenue intersection and internal access tracks. Where possible, access will follow existing tracks to minimise impacts.

The order and timing of the construction activities is not finalised. The order and timing of the construction activities will be finalised with relevant stakeholders and the appointed construction contractor.

3.2. MANAGING CONSTRUCTION ACTIVITIES


A Construction Management Environmental Plan (CEMP) is required for the construction phase of this proposal. It will be prepared by the construction contractor prior to commencement of construction, incorporating relevant mitigation measures outlined in this REF.

3.3. OPERATIONAL REQUIREMENTS

The Avenue South/Festival Drive Roadworks

Following completion of the proposed upgrading of The Avenue South road reserve pavement and Festival Drive road reserve pavement the road reserve may, depending on discussions with Central Coast Council (CCC) be dedicated to CCC. If the road reserve is not dedicated to CCC HCCDC will continue its existing maintenance and operational obligations.

Following completion of the services/utilities infrastructure and the installation is assessed as operational, the infrastructure will become the property of the relevant infrastructure



authorities supported by any necessary easements including CCC The relevant infrastructure authority will be responsible for the ongoing maintenance and operational obligations, including fault rectification in accordance with the terms of their operating license.

Water, Sewer and Drainage Infrastructure Works

Following completion of the water, sewer and drainage infrastructure works and the installation is assessed as operational the infrastructure will become the property of relevant infrastructure authorities including the CCC as the water and sewer authority, supported by any necessary easements. Ongoing maintenance and operational obligations, including fault rectification, would be the responsibility of the relevant infrastructure authority including CCC in accordance with the relevant legislative requirements.



4. STATUTORY FRAMEWORK

The following Acts and Regulations are considered relevant to the proposal, are outlined in the sections below.

4.1. ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The EP&A Act establishes the framework for assessment of environmental impacts and determining planning approvals for development in NSW. It also provides for the creation and implementation of State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) which impact permissibility.


The *Growth Centres (Development Corporations) Act 1974* section 4(5) stipulates Hunter and Central Coast Development Corporation (HCCDC) as an NSW Government Agency. The Interpretation Act 1987 section 13A classifies an NSW Government Agency as a statutory body representing the Crown. The EP&A Act section 1.4 definition of a public authority includes a statutory body representing the Crown.

Under the Infrastructure SEPP, HCCDC as a public authority may carry out defined infrastructure works described under the Infrastructure SEPP without consent (subject to preconditions, if any) on the Project Area and other land.

Although the proposal does not require consent under Part 4 of the EP&A Act the proposal must be assessed under Part 5 of the EP&A Act subject to certain exceptions e.g. exempt development and Biodiversity certification, which do not apply to the proposal.

A precondition to the operation of Part 5 of the EP&A Act is the proposal must fall within the definition of an activity in section 5.1 of the EPA Act. An activity means:

- (a) the use of land, and*
- (b) the subdivision of land, and*
- (c) the erection of a building, and*
- (d) the carrying out of a work, and*
- (e) the demolition of a building or work, and*
- (f) any other act, matter or thing referred to in section 3.14 that is prescribed by the regulations for the purposes of this definition,*
- but does not include:*
- (g) any act, matter or thing for which development consent under Part 4 is required or has been obtained, or*
- (h) any act matter or thing that is prohibited under an environmental planning instrument, or*

- 
- (i) exempt development, or
 - (j) development carried out in compliance with a development control order, or
 - (k) any development of a class or description that is prescribed by the regulations for the purposes of this definition.

HCCDC can utilise Part 5 of the EP&A Act because the proposal falls within the definition of an activity. HCCDC as the determining authority before proceeding with an activity or granting approval to the activity, must consider the environmental impact of that activity. Section 5.5 of the EP&A Act specifies how assessment of environmental impact is to be completed.

Under section 5.5 of the EP&A Act, HCCDC must examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. Clause 228 of the *Environmental Planning & Assessment Regulation 2000* list the factors that HCCDC must consider when judging the likely impact of an activity on the environment. This REF is provided to HCCDC to comply with its statutory obligations.

Under Part 5 of the EP&A Act an Environmental Impact Statement (EIS) is only required if HCCDC, as the determining authority, forms the view that the activity which it is considering is likely to significantly affect the environment (section 5.7 of the EP&A Act).

4.2. STATE ENVIRONMENTAL PLANNING POLICIES

4.2.1. State Environmental Planning Policy (Infrastructure) 2007

The aim of Infrastructure SEPP is to facilitate the effective delivery of infrastructure across NSW (section 2 Infrastructure SEPP).

Section 8 ('Relationship to other environmental planning instruments') of the Infrastructure SEPP provides that if there is an inconsistency between the Infrastructure SEPP and any other environmental planning instrument, the Infrastructure SEPP prevails to the extent of the inconsistency.

Under the Infrastructure SEPP HCCDC as a public authority may carry out defined infrastructure works described under the Infrastructure SEPP without consent (subject to preconditions, if applicable) on the Project Area and other land. HCCDC's proposal falls within the following Infrastructure SEPP categories:

- Part 3 - Development controls, Division 17 - Roads and traffic, Subdivision 1 - Roads and roads infrastructure facilities, Clause 94(1): *"Development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land....."*

- Part 3 - Development controls, Division 5 - Electricity transmission or distribution, Subdivision 1 - Electricity transmission or distribution networks, Clause 41:
“Development for the purpose of an electricity transmission or distribution network may be carried out by or on behalf of an electricity supply authority or public authority without consent on any land.....”
- Part 3 - Development controls, Division 18 - Sewerage systems, Clause 106(3B):
“Development for the purpose of sewage reticulation systems may be carried out without consent on any land in the prescribed circumstances.”
- Part 3 - Development controls, Division 20 - stormwater management systems, Clause 111(1): *“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.”*
- Part 3 - Development controls, Division 21 - Telecommunications and other communication facilities, Clause 114(1): *“Development for the purposes of telecommunications facilities (including radio facilities) may be carried out by a public authority without consent on any land.”*
- Part 3 - Development controls, Division 24 - Water supply systems, Clause 125(1):
“Development for the purpose of water reticulation systems may be carried out by or on behalf of a public authority without consent on any land.”

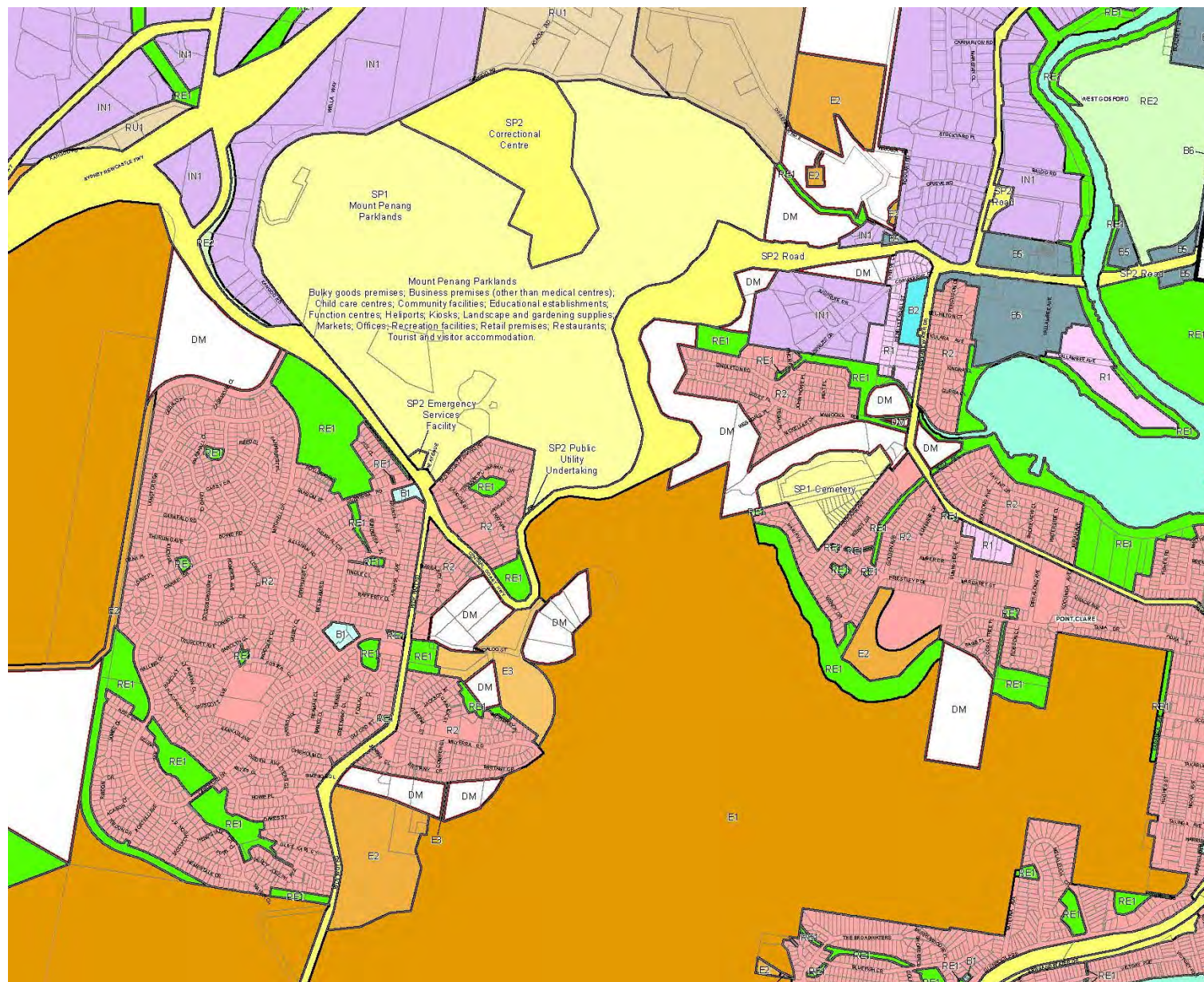
While HCCDC may carry out defined infrastructure works without consent the infrastructure SEPP precludes HCCDC from carrying out the development in particular circumstances unless HCCDC has provided written notice of the intention to carry out the development (together with a scope of works) to the relevant authority and taken into consideration any response to the notice that is received from the relevant authority within 21 days after the notice is given. Further information is provided in Section 5.2.


4.3. LOCAL ENVIRONMENTAL PLANS

4.3.1. Gosford Local Environmental Plan 2014

The GLEP 2014 applies to the Project Area. As shown in Figure 4-1, the proposal is located in the area zoned Zone SP1 Special Activities. The purposes shown on the Land Zoning Map are Bulky goods premises; Business premises (other than medical centres); Childcare centres; Community facilities; Educational establishments; Function centres; Heliports; Kiosks; Landscape and gardening supplies; Markets; Offices; Recreation facilities; Retail premises; Restaurants; Tourist and visitor accommodation.

- Zone**
- B1 Neighbourhood Centre
 - B2 Local Centre
 - B3 Commercial Core
 - B4 Mixed Use
 - B5 Business Development
 - B6 Enterprise Corridor
 - E1 National Parks and Nature Reserves
 - E2 Environmental Conservation
 - E3 Environmental Management
 - E4 Environmental Living
 - IN1 General Industrial
 - IN4 Working Waterfront
 - R1 General Residential
 - R2 Low Density Residential
 - RE1 Public Recreation
 - RE2 Private Recreation
 - RU1 Primary Production
 - RU2 Rural Landscape
 - RU3 Forestry
 - RU6 Village
 - SP1 Special Activities
 - SP2 Infrastructure
 - UL Unzoned Land
 - W1 Natural Waterways
 - W2 Recreational Waterways
 - DM Deferred Matter
 - SECC SEPP (Gosford City Centre) 2018





Clause 1.9(1) of the GLEP 2014 states:

“This Plan is subject to the provisions of any State environmental planning policy that prevails over this Plan as provided by section 36 of the Act.”

Clause 5.12(1) of the GLEP 2014 states:

“This Plan does not restrict or prohibit, or enable the restriction or prohibition of, the carrying out of any development, by or on behalf of a public authority, that is permitted to be carried out with or without development consent, or that is exempt development, under State Environmental Planning Policy (Infrastructure) 2007.”

Development consent for the proposal under the GLEP 2014 is not required because the proposal is permitted without consent pursuant to the Infrastructure SEPP.

The REF has considered applicable factors stipulated in the GLEP 2014.

4.3.2. Gosford Development Control Plan 2013

Gosford Development Control Plan 2013 (GDCP 2013) applies to the Project Area. The GDCP 2013 provides detailed planning and design guidelines to support the planning controls in the GLEP 2014. The GDCP 2013 describes how to go about a land use and provides additional development controls and standards for addressing and managing issues at a local level and provides information to meet Council requirements for sustainable, quality development.

The GDCP 2013 Part 5.3 – Kariong, Mount Penang Parklands applies specific development controls to the Project Area. Part 5.3 requires basic infrastructure and services, such as water, sewer, stormwater, power, telephone lines, gas and roads be delivered generally in accordance with the following servicing strategy reports as amended from time-to-time i.e.:

- Draft Transport Assessment, AECOM, November 2013. Refer Gosford City Council Document No. 19486945;
- Water and Sewer Servicing Strategy. ADW Johnson, November 2013. Refer Gosford City Council Document No. 19486945;
- Roads, Stormwater and Utilities Servicing Strategy, ADW Johnson, November 2013. Refer Gosford City Council Document No. 19486945;
- Flora and Fauna Assessment, Mount Penang Parklands, Travers Bushfire and Ecology, February 2014. Refer Gosford City Council Document No. 19486945; and
- Bushfire Protection Assessment, Mount Penang Parklands, Travers Bushfire & Ecology, February 2014. Refer Gosford City Council Document No. 19486945.

The proposal is generally consistent with the Gosford DCP general development controls and the Gosford DCP Part 5.3 – Kariong, Mount Penang Parklands, specific development controls.

4.4. STATE AND COMMONWEALTH LEGISLATION

4.4.1. Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the protection of the environment, especially those aspects of the environment that are matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have a significant impact on a NES require approval from the Australian Government Minister for the Environment (the Minister). The likely impact on the nine NES protected under the EPBC Act are outlined in the flora and fauna assessment in Appendix 3.

The Flora and Fauna Assessment concluded, the proposal is unlikely to have a significant impact on threatened biodiversity and as such a Species Impact Statement or a referral to the Commonwealth under the EPBC Act is not required.


Further information is provided in Section 6.3.

4.4.2. Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) identifies threatened species, populations, endangered ecological communities, critical habitats and key threatening processes. The BC Act establishes a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity.

Clause 7.8 of the BC Act states:

- (1) This section applies to environmental assessment under Part 5 of the Environmental Planning and Assessment Act 1979.*
- (2) For the purposes of Part 5 of the Environmental Planning and Assessment Act 1979, an activity is to be regarded as an activity likely to significantly affect the environment if it is likely to significantly affect threatened species.*
- (3) In that case, the environmental impact statement under Part 5 of the Environmental Planning and Assessment Act 1979 is to include or be accompanied by:*
 - (a) a species impact statement, or*
 - (b) if the proponent so elects—a biodiversity development assessment report.*
- (4) If the likely significant effect on threatened species is the only likely significant effect on the environment, an environmental impact statement may be dispensed with and Part 5 of the Environmental Planning and Assessment Act 1979 applies as if references to an environmental impact statement were references to a species impact statement or biodiversity development assessment report.*



A Flora and Fauna assessment is attached as Appendix 3. The Flora and Fauna Assessment found;

- No threatened flora species were recorded within the study area. Twelve (12) threatened flora species have potential habitat within the study area. Significance assessments for these potential threatened flora species was undertaken and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.
- No threatened fauna species were recorded within the study area. Thirty-two (32) threatened fauna species have potential habitat within the study area. Significance assessments for these threatened fauna species was undertaken and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.
- No migratory species were recorded however, four species have potential habitat to within the study area. An assessment of the impact of the proposal on these species was conducted and it was determined that study area is not classified as important habitat for any of the migratory species that have potential to occur within the study area.

As defined by the *Biodiversity Conservation Act 2016* the proposal is not expected to have significant impacts on threatened species, populations, ecological, communities or their habitats consequently a species impact statement is not required.

Further information is provided in Section 6.3.

4.4.3. Protection of the Environment Operations Act 1997

The object of the Act is to achieve the protection, restoration and enhancement of the quality of the NSW environment. There is a broad allocation of responsibilities under the Act between the Environmental Protection authority (EPA), local councils and other public authorities. The EPA is made the regulatory authority for:

- activities listed in Schedule 1 to the Act and the premises where they are carried out;
- activities carried out by a State or public authority; and
- other activities in relation to which a licence regulating water pollution is issued.

In nearly all other cases, the regulatory authority is the relevant local council.

No licences/approvals are required for the works under the POEO Act.

No further consideration of the Act is required.



4.4.4. Water Act 1912

The taking of water and its subsequent use has historically been managed through a licensing framework under the *Water Act 1912*. This licensing framework is transitioning to a new licensing and approval framework under the *Water Management Act 2000* (WM Act).

This transition occurs for particular water sources when a water sharing plan which applies to those water sources commences. This transition process is largely complete. The *Water Act 1912* can still apply to:

- take water from a river, lake or aquifer;
- capture rainfall run-off;
- construct and use a work for the purpose of water conservation, irrigation, water supply or drainage;
- sink a bore, well or excavation which may connect with an aquifer - known as aquifer interference activities; and
- dispose of water.

The proposal will include excavation works. Groundwater may would be intercepted, and dewatering required. If groundwater is intercepted and dewatering required it is unlikely that it would exceed the stipulated amount of 3 ML/year and therefore the need for a licence under Part 5 of the *Water Act 1912*.

No further consideration of the Act is required.

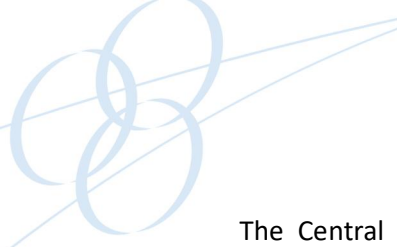
4.4.5. Water Management Act 2000

The WM Act governs the issue of new water licences and the trade of water licences and allocations for those water sources (rivers, lakes and groundwater) in NSW where water sharing plans have commenced.

The proposal is located within the Water Sharing Plan for the Central Coast Unregulated Water Sources 2009, managed under the WM Act.

Under the WM Act, should an amount of water need to be extracted from a surface water source defined in gazetted water sharing plan that exceeds the stipulated amount then licence/approvals must be obtained.

The proposal does not include a requirement for access for water under the WM Act.



The Central Coast Council is a water supply authority under the WM Act. Where any development or engineering works are to be undertaken, the owner or developer is responsible for ensuring the water supply authority's assets are considered.

An owner or developer must make satisfactory arrangements for the provision of services to the new development, which may also involve payment of water and/or sewer developer contributions. To identify the appropriate arrangements, the developer must apply for a 307 Certificate under Section 305 WM Act.

The proposal does include a requirement for water supply works under the WM Act. A section 307 approval under the WM Act for works is required.

4.4.6. Waste Avoidance and Resource Recovery Act 2001

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) promotes waste avoidance and resource recovery in New South Wales. Under this Act, the resource management hierarchy principles in order of priority are:

- avoidance of unnecessary resource consumption;
- resource recovery (including reuse, reprocessing, recycling and energy recovery); and
- disposal.

HCCDC is committed to ensuring responsible management of waste and the reuse of such waste through appropriate measures, in accordance with the resource management hierarchy principles.

No further consideration of the Act is required.

4.4.7. Roads Act 1993

The *Roads Act 1993* makes provisions with respect to public roads. Under this Act, approval is required for works within a public road reserve including but not limited to road pavement works, kerb and gutter, footway works, footpath, vehicular access crossing (other than for single dwellings or garages and with no structures in road reserve) and drainage works within road reserve.

A Section 138 approval/s under the Roads Act 1993 is required for under boring works beneath Kangoo Road to allow the proposed watermain cross-connection to Council's existing watermain and infrastructure works within the Central Coast Highway road reserve

A Section 138 is not required for The Avenue South and Festival Drive, because the roads are not public roads at this stage.

4.4.8. Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to conserve the environmental heritage in NSW. Under this Act, environmental heritage is defined as including buildings, works, relics or places which are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State.

The State Heritage Register (SHR) was established under Section 22 of the Heritage Act and is a list of places and objects of particular importance to the people of NSW, including archaeological sites. Listing on the SHR controls activities such as alteration, damage, demolition, and development. The Project Area is included in the following SHR listing:


- Mount Penang Parklands (SHR #O1667).

Approval under section 57(1) for works to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register. The form of the application is specified by section 60. Section 57(2) provides that an exemption from the approval requirements of section 57(1) can be sought in certain circumstances. An excavation permit is required under sections 139(1) and (2) to disturb or excavate any land containing or likely to contain a relic. The form of the application is specified by section 140. Section 139(4) provides that exceptions from the approval requirements of sections 139(1) and (2) can be sought in certain circumstances.

There is an existing s60 approval (S60/2018/054) for Avenue South/Festival Drive Roadworks.

For the Water, Sewer and Drainage Infrastructure Works a Statement of Heritage Impact (SoHI) has been prepared and is attached as Appendix 4. For the Water, Sewer and Drainage Infrastructure Works the SoHI recommends:

- An approval under s60 of the Heritage Act is required prior to works commencing. This SoHI should be submitted as part of the application package to Heritage NSW. Following determination of the approval works should be undertaken in accordance with any conditions provided by Heritage NSW;
- The excavation for the water infrastructure can proceed with caution. Should suspected archaeological material be identified then works are to stop in that area. The heritage consultant is to be contacted to make an assessment and to devise, in consultation with Heritage NSW, a management strategy for the area and potentially a modification under s65A; and
- A heritage induction is to be provided to all on-site personnel undertaking ground disturbing works so that they understand their obligations to report the discovery of archaeological material and their obligations under the *Heritage Act 1977*.



Further information is provided in Section 6.6.

4.4.9. National Parks and Wildlife Act 1974

Under the *National Parks and Wildlife Act 1974* (NPW Act), approval is required to knowingly destroy, deface, damage or knowingly cause or permit, the destruction of, or damage to, an Aboriginal object or Aboriginal place.

An Aboriginal Due Diligence Assessment, incorporating consultation with a Darkinjung representative, in accordance with the Aboriginal Cultural Heritage Consultation Requirements for proponents (DECCW, 2010) and a search of the Aboriginal Heritage Information Management System (AHIMS), is attached as Appendix 4. The Aboriginal Due Diligence Assessment recommends:

- The whole Project Area is to be subject to an Aboriginal Heritage Impact Permit. The AHIP is to allow for the collection of artefacts after vegetation has been cleared; and
- The water, sewer and drainage infrastructure is to avoid the archaeologically sensitive sandstone area.

Further information is provided in Section 6.7.

4.4.10. Biosecurity Act 2015

The *Biosecurity Act 2015* (BSA Act) has replaced the *Noxious Weed Act 1993* and all noxious weeds are now regulated by the BSA Act. Noxious weeds are renamed as priority weeds and are now regulated with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose. These weeds reduce diversity of native plant and animal species. The BSA Act is implemented and enforced by the Local Control Area for the Local Government Area (LGA).

Weeds would be managed and disposed of in accordance with the requirements of the BSA Act and regulation.

Further information is provided in Section 6.3.

4.5. SUMMARY OF APPROAL REQUIRMENTS

Table 4-1 provides a summary of the likely approvals/licences. The construction contractor's final construction plans may trigger the requirement for additional approvals and licences.

Table 4-1: Summary of required approvals/licences

Act	Approval Requirement	Relevance to the Proposal
Heritage Act 1977	<p>Approval under section 57(1) for works to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register. The form of the application is specified by section 60.</p> <p>Section 57(2) provides that an exemption from the approval requirements of section 57(1) can be sought in certain circumstances.</p> <p>An excavation permit is required under sections 139(1) and (2) to disturb or excavate any land containing or likely to contain a relic. The form of the application is specified by section 140.</p> <p>Section 139(4) provides that exceptions from the approval requirements of sections 139(1) and (2) can be sought in certain circumstances.</p>	The Statement of Heritage Impact recommends an approval under s60 of the Heritage Act prior to works commencing.
National Parks and Wildlife Act 1974	An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the Act to harm or desecrate an Aboriginal heritage object.	The Aboriginal heritage Due Diligence Assessment recommends an AHIP for the whole of the Project Area.
Roads Act 1993	Approval under sections 138 for works in a public road reserve.	The proposal involves under boring Kangoo Road to allow for the installed watermain to cross-connect to Council's existing watermain, and infrastructure works within the Central Coast Highway road reserve.
Water Management Act 2000	Application for 307 Certificate under Section 305 Water Management Act 2000.	Council is a water supply authority under the Water Management Act 2000. The proposal involves under boring Kangoo Road to allow for the installed watermain to cross-connect to Council's existing watermain and Sewer connection.



5. STAKEHOLDER AND COMMUNITY CONSULTATION

5.1. CONSULTATION PRIOR TO THE REF PREPARATION

Consultation during the proposal's planning and design has been predominately carried out by HCCDC and has included:

- Presenting the proposal to the Mount Penang Parklands tenants at a 24/06/19 tenant meeting; and
- Extensive consultation with the Central Coast Council regarding the proposal.

HCCDC will continue liaising with the Mount Penang Parklands tenants and relevant stakeholders.

5.2. INFRASTRUCTURE SEPP REQUIREMENTS

HCCDC's Infrastructure SEPP Part 2 General: Division 1 Consultation requirements are evaluated in Appendix 11. The assessment concludes:


Section 13 Consultation with councils — development with impacts on council-related infrastructure or services

HCCDC is not required to give written notice of the intention to carry out the development (together with a scope of works) to the Central Coast Council because HCCDC requires an approval from Central Coast Council as the water and sewer authority.

Section 14 Consultation with councils — development with impacts on local heritage

HCCDC is not required to give written notice of the intention to carry out the development (together with a scope of works) to the Central Coast Council because HCCDC requires an approval from Central Coast Council.

Section 15 Consultation with councils — development with impacts on flood liable land



HCDCC is not required to give written notice of the intention to carry out the development (together with a scope of works) to the Central Coast Council because the Project Area is not flood liable land and HCCDC requires an approval from Central Coast Council.

Section 16 Consultation with public authorities other than councils

HCDCC is not required to give written notice of the intention to carry out the development (together with a scope of works) to the public authorities referred to in section 16 because the proposal does not trigger the consultation requirements.

5.3. POST DETERMINATION CONSULTATION

Should HCDCC proceed with the proposal, consultation with the Mount Penang Parkland's tenants, community and key stakeholders would be ongoing in the lead up to, and during, construction. The consultation activities would ensure that:

- The Mount Penang Parkland's tenants, community and stakeholders have a high level of awareness of all processes and activities associated with the proposal;
- Accurate and accessible information is made available;
- A timely response is given to issues and concerns raised by the community; and
- Feedback from the community is encouraged.

Construction communication measures could include a 24-hour construction information telephone line and email address, targeted consultation methods (such as letters, notifications, signage and face-to-face communications) and the HCDCC website including updates on the progress of the proposal.

A construction communication management plan would be prepared as part of the Construction Environmental Management Plan (CEMP) including a detailed list of the measures that would be implemented during construction to communicate with, and respond to, stakeholders.



6. ENVIRONMENTAL ASSESSMENT

The environmental assessment is for the proposal's construction phase and operation phase.

Clause 228 of the EP&A Reg 2000 lists, for the purposes of Part 5 of the EP&A Act, the factors to be taken into account when considering the likely impact of an activity on the environment. Appendix 12 considers the potential impacts of the proposal against these factors.

6.1. SOILS AND GEOLOGY

6.1.1. Existing Environment

Geology

The Project area is situated in the Somersby Plateau, which is characterised as Triassic quartz sandstone with thin conglomerates and shale ridge caps. Older Triassic lithic and quartz sandstones are found exposed in valleys and along the coast. Deep yellow earths or rocky outcrops are located on the plateau tops. Uniform and texture-contrast soils are common on sandstones and shale slopes. Loamy sand in alluvium are located along creeks.

Acid Sulfate Soils

The proposal is located on land mapped as 'Class 5' Acid Sulfate Soils (ASS).

Contamination


A search of the NSW Environment Protection Authority (EPA) Contaminated Land Record revealed there is no records of contamination in the Project area.

There is no identified contamination in the Project area however previous historical land uses that may have caused contamination within parts of the Project Area include agricultural/horticultural land uses.

6.1.2. Impact Assessment

The proposal's construction works will require ground disturbance and exposure of soil in The Avenue South/Festival Drive Roadworks disturbance area and the Water, Sewer and Drainage Infrastructure Works disturbance area consequently there is potential for soil erosion and sediment transport during the construction period. Areas subject to disturbance by excavation and trenching will be subject to ongoing potential erosion until they are stabilised.

Under Clause 7.1(2) of the Gosford LEP, 'Class 5' ASS applies to: *"Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which*



the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land". The construction works will not be within 500 metres of adjacent Class 1, 2, 3 or 4 land and will not result in alterations to the long-term level of the watertable.


Excavation may disturb contaminated soils and hazardous materials present in soil. If inadequately managed, the disturbance of any areas of contamination has the potential to impact on human health and the natural environment.

The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure and services consequently the potential to adversely impact the Project area's and surrounding locality's soils and geology during the proposal's operation is minimal.

6.1.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate potential erosion and sedimentation adverse impacts by construction works and operation works and potential adverse impacts on human health and the natural environment from disturbance of contaminated soils and or hazardous material. Mitigation measure could include:

- A Soil and Water Management Plan, including an Acid Sulphate Soil Management sub-plan and an Erosion and Sediment Control (ESCP) sub-plan (prepared in accordance with Landcom's (2004) Managing Urban: Stormwater Soils and Construction), be prepared as part of the Construction Environmental Management Plan (CEMP);
- The ESCP will include appropriate sediment controls for wherever soil disturbance that could result in sediment run-off takes place;
- Erosion and sediment controls will be established prior to the commencement of construction and remain in place until the surface has been stabilised;
- Sediment controls will be placed at the entry points to any culverts and stormwater channels to prevent sediment entering the stormwater system;
- Erosion and sediment control devices will be regularly checked and maintained to ensure the remain effective for the duration of the construction period;
- Stabilisation by revegetation for disturbed areas will occur as soon as practicable within after completion of construction;
- Restoration following the completion of the works will aim to be as close as possible to the pre-works state;
- The road will be swept where it becomes dirty from tracking dirt, which will be minimised where possible;
- An 'unexpected finds protocol' would be prepared to assist with the identification, reporting, assessment, management, health and safety implications, remediation, and/or disposal (at an appropriately licensed facility) of any potentially contaminated soil and/or water; and

- 
- In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the affected area would cease immediately, and the procedures detailed in the unexpected finds protocol would be implemented.

The implementation of the mitigation measures will ensure the potential adverse impact on the Project area's and surrounding locality's soil and geology by the proposal's construction works and operation works is minimal.

6.2. HYDROLOGY, WATER QUALITY & FLOODING

6.2.1. Existing Environment

The Water, Sewer and Drainage Infrastructure Works disturbance area is predominately vegetated and pervious allowing for rainwater infiltration.

The Avenue South/Festival Drive Roadworks disturbance area is predominately road pavement and impervious with rainwater managed by on-site stormwater controls to ensure stormwater flows and stormwater quality.

The Project area is not flood liable and does not have a history of flooding.


6.2.2. Impact Assessment

The proposal's construction works within Avenue South/Festival Drive Roadworks disturbance area will not alter the alignment of drainage lines of any existing dams or creeks, and it is not anticipated to impact surrounding water bodies.

Blockages within the stormwater system in Avenue South/Festival Drive Roadworks disturbance area could potentially affect stormwater levels upstream and downstream. If inadequately managed, construction can result in temporary impacts to the behaviour of local surface water systems.

The proposal's construction works within the Water, Sewer and Drainage Infrastructure Works disturbance area will not alter any alignment of drainage lines or any existing dams or creeks, and it is not anticipated to impact surrounding water bodies.

Construction of the proposal will involve disturbance of the ground surface. The main potential impacts to water quality relate to soil disturbance and runoff during construction. Pollutants such as sediment, soil nutrients and construction waste have the potential to mobilise and enter the stormwater system particularly during high rainfall events.



Potential impacts associated with increased sediment loading include increased turbidity and an increased potential for the transport of contaminants bound to sediment particles. The transportation of contaminated soil from the construction sites could also affect water quality if any contaminants escape containment measures.

Water quality impacts could also potentially occur during construction as a result of contamination by fuel or chemical spills from construction vehicles.

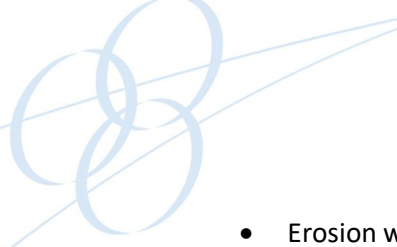
The underbored watermain beneath Kangoo Road, required to allow cross-connection to Council's existing watermain is likely to intercept groundwater. Groundwater inflow/seepage is expected during excavation and dewatering would be required.

The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure consequently the potential to adversely impact the Project area's and surrounding locality's soils, hydrology and water quality during the proposal's operation is minimal.

6.2.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate potential adverse impacts on the hydrology, waterways and flooding by construction works and operation works. Mitigation measure could include:

- A Soil and Water Management Plan, including a Groundwater Management sub-plan and Erosion and Sediment Control sub-plan (prepared in accordance with Landcom's (2004) Managing Urban: Stormwater Soils and Construction) would be prepared as part of the CEMP;
- A Contamination and Hazardous Materials Plan would be prepared as part of the CEMP;
- Fuels and chemicals will be stored and transported in accordance with the Australian Standard AS 1940-2004: The Storage and Handling of Flammable and Combustible Liquids and the Dangerous Goods Act 1975;
- The ground surface will be reinstated progressively;
- Refuelling, fuel decanting and vehicle maintenance work will take place off-site where possible;
- Chemicals, fuels and waste will not be stored or collected for disposal within or adjacent to drainage lines, waterbodies or unsealed surfaces;
- A 'spill kit' will be kept onsite at all times to be used in the event of a chemical or fuel spill;
- Access to site will be contained to approved construction works area or access tracks to minimise site disturbance;

- 
- Erosion will be limited using slit fences and socks to manage runoff fetches and velocities; and
 - Silt fences, straw bales, turf strips and other sediment filters will be located downstream of disturbed areas.

Construction works and operation works are unlikely to adversely impact any nearby surface water, waterways or groundwater.

6.3. ECOLOGY

6.3.1. Existing Environment

Three native Plant Community Types (PCTs) and four non-native vegetation communities were recorded within the study area and these include the following:

- PCT 1641 Dwarf Apple – Scribbly Gum heathy low woodland;
- PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland;
- PCT 1699 Heath-leaved Banksia – Coral Fern wet heath
- Planted Native Trees;
- Exotic Vegetation;
- Exotic Grassland; and
- Constructed Dam.

One TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion* listed as Endangered under both the BC and EPBC Acts was recorded within the study area. This TEC has been mapped as PCT 1699 Heath-leaved Banksia – Coral Fern wet heath within the study area.


6.3.2. Impact Assessment

The proposal will involve the removal of 1.5 - 2ha of native and non-native vegetation as detailed in the Flora and Fauna Assessment at Appendix 3.

The TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion* will not be impacted by the proposal.

PCT 1642 and PCT 1699 have high potential to be groundwater dependent, however as there is no proposed draw down of groundwater and the proposal is unlikely to affect this GDE.

No threatened flora species were recorded within the study area. Twelve (12) threatened flora species have potential habitat within the study area. Significance assessments for these potential threatened flora species was undertaken and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.



No threatened fauna species were recorded within the study area. Thirty-two (32) threatened fauna species have potential habitat within the study area. Significance assessments for these threatened fauna species was undertaken and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.

No migratory species were recorded however, four species have potential habitat to within the study area. An assessment of the impact of the proposal on these species was conducted and it was determined that study area is not classified as important habitat for any of the migratory species that have potential to occur within the study area.

Fifty-seven (57) hollow-bearing trees were recorded within the study area. A maximum of three (3) of these will be removed as part of the proposal.

No threatened aquatic species listed under the FM Act have potential habitat within the study area.

No areas of outstanding biodiversity value (AOBV) listed on the BC Act occur within the study area.

The Flora and Fauna Assessment concluded, the proposal is unlikely to have a significant impact on threatened biodiversity and as such a Species Impact Statement or a referral to the Commonwealth under the EPBC Act is not required.

6.3.3. Mitigation Measures

The Flora and Fauna Assessment made a number of recommendations. In summary, the assessment recommended the avoidance of TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion*. As a result of this recommendation, the TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion* will not be impacted by the proposal.

The Flora and Fauna Assessment also recommended the targeted surveys for *Cryptostylis hunteriana* (Leafless Tongue Orchid) during the November to February flowering period are suggested if there are likely to be any future impacts to PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia Woodland. If this is not practical, then a pre-construction re-check is suggested.

In addition, the following mitigation measures were proposed:

- Limit vegetation clearing to a minimum necessary to construct works. Implement clearing protocols, including


- The boundaries of vegetation clearing to be clearly marked as 'no go zones', signposted and delineated to prevent unauthorised clearing and vehicular and foot traffic;
- Marking trees to be removed and prepare an inventory of trees to be removed;
- Pre-clearance surveys to be completed by an appropriately qualified ecologist; Relocate any bushrock and fallen timber within the vegetation clearing area into adjoining bushland;
- Stockpiles should be placed in cleared areas outside of the 'no go zones'.
- It is recommended that the following mitigation measures be implemented for the removal of the hollow-bearing trees:
 - Marking trees to be removed and preparing an inventory of trees and hollows to be removed;
 - Prepare an inventory of all fauna interactions;
 - Pre-clearance surveys to be completed by an appropriately qualified ecologist;
 - A qualified ecologist should be present during the removal of hollow-bearing trees to relocate any displaced fauna;
 - If practical, removal of hollow-bearing trees be undertaken outside of May – September which is the main breeding season for hollow-dependant fauna.
- Implementation of a weed management control protocol. All equipment, vehicles and machinery wheels and tracks of excavators and other tracked machinery should be cleaned so that they are completely free of soil, seeds and plant material before entering the study area to prevent the introduction of further exotic plant species and pathogens.
- All topsoil from the exotic grassland and exotic vegetation assemblages should be disposed of offsite.

6.4. NOISE AND VIBRATION

6.4.1. Existing Environment

The existing primary noise and vibration sources in The Avenue South/Festival Drive disturbance area are road traffic and pedestrian noise emanating from The Avenue South, Festival Drive, Central Coast Highway, and Kariong High School.

The existing primary noise and vibration sources in the Water, Sewer and Drainage Infrastructure Works disturbance area are road traffic noise from the Kariong Commuter Car Park, Kangoo Road and the Central Coast Highway, and pedestrian noise generated from Mount Penang Gardens.



Events are held sporadically in the Mount Penang Parklands, such as markets and festivals. These generate substantial noise and vibration from sources such as amplified music, high volumes of pedestrian traffic, and heavy and light vehicle movements.

6.4.2. Impact Assessment

The proposal's construction works requires the use of heavy and light machinery/tools which can generate noise and vibration levels at nearby receptors. At any location, the potential impacts may vary greatly depending on factors such as the proximity of receivers, the duration of works, the magnitude of the noise levels, the time at which the construction is undertaken, and the character of the noise or vibration emissions.

The proposal's construction noise emissions in The Avenue South/Festival Drive Roadworks disturbance area could be high during parts of the construction phase.

The proposal's construction vibration emissions in The Avenue South/Festival Drive Roadworks disturbance area are likely to be:

- Impulsive e.g. occasional dropping of heavy equipment occasional loading and unloading;
- Intermittent e.g. construction activity, jack hammers; and
- Continuous e.g. use of heavy machinery.


The proposal's construction noise emissions in the Water, Sewer and Drainage Infrastructure Works disturbance area could be high during parts of the construction phase.

The proposal's construction vibration emissions in the Water, Sewer and Drainage Infrastructure Works disturbance area are likely to be:

- Impulsive e.g. occasional dropping of heavy equipment occasional loading and unloading;
- Intermittent e.g. construction activity, jack hammers; and
- Continuous e.g. use of boring machinery.

There are no noise or vibration sensitive receivers e.g. residences, schools, childcare centres, aged-care facilities, hospitals heritage listed buildings/items, precision laboratories or operating theatres near the Water, Sewer and Drainage Infrastructure Works disturbance area.

There are noise and vibration non-residential receivers and sensitive receivers adjoining The Avenue South/Festival Drive Roadworks disturbance area i.e. the Kariong Mountains High School, Project Area tenants and built form of heritage significance in the heritage precinct.



Without mitigation measures it is likely the construction activities in The Avenue South/Festival Drive Road works disturbance area will generate noise at levels that could potentially adversely impact nearby non-residential receivers and sensitive receivers located in the Project area and surrounding locality. The noise impacts would only be experienced during the construction phase.

It is unlikely the construction activities in The Avenue South/Festival Drive Roadworks disturbance area will generate vibration at levels with the potential to adversely impact nearby non-residential receivers and sensitive receivers located in the Project area and surrounding locality. Specifically, it is unlikely the construction activities will generate vibration at levels with the potential to adversely impact the structures of nearby receivers or structures of heritage items/buildings located in the Project area or surrounding locality.

While construction works would generally occur during the standard working hours set out in the Interim Construction Noise Guideline (DECC, 2009) i.e. Mondays to Fridays between 7am and 6pm, Saturdays between 8am and 1pm and no work occurring on Sundays or public holidays, it may be sensible for some construction activities in The Avenue South/Festival Drive Roadworks disturbance area to be undertaken outside the prescribed hours to lessen the potential for adverse noise and vibration impacts on nearby receivers e.g. Kariong Mountains High School.

The Avenue South/Festival Drive Roadworks disturbance area and Water, Sewer and Drainage Infrastructure Works disturbance area will return to their pre-construction works noise and vibration levels during the proposal's operation.

The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure consequently the potential to adversely impact the Project area's or surrounding locality's noise and vibration amenity during the proposal's operation is minimal.

6.4.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate potential adverse noise and vibration impacts. Mitigation measure could include:

- Noise and Vibration Management Plan be prepared as part of the CEMP;
- Ensuring all equipment complies with the Interim Construction Noise Guideline 2009;
- Machinery and vehicles will be turned off when not in use or throttled down to a minimum;
- Construction completed within the shortest possible time;
- Construction in The Avenue South/Festival Drive Roadworks disturbance area during Kariong Mountains High School holidays;

- Construction works taking place between the hours: Monday to Friday, 7am to 6pm and Saturday at 8am to 1pm;
- Identified noisy construction works to take place outside the standard working hours set out in the Interim Construction Noise Guideline (DECC, 2009);
- Use of noisy equipment and construction work will be scheduled to occur between the hours of 9am and 4pm, where possible;
- Construction activities would be undertaken in accordance with AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites;
- All equipment will be maintained regularly and effectively;
- All equipment with potential to create high levels of noise will only be used in conjunction with noise control;
- Noise monitoring may be used if complaints regarding excessive noise use are received and impacts will be assessed against the Interim Construction Noise Guidelines (DECC 2009);
- If noise limits are found to exceed the established guideline values, then operations would be modified and measures such temporary noise barriers would be implemented;
- Mitigation impacts of the proposed works would be undertaken in accordance with the qualitative assessment guidelines of the Interim Construction Noise Guidelines (DECC 2009) such as community notification of the works, operating plant in a quiet and efficient manner, involving workers in minimising noise and a procedure of handling complaints in accordance with these guidelines;
- Controlling vibration at the source including: choosing alternative, lower-impact equipment, or methods wherever possible; scheduling the use of vibration-causing equipment, such as jackhammers, at the least sensitive time of day; routing, operating or locating high vibration sources as far away from sensitive areas as possible; sequencing operations so that vibration causing activities do not occur simultaneously isolating the equipment causing the vibration on resilient mounts;
- Informing identified stakeholders, including potentially impacted tenants, in the Project Area, of the potential impacts, the time periods over which these will occur and the proposed mitigation measures that will be employed to minimise the impacts; and
- Notice of works provided to identified stakeholders prior to the commencement construction.

The mitigation measures are designed to minimise adverse impacts on the Project area's and surrounding locality's receivers from airborne noise, ground-borne noise and vibration generated during the proposals' construction.

The potential long-term adverse noise and vibration impacts from the proposal's construction on the Project area and surrounding locality is low because of the limited construction time frame.



6.5. AIR QUALITY

6.5.1. Existing Environment

Air quality in the Central Coast Council LGA is generally good and meets the national standards. The NSW Annual Air Quality Statement 2018 released in January 2019 notes overall, air quality met standards for 98% of days during the year on the Central Coast through to 87% of days in South West Sydney.

The Central Coasts air quality monitoring is carried out at the Wyong air quality monitoring site located on the northern apron of Wyong racecourse within a residential/semi-rural area approximately 30km from the Project area. The Project area is approximately 158ha comprising approximately 67ha is bushland, and low-density urban development. Data collected at this station is considered to be representative of ambient air quality in the Project area.

6.5.2. Impact Assessment

Air quality impacts associated with proposal's construction works would mainly result from dust generated during excavation. Other dust sources may be produced by material handling activities associated with movement of construction vehicles on unsealed surfaces. Wind erosion of uncompacted surfaces, such as stockpiled material, could also cause localised emissions of dust.

Dust has the potential to impact on the amenity of people using local facilities, occupying nearby properties or passing the proposal's site (such as workers, people attending the school, and pedestrians/cyclists). Due to the relatively low intensity of construction, the small amount of required earthworks, and the relatively short duration of construction works the potential for adverse dust impacts is considered to be minimal.

The operation of construction plant, machinery and vehicles may also lead to short term increases in exhaust emissions in parts of the Project area and the surrounding locality however, these impacts are relatively minor due to the limited number of construction vehicles and the existing urban nature of The Avenue South/Festival Drive Roadworks disturbance area and other surrounding locality influences on air quality such as car traffic movements along the Central Coast Highway, on both The Avenue South/Festival Drive Roadworks disturbance area and Water, Sewer and Drainage Infrastructure Works disturbance area.

The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure consequently the potential to adversely impact the Project area's surrounding locality air quality during the proposal's operation is minimal.



6.5.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate potential adverse air quality impacts. Mitigation measure could include:

- All vehicles to be fitted with approved exhaust systems to maintain exhaust emissions within acceptable standards;
- Machinery and vehicles will not be left running or idling when not in use;
- Odours or air pollutant complaints will be dealt with promptly and the source will be eliminated wherever practicable;
- All loads of excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation and will remain covered until they are unloaded either for use at the worksite, reuse or disposal at a licensed waste disposal facility;
- Areas that have been disturbed by construction works will be rehabilitated progressively; and
- Monitor all work sites, general work areas and stockpiles for dust generation and watering down or covering affected areas in the event of windy conditions.

The potential long-term adverse air quality impacts from the proposal on the Project area and surrounding locality is low because the proposal is small in size and the construction time limited.

6.6. NON-INDIGENOUS HERITAGE

6.6.1. Existing Environment

The Project area is part of the State Heritage Register listing: Mount Penang Parklands (SHR#01667) and is also listed under the Gosford Local Environmental Plan 2014 as the Mount Penang Heritage Conservation Area (C1) and heritage item (I66).

A Conservation Management Plan (CMP) for Mount Penang Parklands was prepared by Godden Mackay Logan in 2001 and this has been endorsed by the Heritage Council. Another CMP was prepared by EJE in 2012, which was then superseded in 2018 by a CMP prepared by Extent Heritage; which does not yet appear to have been endorsed by the Heritage Council. CMP by TKD is currently with Heritage Council for endorsement.

The Mount Penang Parklands has been used as juvenile rehabilitation centre for the majority of the 20th century. The analysis of available aerial imagery suggests that the Project area was used for agricultural purposes in the late 1950s through to the early 1970s. Apart from the entry road, there is no evidence to suggest that substantial structures were constructed within the Project area.

6.6.2. Impact Assessment

The proposed works are primarily below ground and will occur outside the identified archaeological zones and in an area with nil to low archaeological sensitivity. There will be a temporary minor visual impact during construction while the pipes are being laid and a permanent very minor visual impact as a result of the access road. Upon the completion of the works, the Proposal Area will maintain its rural landscape values and will be in accordance with the views and vistas conservation policies (Extent 2018:69).

An arborists assessment of the 'The Avenue' heritage-listed avenue of trees has been completed and is attached at Appendix 7. The assessment concluded Trees 13 and 14 will be directly affected by the proposed works as they are located within the proposed road realignment and will require removal. These are newer plantings and not part of the original avenue planting. It also recommended two other trees, Trees 9 and 12 should also be removed as Tree 12 has blown over at some point in the past and may become structurally unsound in maturity. Tree 9 is almost dead and could pose a risk to pedestrians and car park users in the future by dropping dead wood.


6.6.3. Mitigation Measures

The Statement of Heritage Impact recommends the following:

- An approval under s60 of the Heritage Act is required prior to works commencing. This SoHI should be submitted as part of the application package to Heritage NSW. Following determination of the approval works should be undertaken in accordance with any conditions provided by Heritage NSW.
- The excavation for the water infrastructure can proceed with caution. Should suspected archaeological material be identified then works are to stop in that area. The heritage consultant is to be contacted to make an assessment and to devise, in consultation with Heritage NSW, a management strategy for the area and potentially a modification under s65A.
- A heritage induction is to be provided to all on-site personnel undertaking ground disturbing works so that they understand their obligations to report the discovery of archaeological material and their obligations under the *Heritage Act 1977*.

The Arborists assessment recommends the following:

- Remove Trees 9, 12, 13 and 14. Tree removal to be undertaken in accordance with WorkCover Amenity Tree Industry Code of Practice 1998.
- Tree remains to be mulched and used within the proposed landscaping works. Any residual mulch to be disposed of in a legal manner.
- Protect remaining trees in accordance with AS4970 Protection of trees on development sites.
- Monitor trees 4, 5, 6, 7, 8, 9, 10 and 11 for any further decline caused by the installation of the electrical conduit.

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- Proposed works include the removal of the uprights and conduits. Conduits and wires will have to be disconnected and left in the ground to prevent further disturbance of the tree's root systems. Lights and other above ground electricals can be removed.
 - Undertake replacement planting of Trees 9 and 12 with 200 litre sized *Lophostemon confertus* (Brush Box).
 - Undertake crown maintenance to remove dead wood. All pruning to be in accordance with AS 4373- 2007 Pruning of amenity trees.
 - Undertake a fertilising regime us a slow release fertiliser suitable for Australian native plants. This will help increase the vigour of the trees and their longevity.
 - Maintain mulch levels at 75-100mm depth to encourage microbial activity in the soil.

6.7. ABORIGINAL HERITAGE

6.7.1. Existing Environment

Aboriginal people have occupied Australia for at least 50,000 years, with potential evidence for earlier occupation. Evidence for earlier occupation is limited by the lower preservation of archaeological deposits extending back in time but is also limited by the types of scientific dating techniques available. In the local region, Aboriginal occupation has been dated to 11,050 years before present which precedes the rise of sea levels around 6000 years before present (Attenbrow, Archaeological Report on Mangrove Creek Environmental Impact Statement, 1979).

A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken and identified that one Aboriginal site a rock engraving (AHIMS#45-3-1289), plots within the Project Area, however, the site description places the site on the other side of the Central Coast Highway.

One Aboriginal artefact was identified during the survey, it was in two parts and scattered 10m apart (HN MP A1 – Mount Penang Artefact 1). In addition, sandstone sheets which have the potential for Aboriginal engravings were identified. A full assessment of the sandstone sheets could not be made on the account of the extensive leaf litter and vegetation; however, based on the information from surrounding Aboriginal sites, these areas have been identified as being archaeologically sensitive.

6.7.2. Impact Assessment

Darkinjung Local Aboriginal Land Council was consulted as part of the Due Diligence Assessment completed for the proposal (Appendix 8).

The proposal will avoid HN MP A1 – Mount Penang Artefact 1 and the archaeologically sensitive sandstone area.

6.7.3. Mitigation Measures

The Due Diligence Assessment recommended:

- The whole Project Area is to be subject to an Aboriginal Heritage Impact Permit. The AHIP is to allow for the collection of artefacts after vegetation has been cleared.
- The water, sewer and drainage infrastructure is to avoid the archaeologically sensitive sandstone area.

The proposal will avoid HN MP A1 – Mount Penang Artefact 1 and the archaeologically sensitive sandstone area.

6.8. VISUAL AMENITY


6.8.1. Existing Environment

The GDCP 2013 Land Forms Map 2.2 shows the Project area's "views to be protected" area and "view corridors" areas. The mapping is supported by visual amenity planning principles detailed in section 5.3.3 of the GDCP 2013 including:

- *Development of the site is to maintain the integrity of the natural setting of the site by minimising impact on existing views and vistas to and from ridge lines located to the east and west of Piles Creek;*
- *Respecting the layout of the buildings, their physical and visual interrelationships, the road system and the scale of development in future planning*
- *Ensuring that new development is not visually intrusive within the heritage precinct of the site;*
- *Respecting the physical and visual relationship between complexes of buildings, such as the relationship of the existing cottages to each other, or the McCabe buildings to the rest of the heritage precinct and site;*
- *Protecting the existing physical and visual relationships between groups or complexes of significant buildings*

The Avenue South/Festival Drive Roadworks disturbance area visual environment includes the Highway Commercial Precinct grassed area with rows of trees that define spaces used for event parking and markets, Central Coast Highway and Kariong Fire Station to the south, Kariong High School, and buildings within the Heritage Precinct to the north, Phillip House Precinct vegetated area to the east and the southern area of the Festival / Gardens Precinct to west.

Water, Sewer and Drainage Infrastructure Works disturbance area visual environment includes Kariong Commuter Park, Kangoo Road and the Central Coast highway to the south, The Festival / Gardens Precinct open space grounds to the north, Highway Commercial



Precinct area grassed with rows of trees to the east and the balance of the Festival / Gardens Precinct southern vegetated area to the west.

6.8.2. Impact Assessment

The proposal is not within the “views to be protected” area or the “view corridors” areas shown in the GDCP 2013 Land Forms map.

The proposal would generate temporary visual impacts during the construction period. These impacts would be experienced by visual receivers (people attending the school, pedestrians, cyclists, motorists and local workers) in the vicinity of the construction works. During construction, visible elements would include work sites, machinery and equipment, fencing, soil stockpiles, waste materials and partially constructed structures.

The potential visual impact of the proposal would depend on the nature and intensity of the construction works. The change in the visual environment would generally be experienced from a relative short distance. Visual impacts would also be more significant at locations where receivers have an unscreened view of the proposal works. However, the impacts would be temporary and limited to the construction period.

The visual impact caused from the removal of trees, along with the removal of grass and shrubs necessary to carry out the works will be offset by the restorations works once the construction works are completed. These restoration works will return the disturbance areas as close to possible to its pre-construction works condition.


There will be negligible visual impact during the operation period for the majority of the proposal’s elements in The Avenue South/Festival Drive Roadworks disturbance area because the elements are either upgrades to the existing elements or new elements that are consistent with local road reserves infrastructure.

There will be negligible adverse visual impacts during the operation of the proposal’s elements in the Water, Sewer and Drainage Infrastructure Works disturbance area because the majority of the elements will be underground.

6.8.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate any potential adverse impacts on the existing visual amenity. Mitigation measure could include:

- Ensuring the construction work site is maintained in an orderly manner;
- All vehicles, construction equipment, materials and refuse relating to the works to be removed from the site, following completion of the works; and

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- Following completion of the proposed works, work sites will be restored as close to their original condition as possible.

The potential for long-term adverse visual impacts by the proposal on Project area and surrounding locality are considered low because of the limited construction time frame and the disturbance areas being restored, as practicable, to their pre-construction condition.

6.9. TRAFFIC AND ACCESS

6.9.1. Existing Environment

Central Coast Council is the roads authority for all public roads (both classified and unclassified) within the Project Area. The RMS is the roads authority for the Central Coast Highway.


The Mount Penang Parklands precincts are serviced by internal roads e.g. The Avenue and Parklands Road which have access via the local road network to Kangoo Road and Central Coast Highway. For access to the main road network there are traffic signals at two intersections, one at the Central Coast Highway / Kangoo Road and another at Central Coast Highway / The Avenue.

RMS comments as part of DA/47433/2015 noted the Central Coast Highway / The Avenue intersection is currently operating at poor levels of service. RMS consider that there is very limited spare capacity at this intersection. Further, this intersection is physically constrained particularly with regards to space requirements for any further upgrades that may be identified as being required as a result of future development applications in Mount Penang Parklands.

Festival Drive is connected to The Avenue and Parklands Road providing primary access to The Central Coast Highway/The Avenue signalised intersection. Secondary road access is available to Kangoo Road.

The Avenue and Festival Drive intersection is a T junction where Festival Avenue gives way to traffic in The Avenue.

Festival Drive is a private sealed road catering for Kariong High School, small business tenants plus coach and school bus movements.



The Avenue North is a private sealed road catering for business and education tenants distributed through the Heritage Precinct and Baxters Track Mixed-use Precinct and the international football and tennis school within the Sports Precinct.

The Gosford Development Control Plan 2013 (GDCP 2013) Street Hierarchy Map 2.6 map shows existing and indicative roads and existing and indicative access points to Mount Penang Parklands. The hierarchy is influenced by the Mount Penang Parklands Masterplan, Transport Assessment, AECOM, November 2013 report.

6.9.2. Impact Assessment


The proposal's construction works will require a number of heavy vehicles and a number of light vehicles.

Construction heavy and light vehicle movements would be distributed across the construction phase and be managed in accordance with a Construction Traffic, Transport and Access Management Plan to minimise the potential for impacts on the existing Project area and surrounding locality roads and transport network, and to ensure adequate levels of safety.

Overall, the total numbers of heavy and light vehicle movements on roads in the surrounding locality during construction would be low compared to the overall traffic volumes on the surrounding locality roads. Construction vehicle generation would not result in a substantial impact on surrounding locality road capacity or the road network overall including the Central Coast Highway / The Avenue intersection.

Construction works and consequently construction traffic movements would commence after all relevant approvals are obtained, and could include the following alterations to part of Project area's existing traffic arrangements:

- Construction vehicles accessing the disturbance areas via the Central Coast Highway and/or Kangoo road;
- Changes to traffic and bus movements through and across The Avenue South/Festival Drive Roadworks disturbance area;
- The Avenue South, Festival Drive and associated intersection being partially closed for a period of approximately 16 weeks;
- Removal of The Avenue South, Festival Drive pedestrian access;
- During the partial closure of The Avenue South, Festival Drive and associated intersection Project Area traffic may need to access the Project Area via alternative access points;
- During the partial closure of The Avenue South, Festival Drive and associated intersection Project Area pedestrians may need to access the Project Area via alternative access points; and
- Installation of environmental and traffic controls in accordance with the CEMP and any conditions of approval for the proposal.



The construction traffic methodology will be developed by the appointed construction contractor.

The alterations to part of Project area's existing traffic arrangements for the likely construction traffic are expected to adversely impact business and education tenants, Kariong Mountains High School, customers, visitors and service providers located within the Project area for the limited construction phase.

The Avenue South/Festival Drive Roadworks disturbance area excludes The Avenue South roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue South intersection. The construction works will not alter Kariong Fire Station's access.


The Avenue South, Festival Drive and associated intersection are designed to meet Central Coast Council's requirements consequently improving this part of the Project area's traffic flows and safety.

The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure consequently the potential to adversely impact the Project area's and the surrounding locality traffic and access arrangements during the proposal's operation is minimal.

6.9.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate any potential adverse impacts on the existing traffic and access arrangements. Mitigation measures could include:

- A Traffic Management Plan will be prepared as part of the CEMP, prior to commencement of construction;
- Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations;
- A construction communication management plan would be prepared as part of the CEMP including a detailed list of the measures that would be implemented during construction to communicate with and respond to the community;
- Construction completed within the shortest possible time;
- Possibly construction in The Avenue South/Festival Drive Roadworks disturbance area during Kariong Mountains High School holidays or other period of low use;
- Appropriate exclusion barriers, signage and site supervision will be employed at all times to ensure that the work site is controlled, and that authorised vehicles and pedestrians are excluded from the works area;

- 
- All measures will be undertaken to ensure that the proposal does not significantly reduce road capacity or disturb traffic flows; and
 - A complaints register will be maintained by the contractor, and complaints will be responded to in a timely fashion.

The potential for long-term adverse traffic and access impacts by the proposal are considered low because of the limited construction time frame.

The Avenue South, Festival Drive and associated intersection are designed to meet Central Coast Council's requirements consequently improving this part of the Project Area's traffic flows and safety.

6.10. SERVICES AND UTILITIES

6.10.1. Existing Environment

Utility investigation was undertaken as part of the Northrop Consulting Engineers design of the infrastructure.

Infrastructure and services within and in the vicinity of the proposal's disturbance areas are identified in the indicative proposal plans attached as Appendix 2.


6.10.2. Impact Assessment

The construction works within The Avenue South/Festival Drive Roadworks disturbance area and Water, Sewer and Drainage Infrastructure Works disturbance area has the potential to impact existing services and infrastructure including gas, electrical, water, wastewater, stormwater and communications. All services (including pits and surface features) within and/or crossing the construction site would need to be relocated and/or protected.

There may be some short-term interruptions to services during construction owing to the need to divert services.

Short-term interruptions to services during construction could impact Project area and surrounding locality users of the services.

Impacts would be minimised by ensuring that the contractor undertakes investigations to locate all underground services in the vicinity of the construction site prior to construction commencing. Consultation with service providers would also be undertaken to minimise the potential for impacts, to coordinate any service relocations, and ensure access to utilities is preserved for any future maintenance activities.



The proposal's operation works are likely confined to infrequent and limited maintenance of the proposal's infrastructure consequently the potential to adversely impact the Project area's surrounding locality's services and utilities during the proposal's operation is minimal.

6.10.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate any potential adverse impacts on existing land services and utilities. Mitigation Measures could include:

- A CEMP including a detailed list of the measures that would be implemented during construction to communicate with and respond to the community;
- Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations;
- Construction completed within the shortest possible time;
- Possibly construction in The Avenue South/Festival Drive Roadworks disturbance area during Kariong Mountains High School holidays or other periods of low use;
- A Services Management Plan to provide specific measures to minimise impacts to services during construction;
- A Dial Before You Dig search must be completed prior to commencement of construction;
- Engage in consultation with companies that have services crossing or in close proximity to the proposed works;
- Detailed survey and consultation with service providers would be undertaken to accurately locate services;
- The detailed design of the proposal would seek to minimise the need for service and utility relocations;
- The need for location of any utilities would be determined in consultation with service providers;
- Ensuring exposed underground services are protected prior to undertaking any bulk excavation or mechanical operations; and
- Staff will be briefed on the existence, location and nature of other utility services.

The potential for long-term adverse impacts on the Project area's and surrounding locality's services and utilities are considered low because of the short construction time frame.

The installation and upgrading of services and utilities will improve the Project area's long-term land services and utilities.



6.11. LAND USES

6.11.1. Existing Environment

The Avenue South/Festival Drive Roadworks disturbance area is predominately occupied by the existing The Avenue South road reserve infrastructure, Festival Drive road reserve infrastructure and associated intersection.

The Water, Sewer and Drainage Infrastructure Works disturbance area is predominately vegetated.

The land uses adjoining The Avenue South/Festival Drive Roadworks disturbance area includes Kariong Mountains High School, business and education tenants distributed through the Heritage Precinct and Baxters Track Mixed-use Precinct and International Football and Tennis School within the Sports Precinct.

Adjoining land uses to the north, east and west of the Water, Sewer and Drainage Infrastructure Works disturbance area is predominately open space roads, public parking infrastructure and commercial development.

6.11.2. Future Land Uses

To drive economic growth in the region, HCCDC has identified the Kangoo Road Commercial Precinct and Highway Commercial Precinct as suitable for commercial redevelopment.

The redevelopments are in line with the planning controls for the Mount Penang Parklands, and consistent with the broader regional planning for the Central Coast. For example, The Gosford Development Control Plan 2013 (GDCP 2013) section 5.3.4.4 Precinct Guidelines description of the desired future character, activities and uses of Kangoo Road Commercial Precinct includes:

- *The Kangoo Road Commercial Precinct fronts Kangoo Road, forming the western edge of the site and the opportunity for large-format development plots suitable for bulky goods, research, information technology and office (Business Park).*
- *Employment uses such as research and development establishments, office/ commercial, co-operative nurseries, workshops, laboratories, other business uses, showrooms, speciality retails, themed attractions, educational institutions, recreational uses, and related ancillary uses are allowed in the Kangoo Road Commercial Precinct.*

The GDCP 2013 section 5.3.4.4 Precinct Guidelines description of the desired future character, activities and uses of Highway Commercial Precinct includes:

- *The Highway Commercial Precinct plays an important role in defining the character of the entire Mount Penang site, due to its highly visible location along the Central Coast Highway, and gateway from the site's primary entrance at The Avenue. The form, scale, quality and design of development within this precinct will influence perceptions of development and activities throughout the rest of the site and must therefore be of the highest standard.*
- *Employment uses such as office/commercial, retail outlets, speciality retail, educational institutions, and related ancillary uses are allowed in the Highway Commercial Precinct.*

The construction of the water main and sewer main within Water, Sewer and Drainage Infrastructure Works disturbance area is required for the desired future character, activities and uses of the Kangoo Road Commercial Precinct and Highway Commercial Precinct.

The upgrade of The Avenue South road reserve infrastructure, Festival Drive road reserve infrastructure, associated intersection and services/utility infrastructure is required for the desired future character, activities and uses of the Highway Commercial Precinct.


6.11.3. Impact Assessment

Impacts on the land uses within The Avenue South/Festival Drive Roadworks disturbance area and the Water, Sewer and Drainage Infrastructure Works disturbance area would be limited to temporary use of land for construction activities including the presence of construction equipment, plant, vehicles and fenced work sites along the work sites. During construction, the use of the land would change from its present uses to a construction site.

After construction works are completed the land use within The Avenue South/Festival Drive Roadworks disturbance area and land use within the Water, Sewer and Drainage Infrastructure Works disturbance area will predominantly return to their post construction land uses as practicable.

The impact of the construction works within The Avenue South/Festival Drive Roadworks disturbance area are expected to be limited to business and education tenants, Kariong Mountain High School, customers, visitors, service providers located within the Project area. In general, there would be changes to the movement patterns for vehicles, pedestrians, cyclists and bus users around construction areas during construction.

The impact of the construction works within the Water, Sewer and Drainage Infrastructure Works disturbance area is not expected to adversely impact the current Project area and/or surrounding locality's land-uses, because of its location.



The Avenue South/Festival Drive Roadworks disturbance area excludes The Avenue South roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue South intersection. The construction works will not alter Kariong Fire Station's access/land use.

The proposal will facilitate the future redevelopment of the Kangoo Road Commercial Precinct and Highway Commercial Precinct in accordance with HCCDC vision and the Project Area's planning strategy/controls.

During the proposal's operation phase the Project area's land uses will return to their post construction environment as far as practicable.

6.11.4. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate any potential adverse impacts on land use. Mitigation Measures could include:

- A Traffic Management Plan will be prepared as part of the CEMP, prior to commencement of construction;
- The Construction Environmental Management Plan (CEMP) will include communication protocols; and
- Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations.

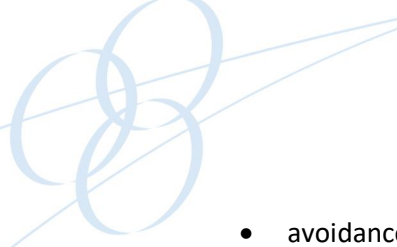
In the long term the proposal is not anticipated to adversely impact the Project area's or surrounding locality's land uses. Any impacts will be minor and limited to the construction phase.

The proposal will facilitate the future redevelopment of the Kangoo Road Commercial Precinct and Highway Commercial Precinct in accordance with HCCDC vision and the Project area's planning strategy/controls.

6.12. WASTE AND RESOURCES

6.12.1. Legislative requirement

HCCDC is committed to ensuring responsible management of waste and the reuse of such waste through appropriate measures, in accordance with the resource management hierarchy principles embodied in the WARR Act. The resource management hierarchy principles in order of priority as outlined in the WARR Act are:

- 
- avoidance of unnecessary resource consumption;
 - resource recovery (including reuse, reprocessing, recycling and energy recovery); and
 - disposal.

By adopting the above principles, HCCDC encourages the most efficient use of resources and reduces cost and environmental harm in accordance with the principles of ecologically sustainable development.

6.12.2. Impact Assessment

The proposal's construction involves the use of a number of resources, including:

resources associated with the operation of construction plant and equipment (fuel and electricity);

construction water (for concrete mixing and dust suppression)


- fill required to meet design levels;
- concrete and paving materials;
- materials required for the supporting infrastructure; and
- landscaping.

The resources required are not currently limited in availability. However, materials such as metal and fuel are non-renewable and would be used conservatively. Excess spoil, not suitable for reuse, would be disposed of in accordance with safeguards and mitigation measures and management measures would assist in minimising the amount of resources required for construction.

Construction would have the potential to generate the following wastes:

- spoil from excavation;
 - surplus concrete, asphalt, bricks and materials;
 - roadside and materials;
 - utility adjustments - such as electrical cabling from installation of wiring;
 - possible industrial waste such as lubricating oils, hydraulic fluids and cleaning agents.
-
- Vegetation;
 - Wastewater;
 - general litter, including glass, plastic, metal and paper waste; and
 - redundant erosion and sediment controls.

Potentially contaminated material and/or hazardous spoil and materials may also be encountered during construction.



Careful planning of construction activities would ensure that the volume of surplus materials is minimised, and disposal is undertaken in accordance with relevant guidelines and legislation. The potential to reuse materials will be investigated.

The proposal would generate greenhouse gas emissions through the operation of plant and machinery during construction. Overall, greenhouse gas emissions resulting from construction would be low.

Only a small quantity of waste would be generated during the proposal's operation. This would mainly relate to maintenance and repair activities. wastes would include wastewater, oils, cleaning agents, and landscaping maintenance wastes.

6.12.3. Mitigation Measures

Reasonable and feasible mitigation measures should be implemented to manage and mitigate any potential adverse impacts caused by the proposal's waste generation and use of resources. Mitigation Measures could include:

- Efficient reuse or removal of all waste from the work area;
- Waste is to be disposed of according to waste disposal safeguards including the POEO Act, WARR Act and the NSW EPA Waste Classification Guidelines;
- Appropriate capture vessels will be used to collect any fuel, lubricant or hydraulic fluid spillages and the contaminant materials will be disposed of at a licensed waste depot
- Green waste from the proposed vegetation clearing will be either chipped for reuse, retained for rehabilitation, mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion, or removed from site and transported to a waste facility licensed to accept green waste;
- Excess spoil will be tested and disposed of at an approved facility licenced to receive the material;
- The Contractor will ensure that staff have up-to-date training in use of emergency spill kits as well as ensuring staff carry these with them on-site;
- The Contractor will ensure that staff are familiar with the correct procedure for storing contaminated or hazardous waste and ensuring that staff remove their own personal rubbish from site daily; and
- On completion of the construction works, the site will be returned as close as possible to its pre-construction position, including ensuring all waste, equipment and machinery has been removed from onsite.

Waste generated during the construction period will be appropriately managed in accordance with the above mitigation measures.



6.13. OTHER ENVIRONMENTAL CONSIDERATIONS

The Avenue South/Festival Drive Roadworks disturbance area and Water, Sewer and Drainage Infrastructure Works disturbance area are identified as Bushfire Prone Land.

A fire management plan should be considered as part to the CEMP.

6.14. CUMULATIVE AND CONSEQUENTIAL IMPACTS

6.14.1. Existing Environment

The impacts caused by this proposal need to be considered in combination with impacts of other development projects within the Project area and surrounding locality.

Development projects with the potential for cumulative impacts with the proposal are considered to be developments of a similar nature and size as the proposal located within the Project area and surrounding locality.

6.14.2. Impact Assessment

There are no known development projects of a similar nature and size as the proposal either located within the Project area or the surrounding locality with the potential for cumulative impacts on the Project area or the surrounding locality.

6.14.3. Mitigation Measures

Prior to the commencement of construction works the appointed contractor will determine if there are development projects of a similar nature and size as the proposal either located within the Project area or the surrounding locality with the potential for cumulative impacts on the Project area or the surrounding locality and if so implement suitable mitigation measures required to offset potential adverse cumulative impacts on the Project area and/or the surrounding locality.

7. SUMMARY OF MITIGATION MEASURES

Details of the environmental mitigation measures for the impacts as outlined in the assessment section above, are outlined below in Table 7-1.

Table 7-1: Summary of mitigation measures

Aspect	Mitigation Measure	Timing	Responsibility
Soil and Geology	A Soil and Water Management Plan, including an Acid Sulphate Soil Management sub-plan and an Erosion and Sediment Control (ESCP) sub-plan (prepared in accordance with Landcom's (2004) Managing Urban: Stormwater Soils and Construction), be prepared as part of the Construction Environmental Management Plan (CEMP).	Pre-construction	Construction Contractor
Soil and Geology	The ESCP will include appropriate sediment controls for wherever soil disturbance that could result in sediment run-off takes place.	Construction	Construction Contractor
Soil and Geology	Erosion and sediment controls will be established prior to the commencement of construction and remain in place until the surface has been stabilised.	Construction	Construction Contractor
Soil and Geology	Sediment controls will be placed at the entry points to any culverts and stormwater channels to prevent sediment entering the stormwater system.	Construction	Construction Contractor
Soil and Geology	Erosion and sediment control devices will be regularly checked and maintained to ensure they remain effective for the duration of the construction period.	Construction	Construction Contractor
Soil and Geology	Stabilisation by revegetation for disturbed areas will occur as soon as practicable within after completion of construction.	Construction	Construction Contractor
Soil and Geology	Restoration following the completion of the works will aim to be as close as possible to the pre-works state.	Construction	Construction Contractor
Soil and Geology	The road will be swept where it becomes dirty from tracking dirt, which will be minimised where possible.	Construction	Construction Contractor
Soil and Geology	An 'unexpected finds protocol' would be prepared to assist with the identification, reporting, assessment, management, health and safety implications, remediation, and/or disposal (at an appropriately licensed facility) of any potentially contaminated soil and/or water.	Pre-construction	Construction Contractor
Soil and Geology	In the event that indicators of contamination are encountered during construction (such as odours or visually contaminated materials), work in the affected area would cease immediately, and the procedures detailed in	Construction	Construction Contractor

Aspect	Mitigation Measure	Timing	Responsibility
	the unexpected finds protocol would be implemented.		
Hydrology, Water and Water Quality	A Soil and Water Management Plan, including a Groundwater Management sub-plan and Erosion and Sediment Control sub-plan (prepared in accordance with Landcom's (2004) Managing Urban: Stormwater Soils and Construction) would be prepared as part of the CEMP.	Pre-construction	Construction Contractor
Hydrology, Water and Water Quality	A Contamination and Hazardous Materials Plan would be prepared as part of the CEMP.	Pre-construction	Construction Contractor
Hydrology, Water and Water Quality	Fuels and chemicals will be stored and transported in accordance with the Australian Standard AS 1940-2004: The Storage and Handling of Flammable and Combustible Liquids and the Dangerous Goods Act 1975.	Construction	Construction Contractor
Hydrology, Water and Water Quality	The ground surface will be reinstated progressively.	Construction	Construction Contractor
Hydrology, Water and Water Quality	Refuelling, fuel decanting and vehicle maintenance work will take place off-site where possible.		
Hydrology, Water and Water Quality	Chemicals, fuels and waste will not be stored or collected for disposal within or adjacent to drainage lines, waterbodies or unsealed surfaces.	Construction	Construction Contractor
Hydrology, Water and Water Quality	A 'spill kit' will be kept onsite at all times to be used in the event of a chemical or fuel spill.	Construction	Construction Contractor
Hydrology, Water and Water Quality	Access to site will be contained to approved construction works area or access tracks to minimise site disturbance.	Construction	Construction Contractor
Hydrology, Water and Water Quality	Erosion will be limited using slit fences and socks to manage runoff fetches and velocities.	Construction	Construction Contractor
Hydrology, Water and Water Quality	Silt fences, straw bales, turf strips and other sediment filters will be located downstream of disturbed areas.	Construction	Construction Contractor
Ecology	Limit vegetation clearing to a minimum necessary to construct works. Implement clearing protocols, including <ul style="list-style-type: none"> The boundaries of vegetation clearing to be clearly marked as 'no go zones', signposted and delineated to prevent unauthorised clearing and vehicular and foot traffic; Marking trees to be removed and prepare an inventory of trees to be removed; 	Construction	Construction Contractor

Aspect	Mitigation Measure	Timing	Responsibility
	<ul style="list-style-type: none"> Pre-clearance surveys to be completed by an appropriately qualified ecologist; Relocate any bushrock and fallen timber within the vegetation clearing area into adjoining bushland; Stockpiles should be placed in cleared areas outside of the 'no go zones'. 		
Ecology	<p>It is recommended that the following mitigation measures be implemented for the removal of the hollow-bearing trees:</p> <ul style="list-style-type: none"> Marking trees to be removed and preparing an inventory of trees and hollows to be removed; Prepare an inventory of all fauna interactions; Pre-clearance surveys to be completed by an appropriately qualified ecologist; A qualified ecologist should be present during the removal of hollow-bearing trees to relocate any displaced fauna; If practical, removal of hollow-bearing trees be undertaken outside of May – September which is the main breeding season for hollow-dependant fauna. 	Construction	Construction Contractor
Ecology	Implementation of a weed management control protocol. All equipment, vehicles and machinery wheels and tracks of excavators and other tracked machinery should be cleaned so that they are completely free of soil, seeds and plant material before entering the study area to prevent the introduction of further exotic plant species and pathogens.	Construction	Construction Contractor
Ecology	All topsoil from the exotic grassland and exotic vegetation assemblages should be disposed of offsite.	Construction	Construction Contractor
Noise and Vibration	Noise and Vibration Management Plan be prepared as part of the CEMP.	Pre-construction	Construction Contractor
Noise and Vibration	Ensuring all equipment complies with the Interim Construction Noise Guideline 2009.	Construction	Construction Contractor
Noise and Vibration	Machinery and vehicles will be turned off when not in use or throttled down to a minimum.	Construction	Construction Contractor
Noise and Vibration	Construction completed within the shortest possible time.	Construction	Construction Contractor
Noise and Vibration	Construction in The Avenue South/Festival Drive Roadworks disturbance area during Kariong Mountains High School holidays, or other periods of low use if possible.	Construction	Construction Contractor


Aspect	Mitigation Measure	Timing	Responsibility
Noise and Vibration	Construction works taking place between the hours: Monday to Friday, 7am to 6m and Saturday at 8am to 1pm.	Construction	Construction Contractor
Noise and Vibration	Identified noisy construction works to take place outside the standard working hours set out in the Interim Construction Noise Guideline (DECC, 2009).	Construction	Construction Contractor
Noise and Vibration	Use of noisy equipment and construction work will be scheduled to occur between the hours of 9am and 4pm, where possible.	Construction	Construction Contractor
Noise and Vibration	Construction activities would be undertaken in accordance with AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites.	Construction	Construction Contractor
Noise and Vibration	All equipment will be maintained regularly and effectively.	Construction	Construction Contractor
Noise and Vibration	All equipment with potential to create high levels of noise will only be used in conjunction with noise control.	Construction	Construction Contractor
Noise and Vibration	Noise monitoring may be used if complaints regarding excessive noise use are received and impacts will be assessed against the Interim Construction Noise Guidelines (DECC 2009).	Construction	Construction Contractor
Noise and Vibration	If noise limits are found to exceed the established guideline values, then operations would be modified and measures such temporary noise barriers would be implemented.	Construction	Construction Contractor
Noise and Vibration	Mitigation impacts of the proposed works would be undertaken in accordance with the qualitative assessment guidelines of the Interim Construction Noise Guidelines (DECC 2009) such as community notification of the works, operating plant in a quiet and efficient manner, involving workers in minimising noise and a procedure of handling complaints in accordance with these guidelines.	Construction	Construction Contractor
Noise and Vibration	Controlling vibration at the source including: choosing alternative, lower-impact equipment, or methods wherever possible; scheduling the use of vibration-causing equipment, such as jackhammers, at the least sensitive time of day; routing, operating or locating high vibration sources as far away from sensitive areas as possible; sequencing operations so that vibration causing activities do not occur simultaneously isolating the equipment causing the vibration on resilient mounts.	Construction	Construction Contractor
Noise and Vibration	Informing identified stakeholders, including potentially impacted tenants, in the Project	Pre-construction	HCCDC/

Aspect	Mitigation Measure	Timing	Responsibility
	Area, of the potential impacts, the time periods over which these will occur and the proposed mitigation measures that will be employed to minimise the impacts.		Construction Contractor
Noise and Vibration	Notice of works provided to identified stakeholders prior to the commencement construction.	Pre-construction	HCCDC/ Construction Contractor
Air Quality	All vehicles to be fitted with approved exhaust systems to maintain exhaust emissions within acceptable standards.	Construction	Construction Contractor
Air Quality	Machinery and vehicles will not be left running or idling when not in use.	Construction	Construction Contractor
Air Quality	Odours or air pollutant complaints will be dealt with promptly and the source will be eliminated wherever practicable.	Construction	Construction Contractor
Air Quality	All loads of excavated material, soil, fill and other erodible matter that are transported to or from the work site will be kept covered at all times during transportation and will remain covered until they are unloaded either for use at the worksite, reuse or disposal at a licensed waste disposal facility.	Construction	Construction Contractor
Air Quality	Areas that have been disturbed by construction works will be rehabilitated progressively.	Construction	Construction Contractor
Air Quality	Monitor all work sites, general work areas and stockpiles for dust generation and watering down or covering affected areas in the event of windy conditions.	Construction	Construction Contractor
Non-Indigenous Heritage	An approval under s60 of the Heritage Act is required prior to works commencing. This SoHI should be submitted as part of the application package to Heritage NSW. Following determination of the approval works should be undertaken in accordance with any conditions provided by Heritage NSW.	Pre-construction	HCCDC
	The excavation for the water infrastructure can proceed with caution. Should suspected archaeological material be identified then works are to stop in that area. The heritage consultant is to be contacted to make an assessment and to devise, in consultation with Heritage NSW, a management strategy for the area and potentially a modification under s65A.	Construction	HCCDC
Non-Indigenous Heritage	A heritage induction is to be provided to all on-site personnel undertaking ground disturbing works so that they understand their obligations to report the discovery of archaeological material and their obligations under the Heritage Act 1977.	Construction	Construction Contractor

Aspect	Mitigation Measure	Timing	Responsibility
Non-Indigenous Heritage	Remove Trees 9, 12, 13 and 14. Tree removal to be undertaken in accordance with WorkCover Amenity Tree Industry Code of Practice 1998.	Construction	Construction Contractor
Non-Indigenous Heritage	Tree remains to be mulched and used within the proposed landscaping works. Any residual mulch to be disposed of in a legal manner.	Construction	Construction Contractor
Non-Indigenous Heritage	Protect remaining trees in accordance with AS4970 Protection of trees on development sites.	Construction	Construction Contractor
Non-Indigenous Heritage	Monitor trees 4, 5, 6, 7, 8, 9, 10 and 11 for any further decline caused by the installation of the electrical conduit.	Construction	Construction Contractor
Non-Indigenous Heritage	Proposed works include the removal of the uplights and conduits. Conduits and wires will have to be disconnected and left in the ground to prevent further disturbance of the tree's root systems. Lights and other above ground electricals can be removed.	Construction	Construction Contractor
Non-Indigenous Heritage	Undertake replacement planting of Trees 9 and 12 with 200 litre sized <i>Lophostemon confertus</i> (Brush Box).	Construction	Construction Contractor
Non-Indigenous Heritage	Undertake crown maintenance to remove dead wood. All pruning to be in accordance with AS 4373- 2007 Pruning of amenity trees.	Construction	Construction Contractor
Non-Indigenous Heritage	Undertake a fertilising regime as a slow release fertiliser suitable for Australian native plants. This will help increase the vigour of the trees and their longevity.	Construction	Construction Contractor
Non-Indigenous Heritage	Maintain mulch levels at 75-100mm depth to encourage microbial activity in the soil.	Construction	Construction Contractor
Aboriginal Heritage	The whole Project Area is to be subject to an Aboriginal Heritage Impact Permit. The AHIP is to allow for the collection of artefacts after vegetation has been cleared.	Pre-construction	HCCDC
Aboriginal Heritage	The water, sewer and drainage infrastructure is to avoid the archaeologically sensitive sandstone area.	Pre-construction/ Construction	HCCDC
Visual Amenity	Ensuring the construction work site is maintained in an orderly manner.	Construction	Construction Contractor
Visual Amenity	All vehicles, construction equipment, materials and refuse relating to the works to be removed from the site, following completion of the works.	Construction	Construction Contractor
Visual Amenity	Following completion of the proposed works, work sites will be restored as close to their original condition as possible.	Construction	Construction Contractor

Aspect	Mitigation Measure	Timing	Responsibility
Traffic and Access	A Traffic Management Plan will be prepared as part of the CEMP, prior to commencement of construction.	Pre-construction	Construction Contractor
Traffic and Access	Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations.	Pre-construction	HCCDC/ Construction Contractor
Traffic and Access	A construction communication management plan would be prepared as part of the CEMP including a detailed list of the measures that would be implemented during construction to communicate with and respond to the community.	Pre-construction	HCCDC/ Construction Contractor
Traffic and Access	Construction completed within the shortest possible time.	Construction	Construction Contractor
Traffic and Access	Possibly construction in The Avenue South/Festival Drive Roadworks disturbance area during Kariong Mountains High School holidays or other period of low use.	Construction	Construction Contractor
Traffic and Access	Appropriate exclusion barriers, signage and site supervision will be employed at all times to ensure that the work site is controlled, and that authorised vehicles and pedestrians are excluded from the works area.	Construction	Construction Contractor
Traffic and Access	All measures will be undertaken to ensure that the proposal does not significantly reduce road capacity or disturb traffic flows.	Construction	Construction Contractor
Traffic and Access	A complaints register will be maintained by the contractor, and complaints will be responded to in a timely fashion.	Construction	Construction Contractor
Services and Utilities	A CEMP including a detailed list of the measures that would be implemented during construction to communicate with and respond to the community.	Construction	Construction Contractor
Services and Utilities	Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations.	Construction	Construction Contractor
Services and Utilities	Construction completed within the shortest possible time.	Construction	Construction Contractor
Services and Utilities	Possibly construction in The Avenue South/Festival Drive Roadworks disturbance	Construction	Construction Contractor

Aspect	Mitigation Measure	Timing	Responsibility
	area during Kariong Mountains High School holidays or other periods of low use.		
Services and Utilities	A Services Management Plan to provide specific measures to minimise impacts to services during construction.	Pre-construction	Construction Contractor
Services and Utilities	A Dial Before You Dig search must be completed prior to commencement of construction.	Pre-construction	Construction Contractor
Services and Utilities	Engage in consultation with companies that have services crossing or in close proximity to the proposed works.	Pre-construction	HCCDC/ Construction Contractor
Services and Utilities	Detailed survey and consultation with service providers would be undertaken to accurately locate services.	Pre-construction	HCCDC/ Construction Contractor
Services and Utilities	The detailed design of the proposal would seek to minimise the need for service and utility relocations.	Pre-construction	HCCDC
Services and Utilities	The need for location of any utilities would be determined in consultation with service providers.	Pre-construction	HCCDC/ Construction Contractor
Services and Utilities	Ensuring exposed underground services are protected prior to undertaking any bulk excavation or mechanical operations.	Construction	Construction Contractor
Services and Utilities	Staff will be briefed on the existence, location and nature of other utility services.	Construction	Construction Contractor
Land Uses	A Traffic Management Plan will be prepared as part of the CEMP, prior to commencement of construction.	Pre-construction	Construction Contractor
Land Uses	The Construction Environmental Management Plan (CEMP) will include communication protocol.	Pre-construction	Construction Contractor
Land Uses	Consultation with relevant stakeholders to facilitate the efficient delivery of the works and to minimise congestion and inconvenience to road users. Stakeholders would include Council, business and education tenants, Kariong Mountains High School and other relevant organisations.	Pre-construction	HCCDC/ Construction Contractor
Waste and Resources	Efficient reuse or removal of all waste from the work area.	Construction	Construction Contractor
Waste and Resources	Waste is to be disposed of according to waste disposal safeguards including the POEO Act, WARR Act and the NSW EPA Waste Classification Guidelines.	Construction	Construction Contractor
Waste and Resources	Appropriate capture vessels will be used to collect any fuel, lubricant or hydraulic fluid spillages and the contaminant materials will be disposed of at a licensed waste depot.	Construction	Construction Contractor



Aspect	Mitigation Measure	Timing	Responsibility
Waste and Resources	Green waste from the proposed vegetation clearing will be either chipped for reuse, retained for rehabilitation, mulched and spread immediately after the trench has been covered to prevent encroachment by weed species and minimise erosion, or removed from site and transported to a waste facility licensed to accept green waste.	Construction	Construction Contractor
Waste and Resources	Excess spoil will be tested and disposed of at an approved facility licenced to receive the material.	Construction	Construction Contractor
Waste and Resources	The Contractor will ensure that staff have up-to-date training in use of emergency spill kits as well as ensuring staff carry these with them on-site.	Construction	Construction Contractor
Waste and Resources	The Contractor will ensure that staff are familiar with the correct procedure for storing contaminated or hazardous waste and ensuring that staff remove their own personal rubbish from site daily.	Construction	Construction Contractor
Waste and Resources	On completion of the construction works, the site will be returned as close as possible to its pre-construction position, including ensuring all waste, equipment and machinery has been removed from onsite.	Construction	Construction Contractor
Other Environmental Considerations	Prior to the commencement of construction works the appointed contractor will determine if there are development projects of a similar nature and size as the proposal either located within the Project area or the surrounding locality with the potential for cumulative impacts on the Project area or the surrounding locality and if so implement suitable mitigation measures required to offset potential adverse cumulative impacts on the Project area and/or the surrounding locality.	Pre-construction	Construction Contractor



8. CONCLUSION

In accordance with the requirements of Part 5 of the EP&A Act and the EP&A Regulation the proposal has been fully assessed. Based on the assessment the proposal is not likely to significantly affect the environment and therefore does not require the preparation of an Environmental Impact Statement (EIS).

The REF includes an assessment of whether the proposal is likely to have a significant impact to matters of national environmental significance under the EPBC Act. The proposal is not likely to have a significant impact on matters of national environmental significance and therefore referral to the Commonwealth Government under the EPBC Act is not required.

As defined by the Biodiversity Conservation Act 2016 the proposal is not expected to have significant impacts on threatened species, populations, ecological communities or their habitats consequently a species impact statement is not required.

The water, sewer, road and services upgrades will facilitate the future sustainable economic growth in the Project area for the benefit of the Central Coast LGA.

This conclusion has taken into consideration the principals of Ecologically Sustainable Development.

The proposal's scope is preliminary and based on the information provided by HCCDC. The proposal will be refined as the proposal's design progresses in consultation with relevant stakeholders. Any substantive changes to the proposal may require subsequent environmental impact assessment.



9. DECLARATION

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

Signed:



Name: Alina Tipper

Position: Senior Environmental Consultant

Date: 18 March 2020



10. REFERENCES

Department of Environment and Climate Change, (NSW) Interim Construction Noise Guideline (2009).

Department of Environment, Climate Change and Water, (NSW) Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010).

Department of Environment, Climate Change and Water, (NSW) Interim Construction Noise Guideline accessed at:
<http://www.environment.nsw.gov.au/resources/noise/09406cnginfo.pdf> (2009)

Environmental Protection Authority (NSW) Waste Classifying Guidelines (2014).

Environmental Protection Authority (NSW) Noise Policy for Industry (2017)

EPS/MJD, Mount Penang Parklands Flora and Fauna Assessment (2020)

Heritage Now, Statement of Heritage Impact (2020)

Heritage Now, Due Diligence Assessment (2020)

Landcom Managing Urban Stormwater, (NSW) Soils and Construction Volume 1, 4th Edition (2004).

Mara Consulting, Arborists Report (2020)



APPENDIX 1

PHOTOGRAPHS OF THE STUDY AREA



Kariong Commuter Carpark looking towards Kangoo Road



The Water, Sewer and Drainage Infrastructure Drainage Works disturbance area



Looking from Festival Drive towards Central Coast Highway



Looking from adjacent to Lower Dam towards Kariong High School/Festival Drive



Kariong High School/Festival Drive looking towards The Avenue South



The Avenue South looking towards The Avenue South/Festival Drive intersection



The Avenue South looking towards The Central Coast Highway Intersection

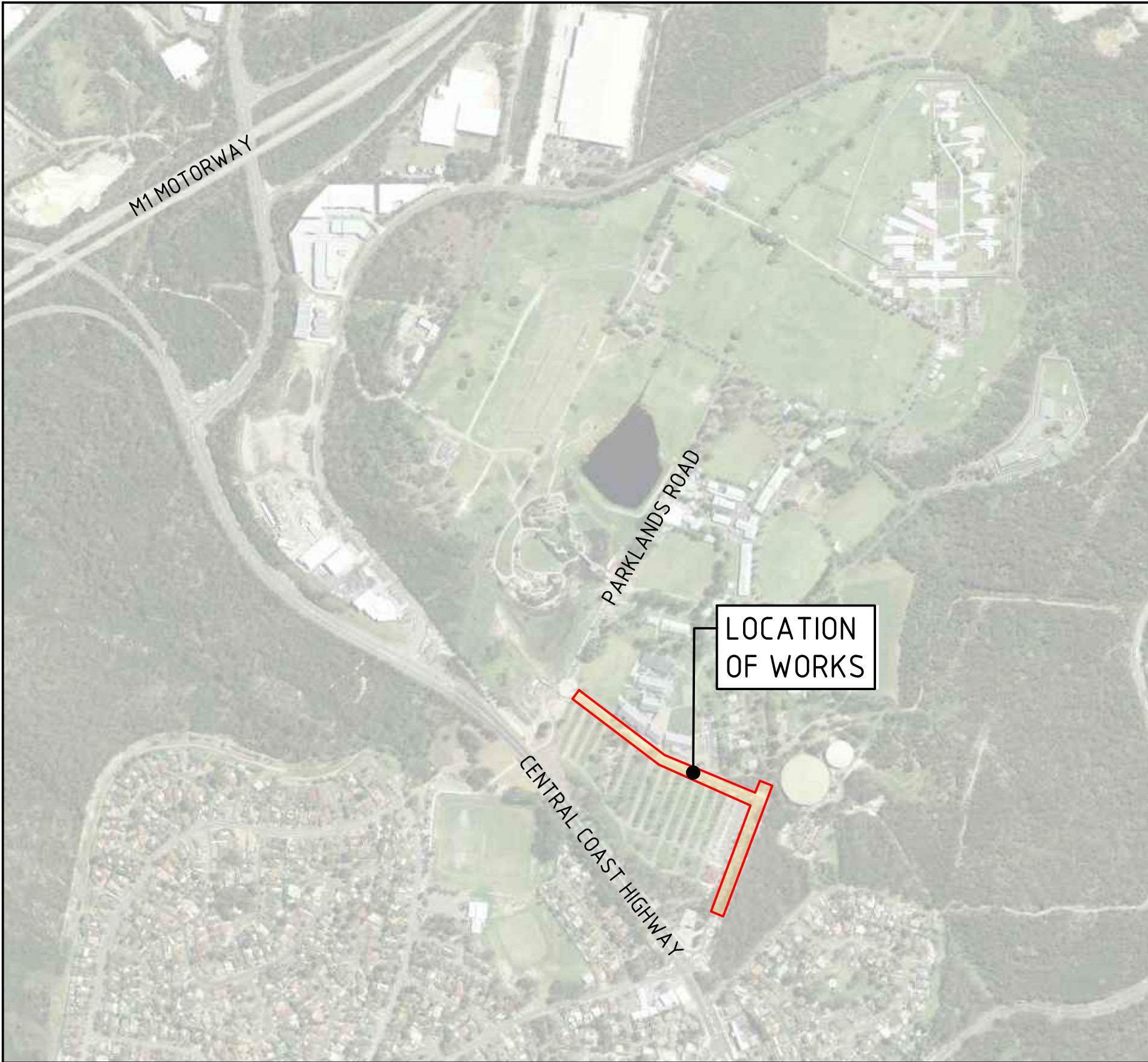


APPENDIX 2

INDICATIVE PROPOSAL PLANS

MT PENANG PARKLANDS, KARIONG NSW 2250

FESTIVAL DRIVE AND THE AVENUE UPGRADE CIVIL ENGINEERING PACKAGE



LOCALITY PLAN

IMAGE SOURCE : NEARMAPS

DRAWING LIST




DWG No.	DRAWING TITLE
01-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
01-C01.11	SPECIFICATION NOTES - SHEET 1
01-C01.12	SPECIFICATION NOTES - SHEET 2
01-C01.21	GENERAL ARRANGEMENT PLAN
01-C02.01	EROSION AND SEDIMENT CONTROL PLAN - SHEET 1
01-C02.02	EROSION AND SEDIMENT CONTROL PLAN - SHEET 2
01-C02.03	EROSION AND SEDIMENT CONTROL PLAN - SHEET 3
01-C04.01	DETAIL PLAN - SHEET 1
01-C04.02	DETAIL PLAN - SHEET 2
01-C04.03	DETAIL PLAN - SHEET 3
01-C04.21	PAVEMENT PLAN - SHEET 1
01-C04.22	PAVEMENT PLAN - SHEET 2
01-C04.23	PAVEMENT PLAN - SHEET 3
01-C04.81	TYPICAL SECTIONS AND DETAILS - SHEET 1
01-C04.82	TYPICAL SECTIONS AND DETAILS - SHEET 2
01-C05.41	ROAD LONGITUDINAL SECTIONS (MC01) - SHEET 1
01-C05.81	ROAD CROSS SECTIONS (MC01) - SHEET 1
01-C05.82	ROAD CROSS SECTIONS (MC01) - SHEET 2
01-C05.83	ROAD CROSS SECTIONS (MC01) - SHEET 3
01-C05.84	ROAD CROSS SECTIONS (MC01) - SHEET 4
01-C05.85	ROAD CROSS SECTIONS (MC01) - SHEET 5
01-C05.86	ROAD CROSS SECTIONS (MC01) - SHEET 6
01-C05.87	ROAD CROSS SECTIONS (MC01) - SHEET 7
01-C05.88	ROAD CROSS SECTIONS (MC01) - SHEET 8

DRAWING LIST

DWG No.	DRAWING TITLE
01-C05.89	ROAD CROSS SECTIONS (MC01) - SHEET 9
01-C05.90	ROAD CROSS SECTIONS (MC01) - SHEET 10
01-C05.91	ROAD CROSS SECTIONS (MC01) - SHEET 11
01-C06.01	SETOUT PLANS - KERB RETURNS - SHEET 1
01-C06.21	SETOUT PLANS - PARKING BAYS - SHEET 1
01-C06.22	SETOUT PLANS - PARKING BAYS - SHEET 2
01-C06.23	SETOUT PLANS - PARKING BAYS - SHEET 3
01-C06.41	SETOUT PLAN - FESTIVAL DRIVE LIP (LHS) - SHEET 1
01-C06.42	SETOUT PLAN - FESTIVAL DRIVE LIP (LHS) - SHEET 2
01-C06.43	SETOUT PLAN - FESTIVAL DRIVE LIP (LHS) - SHEET 3
01-C06.61	SETOUT PLAN - FESTIVAL DRIVE LIP (RHS)
01-C06.81	SETOUT TABLES
01-C07.21	STORMWATER CATCHMENT PLAN
01-C07.31	STORMWATER CATCHMENT TABLES - SHEET 1
01-C07.32	STORMWATER CATCHMENT TABLES - SHEET 2
01-C07.41	STORMWATER LONGITUDINAL SECTIONS - SHEET 1
01-C07.42	STORMWATER LONGITUDINAL SECTIONS - SHEET 2
01-C07.43	STORMWATER LONGITUDINAL SECTIONS - SHEET 3
01-C08.01	SIGNAGE AND LINEMARKING PLAN - SHEET 1
01-C08.02	SIGNAGE AND LINEMARKING PLAN - SHEET 2
01-C08.03	SIGNAGE AND LINEMARKING PLAN - SHEET 3



DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

REVISION		DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT	DRAWING TITLE	JOB NUMBER	
1		ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 <div>ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.</div>	 NORTHROP Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE COVER SHEET, DRAWING LIST AND LOCALITY PLAN	NL191249
2		ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20						DRAWING NUMBER
							DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD			01-C01.01	2
											DRAWING SHEET SIZE = A1	

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL (CCC) CIVIL WORKS SPECIFICATION. READ IN CONJUNCTION WITH THE NOTES PROVIDED BELOW.
IF CONFLICT ARISE , CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS TAKE PRECEDENCE. WHERE CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS ARE SILENT, THE SPECIFICATION NOTES BELOW TAKE PRECEDENCE

ACCESS AND SAFETY

1. THE CONTRACTOR SHALL COMPLY WITH ALL STATUTORY AND INDUSTRIAL REQUIREMENTS FOR PROVISION OF A SAFE WORKING ENVIRONMENT INCLUDING (BUT NOT LIMITED TO) TRAFFIC CONTROL.
2. THE CONTRACTOR SHALL PROVIDE TRAFFIC MANAGEMENT PLANS FOR THE PROPOSED WORKS COMPLETED BY A SUITABLY QUALIFIED PERSON AND APPROVED BY COUNCIL / REGULATORY AUTHORITY. WORKS ARE NOT TO COMMENCE ON SITE PRIOR TO THE APPROVAL OF TRAFFIC MANAGEMENT SCHEMES.
3. THE CONTRACTOR SHALL ENSURE SAFE ACCESS TO ALL ADJACENT AND NEIGHBORING BUSINESSES AND RESIDENCES AT ALL TIMES DURING AND AFTER WORK ACTIVITIES.
4. WHERE NECESSARY THE CONTRACTOR SHALL PROVIDE SAFE PASSAGE OF VEHICLES AND/OR PEDESTRIANS THROUGH OR BY THE SITE AT ALL TIMES.
5. THE CONTRACTOR SHALL ENSURE PUBLIC ACCESS EXTERNAL TO THE SITE IS IN ACCORDANCE WITH COUNCIL'S REQUIREMENTS AT ALL TIMES.

TREE PROTECTION

1. REFER TO LANDSCAPE / ARCHITECTS PLAN FOR TREES TO BE RETAINED AND PROTECTED.
2. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN SHALL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
 - 2.1. INSTALLING APPROPRIATE PROTECTION BARRIER FENCING OR SIMILAR MATERIALS INSTALLED IN ACCORDANCE WITH ARBORIST SPECIFICATIONS.
 - 2.2. CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY. COUNCILS AND/OR INDEPENDENT ARBORISTS TO BE CONSULTED WHERE TREE ROOTS ARE TO BE REMOVED AND/OR CUT.

EXISTING SERVICES

1. ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIAL BEFORE YOU GUD SEARCHES, AND THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE AND CONFIRM THE LOCATION AND LEVEL OF ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE SUPERINTENDENT. CLEARANCES SHALL BE OBTAINED FROM THE RELEVANT SERVICE AUTHORITY. NOTE SERVICE AUTHORITY REQUIREMENTS FOR LOCATING OF SERVICES PRIOR TO COMMENCEMENT OF WORKS.
2. THE CONTRACTOR IS TO PROTECT AND MAINTAIN ALL EXISTING SERVICES THAT ARE TO BE RETAINED IN THE VICINITY OF WORKS. ANY AND ALL DAMAGES TO EXISTING SERVICES AS A RESULT OF PROPOSED WORKS INCLUDING ANY ECONOMIC LOSS SUFFERED AS A RESULT OF DAMAGES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND THE SUPERINTENDENT TO RECTIFY AND MAKE GOOD AT NO COST TO THE PRINCIPAL OR NORTHPOR CONSULTING ENGINEERS.
3. CARE TO BE TAKEN WHEN EXCAVATING NEAR EXISTING SERVICES. NO MECHANICAL EXCAVATIONS AREA TO BE UNDERTAKEN FOR COMMUNICATION, GAS OR ELECTRICAL SERVICES. HAND EXCAVATION ONLY IN THESE AREAS.
4. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE ADJUSTMENT OF EXISTING SERVICE AND INFRASTRUCTURE AS REQUIRED TO FACILITATE PROPOSED WORKS AND CONSTRUCTION REQUIREMENTS.
5. THE CONTRACTOR SHALL ALLOW IN THE PROGRAM FOR THE CAPPING OFF, EXCAVATION AND REMOVAL (IF REQUIRED) OF EXISTING SERVICES IN AREAS AFFECTED BY WORKS UNLESS DIRECTED OTHERWISE ON THE DRAWINGS OR BY THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL ENSURE THAT AT ALL TIMES, SERVICES TO ALL ADJACENT BUILDINGS NOT AFFECTED BY THE WORKS ARE PROTECTED AND NOT DISRUPTED.
7. PRIOR TO COMMENCEMENT OF ANY WORKS THE CONTRACTOR SHALL OBTAIN APPROVAL OF THE PROGRAM FOR THE RELOCATION AND/OR CONSTRUCTION OF TEMPORARY SERVICES AND FOR ANY ASSOCIATED INTERRUPTION OF SUPPLY FROM THE APPROPRIATE SERVICE AUTHORITY.
8. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY SERVICES TO MAINTAIN EXISTING SUPPLY TO BUILDINGS REMAINING IN OPERATION DURING WORKS TO THE SATISFACTION AND APPROVAL OF THE SUPERINTENDENT. ONCE DIVERSION IS COMPLETE AND COMMISSIONED THE CONTRACTOR SHALL REMOVE ALL SUCH TEMPORARY SERVICES AND MAKE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT.

SOIL AND WATER MANAGEMENT

1. ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH RELEVANT ORDINANCES AND REGULATIONS, NOTE IN PARTICULAR THE REQUIREMENTS OF LANDSCAPES MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION (THE 'BLUE BOOK').
2. THE CONTRACTOR MUST NOTIFY COUNCIL WITHIN 5 WORKING DAYS OF THE INITIAL EROSION CONTROL MEASURES BEING INSTALLED AND CHECK/MAINTAIN THE INSTALLED CONTROL MEASURES DAILY.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT.
6. ALL TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB & GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED THROUGHOUT THE DURATION OF CONSTRUCTION. REFER ARCHITECTS PLANS FOR TREES TO BE KEPT.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ONSITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-10F OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE). NOTABLY, ENSURE STOCKPILES DO NOT EXCEED 2.0M HIGH IF MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS, THE CONTRACTOR SHALL PROVIDE AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC).
11. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST. WHERE COUNCIL CONSIDERS THAT THE DUST IS NOT ADEQUATELY CONTROLLED, THE CONTRACTOR MUST INVESTIGATE OTHER DUST MITIGATION MEASURES SUCH AS DUST SUPPRESSANTS. THE CONTRACTOR MUST ENSURE THE CHEMICAL BASED DUST SUPPRESSANT DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD.
12. SHOULD ANY SEDIMENT LANDSLIDE LEAVE THE SITE, THE INCIDENT MUST BE REPORTED TO COUNCIL WITHIN 2 HOURS OF THE SITE MANAGER BECOMING AWARE OF THE INCIDENT.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION & SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A WEEKLY BASIS & SHALL CONTAIN DETAILS ON THE POSITION OF CONTROLS AND ALL MAINTENANCE, CLEANING & BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
14. MEASURES USED TO CONTROL WIND EROSION MUST BE APPROPRIATE FOR THE LOCATION AND PREVENT SOIL EROSION AT ALL TIMES, INCLUDING WORK HOURS, WEEKENDS, PUBLIC HOLIDAYS AND DURING ANY OTHER SHUTDOWN PERIODS.
15. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALISED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.
16. PRIORITY MUST BE GIVEN TO THE PREVENTION, OR AT LEAST MINIMISATION OF SOIL EROSION, RATHER THAN THE TRAPPING OF DISPLACED SEDIMENT. SUCH A CLAUSE SHALL NOT REDUCE THE RESPONSIBILITY OF A CONTRACTOR TO APPLY AND MAINTAIN, AT ALL TIMES, ALL NECESSARY SEDIMENT CONTROL MEASURES.

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1. ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL SPECIFICATIONS, REGULATORY AUTHORITIES SPECIFICATIONS, ENGINEERING DRAWINGS AND NOTES, AUSTRALIAN STANDARDS, LANDCOM AND EPA SPECIFICATIONS AND THE LATEST VERSION OF NATSPEC SPECIFICATIONS. CONFLICTS BETWEEN THE ABOVE DOCUMENT SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2. ALL CIVIL ENGINEERING DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATION DOCUMENTATION, NAMELY ARCHITECTURAL, STRUCTURAL, HYDRAULIC AND LANDSCAPE.
3. THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES BEFORE AND DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCILS AND STATE AUTHORITIES AS REQUIRED.
4. THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.
5. RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF ALL AND ANY WORKS, WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.
6. THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.
7. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMENT OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE ADDED.
8. DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.
9. IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
10. WHERE NEW WORKS ADJUT EXISTING SURFACES AND INFRASTRUCTURE, THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.
11. ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.
12. ORIGIN OF LEVELS SHOWN ON THE FOLLOWING DRAWINGS ARE ASSUMED TO BE TO AUSTRALIAN HEIGHT DATUM (AHD) AS PROVIDED BY SURVEY DATA. THE CONTRACTOR IS TO CONFIRM ALL LEVELS AND HEIGHT DATA PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
13. ALL WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS AND THE DIRECTIONS OF THE SUPERINTENDENT.
14. THE CONTRACTOR IS TO PROVIDE AND INSTALL 10mm MIN. WIDE COMPRESSIBLE FILLER JOINTS BETWEEN BUILDINGS AND CONCRETE PAVEMENTS.
15. THE CONTRACTOR IS TO PROVIDE TEMPORARY DIVERSION DRAINS AND WOUNDS AS REQUIRED TO ENSURE THAT AT ALL TIMES, EXPOSED SURFACES ARE FREE DRAINING AND WHERE NECESSARY EXCAVATE SUMPS AND PROVIDE PUMPING EQUIPMENT TO DRAIN EXPOSED AREAS.
16. ANY AND ALL DAMAGE TO EXISTING INFRASTRUCTURE AND/OR PAVEMENTS SHALL BE REPORTED TO THE SUPERINTENDENT AND SHALL BE REPAIRED AND MADE GOOD BY THE CONTRACTOR TO NEIGHBOURLY AND FLUSH TO EXISTING AT NO EXTRA COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.
17. THE CONTRACTOR IS TO REFER TO HYDRAULIC ENGINEERS DRAWINGS FOR STORMWATER DRAINAGE DETAILS IN ADDITION TO THOSE SHOWN ON THE CIVIL ENGINEERING DRAWINGS. ANY CONFLICTS IDENTIFIED ARE TO BE REFERRED TO THE SITE FORMAN OR SUPERINTENDENT PRIOR TO PROCEEDING WITH WORKS.
18. THE CONTRACTOR IS TO ENSURE ALL FINISHED SURFACE LEVELS DRAIN TOWARDS THE PROPOSED STORMWATER SYSTEM AND NO AREAS POND/HOLD WATER.
19. THE CONTRACTOR SHALL ENSURE COUNCIL ASSETS AND UTILITIES ARE PROTECTED AT ALL TIMES. ANY AND ALL DAMAGE TO COUNCIL ASSETS AND/OR UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF COUNCIL AND THE UTILITIES AUTHORITY AND AT NO COST TO THE PRINCIPAL OR NORTHROP CONSULTING ENGINEERS.

EARTHWORKS (cont)

PRIOR TO THE COMMENCEMENT OF EARTHWORKS THE CONTRACTOR IS TO REVIEW THE HAZARDOUS MATERIALS ASSESSMENT/ENVIRONMENTAL REPORT IN ORDER TO ASCERTAIN ANY ONSITE CONTAMINATION AND MANAGE ACCORDINGLY. ALL SURPLUS EXCAVATED MATERIAL SHALL REQUIRE A WASTE CLASSIFICATION ASSESSMENT PRIOR TO ITS REMOVAL FROM SITE.

1. THE CONTRACTOR SHALL REVIEW THE SITE SPECIFIC GEOTECHNICAL REPORT PREPARED BY DOUGLAS PARTNERS (REF# 75990.00 JUNE 2016 AND OCT 2019), REMOVE ALL TOPSOIL, ORGANIC MATTER, RUBBLE, UNCONTROLLED FILL, UNSUITABLE MATERIAL AND THE LIKE AND UNDERTAKE ALL REQUIRED SUBGRADE/BASE LAYER TESTING (PROOF ROLLING ETC) UNDER THE GUIDANCE OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO BACK FILLING WITH CONTROLLED SPECIFIED MATERIAL.
2. THE CONTRACTOR SHALL ALLOW TO EXCAVATE IN ALL MATERIALS UNLESS NOTED OTHERWISE
3. THE CONTRACTOR SHALL STRIP AND STOCKPILE SUFFICIENT TOPSOIL AS REQUIRED FOR LATER REUSE AND SITE REHABILITATION. EXCESS TOPSOIL MAY BE SPREAD ON SITE ONLY IF AUTHORIZED AND INSTRUCTED BY THE SUPERINTENDENT. ALL MATERIAL STOCKPILES AND UNVEGETATED AREAS SHALL HAVE SEDIMENT AND EROSION CONTROL MEASURES INSTALLED IN ACCORDANCE WITH THE "BLUE BOOK" (MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION, PRODUCED BY LANDOMI. ANY SURPLUS EXCAVATED MATERIAL INCLUDING TOPSOIL SHALL BE REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES. LIMIT STOCKPILE TO A MAXIMUM HEIGHT OF 2.0m UNLESS APPROVED OTHERWISE BY THE SUPERINTENDENT.
5. THE CONTRACTOR IS TO ALLOW FOR A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO PROVIDE ADVICE AND CERTIFICATION OF ANY WORKS ASSOCIATED WITH TREATING OR MANAGING UNSUITABLE GROUND CONDITIONS THROUGHOUT THE CONTRACT (E.G. STABILITY OF EXCAVATIONS, POOR SUBGRADE, ETC).
6. THE CONTRACTOR SHALL PROOF ROLL ALL EXPOSED NATURAL SUBGRADE FOR BUILDING PLATFORMS, PAVED AREAS, AREAS TO BE FILLED, OR CUT BATTERS IN THE PRESENCE OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER WHO WILL CERTIFY THE WORKS AND CONFIRM THAT THE EXPOSED SUBGRADE IS ALL SOFT, WET OR UNSUITABLE MATERIAL. ENCOUNTERED SHALL BE ADVISED TO THE PRINCIPAL'S AGENT FOR INSTRUCTION REMOVE & REPLACE OR REMEDIATE ALL AREAS AS DIRECTED BY THE PRINCIPAL'S AGENT.
7. THE CONTRACTOR AND GEOTECHNICAL ENGINEER ARE TO ENSURE CONTINUITY IN COMPACTION BETWEEN CUT/FILL AREAS LOCATED IN BUILDING PLATFORMS AND ROAD SUBGRADES
8. THE CONTRACTOR IS TO OBTAIN AND PROVIDE CERTIFICATES VERIFYING THE QUALITY OF IMPORTED MATERIAL FOR THE SUPERINTENDENTS APPROVAL.
9. TESTING OF SITE MATERIAL, SUBGRADES AND PAVEMENT LAYERS SHALL BE CARRIED OUT BY AN APPROVED N.A.T. REGISTERED LABORATORY AND IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 WHERE THE FILL IS TO PROVIDE SUPPORT TO BUILDING FLOOR SLAB. LEVEL 1 TESTING PROCEDURES (IN ACCORDANCE WITH AS3798) SHALL BE FOLLOWED, OTHERWISE LEVEL 2 TESTING SHALL BE UNDERTAKEN. THE TESTING AUTHORITY SHALL BE ENGAGED BY THE BUILDER.
10. ALL FILL MATERIAL SHALL BE PLACED IN MAXIMUM 200mm THICK LAYERS (LAYER) AND COMPACTED AT OPTIMUM MOISTURE CONTENT (i.e. - USING SUITABLE COMPACTION EQUIPMENT) TO ACHIEVE A DRY DENSITY DETERMINED IN ACCORDANCE WITH AS1289 2.11, AS1289 5.7.1 AND AS1289 5.8.8 OF NOT LESS THAN THE FOLLOWING STANDARD MINIMUM DRY DENSITY.
- | LOCATION | COMPACTION REQUIREMENT |
|---|------------------------|
| - SERVICE TRENCHES (NOT UNDER PAVEMENTS) | 95% SMDD |
| - SERVICE TRENCHES (UNDER PAVEMENTS) | 100% SMDD |
| - TOP 600mm TO SUBGRADE LEVEL UNDER PAVED AREAS | 100% SMDD |
| - LANDSCAPED & GENERAL AREAS | 95% SMDD |
| - PAVEMENT SUB-BASE LAYERS | 100% SMDD (U.N.O.) |
| - PAVEMENT BASE LAYERS | 100% SMDD (U.N.O.) |
11. FREQUENCY OF TESTING SHALL BE IN ACCORDANCE WITH TABLE 8.1 OF AS3798 FOR TYPE 1 EARTHWORKS
12. DENSITY TESTING SHALL BE UNDERTAKEN WITHIN TRENCHES AT A RATE OF ONE (1) TEST PER TWO (2) LAYERS PER FORTY (40) LINEAL METRES OF TRENCH.
13. WHERE TEST RESULTS ARE BELOW THE SPECIFIED COMPACTION, RECOMPACT AND RETEST UNTIL SPECIFIED COMPACTION STANDARDS ARE ACHIEVED. OTHERWISE SUBGRADE REPLACEMENT IS REQUIRED IF COMPACTION STANDARDS ARE NOT ACHIEVED.
14. IF SUBGRADE OR FILL IS TOO WET TOO ACHIEVE COMPACTION, UNDERTAKE ONE OR MORE OF THE FOLLOWING:
- SCARIFY AND WORK TO ACCELERATE DRYING.
 - STABILIZE BY MIXING WITH LIME.
 - REPLACE WITH SUITABLE MATERIAL. RE-COMPACT WHEN MOISTURE CONTENT APPROACHES OPTIMUM.
15. THE CONTRACTOR CAN REUSE CUT MATERIAL AS DIRECTED BY THE SITE SPECIFIC GEOTECHNICAL AUTHORITY OR PRINCIPALS AGENT. WHERE THERE IS INSUFFICIENT CUT MATERIAL SUITABLE FOR FILLING OR SUBGRADE REPLACEMENT, THE CONTRACTOR IS TO ALLOW TO IMPORT FILL. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING;
- 15.1 APPROVED AND CERTIFIED BY THE SITE GEOTECHNICAL ENGINEER.
- 15.2 MAXIMUM PARTICLE SIZE OF 50mm
- 15.3 PASSING 37.5mm SIEVE (NOT LESS THAN 80%)
- 15.4 PASSING 75 MICRON SIEVE (NOT GREATER THAN 15%)
- 15.5 PLASTICITY INDEX BETWEEN 2-15%
- 15.6 MINIMUM CBR VALUE OF 8%
16. THE CONTRACTOR IS TO ALLOW FOR THE REPLACEMENT OF UNSUITABLE AND/OR SENSITIVE GROUND (I.E. SILTS, ORGANIC MATTER ETC) WITH SELECTED MATERIAL FROM EXCAVATIONS IF AVAILABLE OR SELECT IMPORTED FILL.

EARTHWORKS (cont)

17. THE CONTRACTOR IS TO PROGRAM EXCAVATIONS TO ENSURE THAT BULK EARTHWORKS AND EXPOSED SURFACES ARE ADEQUATELY DRAINED DURING CONSTRUCTION. ALL EXPOSED SURFACES SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLERS MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL AND DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS. SHALL BE RECTIFIED AT NO COST TO THE PRINCIPAL OR NORTHRUP CONSULTING ENGINEERS.
 18. THE CONTRACTOR IS TO PROVIDE AND INSTALL TEMPORARY DRAINAGE OR SUMP PUMPING AS REQUIRED UNTIL SUFFICIENT SITE STORMWATER DRAINAGE HAS BEEN INSTALLED. ENSURE THAT ALL SEDIMENT AND EROSION CONTROL PROVISIONS ARE ADHERED TO FOR TEMPORARY DRAINAGE MEASURES (REFER TO THE ENGINEERING SEDIMENT AND EROSION CONTROL DRAWINGS)
 19. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE AND MAINTAIN THE INTEGRITY OF ALL SERVICES, CONDUITS AND PIPES DURING CONSTRUCTION, SPECIFICALLY DURING THE BACKFILLING AND COMPACTION PROCEDURE. ANY AND ALL DAMAGE TO NEW OR EXISTING SERVICES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST.
 20. ALLOWABLE EXCAVATION TOLERANCE IS -25MM (BELOW DOCUMENTED LEVELS) AND +0MM (ABOVE DOCUMENTED LEVELS). NOTE THAT BULK EARTHWORKS LEVELS MAY NOT ALLOW FOR A SAND LEVELING LAYER. ANY SAND THAT IS REQUIRED DUE TO OVER-EXCAVATION SHALL BE PROVIDED, AT NO EXTRA COST TO THE PRINCIPAL OR NORTHRUP CONSULTING ENGINEERS
 21. ALL EARTH BATTERS SHALL BE CUT/FILLED TO A MAXIMUM 1 (VERTICLE) IN 4 (HORIZONTAL) SLOPE UNLESS NOTED OTHERWISE ON THE DRAWINGS.
 22. ANY CONTAMINATED MATERIAL FOUND ON SITE DURING CONSTRUCTION AND EARTHWORKS ACTIVITIES SHALL BE ADVISED TO THE PRINCIPAL'S AGENT FOR DIRECTION.
- DEEP EXCAVATIONS
23. PRIOR TO THE COMMENCEMENT OF EXCAVATION WORKS GREATER THAN 15M IN DEPTH, THE CONTRACTOR SHALL OBTAIN THE SERVICES OF A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER TO DETERMINE THE STABILITY OF A NATURAL MATERIAL AND BENCHING REQUIREMENTS.
 24. THE CONTRACTOR MUST PROVIDE THE SUPERINTENDENT AND/OR THE DESIGN ENGINEER WITH A COPY OF THE GEOTECHNICAL ENGINEERS REPORT.
 25. THE CONTRACTOR IS TO PROVIDE SAFETY BARRIERS / FENCING IN ACCORDANCE WITH OH&S AND REGULATORY AUTHORITY REQUIREMENTS.



STORMWATER DRAINAGE

1. ALL CONCRETE PIPES SHALL BE CLASS 2 RUBBER-RING JOINTED RCP U.N.O.
2. ALL uPVC PIPES ARE TO BE SOLVENT WELD-JOINTED SEWER GRADE PIPES WITH THE FOLLOWING PIPE CLASS TO BE ADOPTED U.N.O.
 - 1.1. $\phi 100\text{mm}$ OR LESS TO BE CLASS 'SN10'
 - 1.2. $\phi 150\text{mm}$ AND ABOVE TO BE CLASS 'SN8'.
3. uPVC STORMWATER LINES PASSING UNDER FLOOR SLABS TO BE CONCRETE ENCASED.
4. FRC PIPES EQUAL TO THAT OF THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED SUBJECT TO APPROVAL FROM THE SUPERINTENDENT.
5. ALL PIPE ARE TO BE LAID AT 1.0% MIN GRADE U.N.O ALL
6. ALL STORMWATER INLET PITS SHOWN ON THE CIVIL ENGINEERING DRAWINGS SHALL BE CAST IN-SITU REINFORCED CONCRETE PITS (U.N.O.) THE USE OF PRE-CAST CONCRETE STORMWATER DRAINAGE PITS ARE TO BE CONFIRMED AND APPROVED BY THE SUPERINTENDENT AND NORTHOOP CONSULTING ENGINEERS PRIOR TO THEIR PURCHASE AND INSTALLMENT ON SITE (U.N.O.)
7. PIT COVERS
 - 6.1. USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS U.N.O.
 - 6.2. ALL COVERS AND GRATES TO BE POSITION IN A FRAME AND MANUFACTURED AS A UNIT TO THE MINIMUM LOAD CLASS SPECIFIED.
 - 6.3. ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS
 - 6.4. OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES (U.N.O.) CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.
 - 6.5. UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.
 - 6.6. ALL GRATED TRENCH DRAINS SHOULD BE CLASS 'D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.

STORMWATER DRAINAGE (cont)

1. THE CONTRACTOR IS TO ENSURE A SMOOTH TRANSITION BETWEEN ADJACENT PAVEMENT SURFACES AND STORMWATER PIT COVERS/GRATES
 8. ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.
 9. ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH, WATER TIGHT FINISH.
 10. STORMWATER PIPEWORK TO FINISH FLUSH WITH INTERNAL PIT WALLS AND MUST NOT PROTRUDE. CONNECTION TO BE NEATLY RENDER AND MADE NEAT.
 11. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
 12. U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.
 13. WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK.
 14. MATERIAL USED FOR ALL PIPE BEDDING AND BACK FILL SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL. HAVING A HIGH PERMEABILITY AND HIGH STABILITY AND SHALL COMPLY, BE FREE FROM ORGANIC AND CLAY MATERIAL AND COMPLY WITH THE CURRENT VERSION OF AS3725. PIPE BEDDING SHALL BE TYPE HS2 U.N.O. UNDER ROADS AND H2 UNDER GENERAL AREAS U.N.O. AND BE IN ACCORDANCE WITH THE CURRENT VERSION OF AS3725.
 15. THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST.
 16. NOTE THAT THE PIT COVER LEVEL NOMINATED IN GUTTERS ARE TO THE INVERT OF THE GUTTER WHICH ARE 40mm LOWER THAN THE PAVEMENT LEVEL AT LIP OF GUTTER. REFER KERB DETAILS FOR CONFIRMATION.
- SUBSOIL DRAINAGE
17. ALL SUBSOIL DRAINAGE LINES ARE TO BE $\phi 100\text{mm}$ WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;
 - 17.1. THE HIGH SIDE OF PROPOSED TRAFFICED PAVEMENT AREAS.
 - 17.2. ALL PLANTER AND TREE BEDS PROVIDED ADJACENT TO PAVEMENT AREAS.
 - 17.3. BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).
 - 17.4. ALL OTHER AREAS SHOWN ON DRAWINGS.
 - 17.5. CONTRACTOR IS TO MAKE ALLOWANCE IN BOTH TENDER AND CONSTRUCTION COSTING TO ALLOW FOR SUBSURFACE DRAINAGE BEHIND ALL RETAINING WALLS / ABOVE LOCATIONS AND TO MAKE CONNECTION TO STORMWATER SYSTEM.
 18. WHERE SUBSOIL DRAINAGE PASSES BENEATH BUILDINGS / PAVED AREAS AND/ OR PAVEMENTS THE CONTRACTOR TO ENSURE $\phi 100\text{mm}$ CLASS "SMO" uPVC DRAINAGE LINE IS USED AND THAT PROPRIETARY FITTINGS ARE USED TO RECONNECT SUBSOIL DRAINAGE LINE.
 19. THE CONTRACTOR SHALL INSTALL INSPECTION OPENINGS / CLEAROUTS TO ALL SUBSOIL DRAINAGE LINES AND DOWNPIPE LINES AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH COUNCIL SPECIFICATIONS AT MAXIMUM 30m CENTRE AND AT ALL UPSTREAM ENDPOINTS.
 20. PROVIDE 3.0m LENGTH OF $\phi 100$ SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.
 21. IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC.



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT		PROJECT	DRAWING TITLE	JOB NUMBER
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	<small>ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.</small>	 Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE SPECIFICATION NOTES - SHEET 1	NL191249
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20						
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD				
DRAWING SHEET SIZE = A1											

NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL (CCC) CIVIL WORKS SPECIFICATION. READ IN CONJUNCTION WITH THE NOTES PROVIDED BELOW.
IF CONFLICT ARISE , CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS TAKE PRECEDENCE. WHERE CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS ARE SILENT, THE SPECIFICATION NOTES BELOW TAKE PRECEDENCE

PAVEMENTS

1. ALL PAVEMENT MATERIALS SHALL COMPLY WITH CURRENT RMS AND/OR COUNCIL SPECIFICATIONS. PROVIDE CERTIFICATES VERIFYING THE QUALITY AND SPECIFICATION COMPLIANCE OF ALL IMPORTED MATERIAL. CERTIFICATES ARE TO BE VERIFIED AGAINST STOCKPILED MATERIAL AND NOT BE MORE THAN 1 MONTH OLD.

2. ALL PAVEMENTS HAVE BEEN DESIGNED FOR A SUBGRADE CBR AS NOMINATED ON THE PAVEMENT DETAILS

COMPACTION STANDARDS

BASE 98% MODIFIED MAXIMUM DRY DENSITY
SUBBASE 98% MODIFIED MAXIMUM DRY DENSITY
SUBGRADE 100% STANDARD MAXIMUM DRY DENSITY

3. THE CONTRACTOR SHALL CONFIRM THE DESIGN CBR WITH A MINIMUM OF 3 TESTS TAKEN AT SUBGRADE LEVEL. WHERE DISCREPANCY IS FOUND, CONTACT THE DESIGN ENGINEER.

4. ALLOW FOR AT LEAST TWO SUCCESSFUL COMPACTION TESTS IN EACH LAYER. ALLOW FOR ONE (1) ADDITIONAL TEST PER 200sq.m OF PAVEMENT. ALL COMPACTION TESTING TO BE BY A N.A.T.A. REGISTERED LABORATORY IN ACCORDANCE WITH THE LATEST VERSION OF AS3798 FOR PAVEMENTS (MINIMUM 2 TESTS PER LAYER).

5. MATCH NEW PAVEMENTS NEATLY AND FLUSH WITH EXISTING

6. AFTER BASE IS APPROVED, SWEEP CLEAN AND PRIME AT NOMINAL RATE OF 1.0L PER 1.0 sq.m.

7. PAVEMENT HOLD POINTS

7.1. SUB-GRADE PROOF ROLL PRIOR TO SET-UP AND FORM FOR CONCRETE POUR.
7.2. INSPECTION OF FORMWORK / STEEL PRIOR TO CONCRETE POUR.
7.3. SUBMISSION OF SUB-GRADE AND BASE DENSITY TESTS.

ASPHALTIC CONCRETE

1. GENERAL

1.1. ALL ASPHALTIC CONCRETE (AC) WORK TO BE PREPARED AND CARRIED OUT IN ACCORDANCE WITH GOOD ASPHALTIC PAVING PRACTICE AS DESCRIBED IN AS2150-2005 "ASPHALT (HOT-MIXED) PAVING - GUIDE TO GOOD PRACTICE" AND CURRENT RMS SPECIFICATIONS.

2. PAVEMENT PREPARATION

2.1. THE FINISHED PAVEMENT SURFACE TO BE SEALED SHALL BE WITHIN +/- 2% OF THE OPTIMUM AND BROOMED BEFORE COMMENCEMENT OF WORK TO ENSURE COMPLETE REMOVAL OF ALL SUPERFICIAL FOREIGN MATTER.
2.2. PRIME ALL SURFACES TO BE SEALED. ALLOW PRIME TO SETTLE FOR A MINIMUM OF 3 DAYS BEFORE APPLYING TACK COAT AND ASPHALT.
2.3. SWEEP PRIMED SURFACES BEFORE APPLYING PRIME/TACK COAT.
2.4. ALL DEPRESSIONS OR UNEVEN AREAS ARE TO BE TACK-COATED AND BROUGHT UP TO GENERAL LEVEL OF PAVEMENT WITH ASPHALTIC CONCRETE BEFORE LAYING OF MAIN COURSE.
2.5. ALL DEFECTS IN THE BASE COURSE INCLUDING CRACKS, SURFACE DEFORMATION AND THE LIKE SHALL BE REPAIRED AS DIRECTED BY THE SUPERINTENDENT PRIOR TO PLACEMENT OF TACK COAT AND/OR AC COURSES.

3. PLACEMENTS

3.1. ALL ASPHALT SHALL BE PLACED UTILISING APPROVED MECHANICAL PAVING MACHINES. DO NOT HAND PLACE ASPHALT WITHOUT PRIOR APPROVAL FROM NORTHROP CONSULTING ENGINEERS.

4. JOINTS

4.1. THE NUMBER OF JOINTS BOTH LONGITUDINAL AND TRANSVERSE SHALL BE KEPT TO A MINIMUM.
4.2. THE DENSITY AND SURFACE FINISH AT JOINTS SHALL BE SIMILAR TO THOSE OF THE REMAINDER OF THE LAYER.

5. COMPACTION

5.1. ALL COMPACTION SHALL BE UNDERTAKEN USING SELF PROPELLED ROLLERS.
5.2. INITIAL ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 105°C USING A STEEL DRUM ROLLER HAVING A MINIMUM WEIGHT OF 8 TONNES AND A MAXIMUM UNIT LOAD ON THE REAR DRUM EQUIVALENT TO 55kN/m WIDTH OF DRUM.
5.3. SECONDARY ROLLING SHALL BE COMPLETED BEFORE THE MIX TEMPERATURE FALLS BELOW 80°C USING A PNEUMATIC TYRED ROLLER OF AT LEAST 10 TONNES MASS. A MINIMUM TYRE PRESSURE OF 550kPa AND A MINIMUM TOTAL LOAD OF 1 TONNE ON EACH TYRE.
5.4. ROLLED SURFACES SHALL BE SMOOTH AND FREE OF UNDULATIONS. BONY AND/OR UNEVEN SURFACES WILL BE REJECTED.
5.5. PROVIDE 2 No. MINIMUM COMPACTION TESTS.

6. FINISHED SURFACE PROPERTIES

6.1. FINISHED SURFACES SHALL BE SMOOTH, DENSE AND TRUE OF SHAPE AND SHALL NOT VARY MORE THAN:
6.1.1. 3mm FROM THE SPECIFIED PLAN LEVEL AT ANY POINT.
6.1.2. 3mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID TRANSVERSELY.
6.1.3. 5mm FROM THE BOTTOM OF A STRAIGHT EDGE LAID LONGITUDINALLY.
6.1.4. MINUS 0 TO PLUS 2mm ADJACENT TO OTHER ELEMENTS SUCH AS KERBS AND THE LIKE TO AVOID POOLING OF SURFACE WATER.
6.1.5. MINUS 0 FROM THE SPECIFIED THICKNESS.

7. DO NOT STORE PLANT EQUIPMENT OR TRAFFIC NEWLY LAID ASPHALTIC CONCRETE PAVEMENTS WITHOUT PRIOR APPROVAL FROM THE ENGINEER.

8. DO NOT APPLY MARKING PAINTS UNTIL ASPHALT HAS CURED IN ACCORDANCE WITH PAINT MANUFACTURERS SPECIFICATIONS.

CONCRETE PAVEMENTS

1. THIS SECTION REFERS TO CIVIL CONCRETE WORKS AND DOES NOT INCLUDE STRUCTURAL ELEMENTS SUCH AS BUILDINGS, BELOW GROUND STRUCTURES OR RETAINING WALLS.

2. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

3. NO CONCRETE IS TO BE POURED ON DAYS FORECAST TO BE GREATER THAN 30 DEGREES CENTIGRADE

4. CONCRETE POURS IN CONDITIONS OF HIGH TEMPERATURE, HIGH WIND OR MODERATE COMBINATIONS OF EACH WILL LEAD TO EXCESSIVE CRACKING. THE CONTRACTOR SHALL TAKE FULL RESPONSIBILITY OF SUCH CONCRETE FINISHES AND SHALL UNDERTAKE REMEDIATION WORK AS DIRECTED BY THE SUPERINTENDENT AND AT NO EXTRA COST

5. CONCRETE QUALITY AND REINFORCING COVER

ALL REQUIREMENTS OF THE CURRENT ACSE CONCRETE SPECIFICATION DOCUMENT 1 SHALL APPLY TO THE FORMWORK, REINFORCEMENT AND CONCRETE UNLESS NOTED OTHERWISE.

ELEMENT	CONCRETE STRENGTH f _c (MPa)	SPECIFIED SLUMP	NOMINAL AGGREGATE SIZE	MAX. 56 DAY DRYING SHRINKAGE	COVER (mm)
KERBS AND PATHS	25	60	20	650microns	TOP 40
PITS AND VEHICULAR PAVEMENTS	32	80	20	650microns	TOP 40

6. CONCRETE PROPERTIES SHALL BE VARIED FROM NORMAL CLASS AS FOLLOWS

6.1. MINIMUM CEMENT CONTENT 250 kg/m³
6.2. MAXIMUM 56 DAY SHRINKAGE STRAIN - AS NOMINATED ABOVE
6.3. PRIOR TO COMMENCEMENT CONCRETE SUPPLIER TO PROVIDE DRYING SHRINKAGE TEST RESULTS FROM PRODUCTION ASSESSMENT AS EVIDENCE THAT SPECIFIED DRYING SHRINKAGE LIMITS CAN BE ACHIEVED USING NORMAL MIX DESIGN.

7. ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON MILD STEEL PLASTIC TIPPED CHAIRS. PLASTIC CHAIRS OR CONCRETE CHAIRS AT NOT GREATER THAN 1m CENTRES BOTH WAYS. BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.

8. CEMENT TYPE SHALL BE (ACSE SPECIFICATION) TYPE SL.

9. PROJECT CONTROL TESTING SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 1379. TEST CYLINDERS ARE TO BE KEPT ON SITE.

10. ALL COMPRESSIVE STRENGTH TEST REPORTS SHALL BE SUBMITTED TO THE CIVIL ENGINEER FOR REVIEW.

11. ALL CONCRETE IS TO BE CONTINUOUSLY CURED FOR A MINIMUM PERIOD OF 10 DAYS AFTER PLACING. CURING TO COMMENCE IMMEDIATELY AFTER FINISHING. SPRAY ON CURING COMPOUNDS TO COMPLY WITH AS3799.

12. PLACE CONCRETE CONTINUOUSLY BETWEEN CONSTRUCTION JOINTS SHOWN ON PLAN. DO NOT BREAK OR INTERRUPT SUCCESSIVE POURS SUCH THAT COLD JOINTS OCCUR. ANY REVISIONS OR ADDITIONS TO CONSTRUCTION JOINTS SHOWN ON PLAN REQUIRE APPROVAL FROM NORTHROP CONSULTING ENGINEERS.

13. FALLS IN SLAB AS SHOWN ON PLAN MAINTAIN MINIMUM SLAB THICKNESS AS SHOWN.

14. NO ADMIXTURES SHALL BE USED IN CONCRETE UNLESS APPROVED IN WRITING BY THE DESIGN ENGINEER.

15. THE FINISHED CONCRETE SHALL BE A DENSE HOMOGENOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS.

16. FABRIC SHALL BE LAPPED IN ACCORDANCE WITH THE FOLLOWING DETAIL:

25 MIN.

LAP TWO WIRES

FOLLOWING THE FABRIC SYMBOL SL IS THE REFERENCE NUMBER FOR FABRIC TO AS1304.

17. POLYETHYLENE SHEET SHALL BE PLACED BELOW ALL CONCRETE PAVEMENTS.

18. ALL PENETRATIONS TO HAVE 2/N12 TRIMMER BARS TOP AND BOTTOM TO EACH FACE U.N.O. EXTEND TRIMMERS 700 BEYOND PENETRATION. MAINTAIN 40mm COVER TOP AND BOTTOM.

19. FORMWORK CLASS SHALL BE IN ACCORDANCE WITH AS3600.

20. SURFACE FINISHES:

ELEMENT	FORMWORK CLASS
STORMWATER PIT	OFF FORM
PAVEMENTS	MACHINE FLOAT / BROOM FINISH
KERBS	STEEL FLOAT / TROWEL

21. REINFORCEMENT SYMBOLS:

N DENOTES GRADE 450 N BARS TO AS1302 GRADE N
R DENOTES 230 R HOT ROLLED PLAIN BARS TO AS1302
SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS1304

NUMBER OF BARS IN GROUP

NOMINAL BAR SIZE IN mm

17 N 20-250

BAR GRADE AND TYPE

SPACING IN mm THE FIGURE

PAVEMENT JOINTS

1. PROVIDE 10mm ABLEFLEX BETWEEN NEW CONCRETE WORKS AND EXISTING STRUCTURES.

2. LOCAL AUTHORITY REQUIREMENTS SHALL TAKE PRECEDENCE WITHIN THE PUBLIC ROAD RESERVE.

3. DOWELS TO BE PLACED ON PROPRIETARY CRADLES TO ENSURE CORRECT SPACING AND ALIGNMENT.

4. PEDESTRIAN PAVEMENTS

ALL PEDESTRIAN PAVEMENTS ARE TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

5. EXPANSION JOINTS ARE TO BE LOCATED WHERE POSSIBLE AT TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX. 6.0m CENTRES.

6. WEAKENED PLANE JOINTS (SAWN OR TOOL JOINTS) ARE TO BE LOCATED AT A MAX. SPACING OF 15m x WIDTH OF THE PAVEMENT.

7. WHERE POSSIBLE JOINTS SHOULD BE LOCATED TO MATCH KERBING AND OR ADJACENT PAVEMENT JOINTS.

8. TYPICAL PEDESTRIAN PAVEMENT JOINT DETAIL

SJ/T

SJ/T

EJ

SJ/T

W

6.0m MAX.

15 x W

9. VEHICULAR PAVEMENTS

ALL VEHICULAR PAVEMENTS TO BE JOINTED AS FOLLOWS U.N.O. ON THE DESIGN DRAWINGS.

10. TIED KEYED CONSTRUCTION JOINTS SHOULD GENERALLY BE LOCATED LONGITUDINALLY AT A MAX. OF 5.0m CENTRES.

11. SAWN JOINTS SHOULD GENERALLY BE LOCATED LATERALLY AT A MAX. OF 5.0m CENTRES WITH DOWELED EXPANSION JOINTS AT MAX. 15.0m CENTRES.

12. TYPICAL VEHICULAR PAVEMENT JOINT DETAIL.

SJ

SJ

EJ

SJ

SJ

5.0m MAX.

15.0m MAX.

13. KERB EXPANSION JOINTS SHALL BE FORMED FROM 10mm ABLEFLEX FOR FULL DEPTH OF SECTION.

14. KERB EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, TANGENT POINTS OF CURVES / CORNERS AND AT 12m MAX CENTRES.

15. KERB TOOLED JOINTS TO BE MIN 3mm WIDE AND LOCATED AT MAX 3m CENTRES.

16. INTEGRAL KERB JOINTS SHALL MATCH THE LOCATION OF PAVEMENT JOINTS.

DRAWN: R. GREIVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

DRAWING NOT TO BE USED FOR CONSTRUCTION
UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

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PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250

FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SPECIFICATION NOTES - SHEET 2

DRAWING NUMBER

NL191249

01-C01.12

DRAWING SHEET SIZE = A1

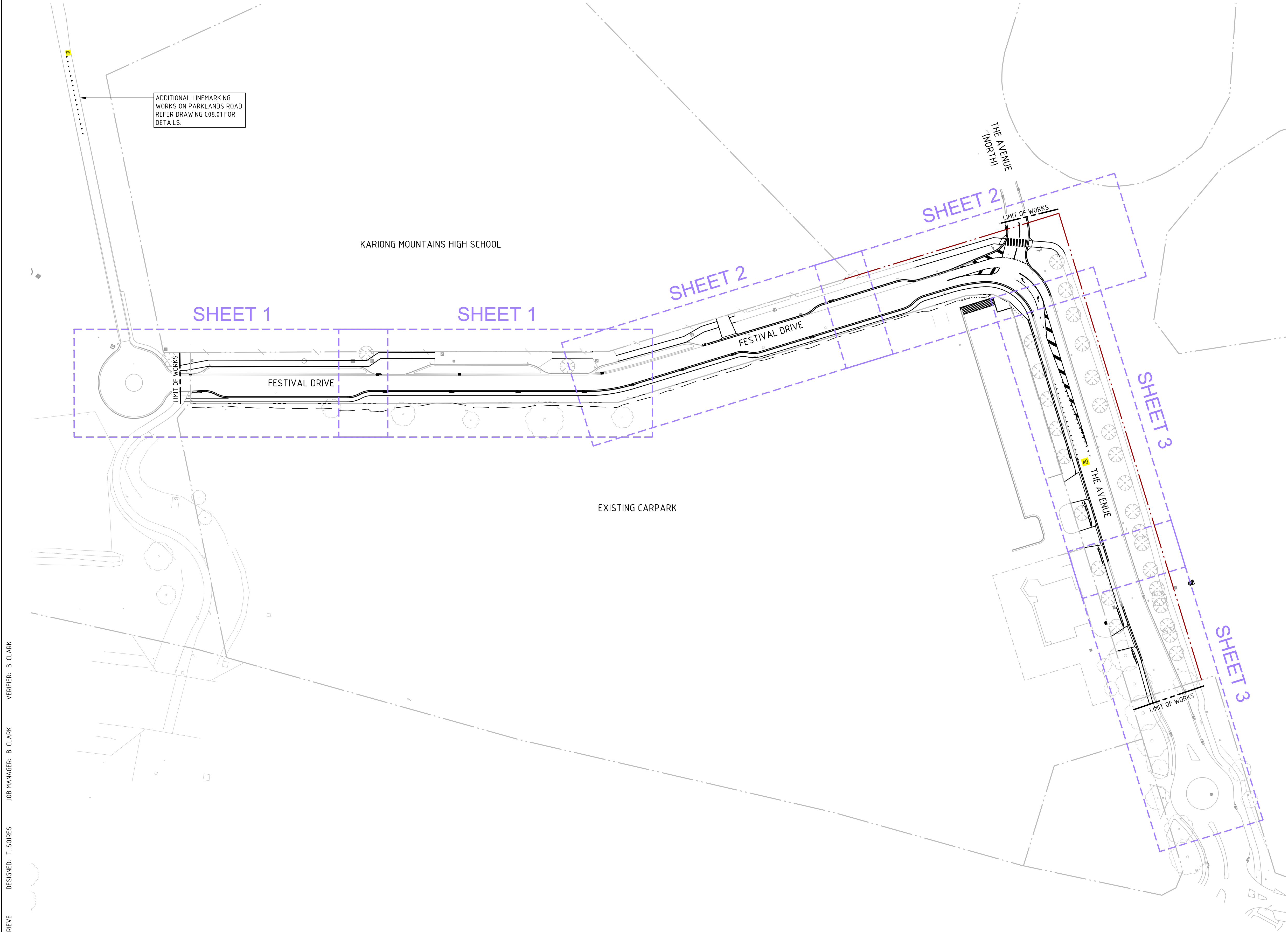
DRAWING NUMBER

01-C01.12

REVISION

2

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



LEGEND	
	PROPOSED BOUNDARY
	EXISTING BOUNDARY
	SHEETS AT 1:200



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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SCALE 1:800@A1

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Newcastle

Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**

**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

GENERAL ARRANGEMENT PLAN

JOB NUMBER

NL191249

DRAWING NUMBER

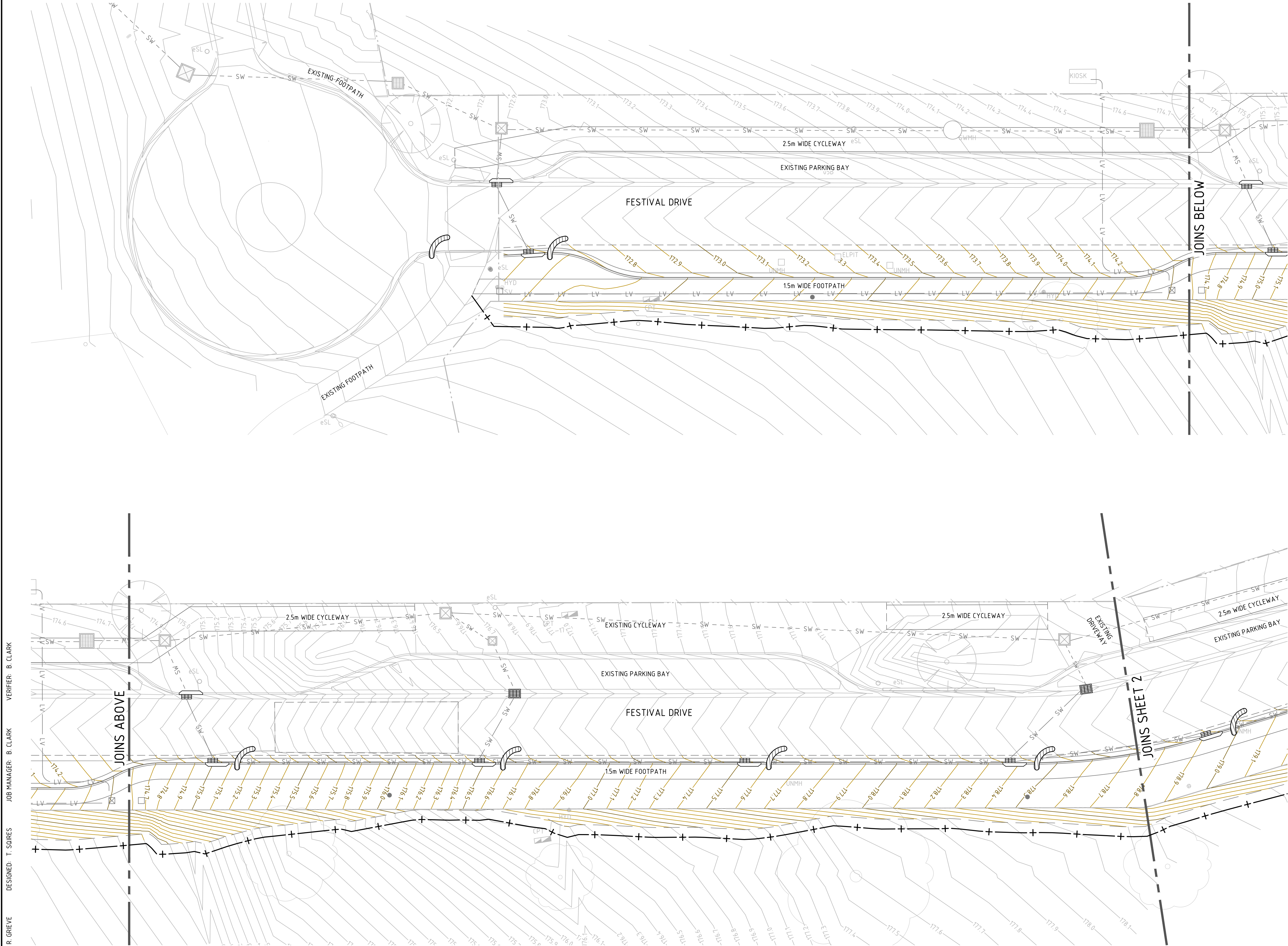
01-C01.21

REVISION

2

DRAWING SHEET SIZE = A1

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



LEGEND

PROPOSED BOUNDARY

EXISTING BOUNDARY

PROPOSED CONTOURS (0.1m INTERVAL)

EXISTING CONTOURS (0.1m INTERVAL)

SEDIMENT FENCE IN ACCORDANCE WITH 'THE BLUE BOOK'

SANDBAG / GEOTEXTILE SAUSAGE SEDIMENT FILTER IN ACCORDANCE WITH 'THE BLUE BOOK'

HAY BALE SEDIMENT FILTER IN ACCORDANCE WITH 'THE BLUE BOOK'

- NOTES
1.

ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3.

INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4.

ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5.

THE SEDIMENT AND EROSION CONTROL MEASURES SHOWN ON THIS PLAN ARE GENERAL SITE MEASURES. ADDITIONAL MEASURES MAY BE REQUIRED AROUND INDIVIDUAL BUILDING ZONES DEPENDENT ON THE SEQUENCE OF CONSTRUCTION.
6.

INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
7.

ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
8.

THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
9.

ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
10.

STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
11.

CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
12.

ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
13.

PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
14.

ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

Hunter & Central Coast Development Corporation

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SCALE 1:200@A1

0

2

4

6

8

10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

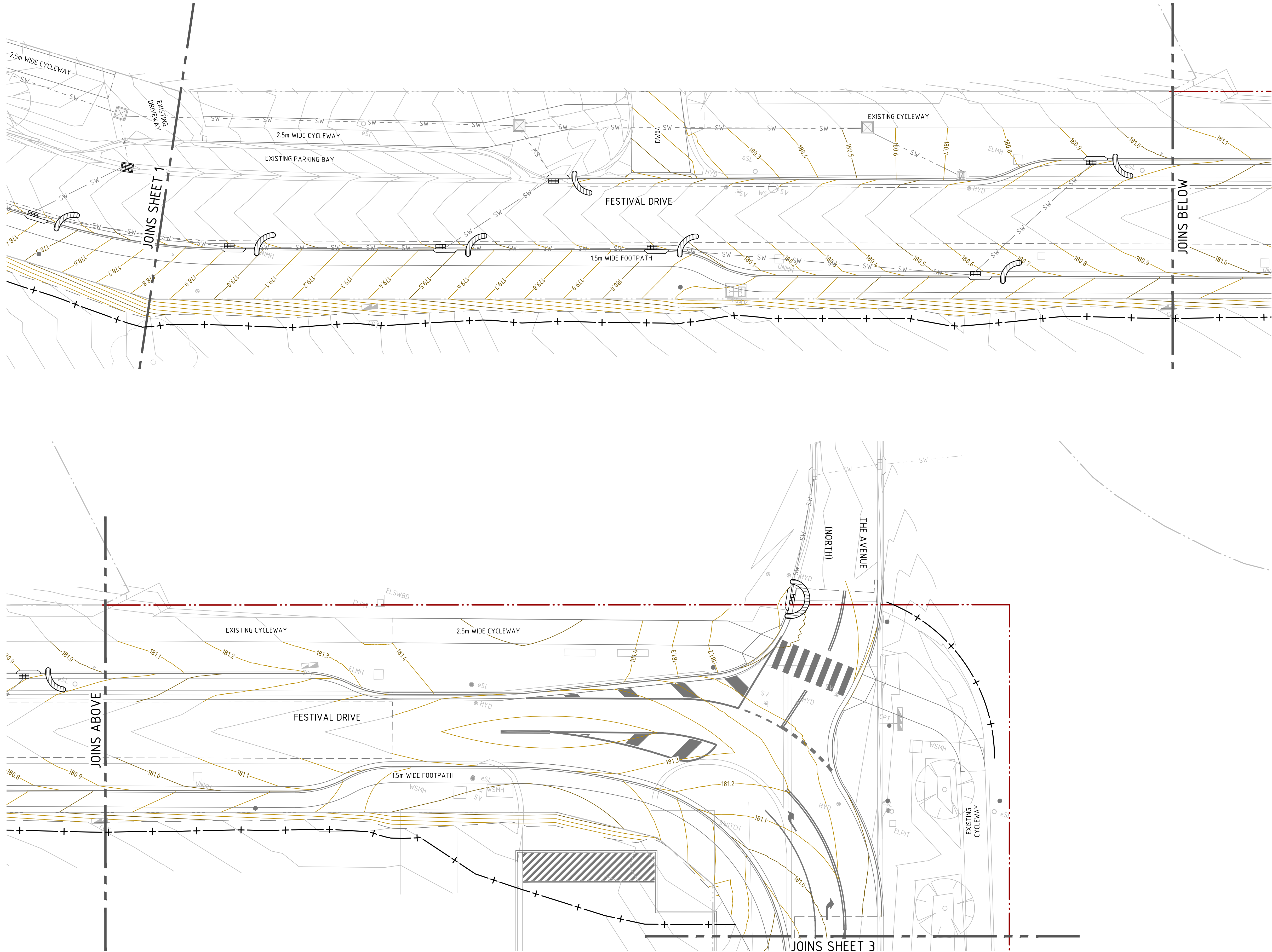
**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
**EROSION AND SEDIMENT CONTROL
PLAN - SHEET 1**

JOB NUMBER	
NL191249	
DRAWING NUMBER	REVISION
01-C02.01	1
DRAWING SHEET SIZE = A1	

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- PROPOSED CONTOURS (0.1m INTERVAL)
- EXISTING CONTOURS (0.1m INTERVAL)
- SEDIMENT FENCE IN ACCORDANCE WITH 'THE BLUE BOOK'
- SANDBAG / GEOTEXTILE SAUSAGE SEDIMENT FILTER IN ACCORDANCE WITH 'THE BLUE BOOK'
- HAY BALE SEDIMENT FILTER IN ACCORDANCE WITH 'THE BLUE BOOK'

NOTES

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- INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
- ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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SCALE 1:200@A1

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
EROSION AND SEDIMENT CONTROL
PLAN - SHEET 2

DRAWING NUMBER

REVISION

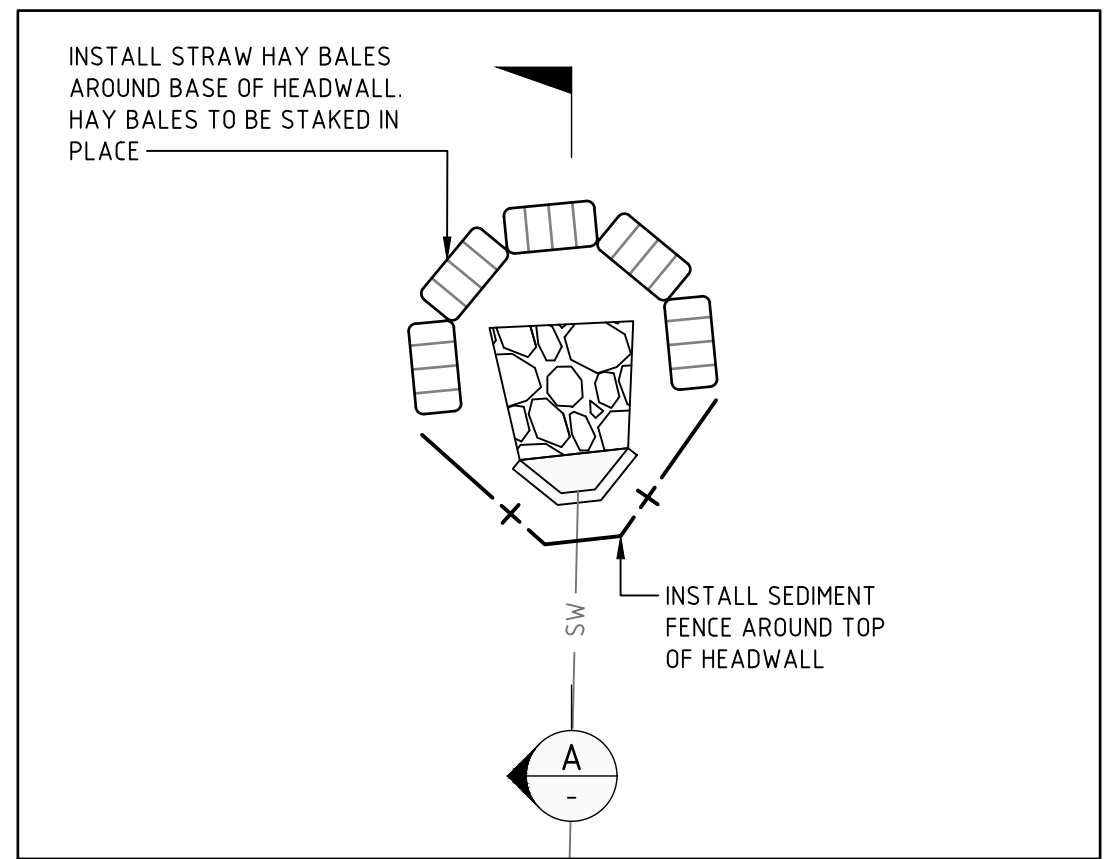
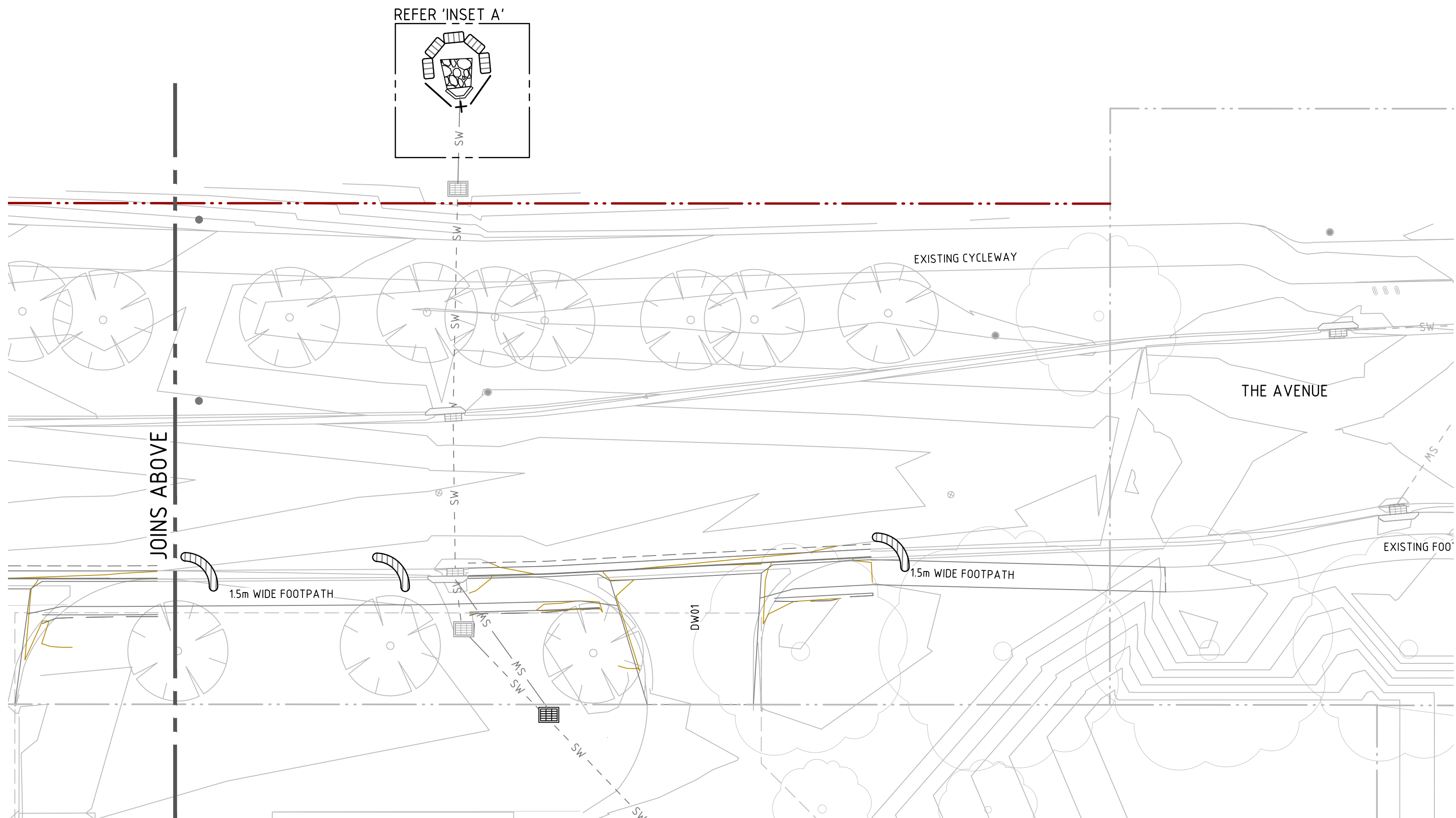
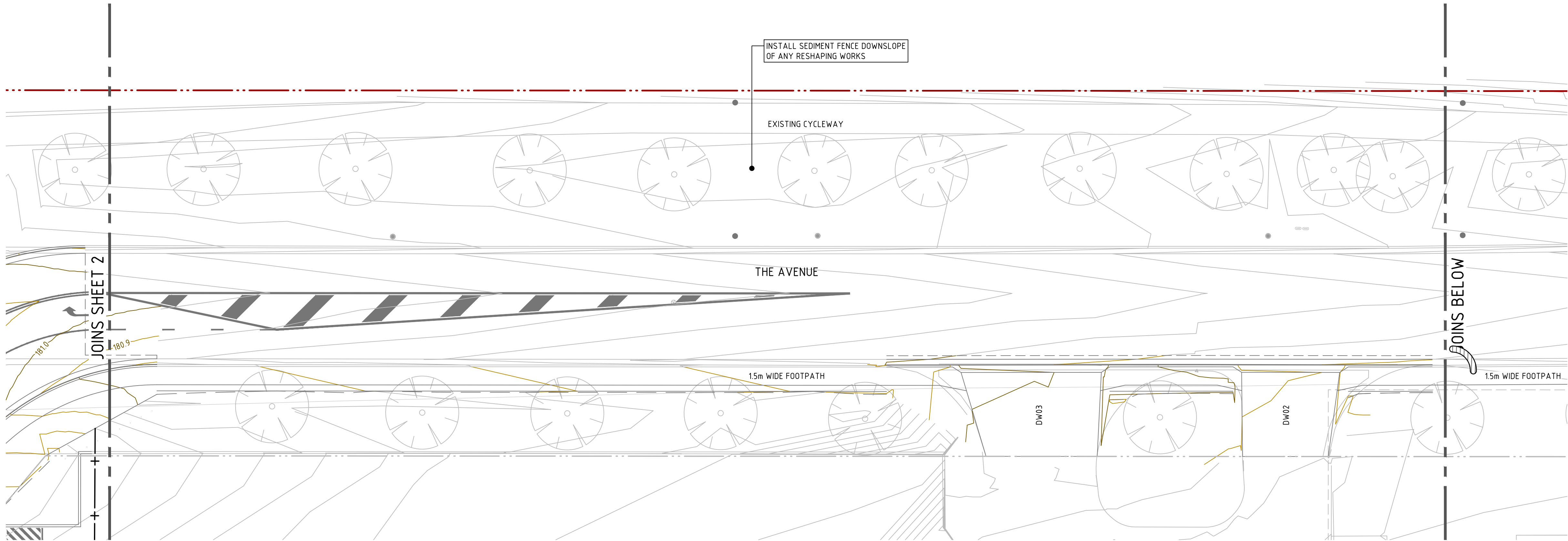
JOIN NUMBER

01-C02.02

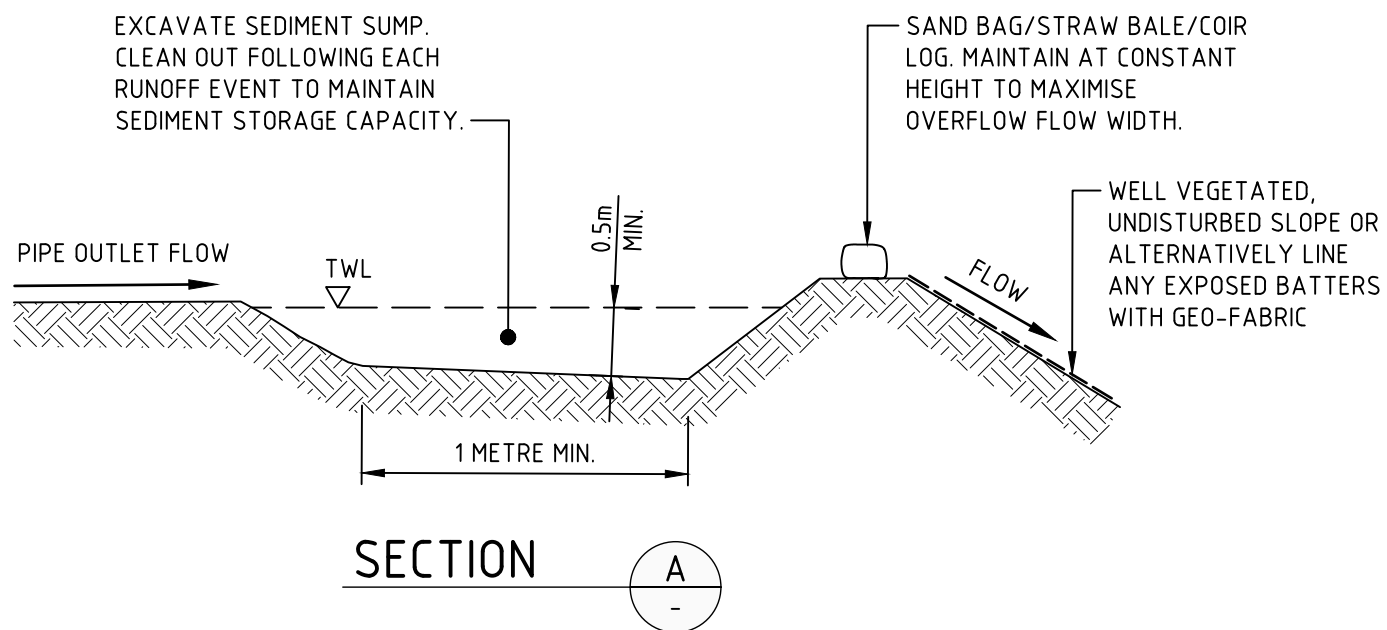
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DRAWING SHEET SIZE = A1

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



INSET A



SECTION

LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- PROPOSED CONTOURS (0.1m INTERVAL)
- EXISTING CONTOURS (0.1m INTERVAL)
- SEDIMENT FENCE IN ACCORDANCE WITH 'THE BLUE BOOK'
- SANDBAG / GEOTEXTILE SAUSAGE SEDIMENT FILTER IN ACCORDANCE WITH 'THE BLUE BOOK'
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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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ARCHITECT
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SCALE 1:200@A1
0 2 4 6 8 10m

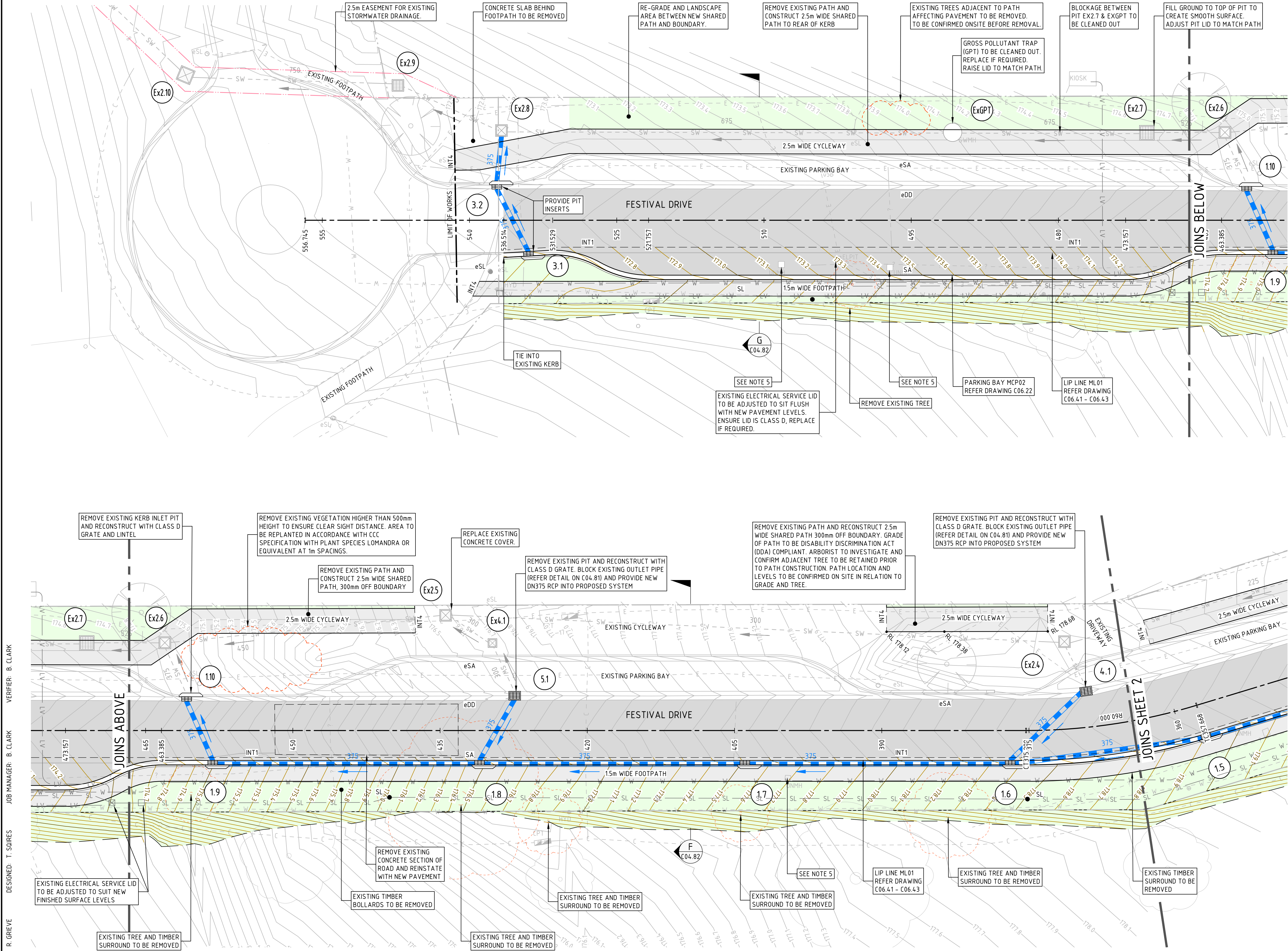
NORTHROP
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Level 1, 215 Pacific Hwy, Charlestown NSW 2290
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ABN 81 094 433 100

PROJECT
MT PENANG PARKLANDS KARIONG NSW 2250
FESTIVAL DRIVE AND THE AVENUE UPGRADE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
EROSION AND SEDIMENT CONTROL PLAN - SHEET 3

JOB NUMBER
NL191249
DRAWING NUMBER
01-C02.03
REVISION
1
DRAWING SHEET SIZE = A1

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREIVE



LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- eXX EXISTING FEATURE (TYPE AS LABELLED)
- SA BARRIER KERB AND CHANNEL TO CCC STD SD0501
- SM BARRIER KERB TO CCC STD SD0501
- DD DISHED CROSSING TO CCC STD SD0511
- VC VEHICLE CROSSING TO CCC STD SD0503
- KR KERB RAMP TO CCC STD SD0502
- INT1 PAVEMENT INTERFACE TYPE 1 TO CCC STD SD0512
- INT2 PAVEMENT INTERFACE TYPE 2 TO CCC STD SD0304
- INT3 PAVEMENT INTERFACE TYPE 3 TO CCC STD SD0503
- INT4 PAVEMENT INTERFACE TYPE 4 TO CCC STD SD0601
- RL XX.XX PROPOSED SPOT HEIGHT
- STORMWATER PIPE, SIZE AND DIRECTION OF GRADE
- EXISTING STORMWATER PIPE
- STORMWATER PIT / DEVICE AND ID TAG, REFER 'STORMWATER LONGITUDINAL SECTIONS' FOR TYPE, SIZE AND SETOUT.
- BATTER EXTENTS
- PROPOSED FSL CONTOURS (0.1m INTERVALS)
- EXISTING CONTOURS (0.1m INTERVALS)
- DWxx DRIVEWAY NUMBER ONLY. PROVIDED FOR DOCUMENTATION CLARITY.
- EXISTING SERVICES BASED ON SURVEY DATA SUPPLIED
- PROPOSED STREET LIGHT POLE
- EXISTING STREET LIGHT POLE TO BE REMOVED. REFER TO ELECTRICAL ENGINEERS DRAWINGS FOR DETAIL
- PROPOSED WATER
- PROPOSED LV ELECTRICAL
- PROPOSED STREET LIGHT ELECTRICAL

PROPOSED SERVICES SUBJECT TO CHANGE.
REFER TO CORRESPONDING DESIGN PLANS

NOTES

- REFER 'SPECIFICATIONS NOTES' FOR SITEWORKS GENERAL REQUIREMENTS.
- UNLESS NOTED OTHERWISE, ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS AND DETAILS. ANY DISCREPANCIES TO BE REPORTED TO NORTHROP ENGINEERS FOR CLARIFICATION.
- REMOVE ALL BARRICADES AND ASSOCIATED POLES FROM WITHIN THE PROPOSED ROAD RESERVES OF THE AVENUE AND FESTIVAL DRIVE.
- SUBSOIL DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH CCC STD SD0301
- EXISTING REDUNDANT IRRIGATION PITS AND SYSTEM TO BE REMOVED. CONTRACTOR TO CONFIRM ELECTRICAL LINE ASSOCIATED WITH SOLENOID HAS BEEN DISCONNECTED PRIOR TO ANY WORKS.

WARNING

EXISTING SERVICES EXIST IN THE VICINITY OF THE WORKS. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORK.

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
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SCALE 1:200@A1

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Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**

**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

DETAIL PLAN - SHEET 1

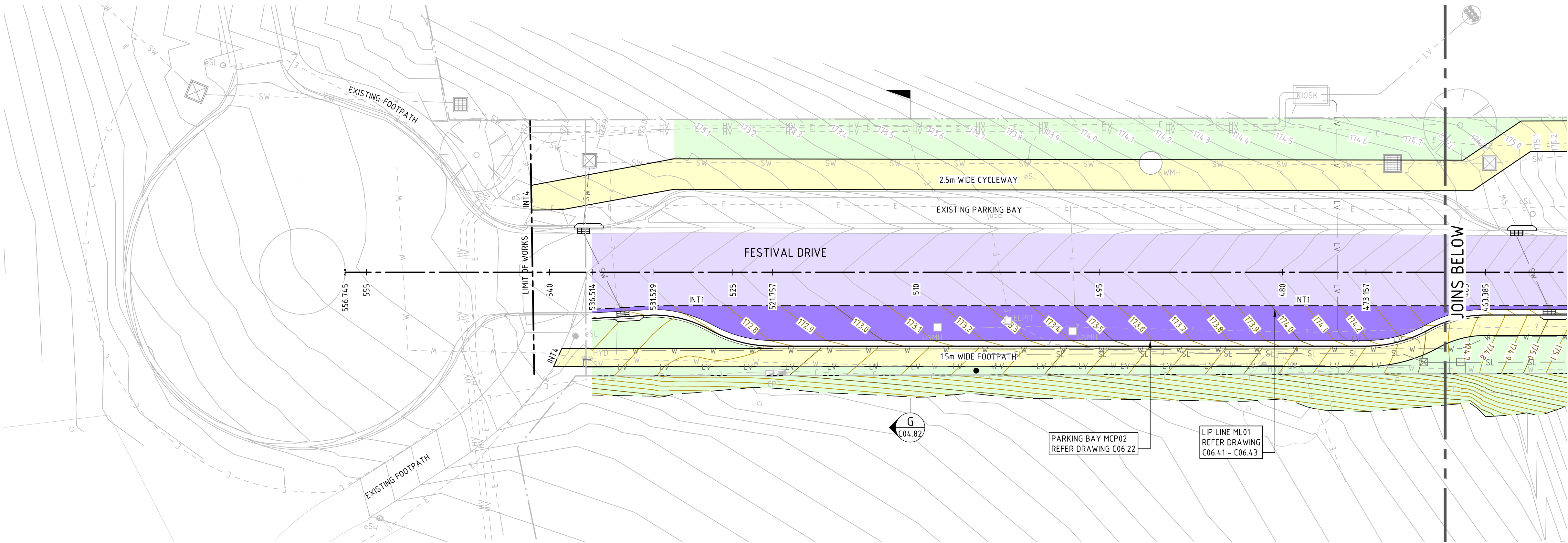
JOB NUMBER

NL191249

DRAWING NUMBER	REVISION
01-C04.01	2

DRAWING SHEET SIZE = A1

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREIVE



LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- FULL DEPTH FLEXIBLE PAVEMENT
REFER TO DRAWING C04.81
- AC RESHEET
REFER TO DRAWING C04.81
- CONCRETE DRIVEWAY
TO CCC STD SD0503 FOR LAYOUT
TO CCC STD SD0506 FOR PAVEMENT DEPTH
- CONCRETE FOOTPATH PAVEMENT
TO CCC STD SD0601
- LANDSCAPING. REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR DETAILS.
- INT1 PAVEMENT INTERFACE TYPE 1
TO CCC STD SD0512
- INT2 PAVEMENT INTERFACE TYPE 2
TO CCC STD SD0304
- INT3 PAVEMENT INTERFACE TYPE 3
TO CCC STD SD0503
- INT4 PAVEMENT INTERFACE TYPE 4
TO CCC STD SD0601
- EXISTING SERVICES
BASED ON SURVEY DATA SUPPLIED
- SW PROPOSED STORMWATER
- W PROPOSED WATER
- LV PROPOSED LV ELECTRICAL
- SL PROPOSED STREET LIGHT ELECTRICAL

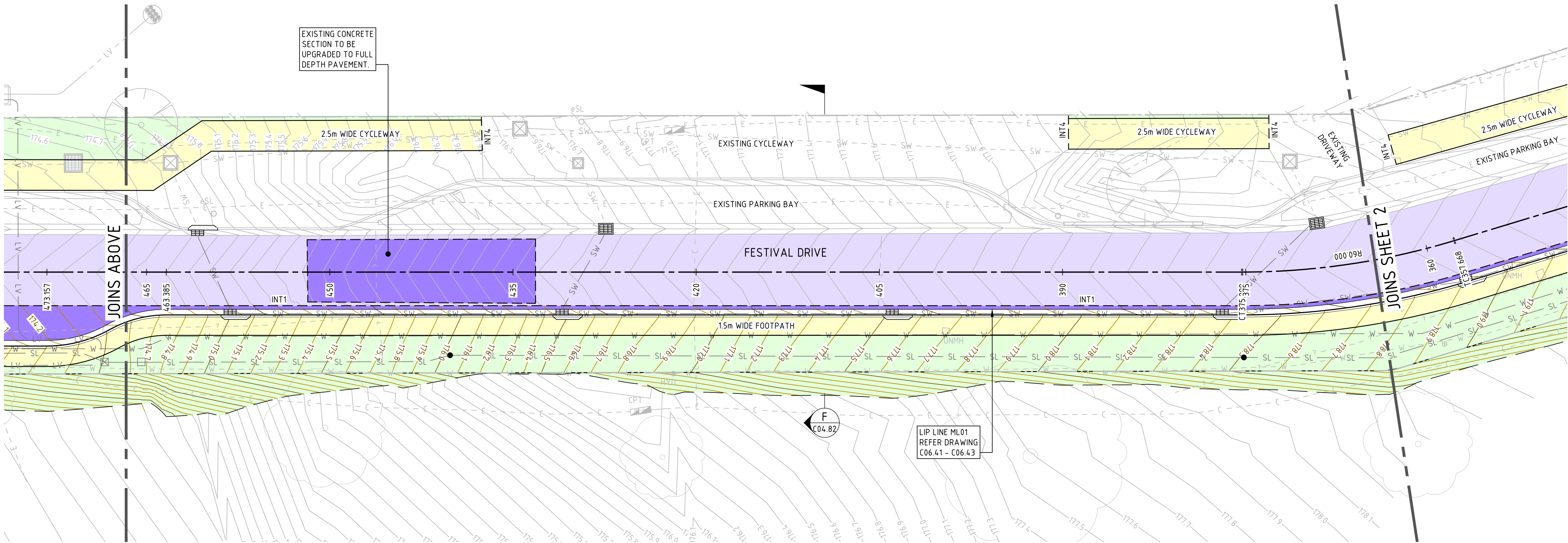
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REFER TO CORRESPONDING DESIGN PLANS

NOTES

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- SUBSOIL DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH CCC STD SD0301
- CONTRACTOR TO CONFIRM ALL CBR VALUES PRIOR TO COMMENCEMENT OF WORKS.
- ENSURE ALL PAVEMENT INTERFACES MATCH NEATLY WITH EXISTING LEVELS.
- PROVIDE ISOLATION JOINTS TO BUILDING SURROUND, REAR OF KERBS, ABUTMENTS TO RETAINING WALLS AND UTILITY SERVICE PITS / POLES.

WARNING

EXISTING SERVICES EXIST IN THE VICINITY OF THE WORKS. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORK.



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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SCALE 1:200@A1

0 2 4 6 8 10m

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Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

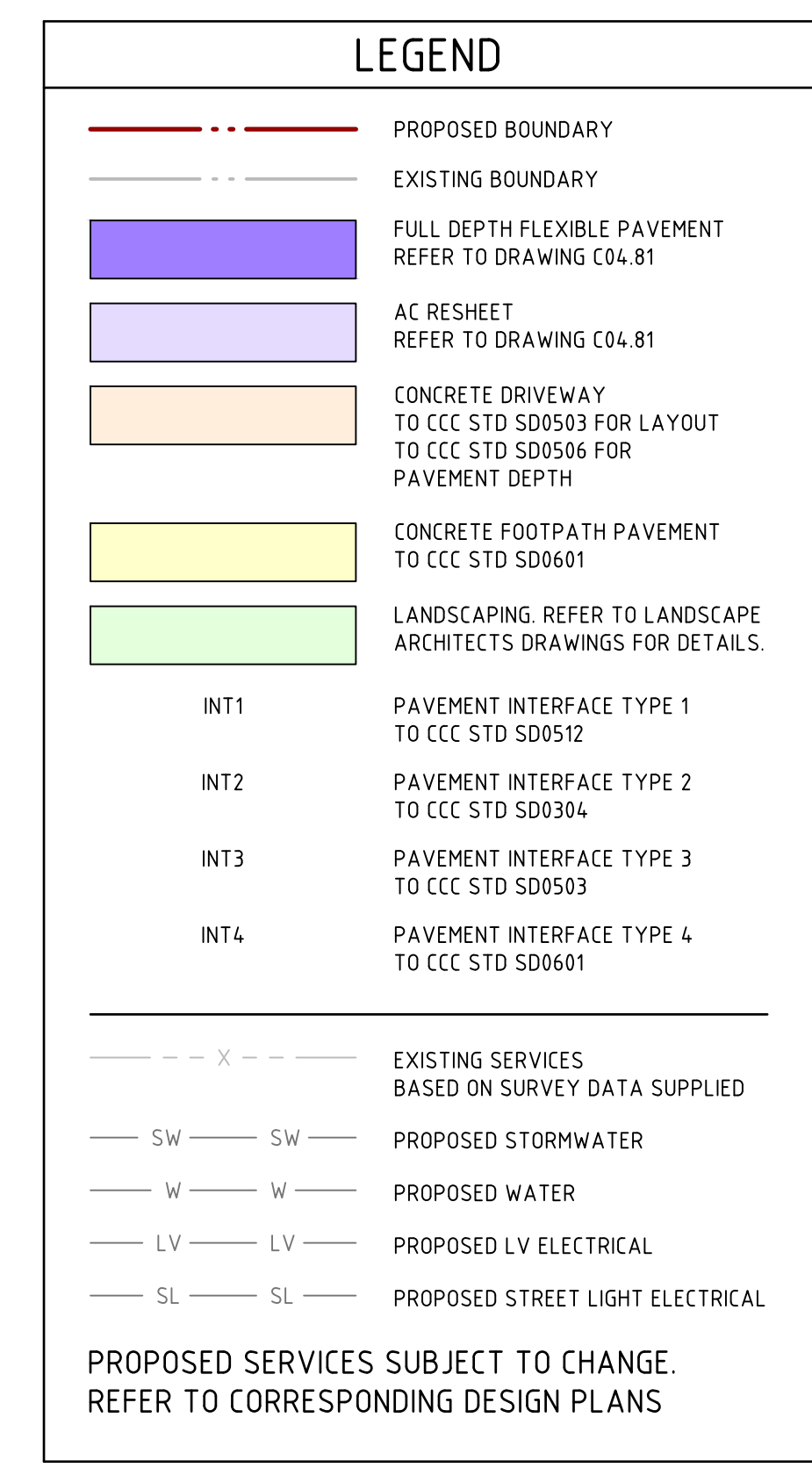
PROJECT
**MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE
**CIVIL ENGINEERING PACKAGE
PAVEMENT PLAN - SHEET 1**

JOB NUMBER
NL191249

DRAWING NUMBER 01-C04.21	REVISION 2
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DRAWING SHEET SIZE = A1



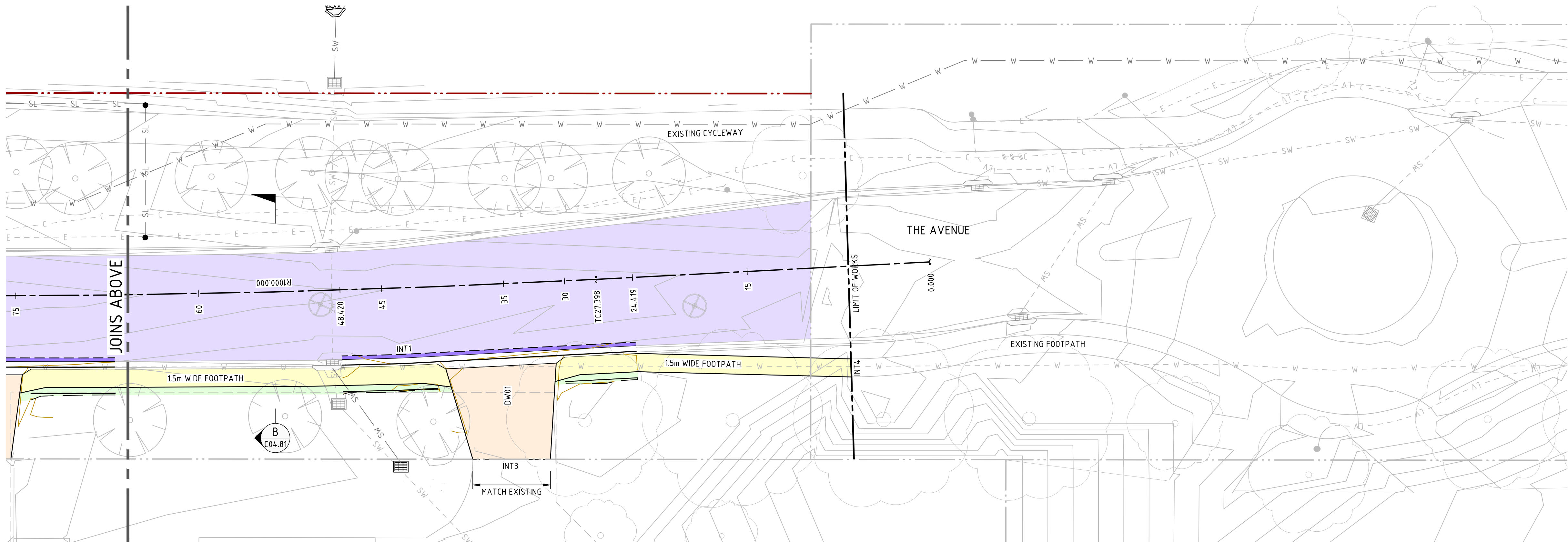
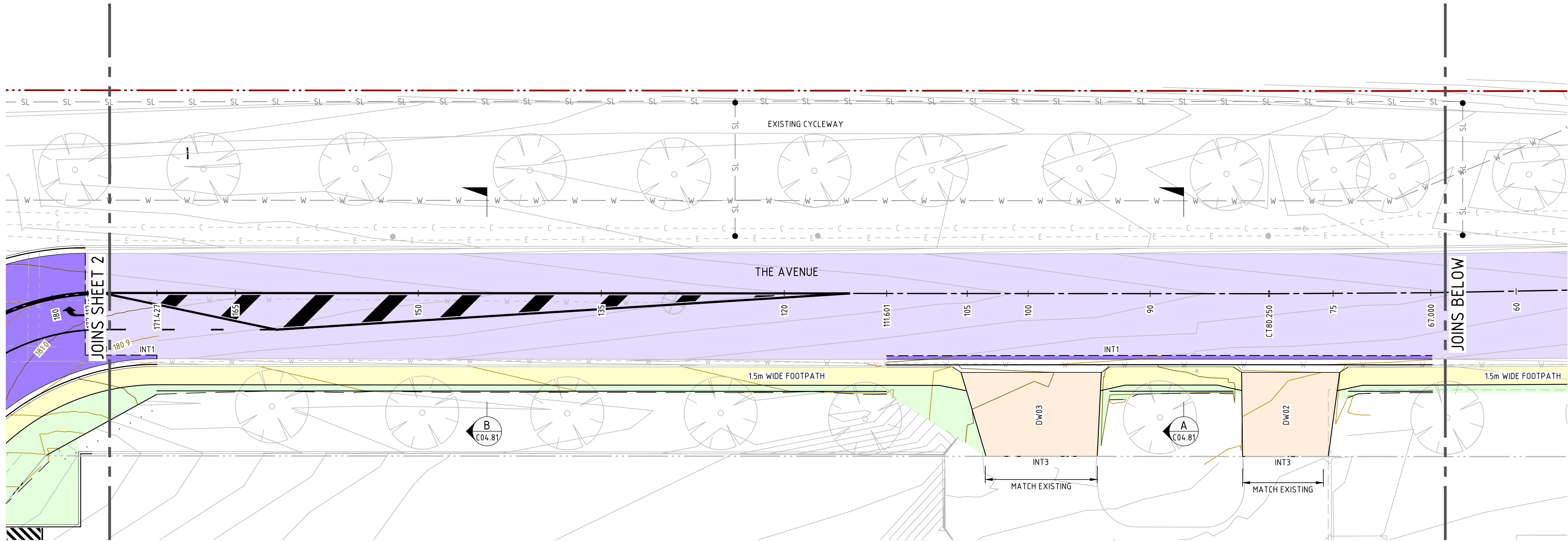
- | NOTES | |
|-------|--|
| 1. | REFER 'SPECIFICATIONS NOTES' FOR PAVEMENT GENERAL REQUIREMENTS. |
| 2. | UNLESS NOTED OTHERWISE, ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL (CCC) SPECIFICATIONS AND DETAILS. ANY DISCREPANCIES TO BE REPORTED TO NORTHOPE ENGINEERS FOR CLARIFICATION. |
| 3. | SUBSOIL DRAINAGE TO BE INSTALLED IN ACCORDANCE WITH CCC STD S00301 |
| 4. | CONTRACTOR TO CONFIRM ALL CBR VALUES PRIOR TO COMMENCEMENT OF WORKS. |
| 5. | ENSURE ALL PAVEMENT INTERFACES MATCH NEATLY WITH EXISTING LEVELS. |
| 6. | PROVIDE ISOLATION JOINTS TO BUILDING SURROUND, REAR OF KERBS, ABUTMENTS TO RETAINING WALLS AND UTILITY SERVICE PITS / POLES. |

<p style="text-align: center;">WARNING</p> <p>EXISTING SERVICES EXIST IN THE VICINITY OF THE WORKS. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL SERVICES PRIOR TO COMMENCING WORK.</p>
--



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT	DRAWING TITLE	JOB NUMBER			
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 <p>ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.</p>  <p>NORTHROP</p> <p>Newcastle</p> <p>Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100</p>	 <p>SCALE 1:200 @ A1</p> 	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE PAVEMENT PLAN - SHEET 2	NL191249		
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20							01-C04.22	2
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD			DRAWING SHEET SIZE = A1			

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- FULL DEPTH FLEXIBLE PAVEMENT
REFER TO DRAWING C04.81
- AC RESHEET
REFER TO DRAWING C04.81
- CONCRETE DRIVEWAY
TO CCC STD SD0503 FOR LAYOUT
TO CCC STD SD0506 FOR
PAVEMENT DEPTH
- CONCRETE FOOTPATH PAVEMENT
TO CCC STD SD0601
- LANDSCAPING. REFER TO LANDSCAPE
ARCHITECTS DRAWINGS FOR DETAILS.
- INT1 PAVEMENT INTERFACE TYPE 1
TO CCC STD SD0512
- INT2 PAVEMENT INTERFACE TYPE 2
TO CCC STD SD0304
- INT3 PAVEMENT INTERFACE TYPE 3
TO CCC STD SD0503
- INT4 PAVEMENT INTERFACE TYPE 4
TO CCC STD SD0601
- EXISTING SERVICES
BASED ON SURVEY DATA SUPPLIED
- SW PROPOSED STORMWATER
- W PROPOSED WATER
- LV PROPOSED LV ELECTRICAL
- SL PROPOSED STREET LIGHT ELECTRICAL

PROPOSED SERVICES SUBJECT TO CHANGE.
REFER TO CORRESPONDING DESIGN PLANS

NOTES

- REFER 'SPECIFICATIONS NOTES' FOR PAVEMENT GENERAL REQUIREMENTS.
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- CONTRACTOR TO CONFIRM ALL CBR VALUES PRIOR TO COMMENCEMENT OF WORKS.
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CLIENT
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SCALE 1:200@A1

0 2 4 6 8 10m

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ABN 81 094 433 100

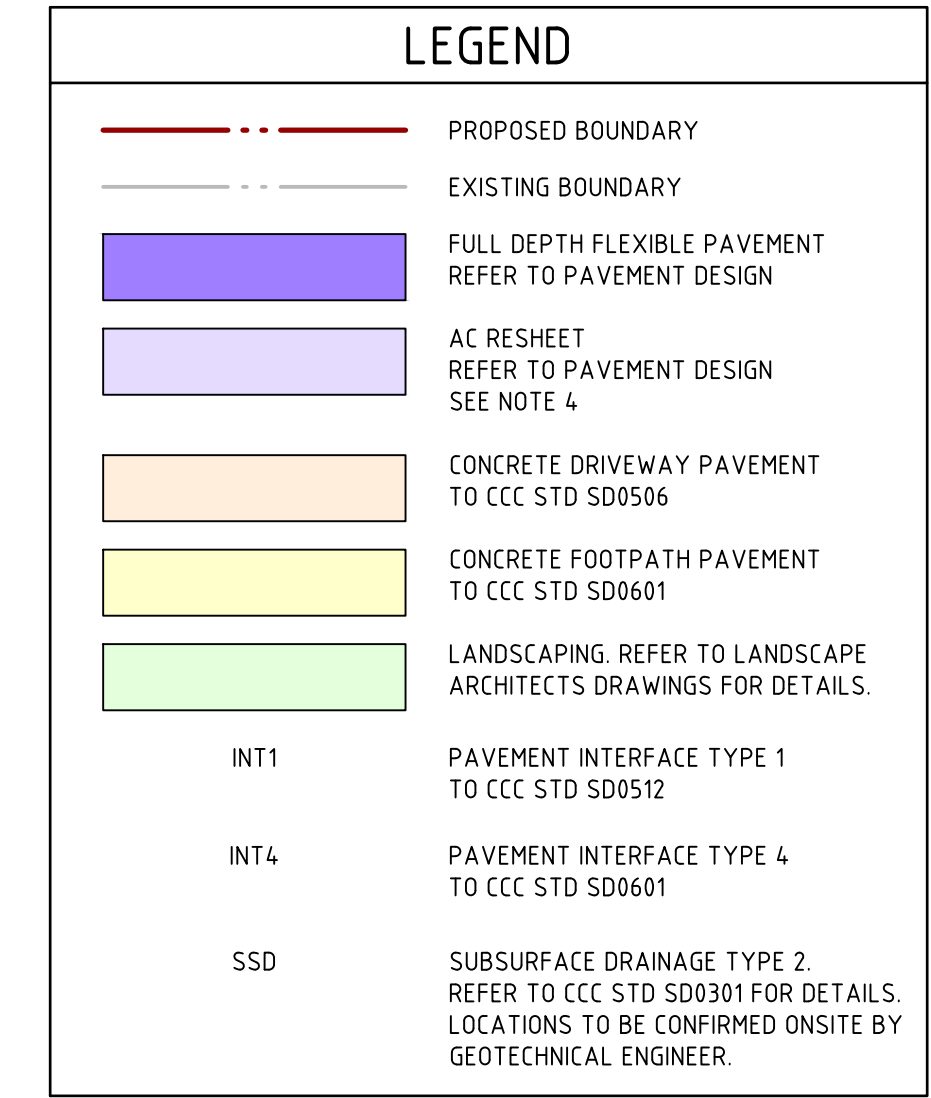
PROJECT
**MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE
**CIVIL ENGINEERING PACKAGE
PAVEMENT PLAN - SHEET 3**

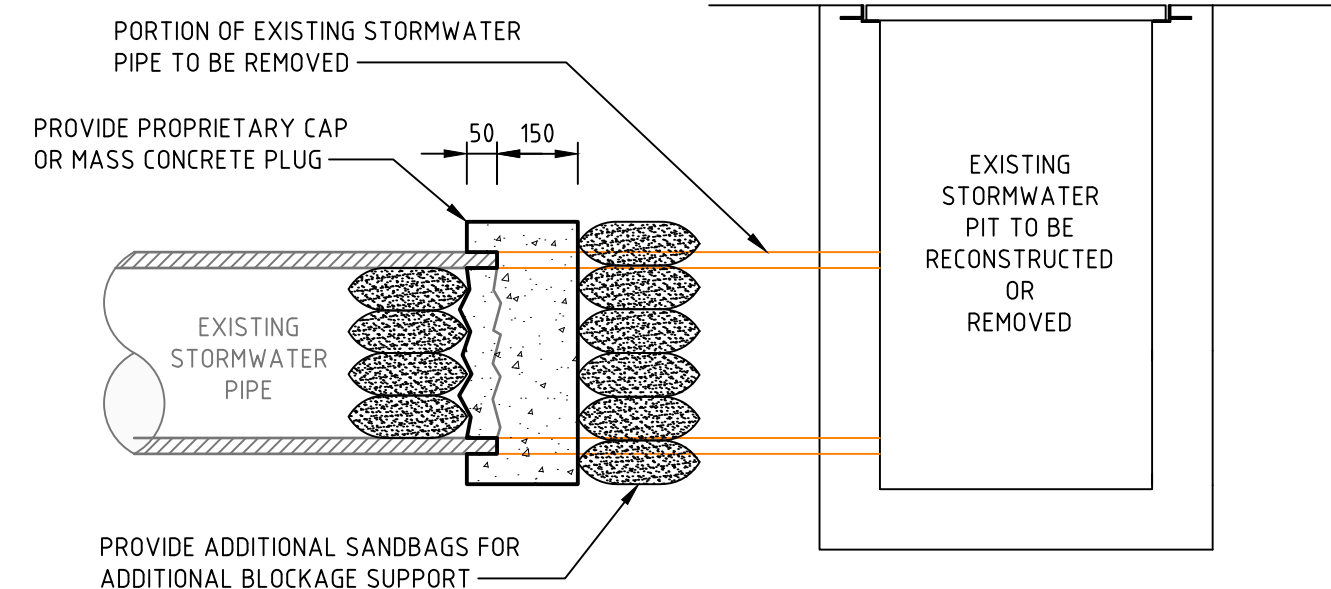
JOB NUMBER
NL191249

DRAWING NUMBER 01-C04.23	REVISION 2
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DRAWING SHEET SIZE = A1



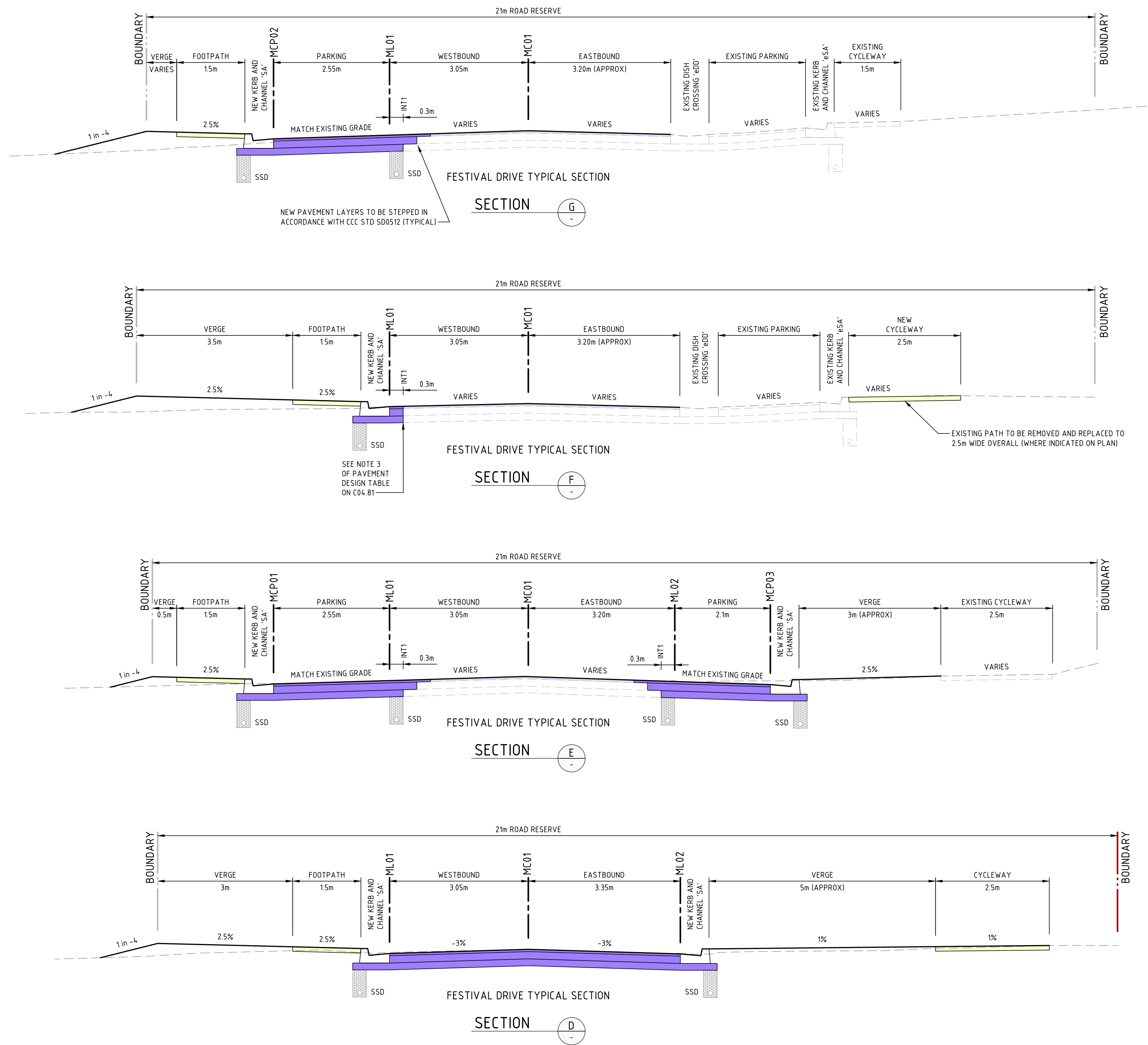
MATERIAL QUALITY AND COMPACTION REQUIREMENTS		
LAYER	MATERIAL QUALITY	COMPACTION
ASPHALT WEARING COURSE	CONFORM TO RTA SPEC R116	-
BASECOURSE	CONFORM TO RMS SPEC R71 AND RMS SPEC 3051	MINIMUM 98% MODIFIED COMPACTION
SUBBASE COURSE	CONFORM TO RMS SPEC R71 AND RMS SPEC 3051	MINIMUM 95% MODIFIED COMPACTION
SELECT SUBGRADE	MINIMUM SOAKED CBR 15% AND MAXIMUM PI 6%	MINIMUM 100% STANDARD
SUGRADE	MINIMUM SOAKED CBR 15%	MINIMUM 100% STANDARD COMPACTION OR 80% DENSITY INDEX (SAND)



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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.	 Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE TYPICAL SECTIONS AND DETAILS - SHEET 1	NL191249 01-C04.81	REVISION 2
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20							
											DRAWING SHEET SIZE = A1	

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREVE



LEGEND	
	PROPOSED BOUNDARY
	EXISTING BOUNDARY
	FULL DEPTH FLEXIBLE PAVEMENT REFER TO PAVEMENT DESIGN
	AC RESHEET REFER TO PAVEMENT DESIGN SEE NOTE 4
	CONCRETE DRIVEWAY PAVEMENT TO CCC STD SD0506
	CONCRETE FOOTPATH PAVEMENT TO CCC STD SD0601
	LANDSCAPING. REFER TO LANDSCAPE ARCHITECTS DRAWINGS FOR DETAILS.
INT1	PAVEMENT INTERFACE TYPE 1 TO CCC STD SD0512
INT4	PAVEMENT INTERFACE TYPE 4 TO CCC STD SD0601
SSD	SUBSURFACE DRAINAGE TYPE 2. REFER TO CCC STD SD0301 FOR DETAILS. LOCATIONS TO BE CONFIRMED ONSITE BY GEOTECHNICAL ENGINEER.



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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
**TYPICAL SECTIONS AND DETAILS -
SHEET 2**

DRAWING NUMBER

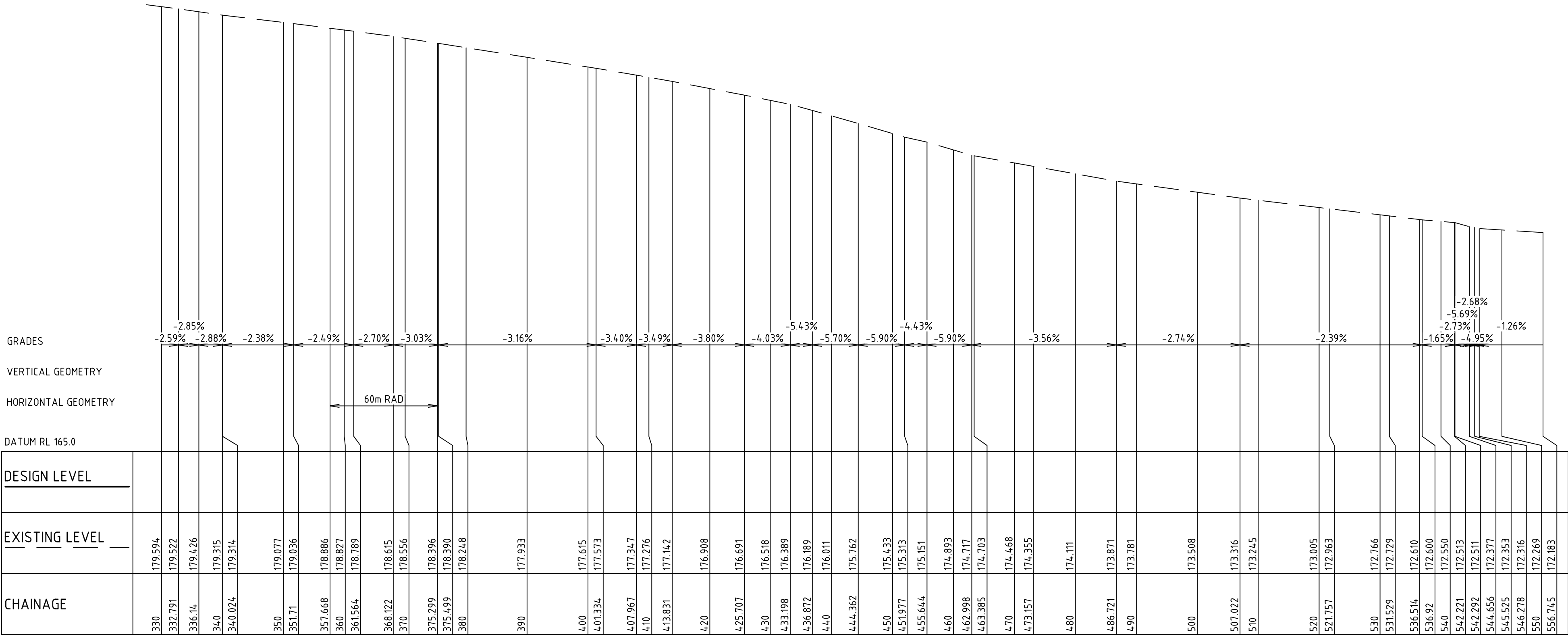
01-C04.82

REVISION

2

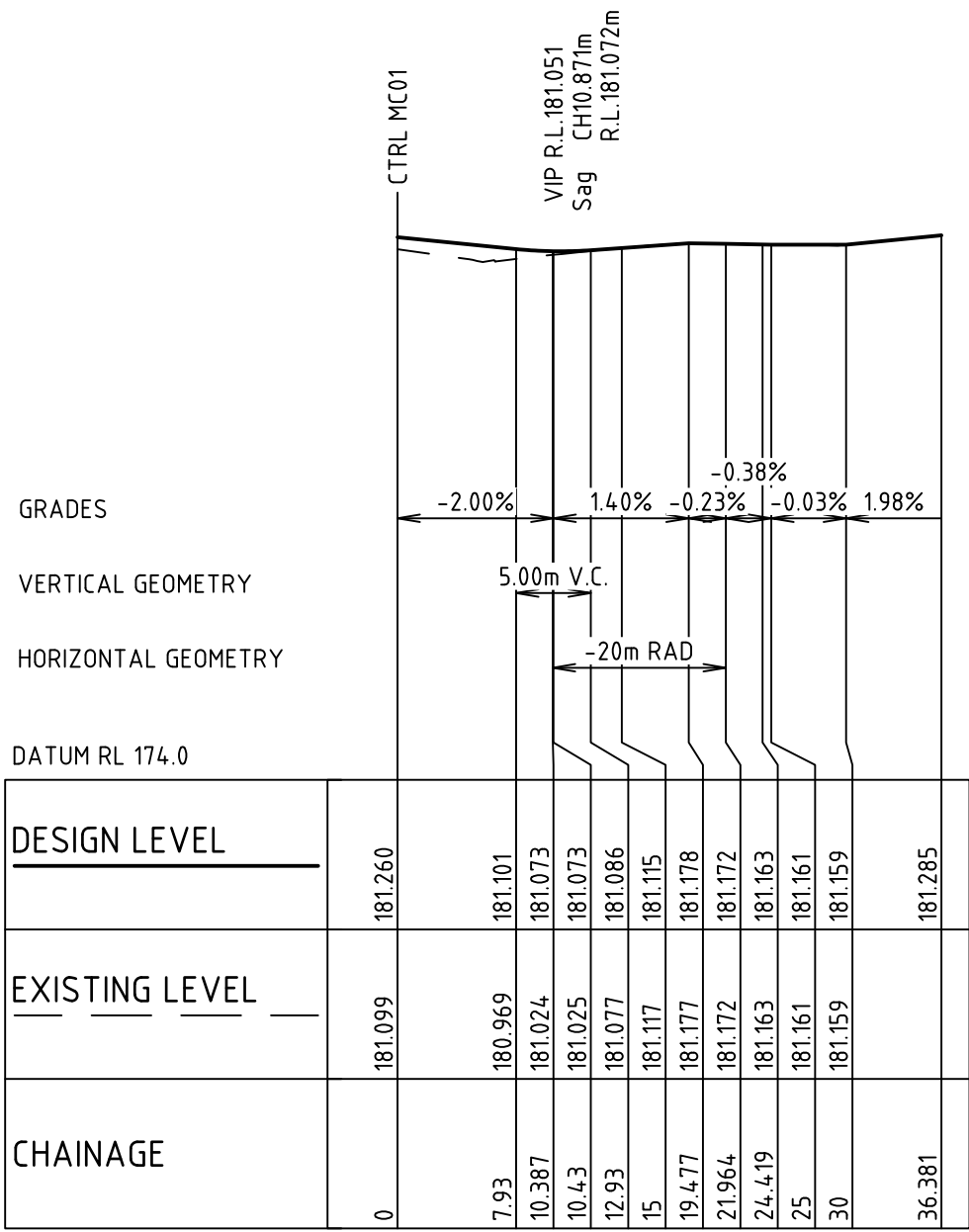
DRAWING SHEET SIZE = A1

DESIGNED: T. SOIRES
DRAWN: R. GREIVE
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



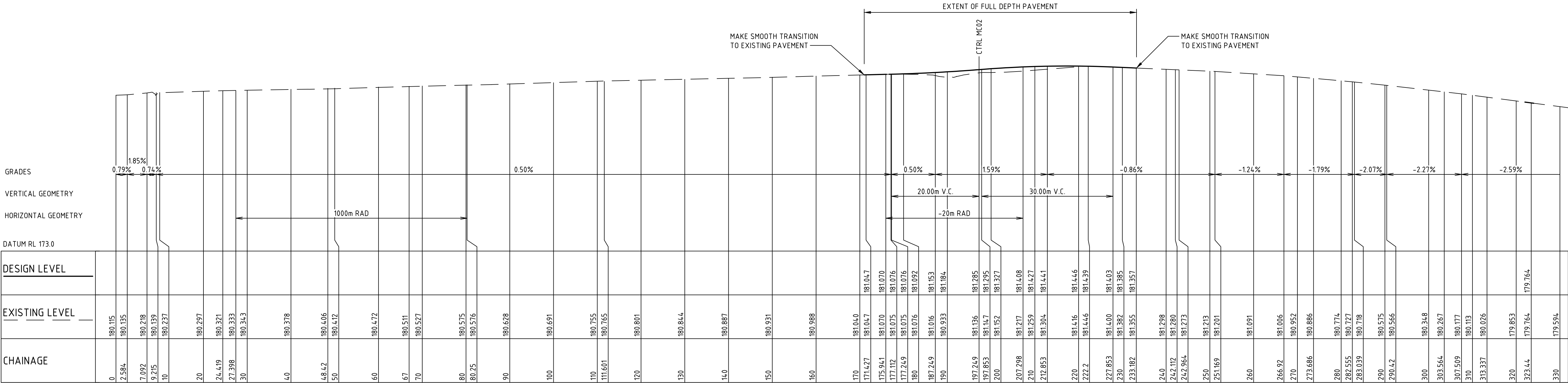
LONGITUDINAL SECTION - THE AVENUE & FESTIVAL DRIVE CONTROL (MC01)

REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



LONGITUDINAL SECTION - THE AVENUE NORTH CONTROL (MC02)

REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



LONGITUDINAL SECTION - THE AVENUE & FESTIVAL DRIVE CONTROL (MC01)

REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:500@A1
VERTICAL SCALE 1:100@A1



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SCALE 1:500@A1
SCALE 1:100@A1

0 5 10 15 20 25m
0 1 2 3 4 5m

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PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

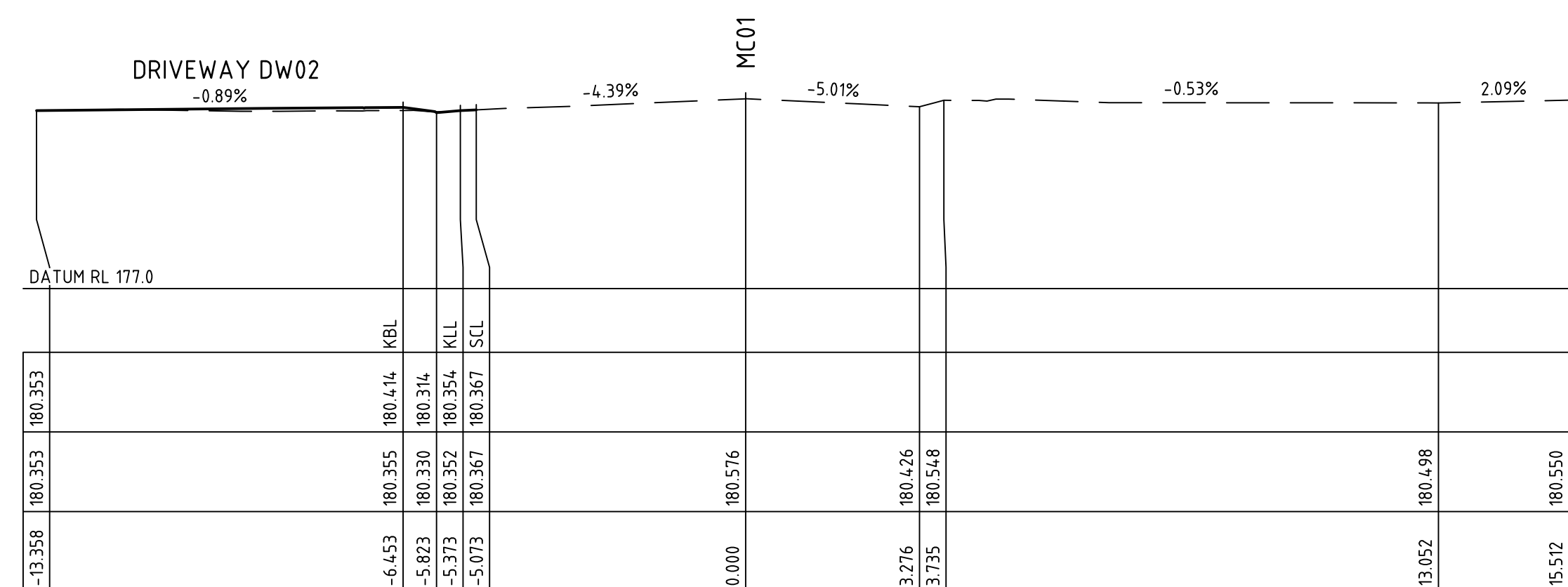
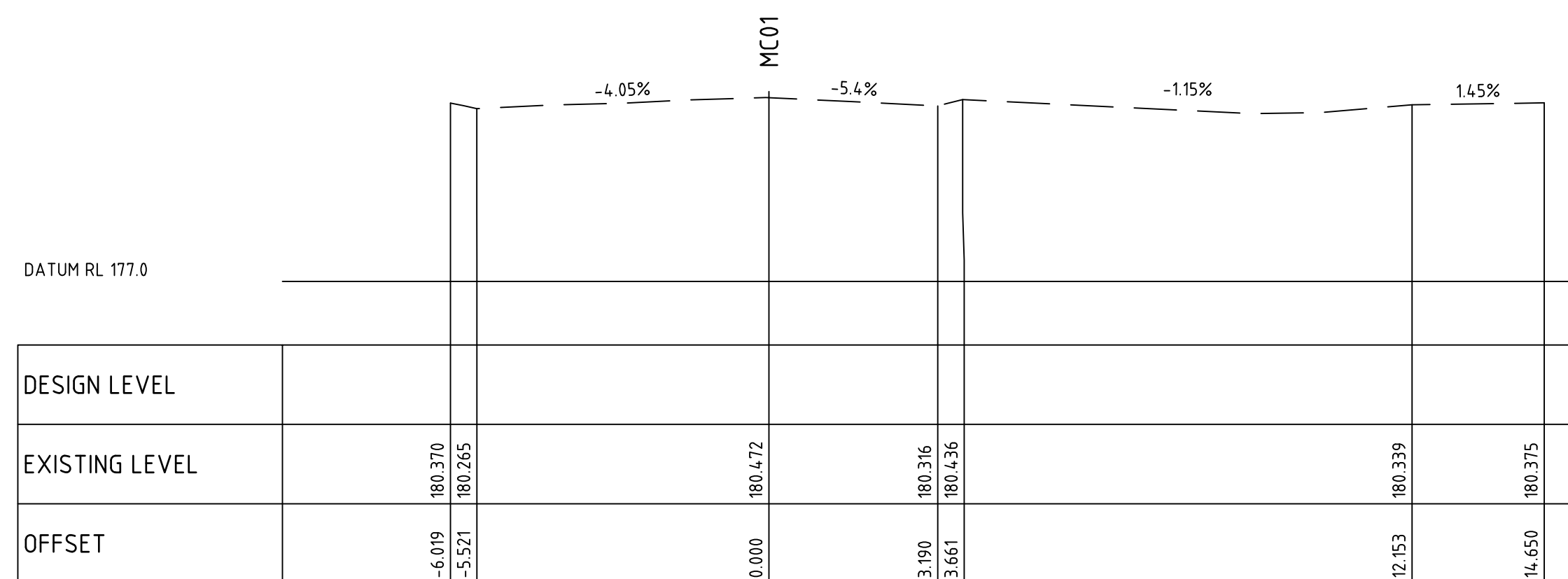
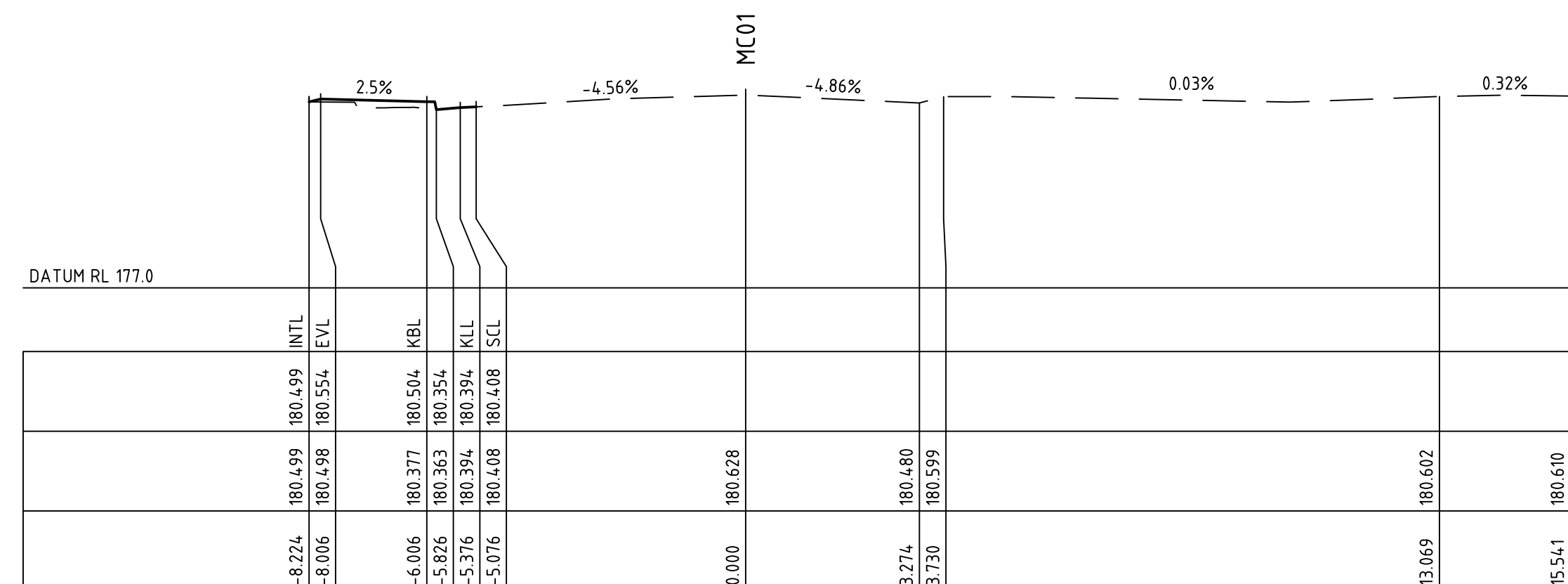
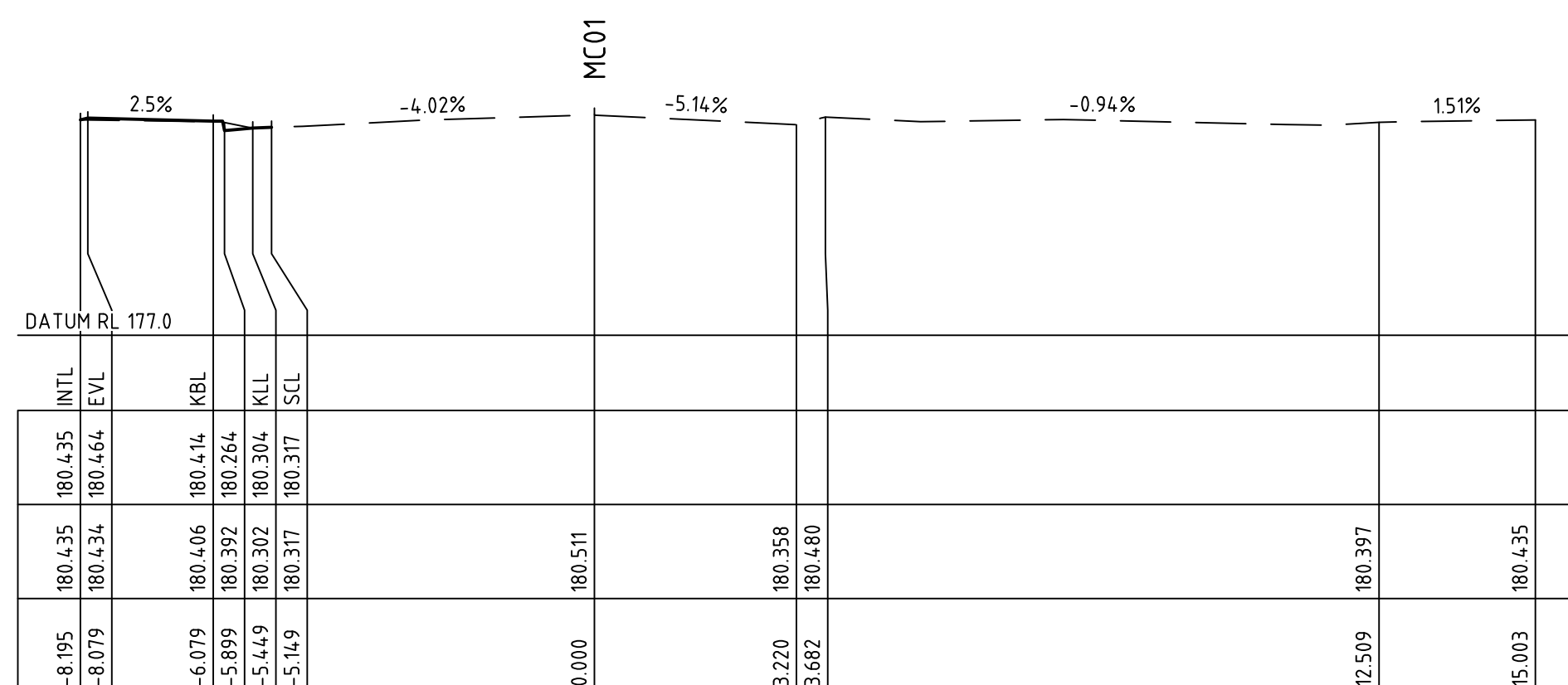
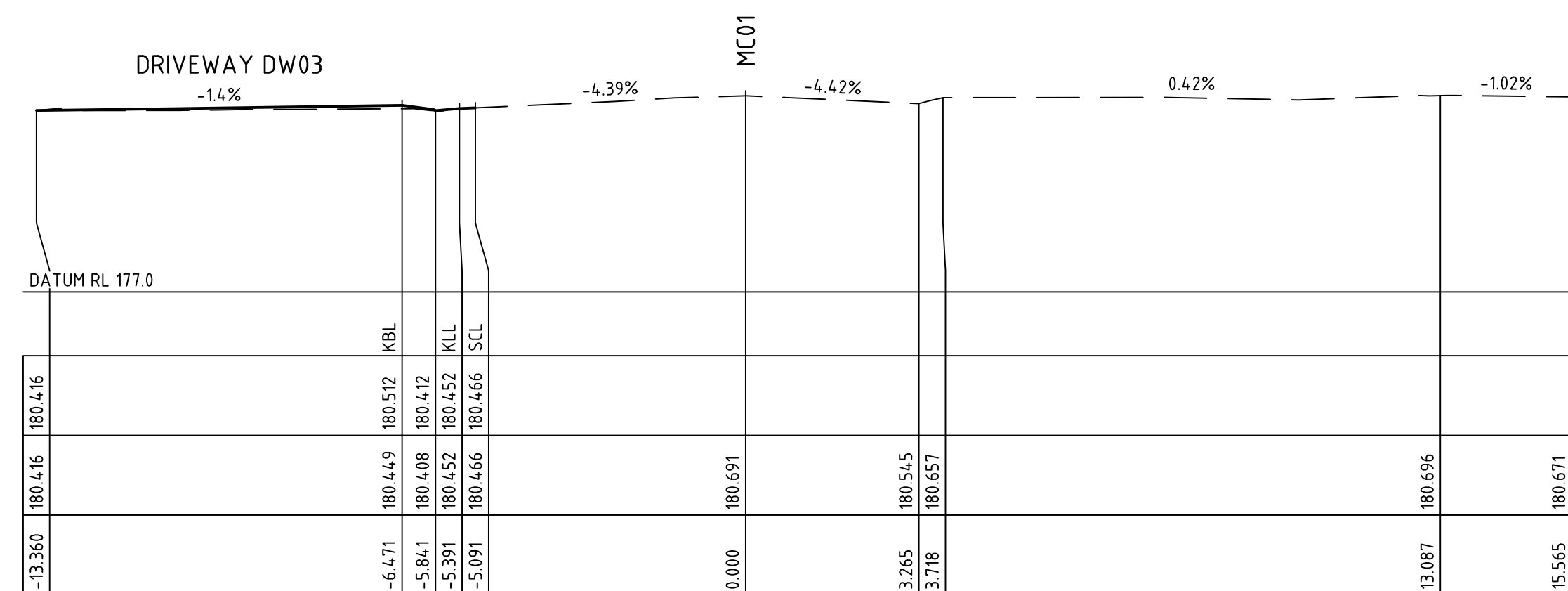
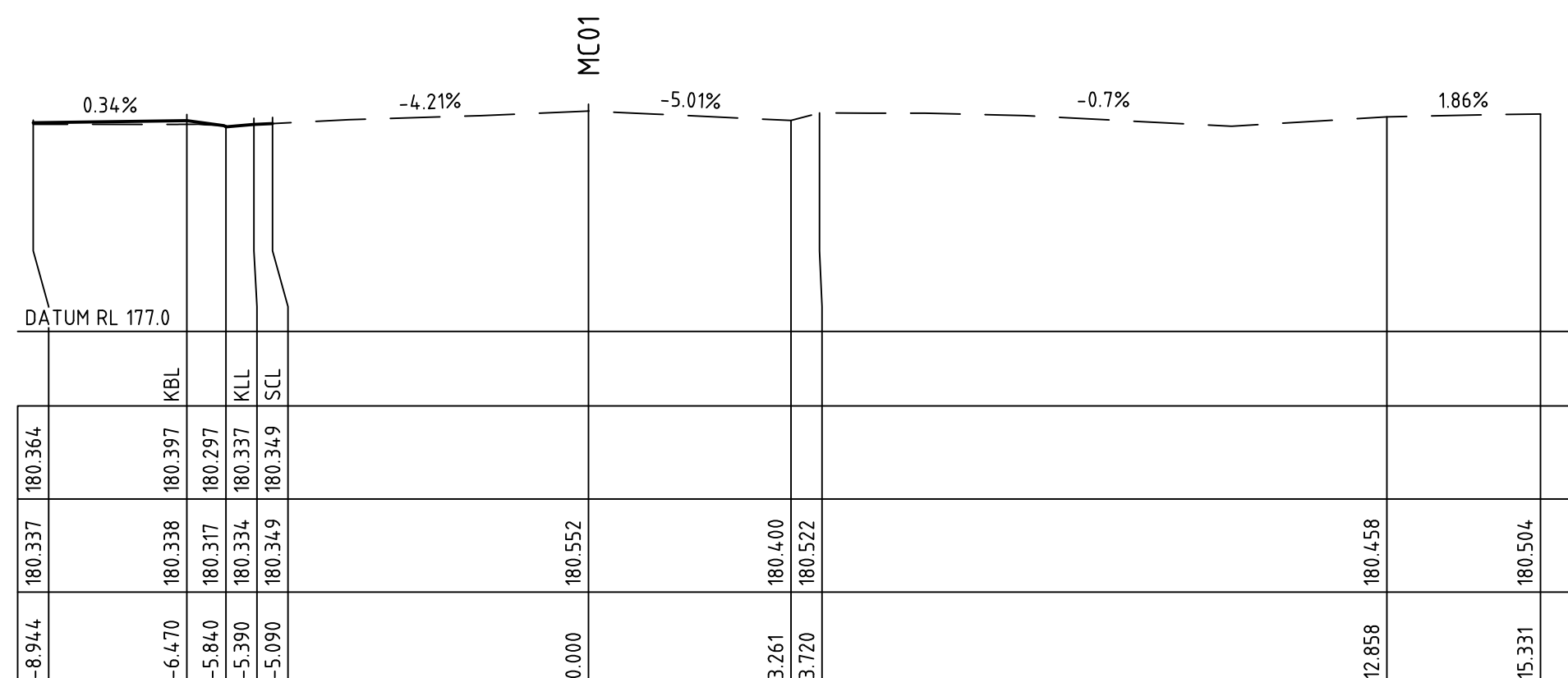
CIVIL ENGINEERING PACKAGE
ROAD LONGITUDINAL SECTIONS
(MC01) - SHEET 1





JOB NUMBER
NL191249

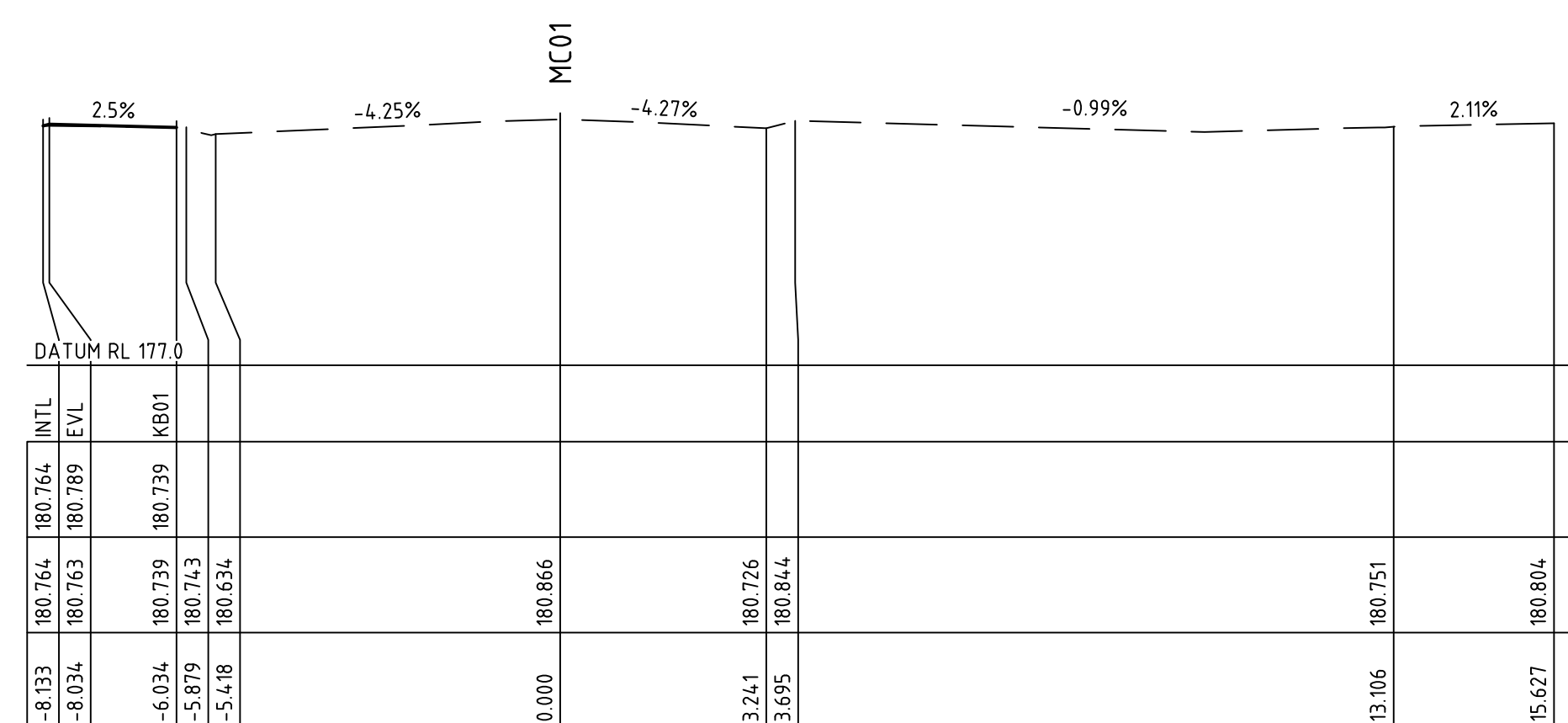
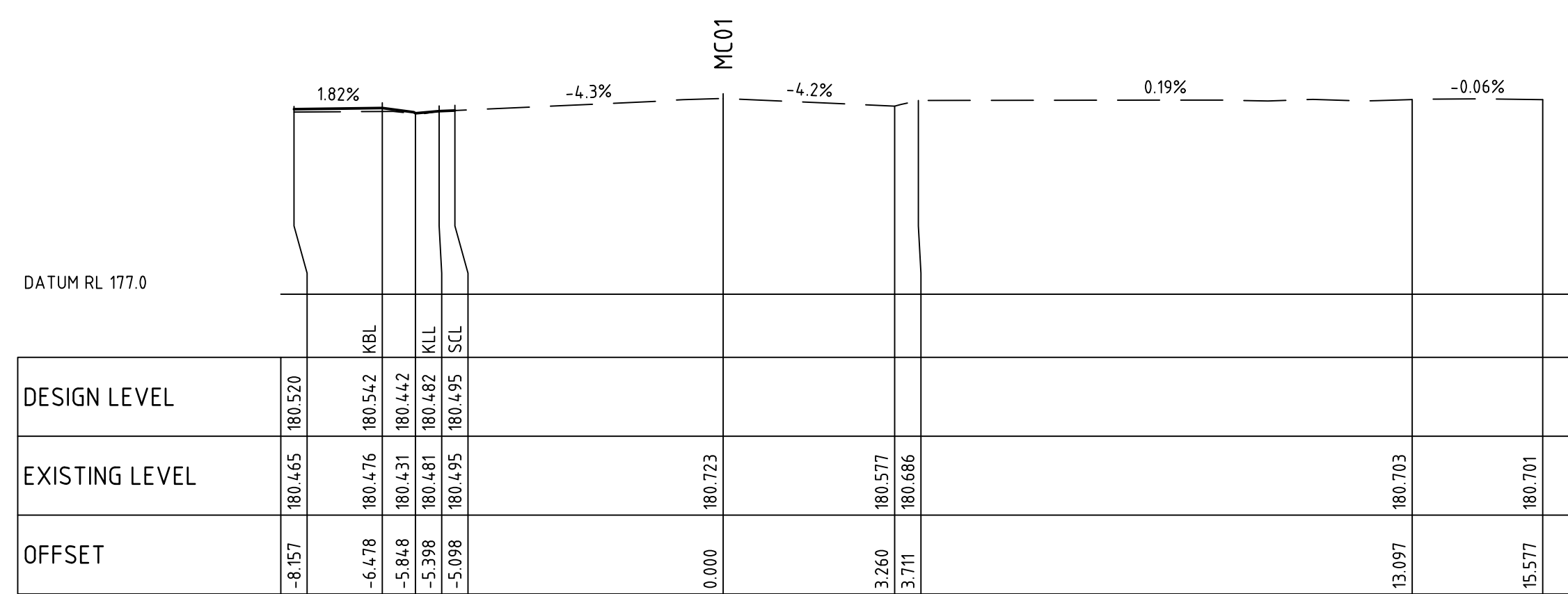
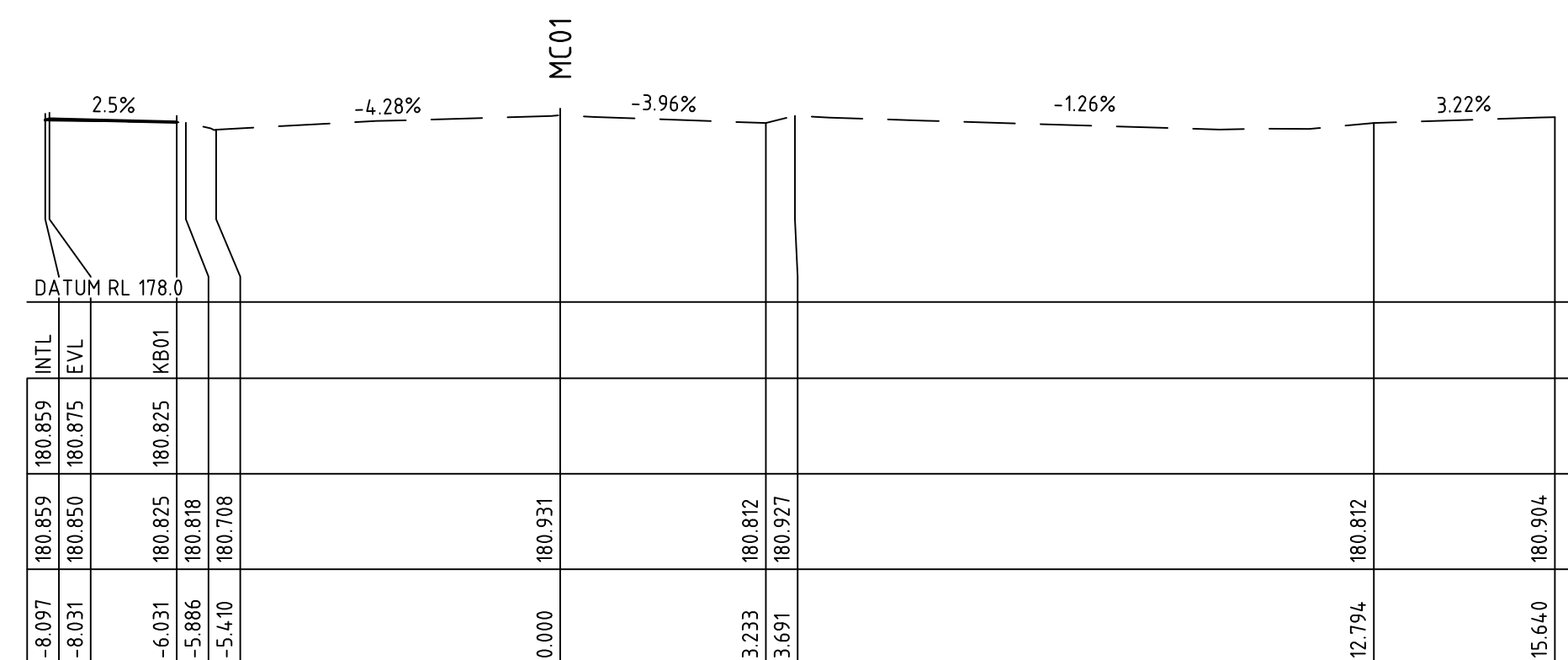
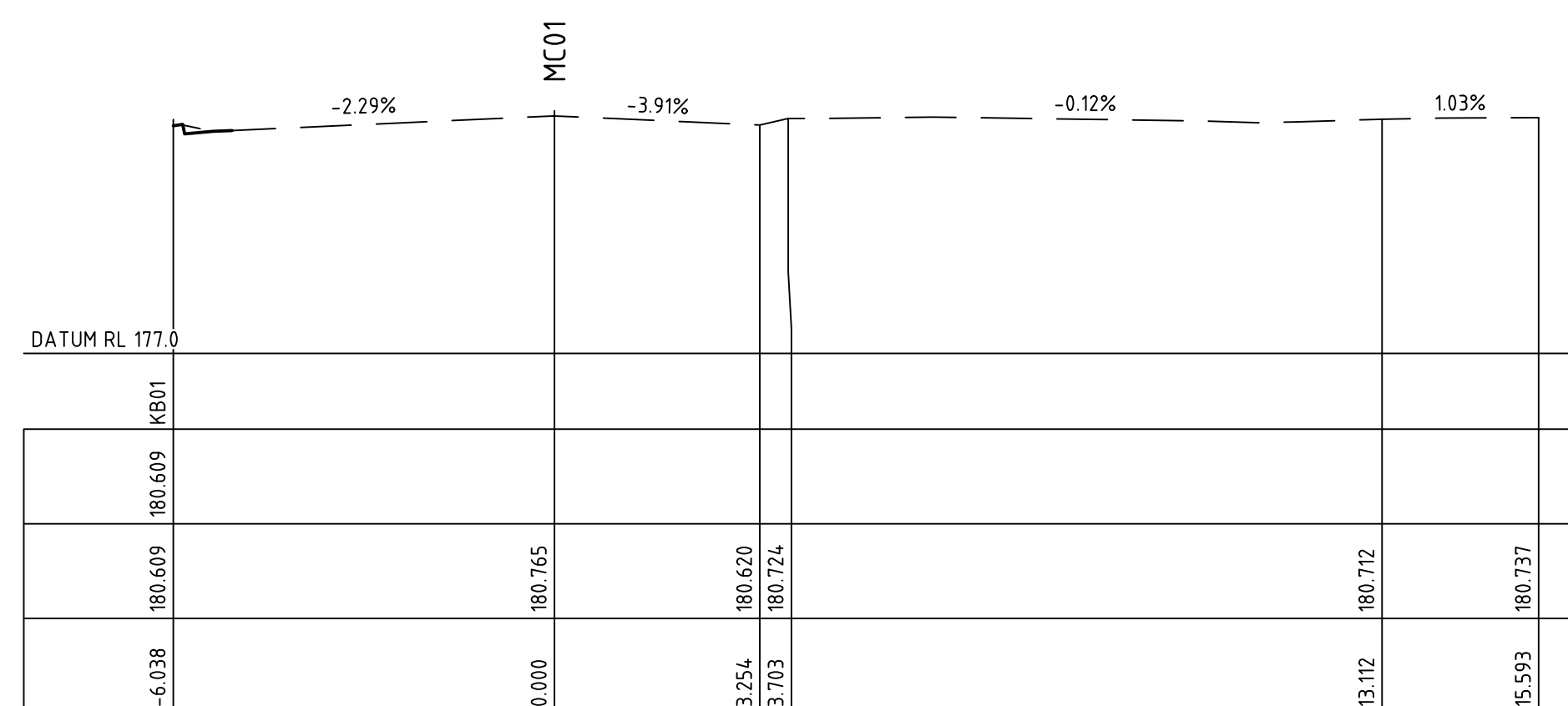
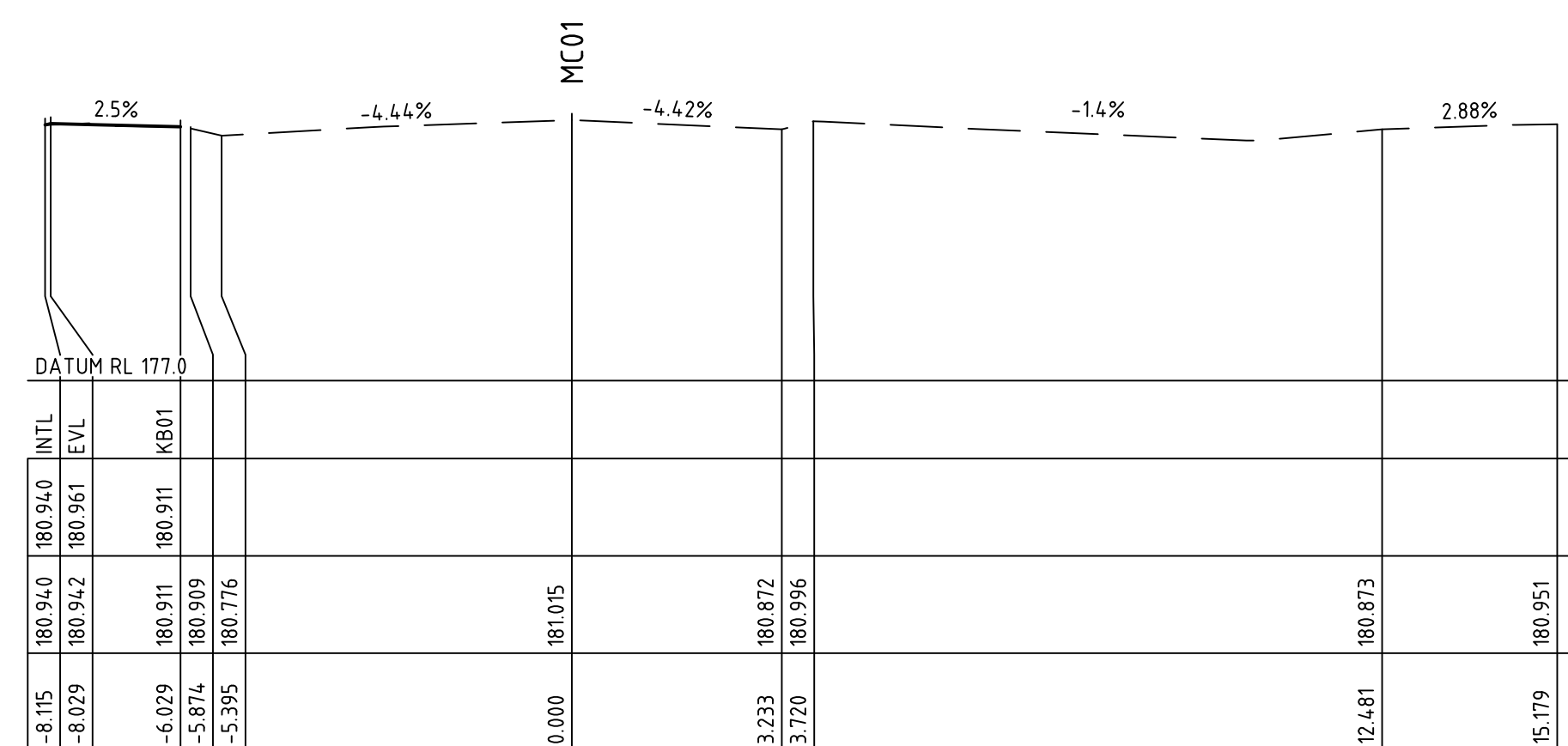
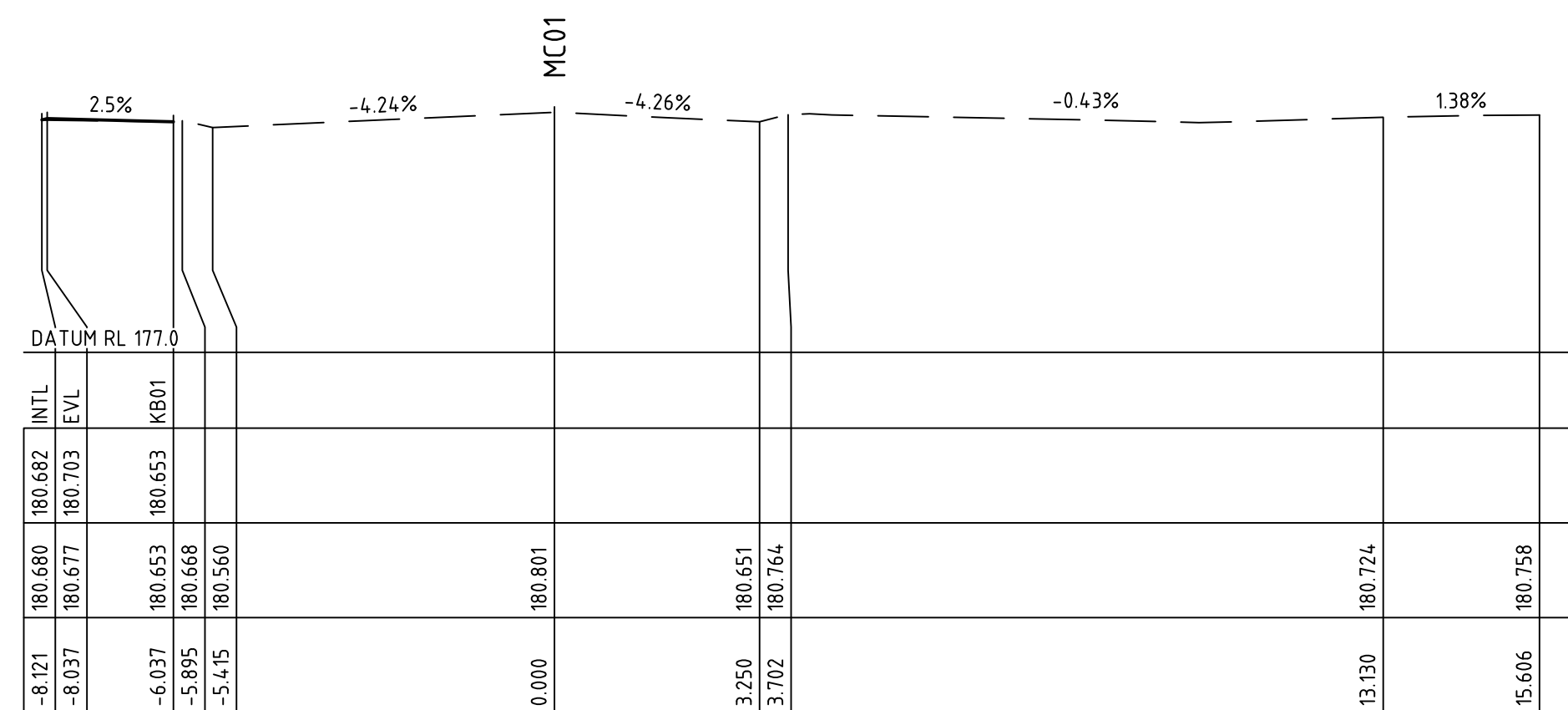
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REVISION
2

DRAWING SHEET SIZE = A1



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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 Northrop Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	 Northrop Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE ROAD CROSS SECTIONS (MC01) - SHEET 2	NL191249	
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20							
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD	SCALE 1:100 @ A1 			DRAWING NUMBER 01-C05.82	REVISION 2
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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 Northrop Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE ROAD CROSS SECTIONS (MC01) - SHEET 3	NL191249
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20					
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD	SCALE 1:100 @ A1 		DRAWING NUMBER 01-C05.83
										REVISION 2
										DRAWING SHEET SIZE = A1



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SCALE 1:100 @ A1



A horizontal scale bar with a black outline. It is divided into five equal segments, each representing 1 meter. The segments are labeled 0, 1, 2, 3, 4, and 5m at the top. The first segment (0 to 1m) is further subdivided into ten smaller units, each representing 100mm.

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Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**

**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

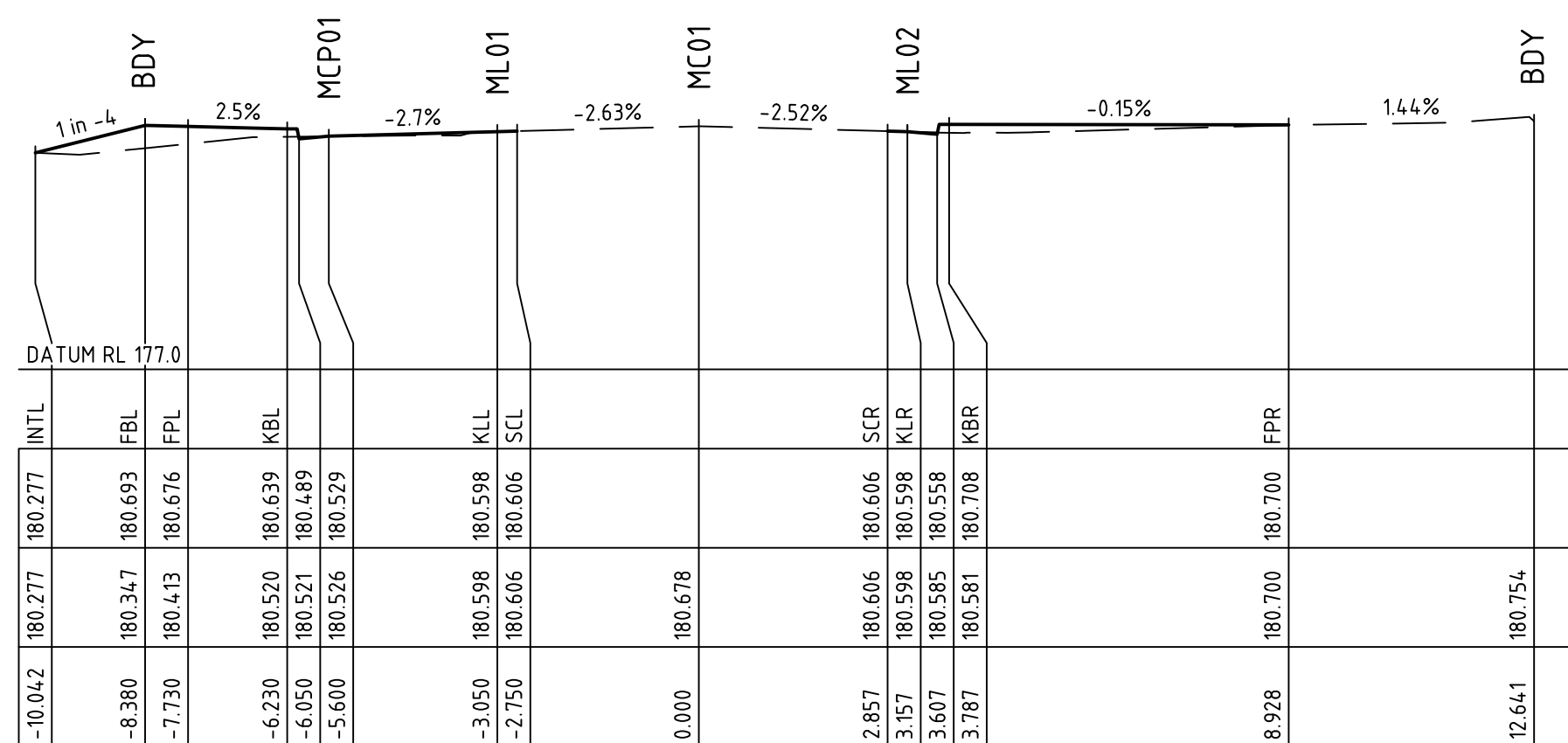
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CIVIL ENGINEERING PACKAGE

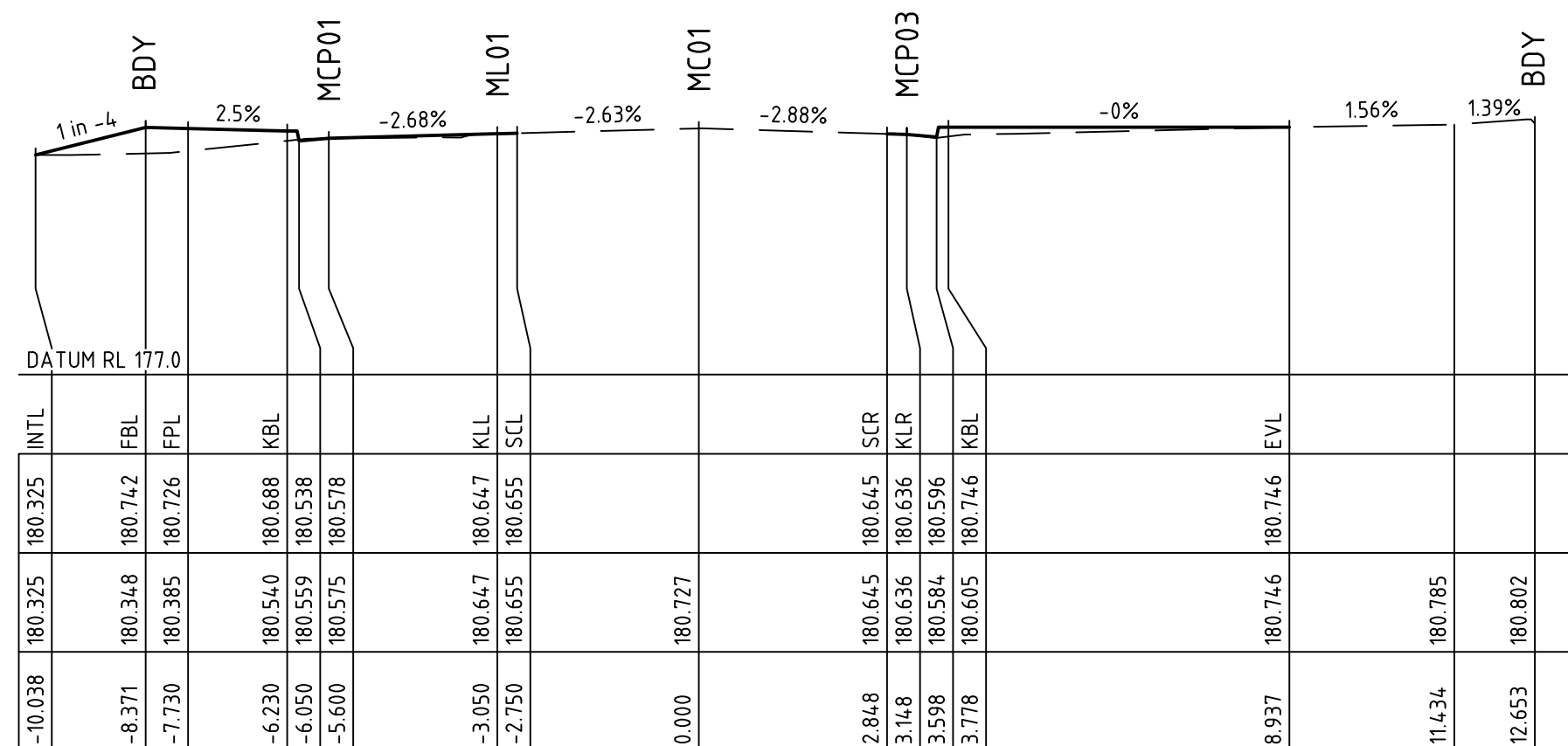
ROAD CROSS SECTIONS (MC01) -
SHEET 6

JOB NUMBER	
NL191249	
DRAWING NUMBER	REVISION
01-C05.86	2
DRAWING SHEET SIZE = A1	

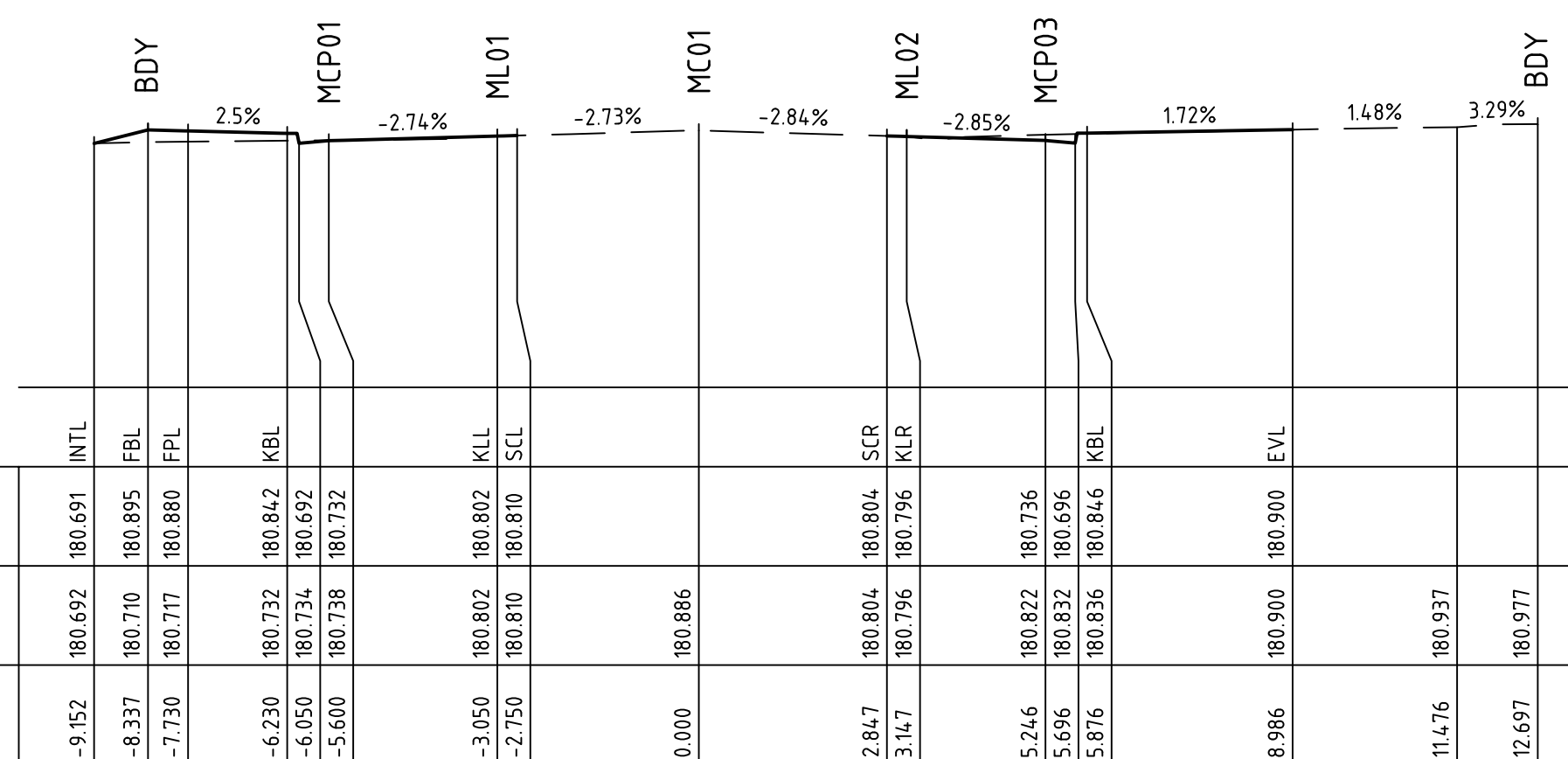




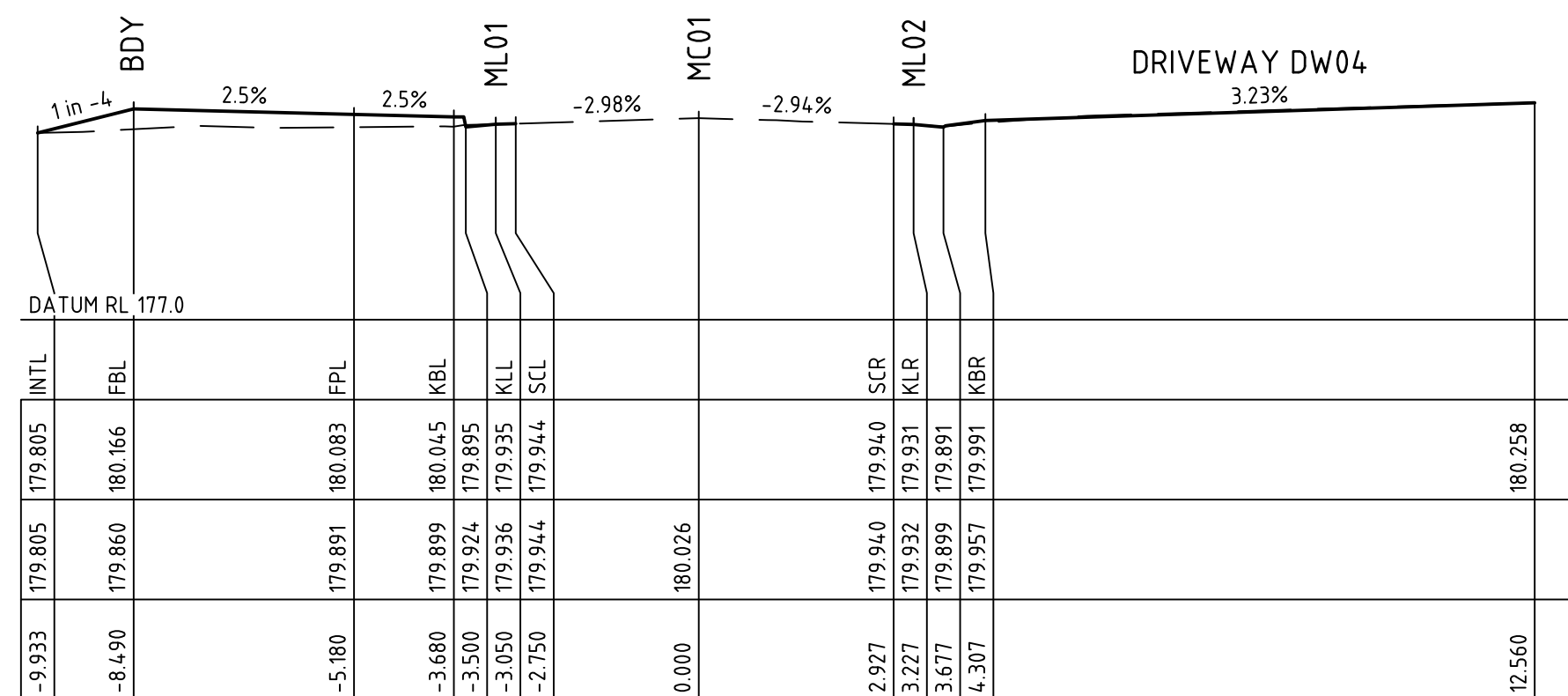
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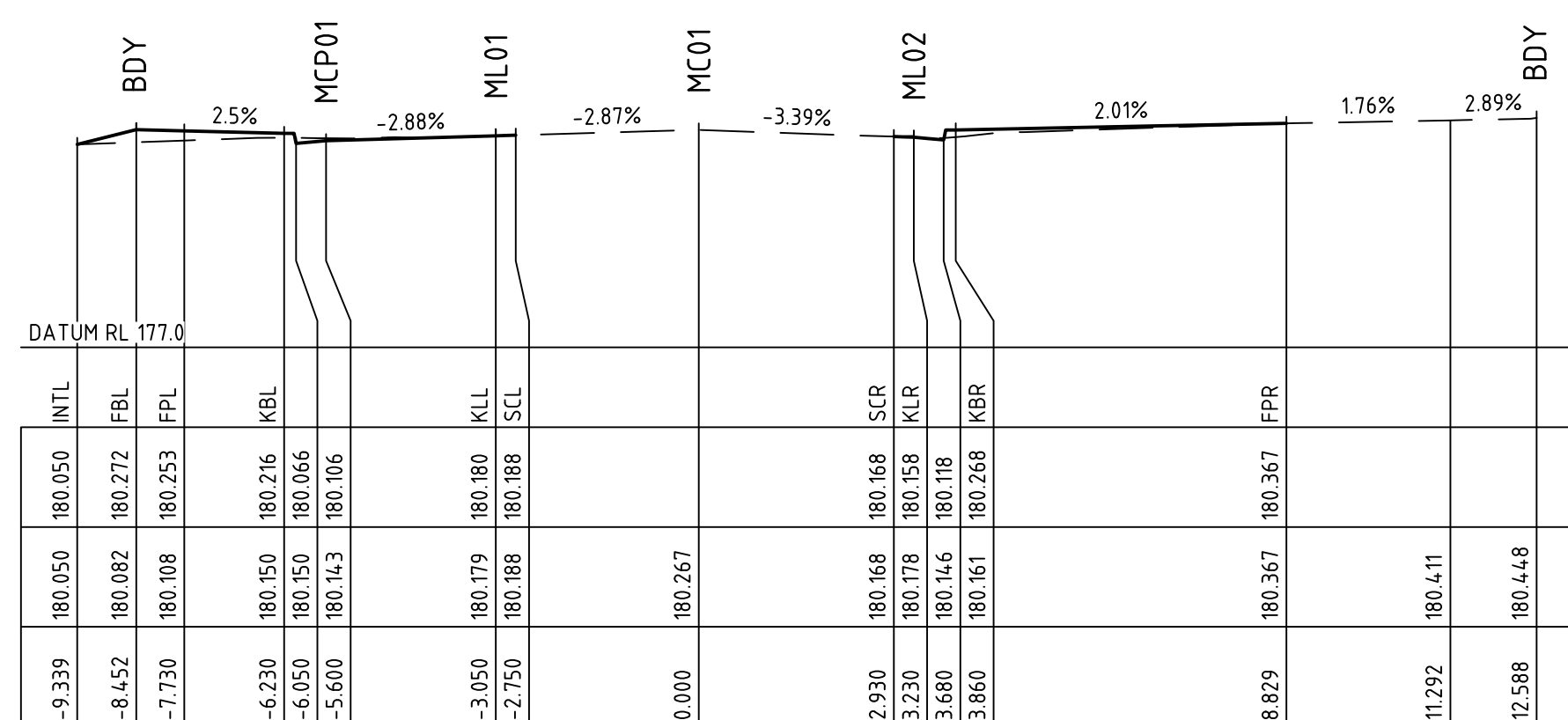
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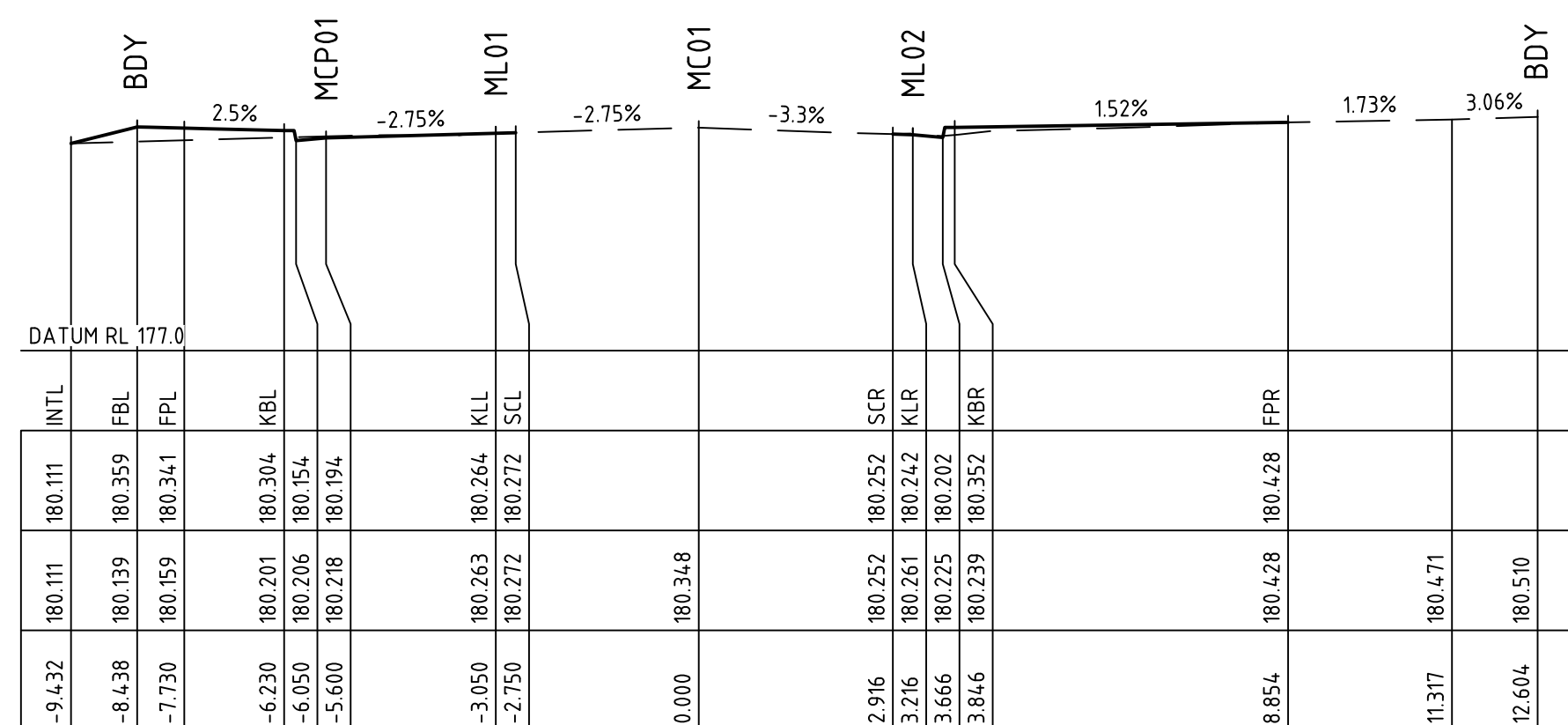
CHAINAGE 273.686



CHAINAGE 313.337



CHAINAGE 303.564



CHAINAGE 300.000

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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
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SCALE 1:100 @ A1



A horizontal scale bar with a black outline. It is divided into five equal segments, each representing 1 meter. The segments are labeled 0, 1, 2, 3, 4, and 5m at the top. The first segment (0 to 1m) is further subdivided into ten smaller units, each representing 100mm.

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PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**

**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

ROAD CROSS SECTIONS (MC01) -
SHEET 7

JOB NUMBER	
NL191249	
DRAWING NUMBER	REVISION
01-C05.87	2
DRAWING SHEET SIZE = A1	

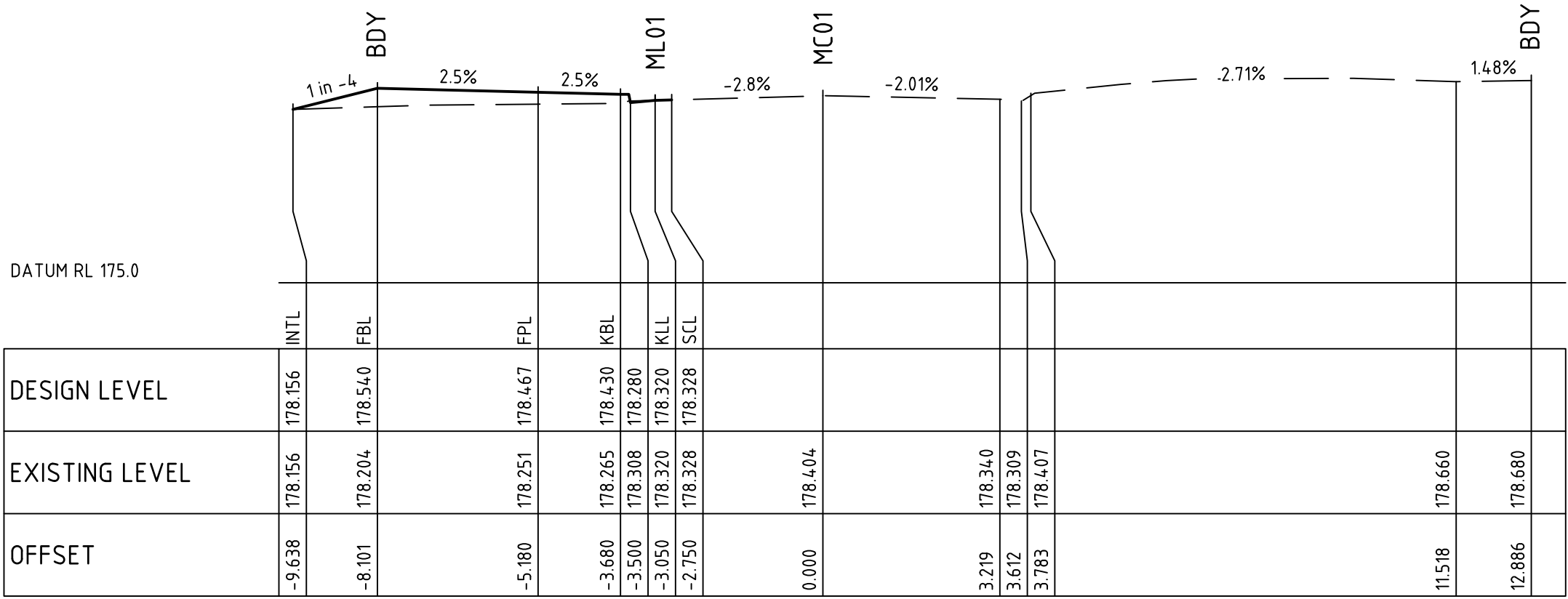


DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

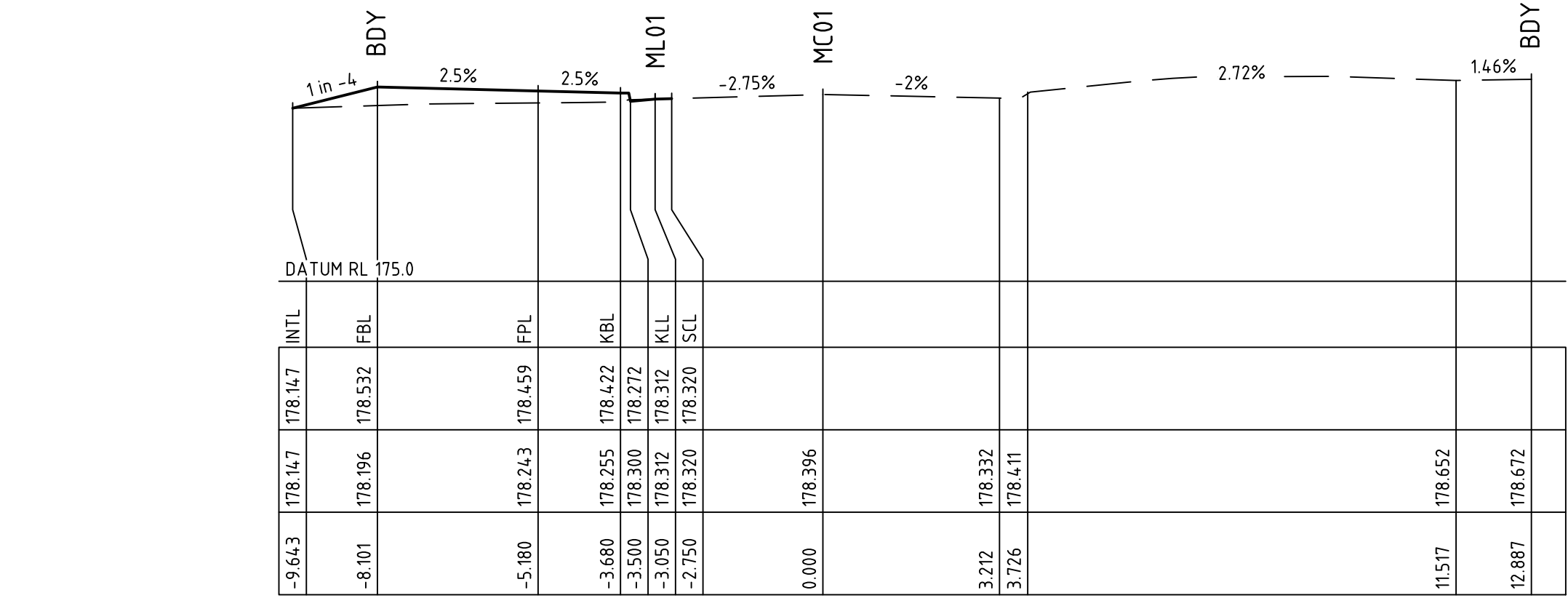
DATUM RL 175.0

DESIGN LEVEL	INTL	FBL	FPL	KBL	KLL	SCL	MC01	ML01	BDY
	178.156	178.204	178.467	178.430	178.280	178.320	178.404	178.407	178.680
EXISTING LEVEL	178.156	178.204	178.467	178.430	178.280	178.320	178.404	178.407	178.680
OFFSET	-9.638	-8.101	-5.180	-3.680	-3.500	-2.750	0.000	3.719	12.886

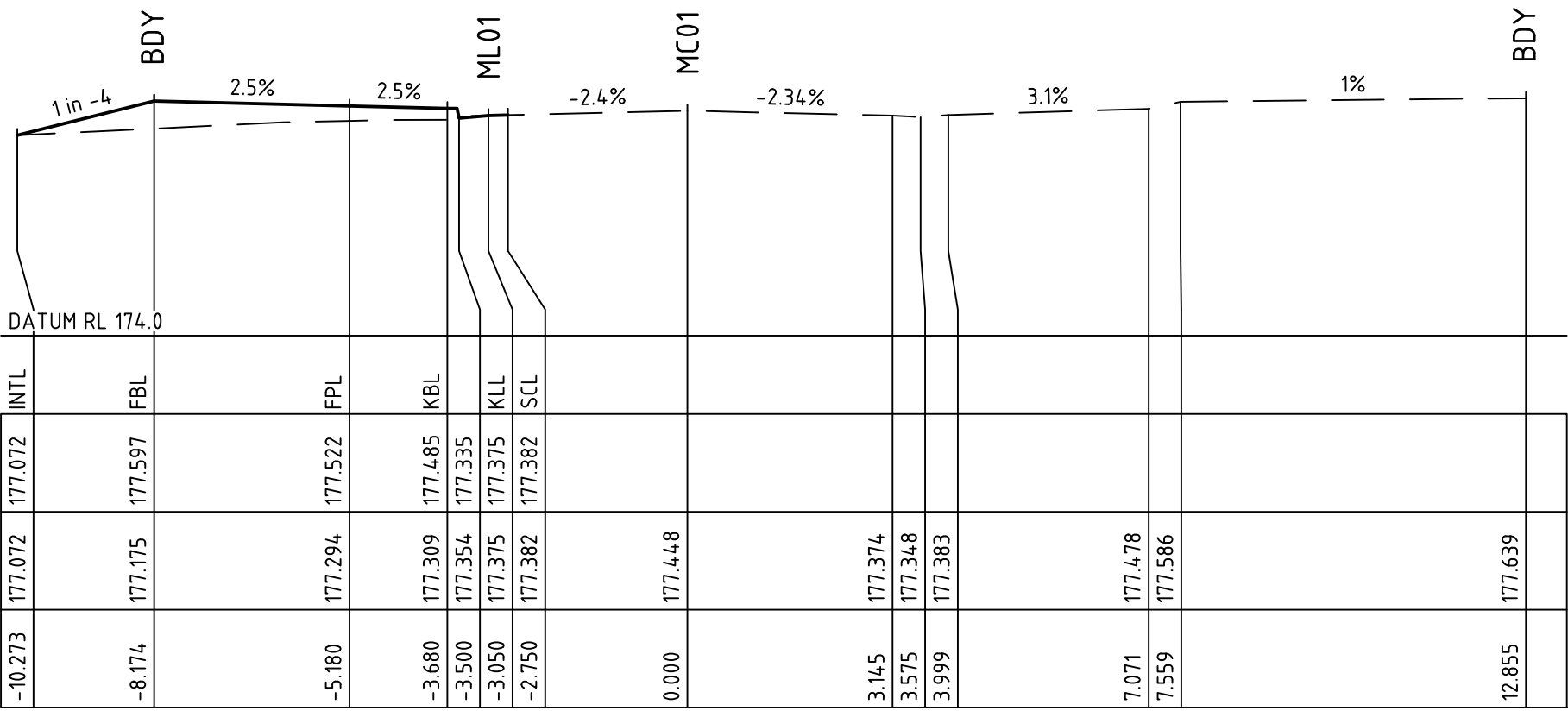
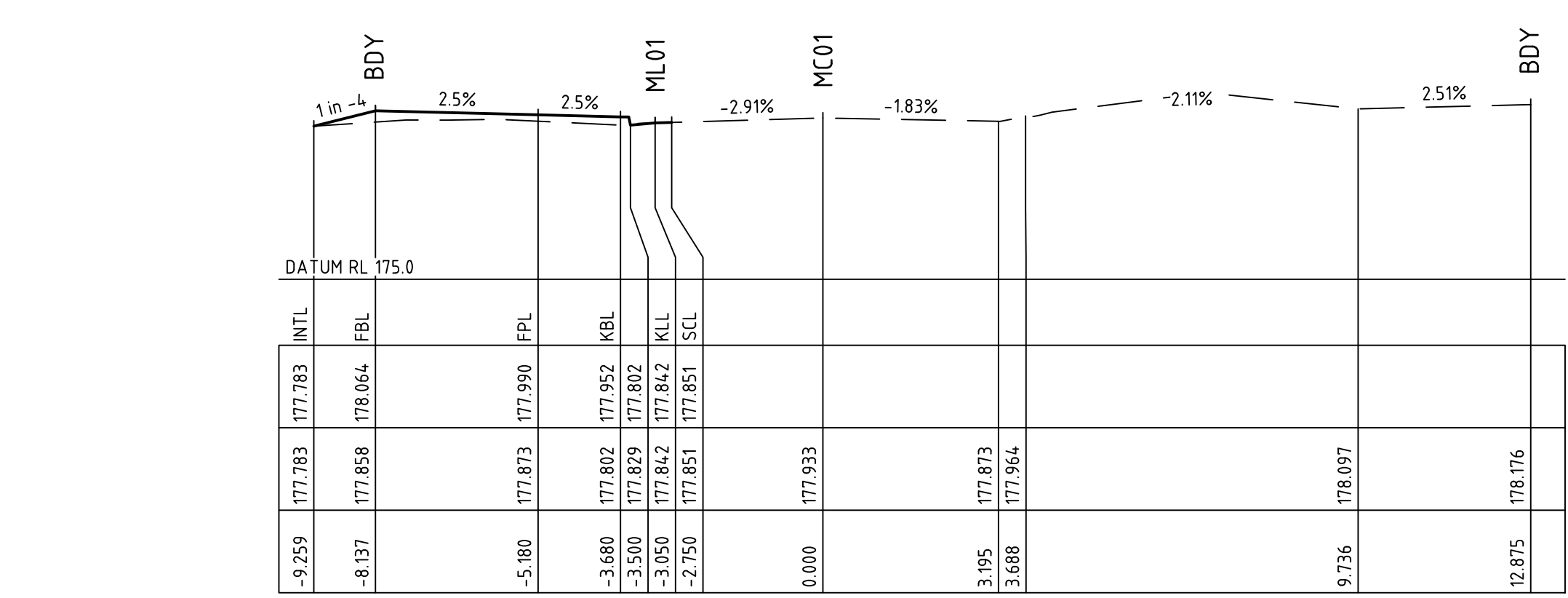
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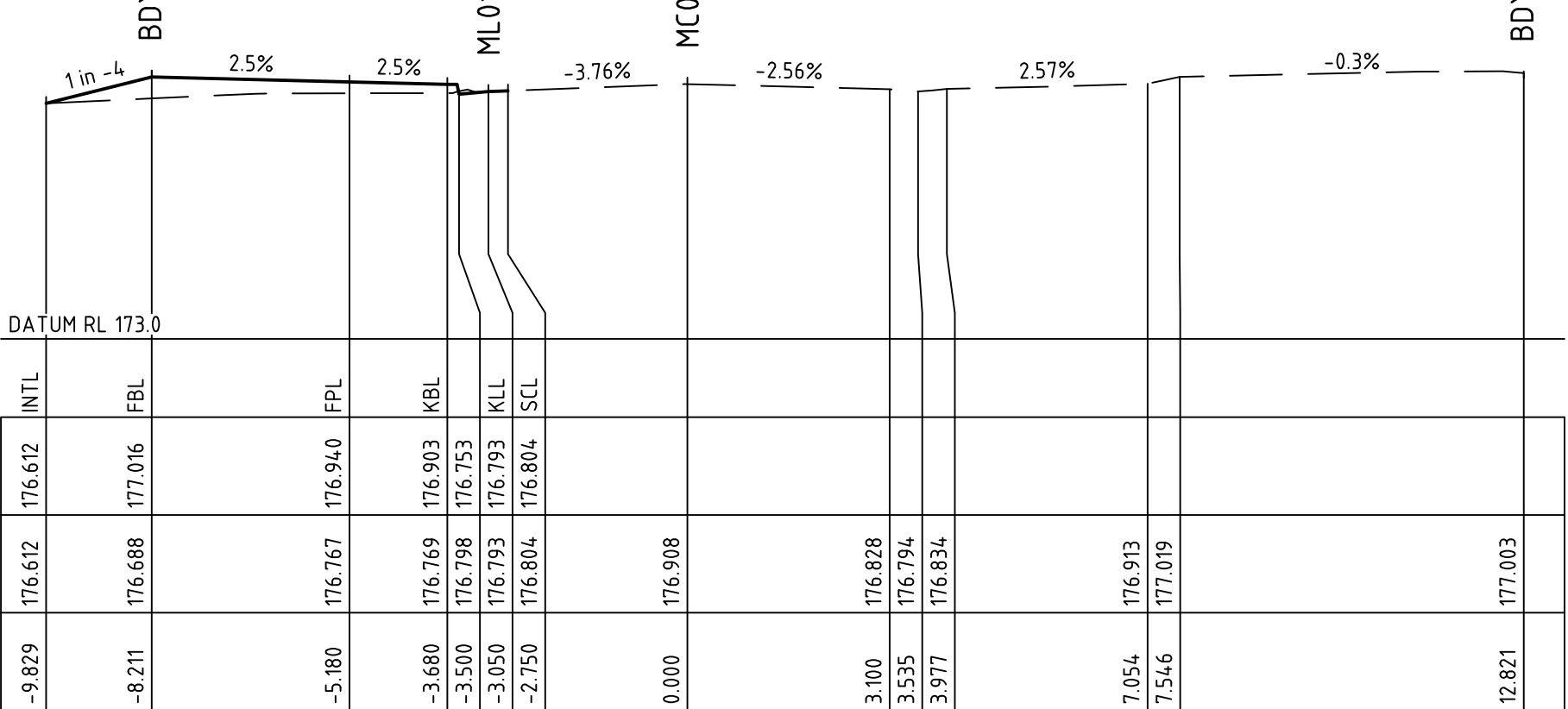
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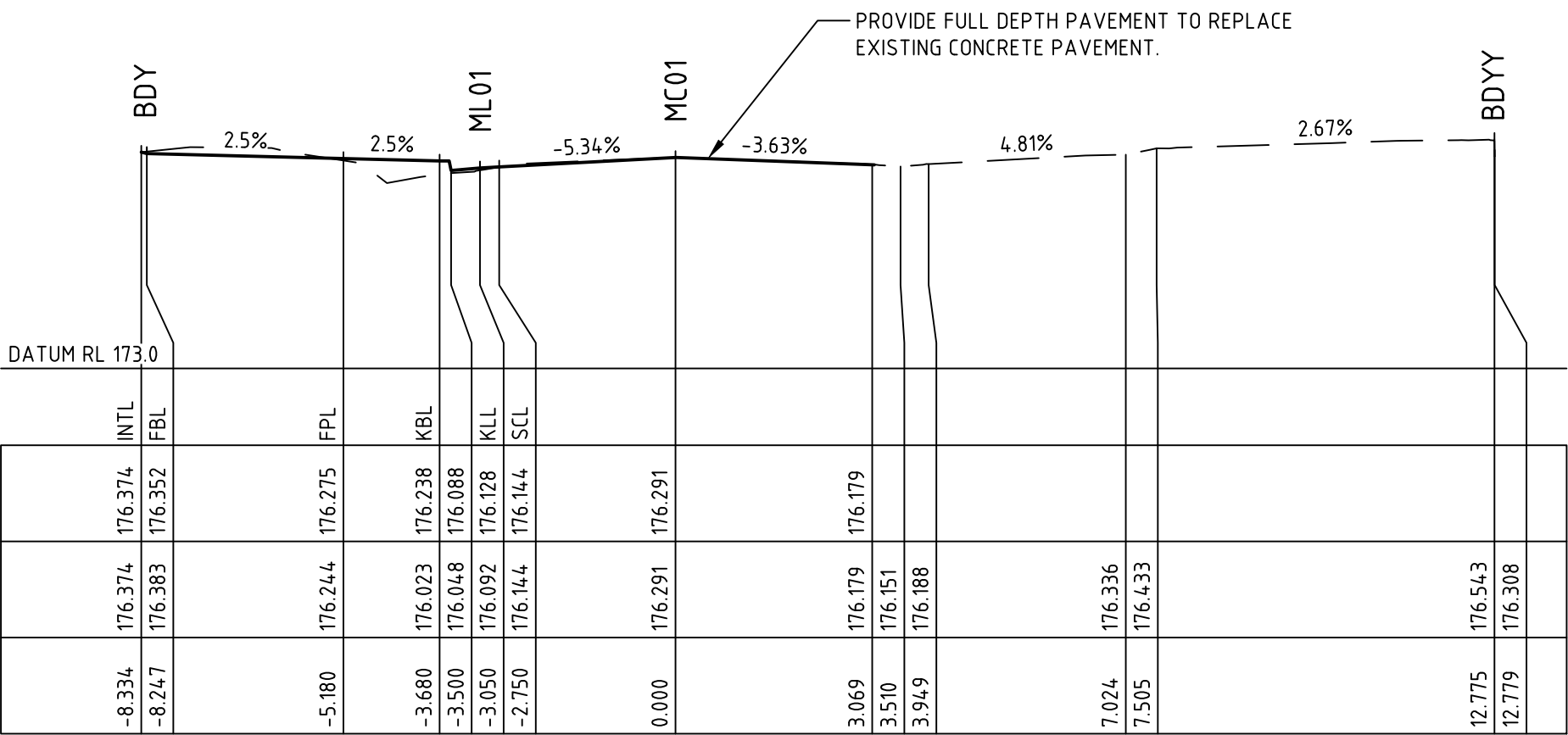
CHAINAGE 390.000



CHAINAGE 405.000



CHAINAGE 420.000



CHAINAGE 435.000



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
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Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
ROAD CROSS SECTIONS (MC01) -
SHEET 9

DRAWING NUMBER

REVISION

01-C05.89

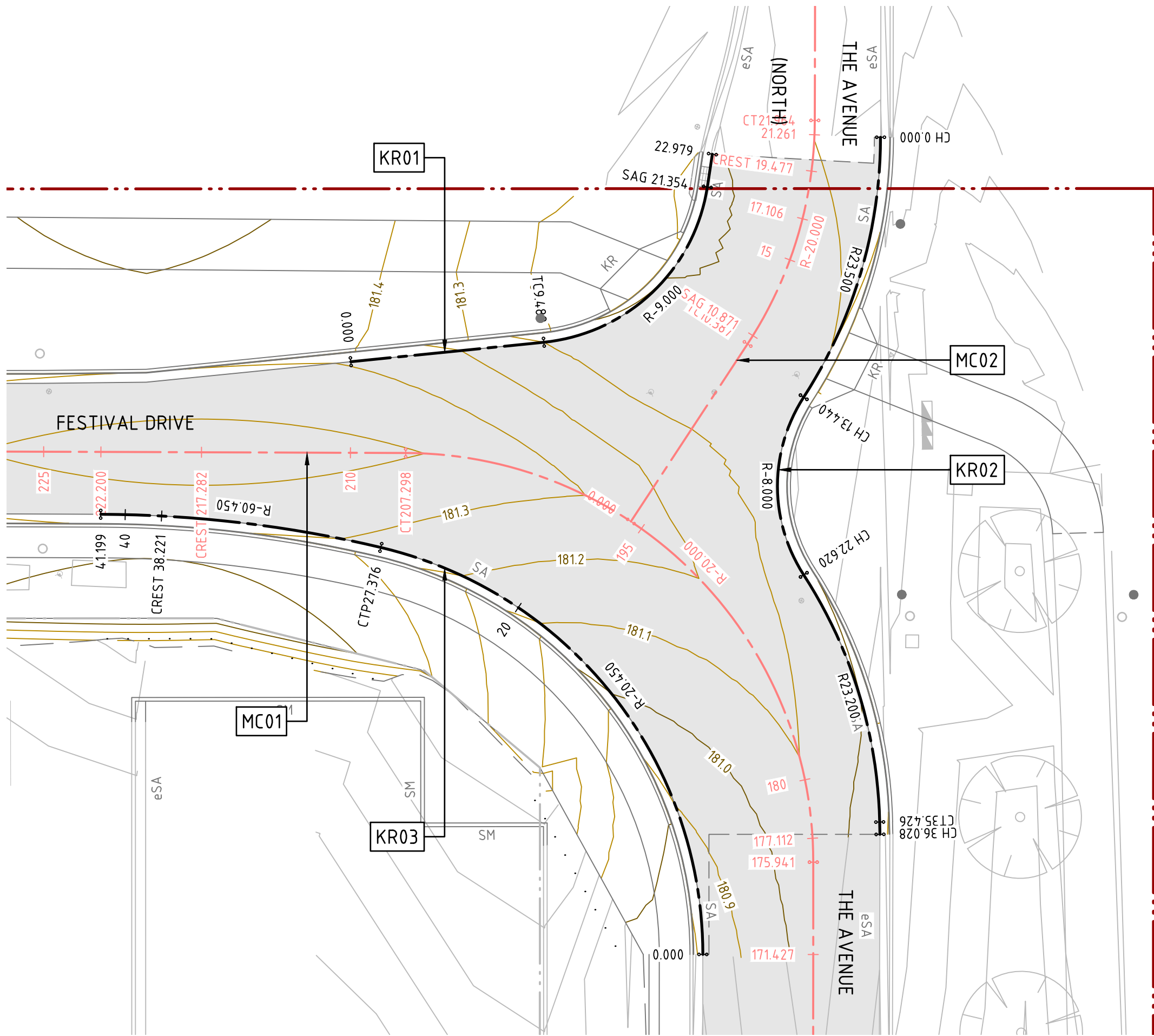
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DRAWING SHEET SIZE = A1

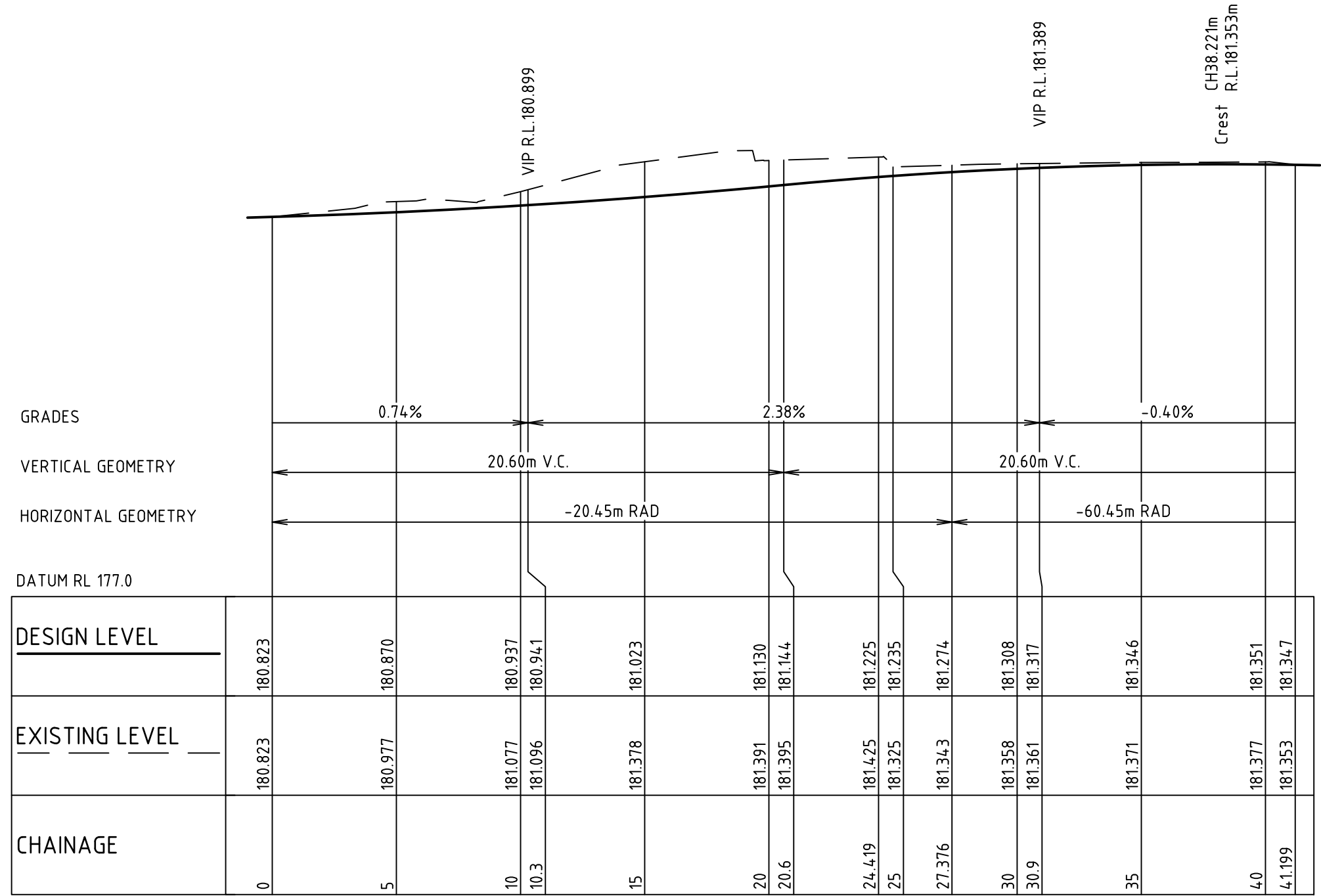
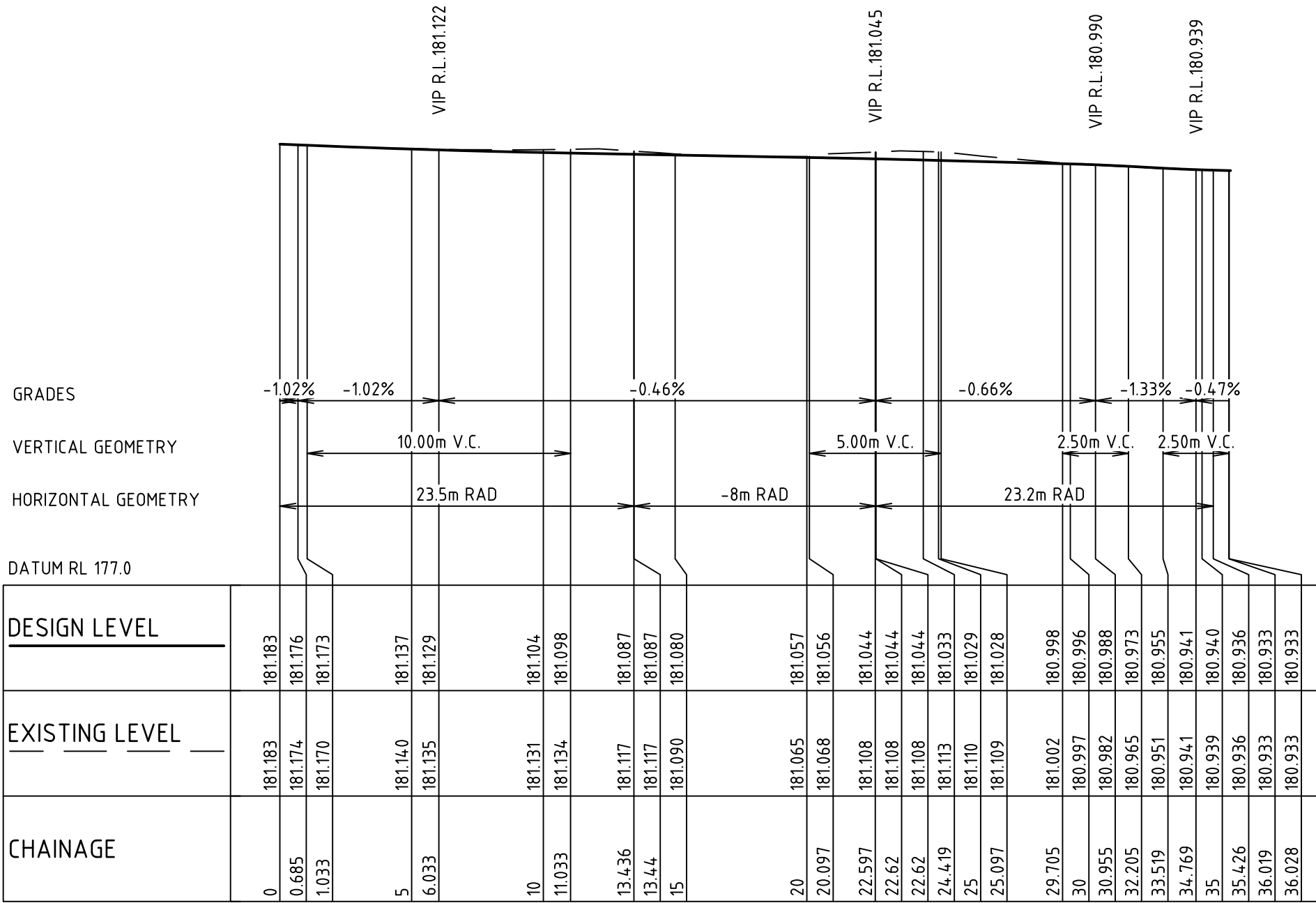
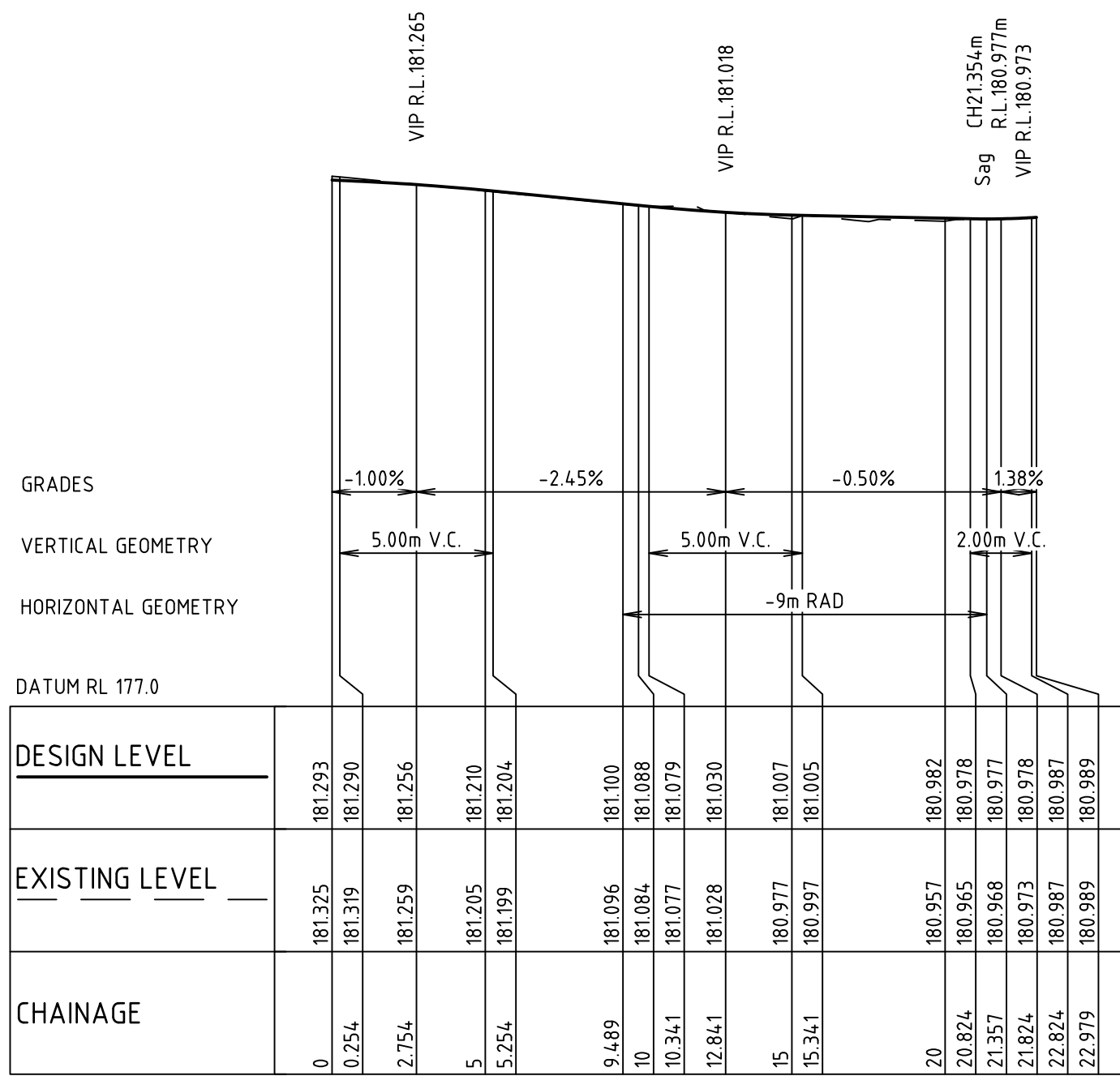
CHAINAGE 510.000

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DRAWN: R. GREIVE
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



PLAN
SCALE 1:200



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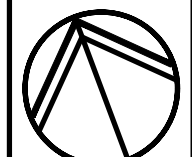


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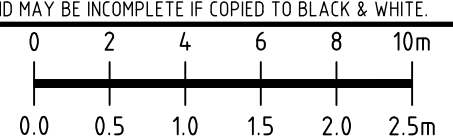
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SCALE 1:50@A1





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Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

**SETOUT PLANS - KERB
RETURNS - SHEET 1**

JOB NUMBER

NL191249

DRAWING NUMBER

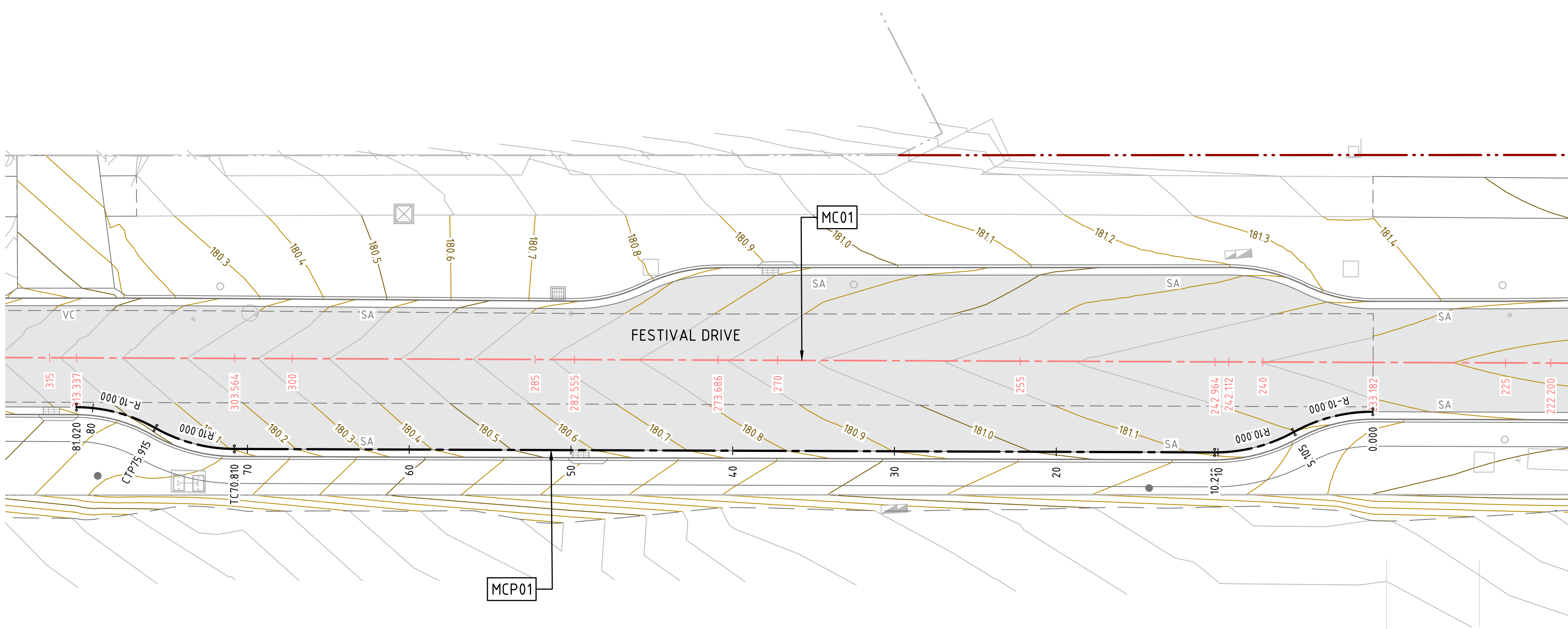
01-C06.01

REVISION

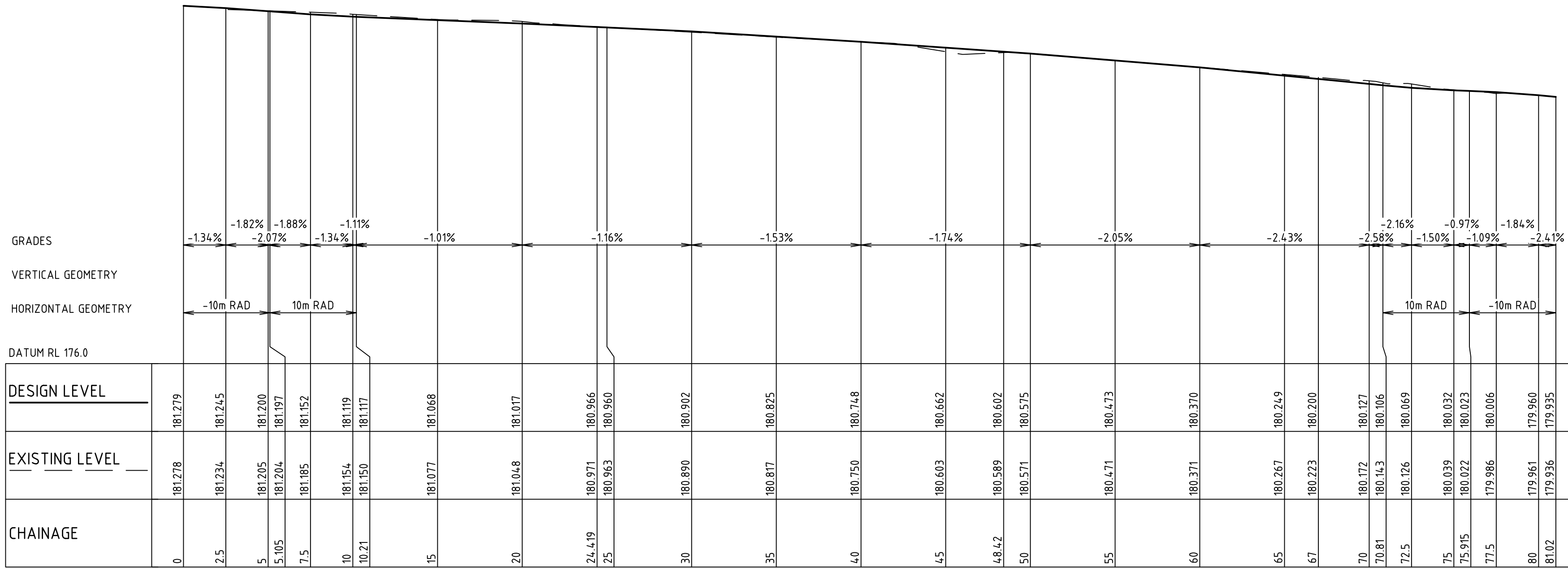
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DRAWING SHEET SIZE = A1

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREVE


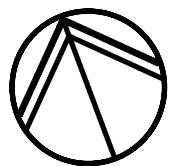


PLAN
SCALE 1:200

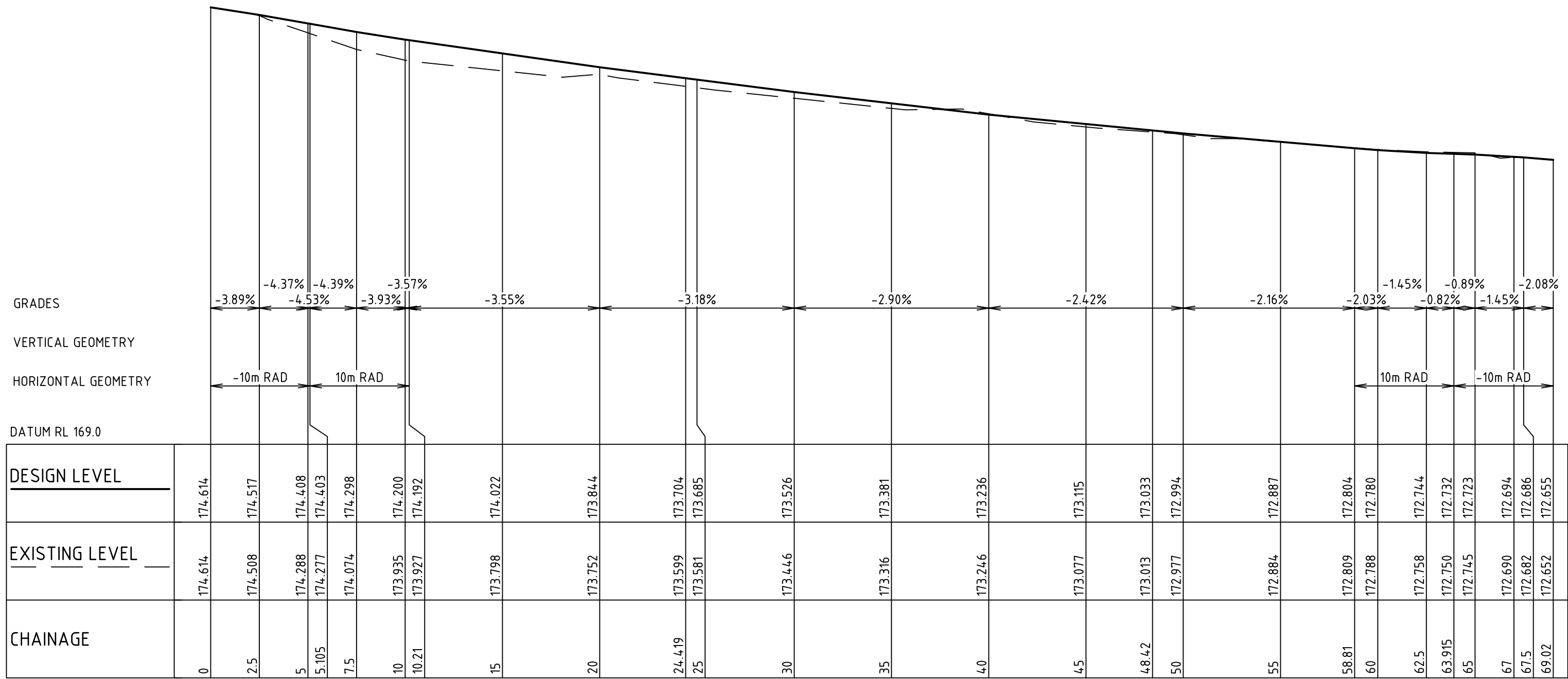
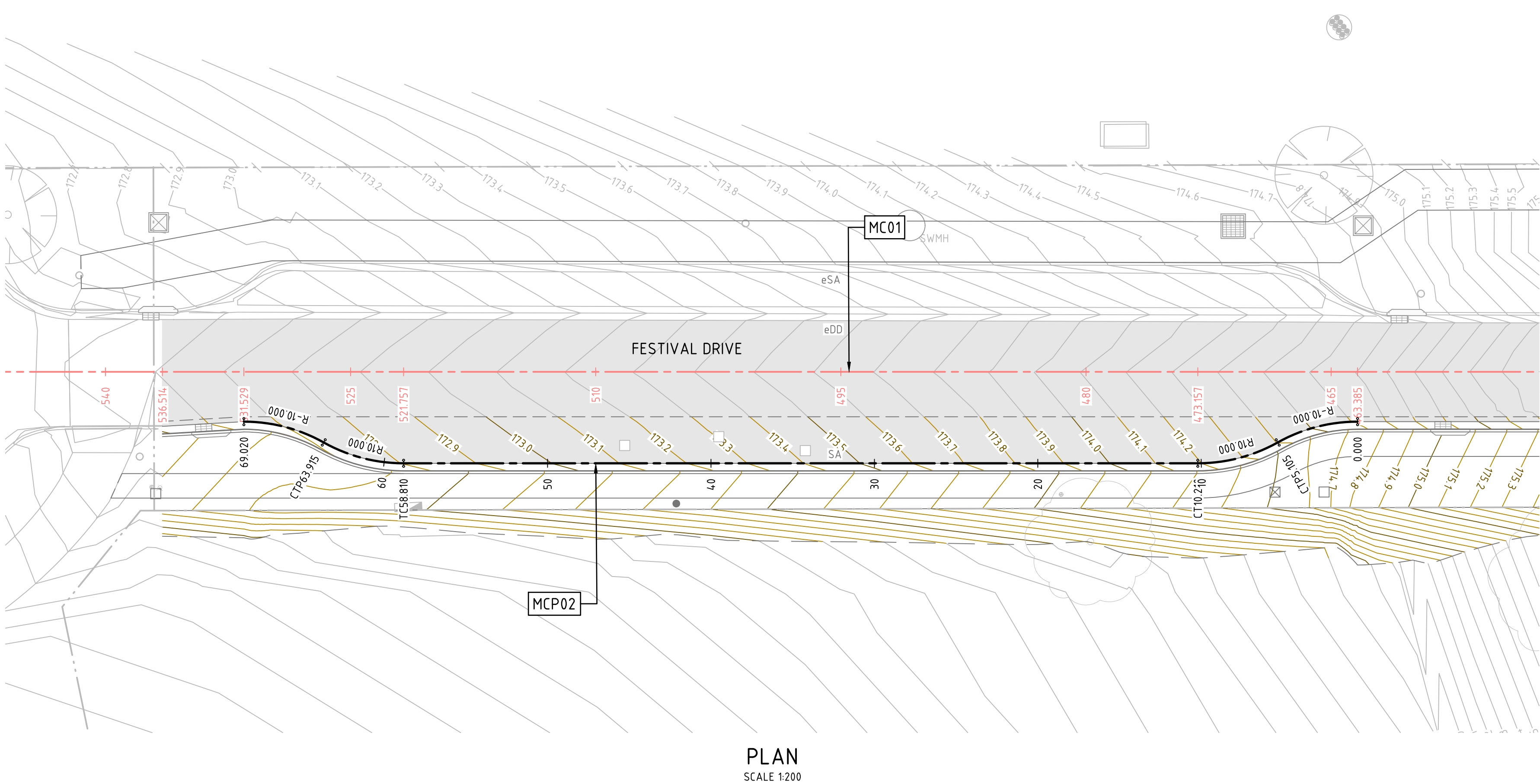


LONGITUDINAL SECTION - MCP01
REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:200@A1
VERTICAL SCALE 1:50@A1



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	PROJECT	DRAWING TITLE	JOB NUMBER		
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 NORTHROP Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250	CIVIL ENGINEERING PACKAGE	NL191249		
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							SCALE 1:200@A1 SCALE 1:50@A1					

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LONGITUDINAL SECTION - MCP02
REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:200@A1
VERTICAL SCALE 1:50@A1



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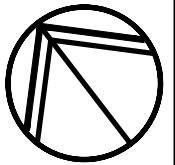


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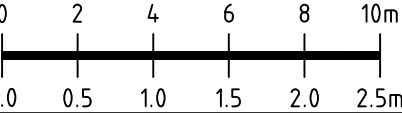
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SCALE 1:50@A1





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Level 1, 215 Pacific Hwy, Charlestown NSW 2290
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PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
**SETOUT PLANS - PARKING
BAYS - SHEET 2**

JOB NUMBER

NL191249

DRAWING NUMBER

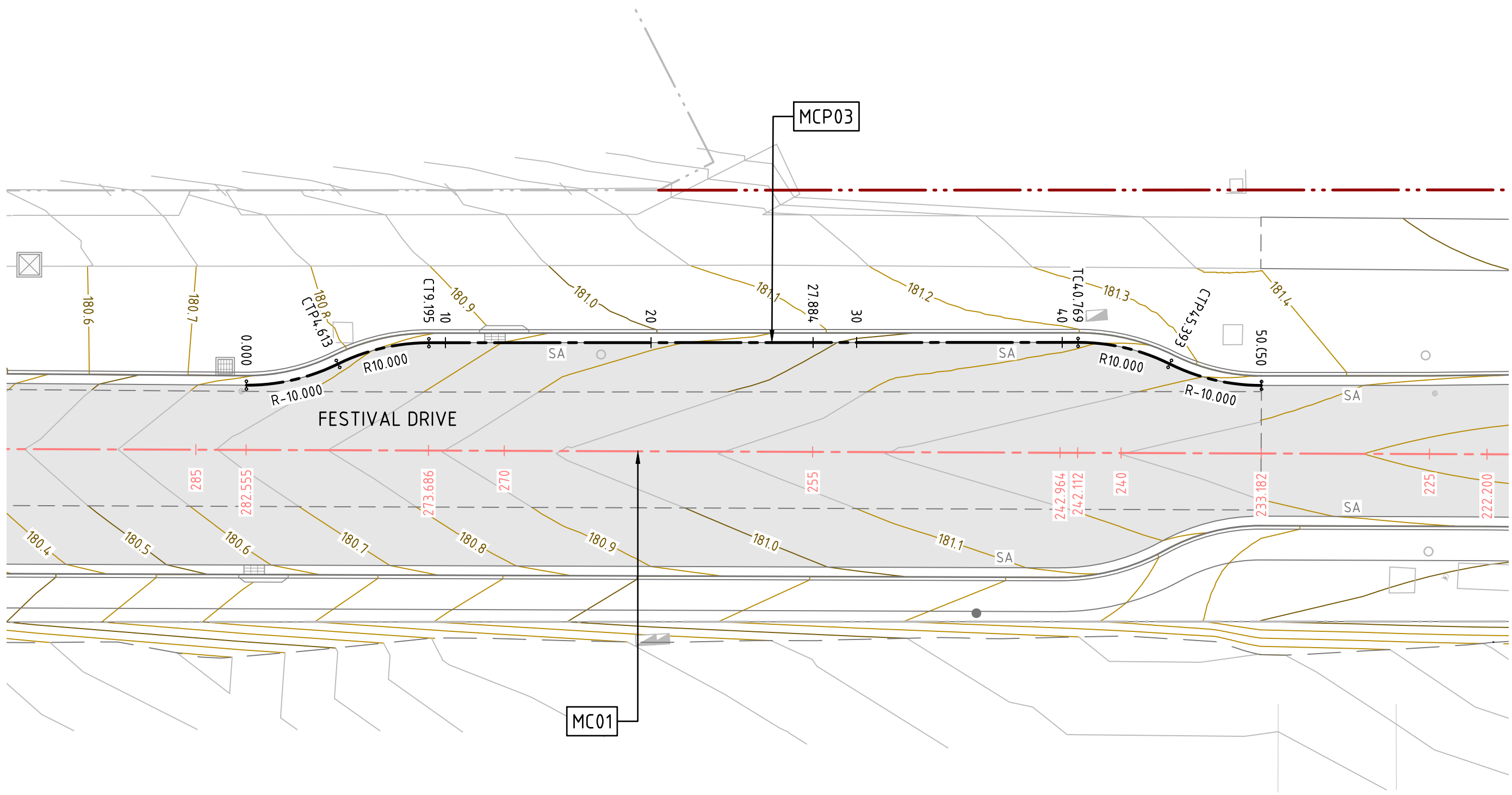
01-C06.22

REVISION

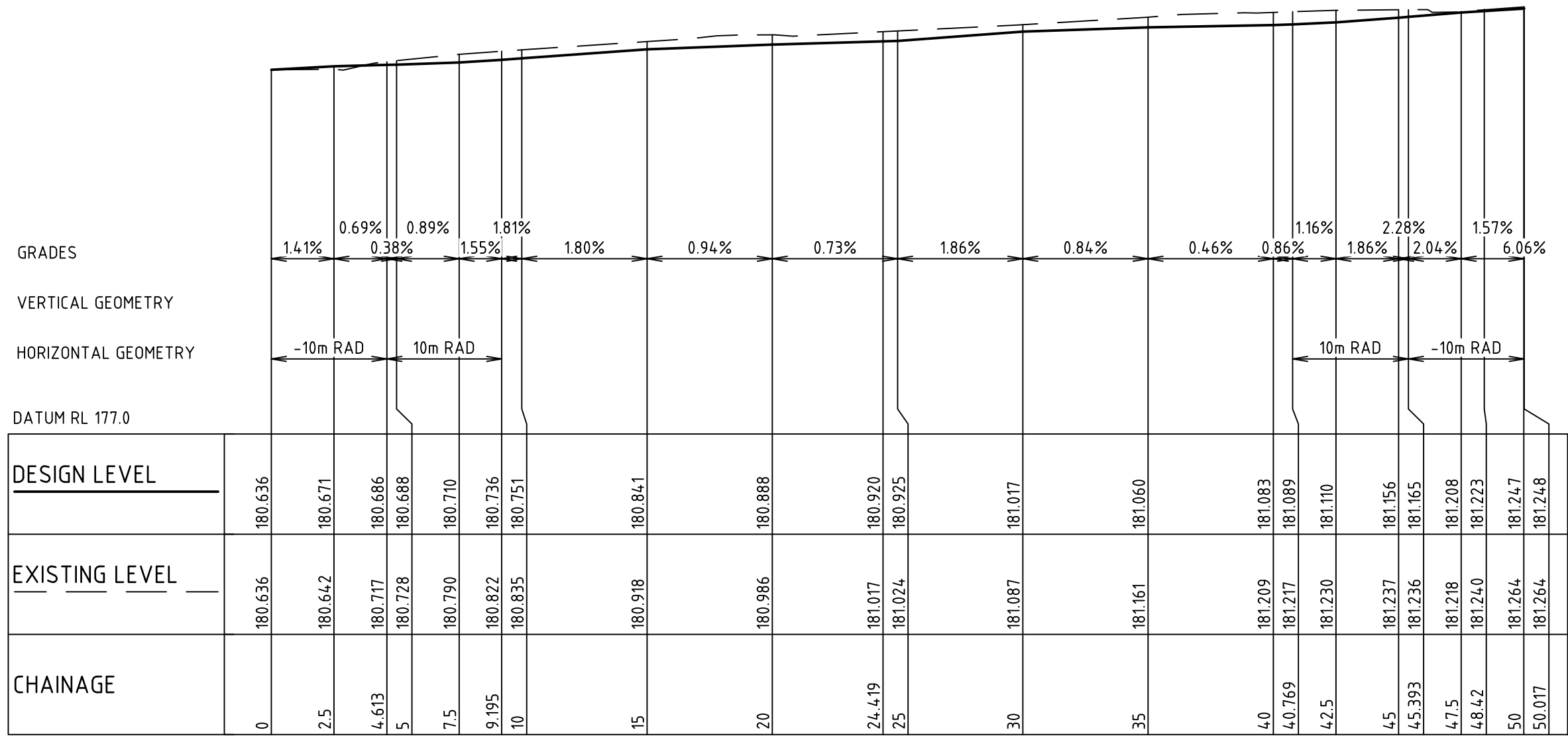
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JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREIVE



PLAN
SCALE 1:200



LONGITUDINAL SECTION - MCP03

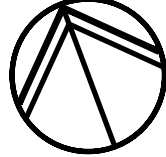
REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:200@A1
VERTICAL SCALE 1:50@A1



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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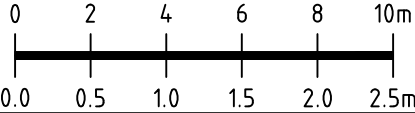
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SCALE 1:50@A1





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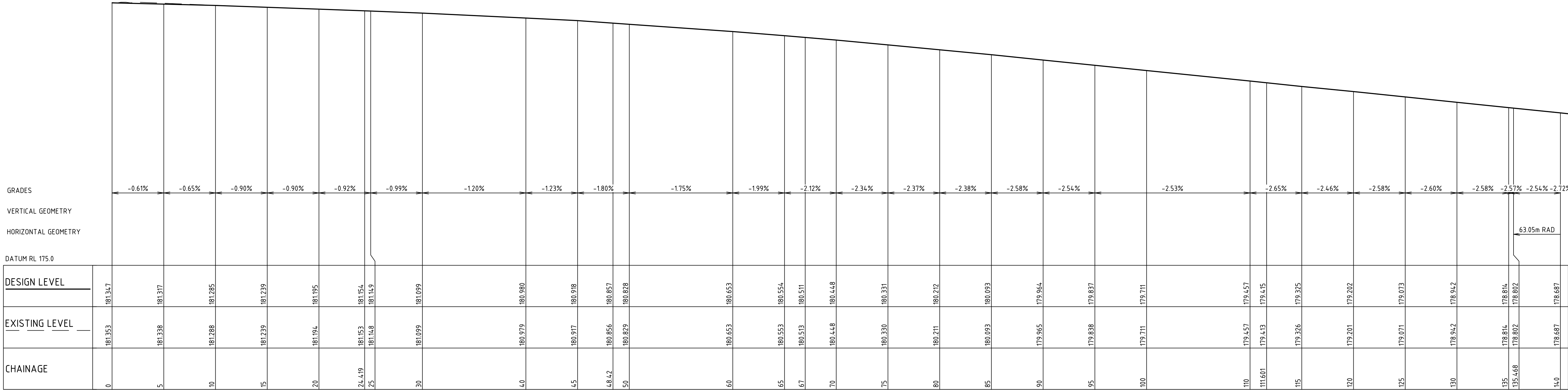
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT
MT PENANG PARKLANDS KARIONG NSW 2250
FESTIVAL DRIVE AND THE AVENUE UPGRADE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SETOUT PLANS - PARKING BAYS - SHEET 3

JOB NUMBER	
NL191249	
DRAWING NUMBER	REVISION
01-C06.23	2
DRAWING SHEET SIZE = A1	

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DRAWN: R. GREIVE
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



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SCALE 1:200@A1
SCALE 1:50@A1

0 2 4 6 8 10m
0.0 0.5 1.0 1.5 2.0 2.5m

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PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
**SETOUT PLAN - FESTIVAL
DRIVE LIP (LHS) - SHEET 1**

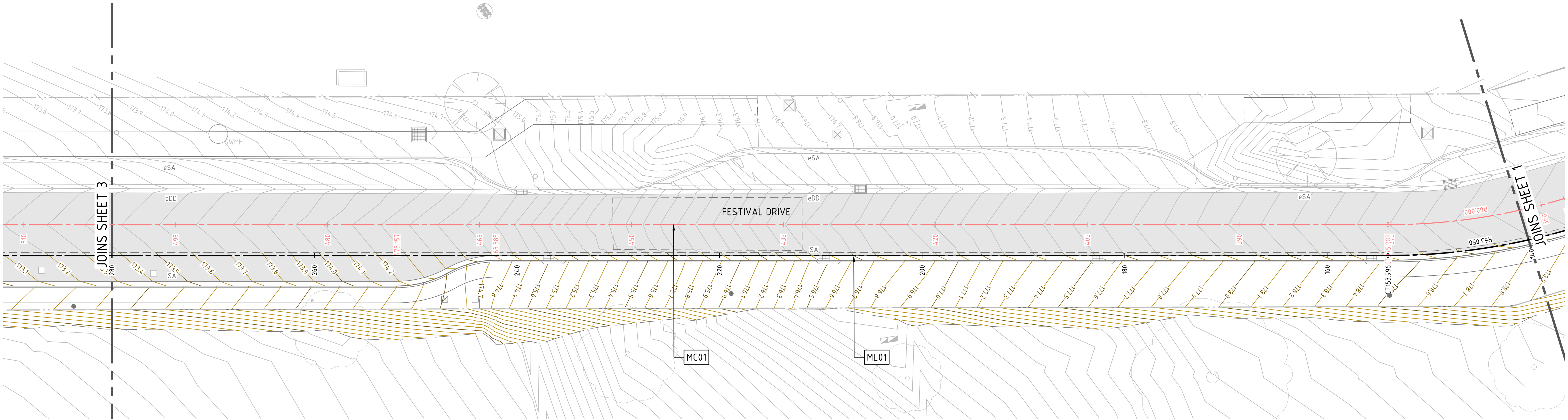
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01-C06.41

REVISION
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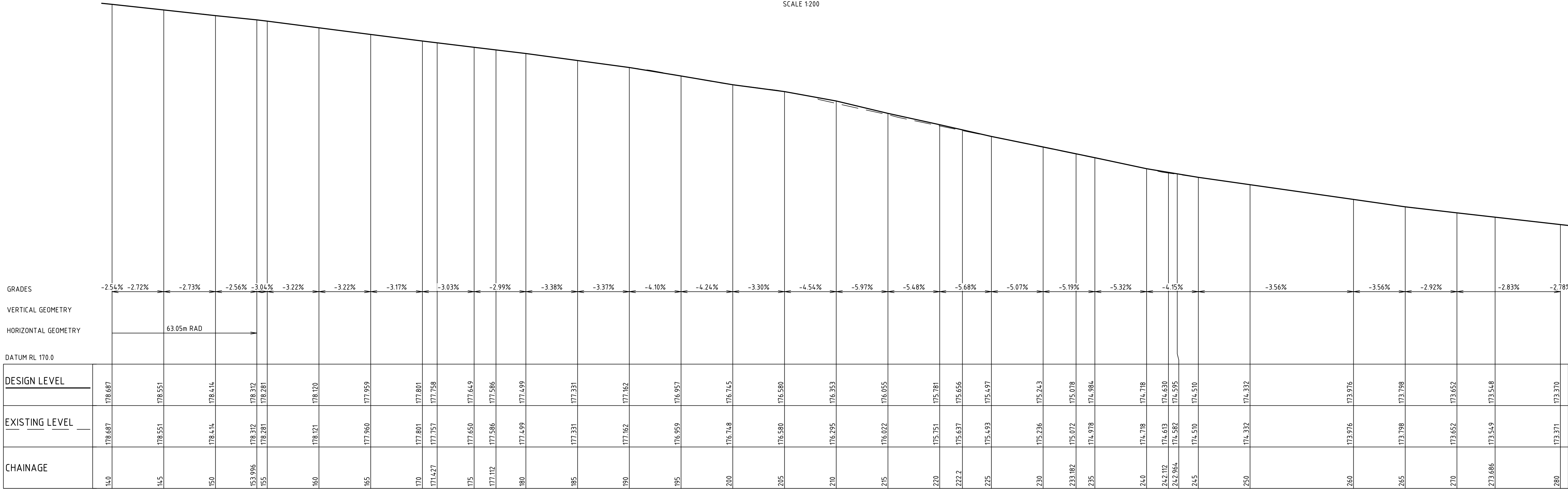
DRAWING SHEET SIZE = A1



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DRAWN: R. GREIVE
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



PLAN
SCALE 1:200



LONGITUDINAL SECTION - FESTIVAL DRIVE LIP LHS (ML01)

REFER C06.81 FOR SETOUT TABLES
HORIZONTAL SCALE 1:200@A1
VERTICAL SCALE 1:50@A1



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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SCALE 1:50@A1

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ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**

**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

**SETOUT PLAN - FESTIVAL
DRIVE LIP (LHS) - SHEET 2**

JOB NUMBER

NL191249

DRAWING NUMBER

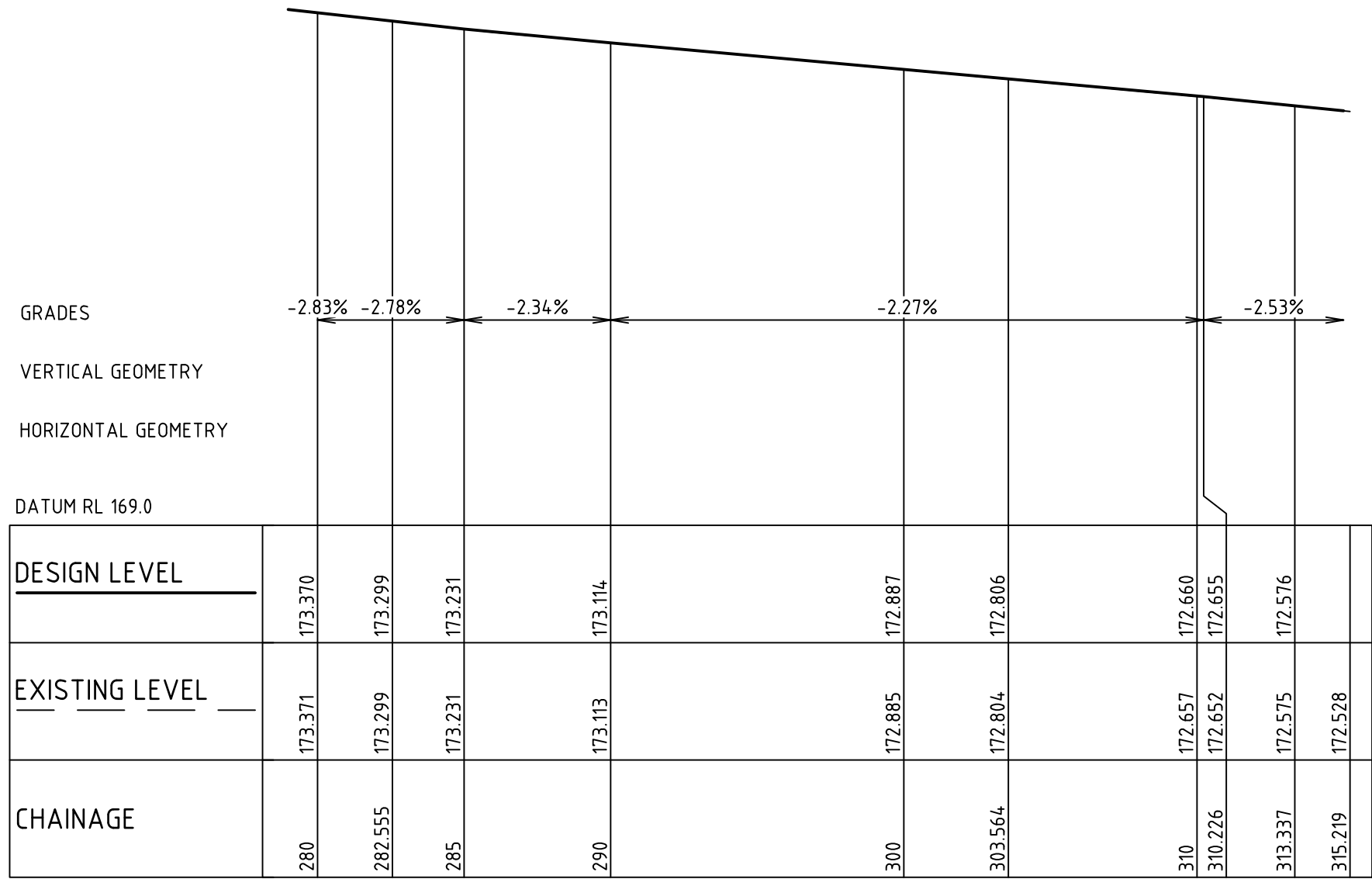
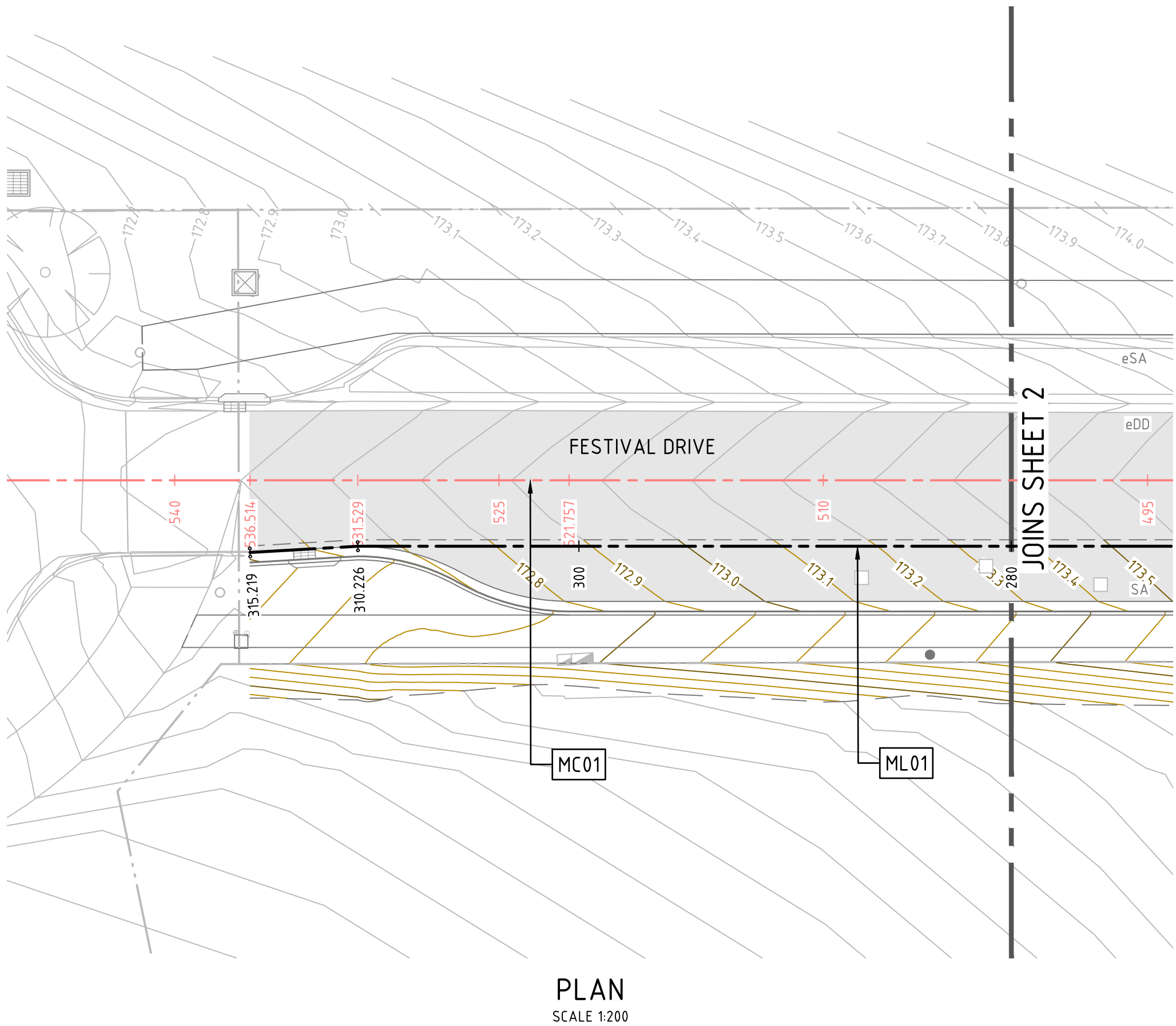
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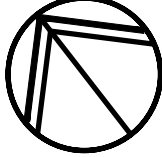
REVISION

2

DRAWING SHEET SIZE = A1

DESIGNED: T. SOIRES
DRAWN: R. GREVE
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



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1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 Hunter & Central Coast Development Corporation	 NORTHROP Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE SETOUT PLAN - FESTIVAL DRIVE LIP (LHS) - SHEET 3	NL191249 DRAWING NUMBER 01-C06.43 <small>DRAWING SHEET SIZE = A1</small>
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DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

CONTROL MC01 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341697.902	6299393.990	17°27'54.52"			
TC	27.398	341706.125	6299420.124	17°27'54.52"			
IP 2	53.824	341716.058	6299445.338		R = 1000.000	52.852	3°01'41.60"
CT	80.250	341723.312	6299470.098	20°29'36.12"			
IP 3	175.940	341756.813	6299559.732				
IP 4	175.941	341756.813	6299559.732				
IP 5	191.619	341763.793	6299578.412		R = -20.000	31.357	89°49'53.26"
CT	207.298	341745.134	6299585.447	290°39'28.73"			
TC	357.668	341604.432	6299638.496	290°39'28.73"			
IP 6	366.484	341596.123	6299641.628		R = 60.000	17.632	16°50'12.64"
CT	375.299	341589.078	6299647.033	307°29'41.37"			
IP 7	556.745	341445.118	6299757.177	307°29'41.37"			

CONTROL MC02 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341754.279	6299578.460	53°46'30.30"			
TC	10.387	341762.658	6299584.598	53°46'30.30"			
IP 2	16.175	341767.463	6299588.117		R = -20.000	11.577	33°09'57.41"
CT	21.964	341769.559	6299593.692	20°36'32.89"			
IP 3	36.381	341774.634	6299607.187	20°36'32.89"			

CONTROL ML01 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341730.114	6299587.850	290°39'28.73"			
TC	135.468	341603.356	6299635.642	290°39'28.73"			
IP 2	144.732	341594.625	6299638.934		R = 63.050	18.528	16°50'12.64"
CT	153.996	341587.222	6299644.614	307°29'41.37"			
IP 3	310.226	341463.267	6299739.709				
IP 4	315.219	341459.136	6299742.514	304°10'43.95"			

CONTROL ML02 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING
IP 1	0.000	341637.586	6299629.410	110°28'19.44"
IP 2	15.932	341652.511	6299623.837	
IP 3	40.885	341675.826	6299614.942	
IP 4	49.809	341684.176	6299611.792	
IP 5	98.441	341729.749	6299594.820	110°25'35.18"

CONTROL MCP01 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341719.828	6299591.728	290°39'28.73"			
IP 2	2.553	341717.387	6299592.649		R = -10.000	5.105	29°14'58.32"
IP 3	5.105	341714.807	6299592.259				
IP 4	7.658	341712.227	6299591.869		R = 10.000	5.105	29°14'59.69"
IP 5	10.210	341709.785	6299592.790				
TC	70.810	341653.081	6299614.169	290°39'28.73"			
IP 6	73.363	341650.640	6299615.089		R = 10.000	5.105	29°14'58.31"
CC	75.915	341648.959	6299617.085	319°54'27.04"			
IP 7	78.468	341647.279	6299619.082		R = -10.000	5.105	29°14'58.31"
IP 8	81.020	341644.837	6299620.002	290°39'28.73"			

CONTROL MCP02 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341517.334	6299698.230	307°29'41.37"			
IP 2	2.553	341515.263	6299699.819		R = -10.000	5.105	29°14'58.31"
CC	5.105	341512.681	6299700.193	278°14'43.05"			
IP 3	7.658	341510.098	6299700.567		R = 10.000	5.105	29°14'58.31"
CT	10.210	341508.028	6299702.155	307°29'41.37"			
TC	58.810	341469.468	6299731.738	307°29'41.37"			
IP 4	61.363	341467.398	6299733.326		R = 10.000	5.105	29°14'58.31"
CC	63.915	341466.368	6299735.724	336°44'39.68"			
IP 5	66.468	341465.338	6299738.121		R = -10.000	5.105	29°14'58.31"
IP 6	69.020	341463.267	6299739.709	307°29'41.37"			

CONTROL MCP03 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341675.826	6299614.942	110°36'34.90"			
IP 2	2.307	341678.024	6299614.115		R = -10.000	4.613	26°25'59.10"
CC	4.613	341680.360	6299614.354	84°10'35.79"			
IP 3	6.904	341682.680	6299614.590		R = 10.000	4.581	26°14'59.35"
CT	9.195	341684.865	6299613.777	110°25'35.14"			
TC	40.769	341714.454	6299602.757	110°25'35.14"			
IP 4	43.081	341716.660	6299601.935		R = 10.000	4.624	26°29'30.16"
CC	45.393	341718.268	6299600.216	136°55'05.30"			
IP 5	47.705	341719.876	6299598.497		R = -10.000	4.624	26°29'29.69"
IP 6	50.017	341722.082	6299597.675	110°25'35.61"			

CONTROL KR01 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341744.177	6299590.568	104°42'21.84"			
TC	9.489	341753.355	6299588.159	104°42'21.84"			
IP 2	15.423	341760.102	6299586.388		R = -9.000	11.868	75°33'16.90"
CT	21.357	341763.500	6299592.480	29°09'04.95"			
IP 3	22.979	341764.290	6299593.896	29°09'04.95"			




CONTROL KR02 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341772.283	6299591.796	200°32'45.96"			
IP 2	6.718	341769.858	6299585.328		R = 23.500	13.436	32°45'27.43"
IP 3	13.436	341764.320	6299581.201				
IP 4	13.440	341764.317	6299581.198				
IP 5	18.030	341760.172	6299578.109		R = -8.000	9.180	65°44'36.71"
IP 6	22.620	341761.285	6299573.060				
IP 7	22.620	341761.285	6299573.060				
IP 8	29.023	341762.701	6299566.644		R = 23.200	12.805	31°37'28.83"
CT	35.426	341760.542	6299560.438	199°11'05.51"			
IP 9	36.028	341760.344	6299559.869	199°11'05.52"			

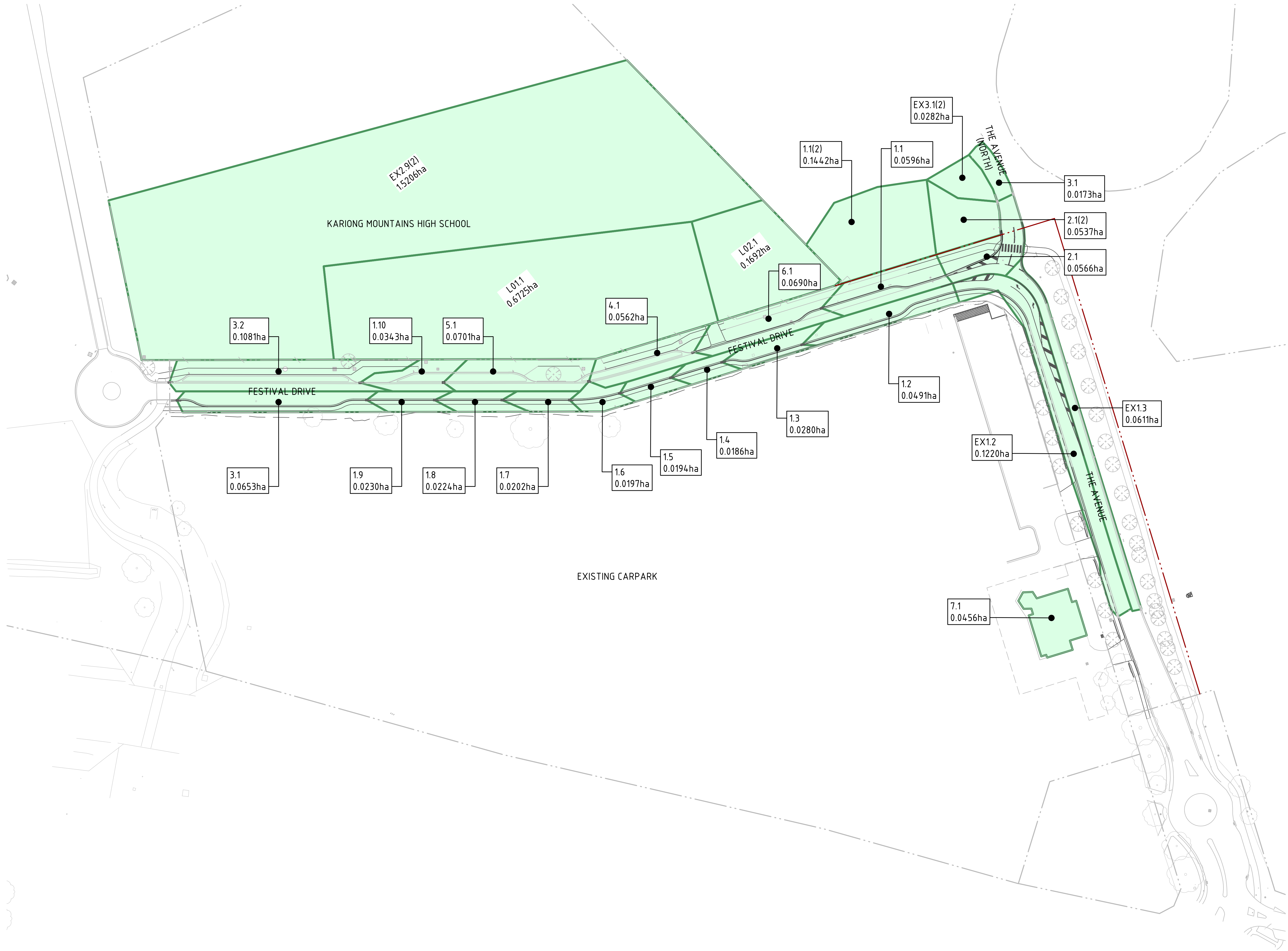
CONTROL KR03 – HORIZONTAL SETOUT

PT	CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
IP 1	0.000	341750.176	6299557.393	20°27'36.31"			
IP 2	13.688	341755.832	6299572.552		R = -20.450	27.376	76°41'58.88"
CC	27.376	341742.381	6299581.543	303°45'37.43"			
IP 3	34.288	341736.610	6299585.401		R = -60.450	13.824	13°06'08.70"
IP 4	41.199	341730.114	6299587.850	290°39'28.73"			



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT		PROJECT	DRAWING TITLE	JOB NUMBER	
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19	 	 Newcastle Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100	<p>ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.</p>	MT PENANG PARKLANDS KARIONG NSW 2250 FESTIVAL DRIVE AND THE AVENUE UPGRADE	CIVIL ENGINEERING PACKAGE SETOUT TABLES	NL191249	
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20							DRAWING NUMBER
											01-C06.81	2
											DRAWING SHEET SIZE = A1	
DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED							THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD					

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

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NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250
FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

**CIVIL ENGINEERING PACKAGE
STORMWATER CATCHMENT PLAN**

JOB NUMBER

NL191249

DRAWING NUMBER

01-C07.21

REVISION

2

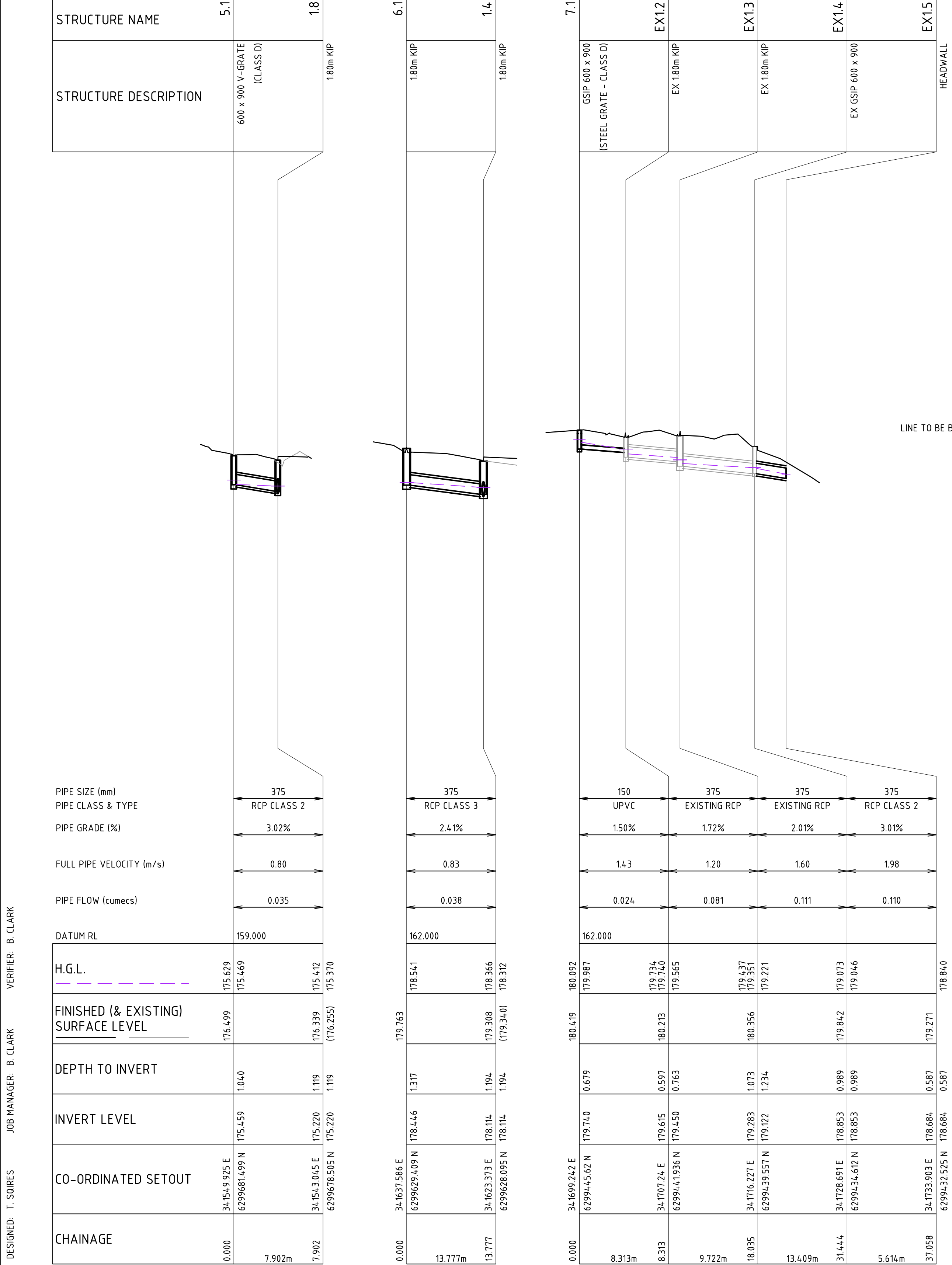
DRAWING SHEET SIZE = A1

DRAWN: R. GREVE
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LOCATION & LANDUSE				TIME & RUNOFF									INLET DESIGN			OVERLAND FLOW										PIPED SYSTEM DESIGN						RESULTS							
Pit	Pipe	Subcatchment Areas (ha)				Time of Conc. Impervious	Time of Conc. Pervious	Time of Conc. Impervious	Time of Conc. Pervious	Catchment Flow	Critical Burst Duration	Critical Burst Event ID	Inlet	Inlet	Pit Grate	Bypass	Overland	Flow	Flow	Velocity x	Captured Pipe	Velocity	Pipe	Pipe	Pipe	Pipe	Upstream Invert	Downstream Invert	Critical HGL Storm	Upstream HGL	Downstream HGL	Pressure Change	Pipe	Water Surface	Freeboard				
Name	Name	Type 1	Type 2	% Impervious Type 1	% Impervious Type 2	Type 1 Tc (min)	Type 1 Tc (min)	Type 2 Tc (min)	Type 2 Tc (min)	Q (L/s)	(min)		Type	Curve	Level m (ADH)	Pit	Flow Q (L/s)	Width (m)	Depth (m)	Depth Ratio	Flow Q (L/s)	V (m/s)	Length (m)	Grade (%)	Size (mm)	Class	Level (m)	Level (m)	Duration (min)	in Pipe (m AHD)	in Pipe (m AHD)	Coefficient (ku)	Cover (m)	Elevation (m AHD)	Depth (m)				
1.1	1.1 to 1.2	0.060	0.144	10.000	100.000	5.000	6.000		10.000	111	10.000	4356.000	180m KERB INLET PIT		180.754	6.100	50.000	1.891	0.080	0.070	88.000	1.080	16.567	2.180	375	RCP CLASS 3	179.213	178.852	25.000	179.253	179.063	8.060	1.101	179.516	1.238				
1.2	1.2 to 1.3	0.049		10.000	100.000	5.000	6.000			36	15.000	4393.000	180m KERB INLET PIT		180.546	1.300	22.000	1.241	0.063	0.050	34.000	1.490	32.841	1.590	375	RCP CLASS 3	178.852	178.328	10.000	178.966	178.634	1.760	1.100	179.063	1.485				
1.3	1.3 to 1.4	0.028		10.000	100.000	5.000	6.000			22	10.000	4363.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	179.856	1.400	13.000	0.882	0.053	0.040	22.000	1.390	21.393	1.000	375	RCP CLASS 2	178.328	178.114	10.000	178.561	178.464	0.910	0.749	178.634	1.222				
1.4	1.4 to 1.5	0.019		10.000	100.000	5.000	6.000			13	10.000	4354.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	179.308	1.500	14.000	0.913	0.053	0.040	13.000	2.210	21.393	1.940	375	RCP CLASS 2	178.114	177.700	10.000	178.387	177.997	0.490	0.617	178.464	0.844				
1.5	1.5 to 1.6	0.019		10.000	100.000	5.000	6.000			14	10.000	4354.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	178.762	1.600	13.000	0.837	0.051	0.040	14.000	2.620	20.195	2.990	375	RCP CLASS 2	177.700	177.096	10.000	177.911	177.680	0.470	0.600	177.997	0.765				
1.6	1.6 to 1.7	0.018		10.000	100.000	5.000	6.000			13	15.000	4393.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	178.222	1.700	14.000	0.872	0.052	0.040	13.000	2.830	27.031	2.970	375	RCP CLASS 2	177.096	176.293	10.000	177.622	176.947	0.430	0.636	177.680	0.542				
1.7	1.7 to 1.8	0.020		10.000	100.000	5.000	6.000			14	10.000	4363.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	177.370	1.800	16.000	0.871	0.052	0.050	14.000	3.140	27.031	3.970	375	RCP CLASS 2	176.293	175.220	10.000	176.896	176.159	0.410	0.606	176.947	0.423				
1.8	1.8 to 1.9	0.022		10.000	100.000	5.000	6.000			16	15.000	4393.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	176.339	1.900	16.000	0.785	0.050	0.030	16.000	3.100	27.179	7.050	375	RCP CLASS 2	175.220	173.305	10.000	176.108	174.984	0.460	0.639	176.159	0.180				
1.9	1.9 to 1.10	0.023		10.000	100.000	5.000	6.000			16	15.000	4393.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 5% grade	174.876	3.100	165.000	2.791	0.108	0.150	-58.000	3.040	7.449	1.940	375	RCP CLASS 3	173.305	173.161	10.000	174.729	174.627	1.320	1.100	174.984					
1.1	1.10 to EX2.6	0.034		10.000	100.000	5.000	6.000			158	15.000	4393.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 5% grade	174.700	3.200	111.000	2.663	0.075	0.090	119.000	3.340	5.924	1.000	375	EXISTING RCP	173.161	173.102	10.000	174.375	173.995	0.900	1.226	174.627	0.073				
2.1	2.1 to EX3.1	0.057	0.054	10.000	100.000	5.000	6.000		10.000	64	10.000	4356.000	180m KERB INLET PIT (SAG)	180m KERB INLET PIT (SAG)	180.938	EX3.1	0.000	0.000	0.082	0.000	88.000	0.850	12.785	0.500	375	RCP CLASS 2	179.914	179.850	10.000	180.195	180.140	6.520	0.572	180.385	0.553				
3.1	3.1 to 3.2	0.065		10.000	100.000	5.000	6.000			165	10.000	4354.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	172.554	LOST	81.000	2.627	0.103	0.080	87.000	0.800	7.757	1.000	375	RCP CLASS 3	171.015	170.937	10.000	172.569	172.562	3.600	1.100	172.657					
3.2	3.2 to EX2.8	0.108		10.000	100.000	5.000	6.000			111	10.000	4354.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 1% grade	172.500	LOST	16.000	1.287	0.064	0.030	88.000	1.460	5.747	3.780	375	RCP CLASS 2	170.937	170.720	10.000	172.381	172.377	1.800	1.256	172.564					
4.1	4.1 to 1.6	0.056		10.000	100.000	5.000	8.000			49	15.000	4393.000	600 x 900 V-GRATE (CLASS D)	600 x 900 V-GRATE, 3% grade	178.450	5.100	51.000	1.665	0.075	0.080	47.000	0.760	10.775	2.020	375	RCP CLASS 3	177.314	177.096	10.000	177.686	177.680	3.600	0.700	177.715	0.735				
5.1	5.1 to 1.8	0.070		10.000	100.000	5.000	6.000			51	10.000	4354.000	600 x 900 V-GRATE (CLASS D)	600 x 900 V-GRATE, 5% grade	176.499	1.100	12.000	0.623	0.045	0.020	51.000	0.810	7.902	3.020	375	RCP CLASS 2	175.459	175.220	10.000	176.163	176.159	8.870	0.606	176.218	0.281				
6.1	6.1 to 1.4	0.069		10.000	100.000	5.000	6.000			68	10.000	4365.000	120m KERB INLET PIT	120m KERB INLET PIT, 3% crossfall, 3% grade	179.763	4.100	49.000	1.677	0.075	0.080	57.000	0.980	13.777	2.410	375	RCP CLASS 3	178.446	178.114	10.000	178.562	178.464	0.000	0.700	178.562	1.201				
7.1	EX1.1 to EX1.2	0.046		0.000	100.000	5.000	6.000			35	15.000	4393.000	GSIP 600 x 900 (STEEL GRATE - CLASS D)		180.300				0.000		35.000	1.820	8.313	1.500	150	UPVC	179.740	179.615	15.000	180.205	179.807	6.000	0.426	180.302					
EX1.2	EX1.2 to EX1.3	0.122		25.000	100.000	5.000	6.000			83	10.000	4363.000	EX 180m KERB INLET PIT		180.160	LOST	13.000	1.153	0.060	0.030	70.000	1.250	9.722	1.720	375	EXISTING RCP	179.450	179.283	10.000	179.611	179.458	4.660	0.270	179.807	0.353				
EX1.3	EX1.3 to EX1.4	0.061		0.000	100.000	5.000	6.000			46	15.000	4393.000	EX 180m KERB INLET PIT		180.210	LOST	3.000	0.409	0.036	0.020	43.000	1.640	13.409	2.010	375	EXISTING RCP	179.122	178.853	15.000	179.250	179.123	1.350	0.526	179.413	0.797				
EX1.4	EX1.4 to EX1.5			10.000	100.000					0	10.000	4354.000	EX GSIP 600 x 900	GSIP 600 x 900	179.835	LOST	0.000	0.000	0.000	0.000	0.000	2.080	5.614	3.010	375	RCP CLASS 2	178.853	178.684	15.000	179.094	178.866	0.200	0.601	179.123	0.712				
EX1.5										0	10.000	4354.000	HW outlet		179.059				0.000		0.000													178.866					
EX2.1	EX2.1 to EX2.2			10.000	100.000					0	10.000	4354.000	END CAP		179.835				0.000		0.000	0.780	10.686	3.560	225	UPVC	179.610	179.230	15.000	179.837	179.882	0.000	0.685	179.837					
EX2.2	EX2.2 to EX2.3			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		180.539				0.000		0.000	2.470	35.239	2.700	225	UPVC	179.140	178.190	15.000	179.784	178.595	2.000	1.165	179.882	0.658				
EX2.3	EX2.3 to EX2.4			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		179.800				0.000		0.000	2.370	40.325	1.740	225	UPVC	178.180	177.480	10.000	178.580	177.705	0.200	0.959	178.595	1.206				
EX2.4	EX2.4 to EX2.5			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		178.670				0.000		0.000	1.830	63.102	3.900	300	UPVC	177.460	175.000	10.000	177.580	176.150	0.000	0.897	177.580	1.090				
EX2.5	EX2.5 to EX2.6			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		176.574				0.000		0.000	4.750	28.739	8.940	375	EXISTING RCP	175.040	172.470	10.000	176.082	173.995	0.500	1.066	176.150	0.424				
EX2.6	EX2.6 to EX2.7			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		174.859				0.000		0.000	3.900	7.954	4.650	525	EXISTING RCP	172.410	172.040	10.000	173.598	172.965	1.510	1.799	173.995	0.864				
EX2.7	EX2.7 to EX GPT			10.000	100.000					0	10.000	4354.000	EX GSIP 1200 x 1200		174.553				0.000		0.000	3.590	19.823	2.300	675	EXISTING RCP	172.080	171.624	10.000	172.965	172.801	0.000	1.629	172.965	1.621				
EX GPT	EX GPT to EX2.8			10.000	100.000					0	10.000	4354.000	GPT		174.029				0.000		0.000	2.360	45.931	2.430	675	EXISTING RCP	171.624	170.510	10.000	172.755	172.377	0.200	1.473	172.801	1.227				
EX2.8	EX2.8 to EX2.9			10.000	100.000					0	10.000	4354.000	EX JB 900 x 900		172.865				0.000		0.000	2.590	11.506	0.500	675	EXISTING RCP	170.420	170.362	10.000	172.251	172.118	0.400	1.412	172.377	0.489				
EX2.9	EX2.9 to EX2.10		1.521	10.000	60.000				5.000	10.000	856	10.000	4356.000	EX GSIP 900 x 900	GSIP 900 x 900	172.560	LOST	423.000	4.625	0.173	0.200	432.000	3.020	21.654	1.400	750	RCP CLASS 2	170.362	170.060	10.000	171.639	171.338	1.010	1.126	172.118	0.442			
EX2.10	EX2.10 to EX2.11			10.000	100.000					0	10.000	4354.000	EX JB 1200 x 1200		172.159				0.000		0.000	3.020	41.850	1.000	750	EXISTING RCP	170.060	169.642	15.000	171.120	170.511	0.530	0.357	171.338	0.821				
EX2.11	EX2.11 to EX2.12			10.000	100.000					0	10.000	4354.000	EX JB 1200 x 1200		170.880				0.000		0.000	3.010	2.895	1.000	750	EXISTING RCP	169.642	169.613	10.										

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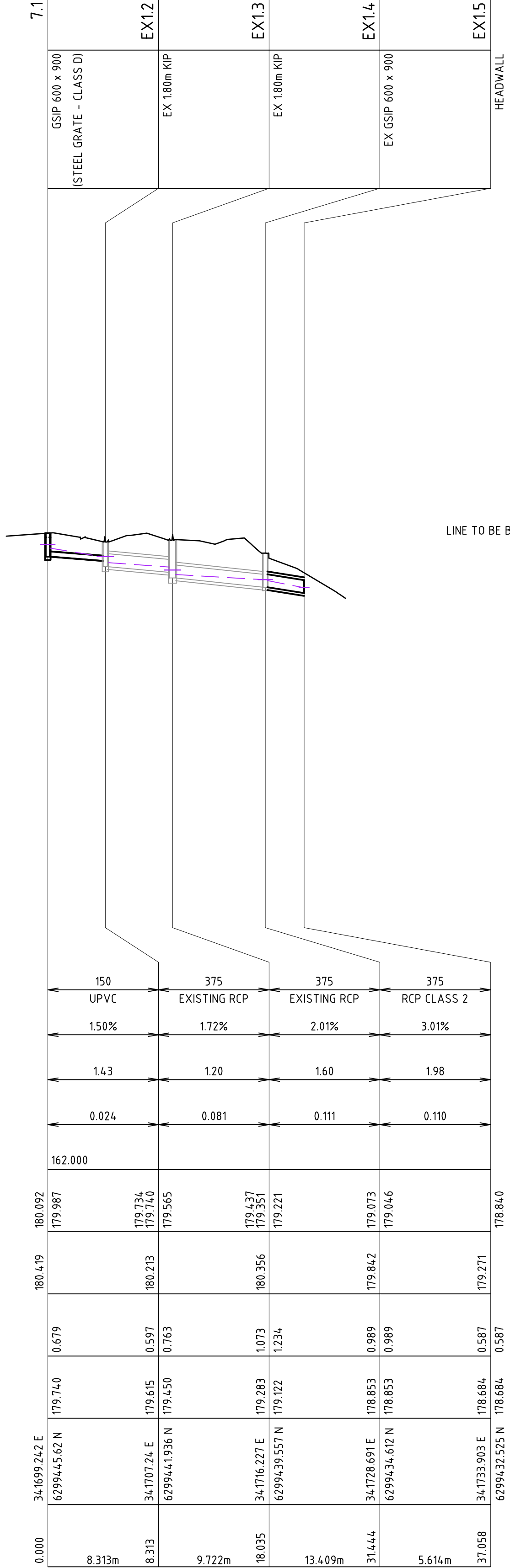
LOCATION & LANDUSE				TIME & RUNOFF									INLET DESIGN			OVERLAND FLOW										PIPED SYSTEM DESIGN						RESULTS							
Pit	Pipe	Subcatchment Areas (ha)				Time of Conc. Impervious	Time of Conc. Pervious	Time of Conc. Impervious	Time of Conc. Pervious	Catchment Flow	Critical Burst Duration	Critical Burst Event ID	Inlet	Inlet	Pit Grate	Bypass	Overland	Flow	Flow	Velocity x	Captured Pipe	Velocity	Pipe	Pipe	Pipe	Pipe	Upstream Invert	Downstream Invert	Critical HGL Storm	Upstream HGL	Downstream HGL	Pressure Change	Pipe	Water Surface	Freeboard				
Name	Name	Type 1	Type 2	% Impervious Type 1	% Impervious Type 2	Type 1 Tc (min)	Type 1 Tc (min)	Type 2 Tc (min)	Type 2 Tc (min)	Q (L/s)	(min)		Type	Curve	Level m (ADH)	Pit	Flow Q (L/s)	Width (m)	Depth (m)	Depth Ratio	Flow Q (L/s)	V (m/s)	Length (m)	Grade (%)	Size (mm)	Class	Level (m)	Level (m)	Duration (min)	in Pipe (m AHD)	in Pipe (m AHD)	Coefficient (ku)	Cover (m)	Elevation (m AHD)	Depth (m)				
1.1	1.1 to 1.2	0.060	0.144	10.000	100.000	5.000	6.000		10.000	70	25.000	4447.000	180m KERB INLET PIT		180.754	6.100	41.000	1.833	0.079	0.070	61.000	1.050	16.567	2.180	375	RCP CLASS 3	179.213	178.852	25.000	179.245	179.030	8.350	1.101	179.443	1.311				
1.2	1.2 to 1.3	0.049		10.000	100.000	5.000	6.000			28	25.000	4447.000	180m KERB INLET PIT		180.546	1.300	16.000	1.127	0.058	0.040	27.000	1.430	32.841	1.590	375	RCP CLASS 3	178.852	178.328	15.000	178.955	178.550	1.810	1.100	179.030	1.515				
1.3	1.3 to 1.4	0.028		10.000	100.000	5.000	6.000			16	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	179.856	1.400	10.000	0.719	0.045	0.030	16.000	1.330	21.393	1.000	375	RCP CLASS 2	178.328	178.114	25.000	178.479	178.379	0.850	0.749	178.550	1.306				
1.4	1.4 to 1.5	0.019		10.000	100.000	5.000	6.000			10	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	179.308	1.500	11.000	0.759	0.049	0.040	10.000	2.140	21.393	1.940	375	RCP CLASS 2	178.114	177.700	15.000	178.317	177.907	0.480	0.617	178.379	0.929				
1.5	1.5 to 1.6	0.019		10.000	100.000	5.000	6.000			11	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	178.762	1.600	9.000	0.587	0.044	0.030	11.000	2.440	20.195	2.990	375	RCP CLASS 2	177.700	177.096	15.000	177.845	177.336	0.480	0.600	177.895	0.874				
1.6	1.6 to 1.7	0.018		10.000	100.000	5.000	6.000			9	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	178.222	1.700	11.000	0.709	0.045	0.040	9.000	2.690	27.031	2.970	375	RCP CLASS 2	177.096	176.293	25.000	177.281	176.542	0.420	0.636	177.336	0.886				
1.7	1.7 to 1.8	0.020		10.000	100.000	5.000	6.000			11	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	177.370	1.800	11.000	0.725	0.045	0.040	11.000	3.070	27.031	3.970	375	RCP CLASS 2	176.293	175.220	15.000	176.501	175.422	0.390	0.606	176.542	0.828				
1.8	1.8 to 1.9	0.022		10.000	100.000	5.000	6.000			11	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	176.339	1.900	11.000	0.617	0.042	0.020	11.000	2.690	27.179	7.050	375	RCP CLASS 2	175.220	173.305	10.000	175.376	174.196	0.410	0.639	175.422	0.917				
1.9	1.9 to 1.10	0.023		10.000	100.000	5.000	6.000			11	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 5% grade	174.876	3.100	36.000	1.401	0.068	0.070	11.000	2.270	7.449	1.940	375	RCP CLASS 3	173.305	173.161	25.000	174.190	173.876	1.320	1.100	174.196	0.432				
1.1	1.10 to EX2.6	0.034		10.000	100.000	5.000	6.000			19	25.000	4447.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 5% grade	174.700	3.200	58.000	2.064	0.057	0.060	19.000	2.650	5.924	1.000	375	EXISTING RCP	173.161	173.102	25.000	173.744	173.578	0.420	1.226	173.876	0.982				
2.1	2.1 to EX3.1	0.057	0.054	10.000	100.000	5.000	6.000		10.000	42	10.000	4372.000	180m KERB INLET PIT (SAG)	180m KERB INLET PIT (SAG)	180.938	EX3.1	0.000	0.000	0.069	0.000	58.000	0.680	12.785	0.500	375	RCP CLASS 2	179.914	179.850	25.000	180.130	180.071	7.010	0.572	180.248	0.690				
3.1	3.1 to 3.2	0.065		10.000	100.000	5.000	6.000			36	10.000	4369.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 3% grade	172.554	LOST	0.000	0.149	0.002	0.000	31.000	0.620	7.757	1.000	375	RCP CLASS 3	171.015	170.937	25.000	171.840	171.837	3.600	1.100	171.856	0.698				
3.2	3.2 to EX2.8	0.108		10.000	100.000	5.000	6.000			58	10.000	4369.000	180m KERB INLET PIT	180m KERB INLET PIT, 3% crossfall, 1% grade	172.500	LOST	3.000	0.409	0.036	0.010	53.000	1.420	5.747	3.780	375	RCP CLASS 2	170.937	170.720	15.000	171.786	171.647	1.800	1.256	171.837	0.663				
4.1	4.1 to 1.6	0.056		10.000	100.000	5.000	8.000			33	25.000	4447.000	600 x 900 V-GRATE (CLASS D)	600 x 900 V-GRATE, 3% grade	178.450	5.100	38.000	1.502	0.069	0.070	33.000	0.800	10.775	2.020	375	RCP CLASS 3	177.314	177.096	25.000	177.330	177.336	3.600	0.700	177.426	1.011				
5.1	5.1 to 1.8	0.070		10.000	100.000	5.000	6.000			38	25.000	4447.000	600 x 900 V-GRATE (CLASS D)	600 x 900 V-GRATE, 5% grade	176.499	1.100	19.000	0.892	0.052	0.040	38.000	0.810	7.902	3.020	375	RCP CLASS 2	175.459	175.220	25.000	175.470	175.422	8.870	0.606	175.624	0.856				
6.1	6.1 to 1.4	0.069		10.000	100.000	5.000	6.000			41	25.000	4447.000	120m KERB INLET PIT	120m KERB INLET PIT, 3% crossfall, 3% grade	179.763	4.100	33.000	1.449	0.067	0.060	41.000	0.880	13.777	2.410	375	RCP CLASS 3	178.446	178.114	25.000	178.544	178.379	0.000	0.700	178.544	1.219				
7.1	EX1.1 to EX1.2	0.046		0.000	100.000	5.000	6.000			27	25.000	4447.000	GSIP 600 x 900 (STEEL GRATE - CLASS D)		180.300				0.000		27.000	1.560	8.313	1.500	150	UPVC	179.740	179.615	25.000	180.032	179.750	6.010	0.426	180.139	0.161				
EX12	EX12 to EX13	0.122		25.000	100.000	5.000	6.000			66	25.000	4447.000	EX 180m KERB INLET PIT		180.160	LOST	6.000	0.839	0.051	0.020	58.000	1.220	9.722	1.720	375	EXISTING RCP	179.450	179.283	25.000	179.574	179.441	4.850	0.270	179.750	0.410				
EX13	EX13 to EX14	0.061		0.000	100.000	5.000	6.000			36	25.000	4447.000	EX 180m KERB INLET PIT		180.210	LOST	2.000	0.315	0.027	0.010	35.000	1.590	13.409	2.010	375	EXISTING RCP	179.122	178.853	15.000	179.224	179.066	1.280	0.526	179.369	0.862				
EX14	EX14 to EX15			10.000	100.000					0	10.000	4369.000	EX GSIP 600 x 900	GSIP 600 x 900	179.835	LOST	0.000	0.000	0.000	0.000	0.000	2.010	5.614	3.010	375	RCP CLASS 2	178.853	178.684	15.000	179.039	178.836	0.200	0.601	179.066	0.749				
EX15										0	10.000	4369.000	HW outlet		179.059				0.000		0.000													178.836					
EX2.1	EX2.1 to EX2.2			10.000	100.000					0	10.000	4369.000	END CAP		179.835				0.000		0.000	0.380	10.686	3.560	225	UPVC	179.610	179.230	25.000	179.610	179.797	0.000	0.685	179.610	0.225				
EX2.2	EX2.2 to EX2.3			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		180.539				0.000		0.000	2.420	35.239	2.700	225	UPVC	179.140	178.190	20.000	179.699	178.369	2.000	1.165	179.797	0.742				
EX2.3	EX2.3 to EX2.4			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		179.800				0.000		0.000	2.360	40.325	1.740	225	UPVC	178.180	177.480	20.000	178.354	177.654	0.200	0.959	178.369	1.246				
EX2.4	EX2.4 to EX2.5			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		178.670				0.000		0.000	1.710	63.102	3.900	300	UPVC	177.460	175.000	25.000	177.571	175.754	0.000	0.897	177.571	1.092				
EX2.5	EX2.5 to EX2.6			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		176.574				0.000		0.000	4.630	28.739	8.940	375	EXISTING RCP	175.040	172.470	25.000	175.686	173.578	0.500	1.066	175.754	0.820				
EX2.6	EX2.6 to EX2.7			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		174.859				0.000		0.000	3.580	7.954	4.650	525	EXISTING RCP	172.410	172.040	10.000	173.193	172.481	1.550	1.799	173.578	1.281				
EX2.7	EX2.7 to EX GPT			10.000	100.000					0	10.000	4369.000	EX GSIP 1200 x 1200		174.553				0.000		0.000	3.580	19.823	2.300	675	EXISTING RCP	172.080	171.624	25.000	172.481	172.065	0.000	1.629	172.481	2.051				
EX GPT	EX GPT to EX2.8			10.000	100.000					0	10.000	4369.000	GPT		174.029				0.000		0.000	2.340	45.931	2.430	675	EXISTING RCP	171.624	170.510	15.000	171.994	171.647	0.200	1.473	171.968	2.061				
EX2.8	EX2.8 to EX2.9			10.000	100.000					0	10.000	4369.000	EX JB 900 x 900		172.865				0.000		0.000	2.240	11.506	0.500	675	EXISTING RCP	170.420	170.362	25.000	171.684	171.579	0.360	1.412	171.647	1.092				
EX2.9	EX2.9 to EX2.10		1.521	10.000	60.000				5.000	10.000	563	25.000	4447.000	EX GSIP 900 x 900	GSIP 900 x 900	172.560	LOST	239.000	3.528	0.141	0.150	317.000	2.510	21.654	1.400	750	RCP CLASS 2	170.362	170.060	25.000	171.250	171.035	1.250	1.126	171.579	1.077			
EX2.10	EX2.10 to EX2.11			10.000	100.000					0	10.000	4369.000	EX JB 1200 x 1200		172.159				0.000		0.000	2.510	41.850	1.000	750	EXISTING RCP	170.060	169.642	20.000	170.816	170.456	0.530	0.357	171.035	1.124				
EX2.11	EX2.11 to EX2.12			10.000	100.000					0	10.000	4369.000	EX JB 1200 x 1200		170.880				0.000		0.000	2.530	2.895	1.000	750	EXISTING RCP	169.642	169.613</											



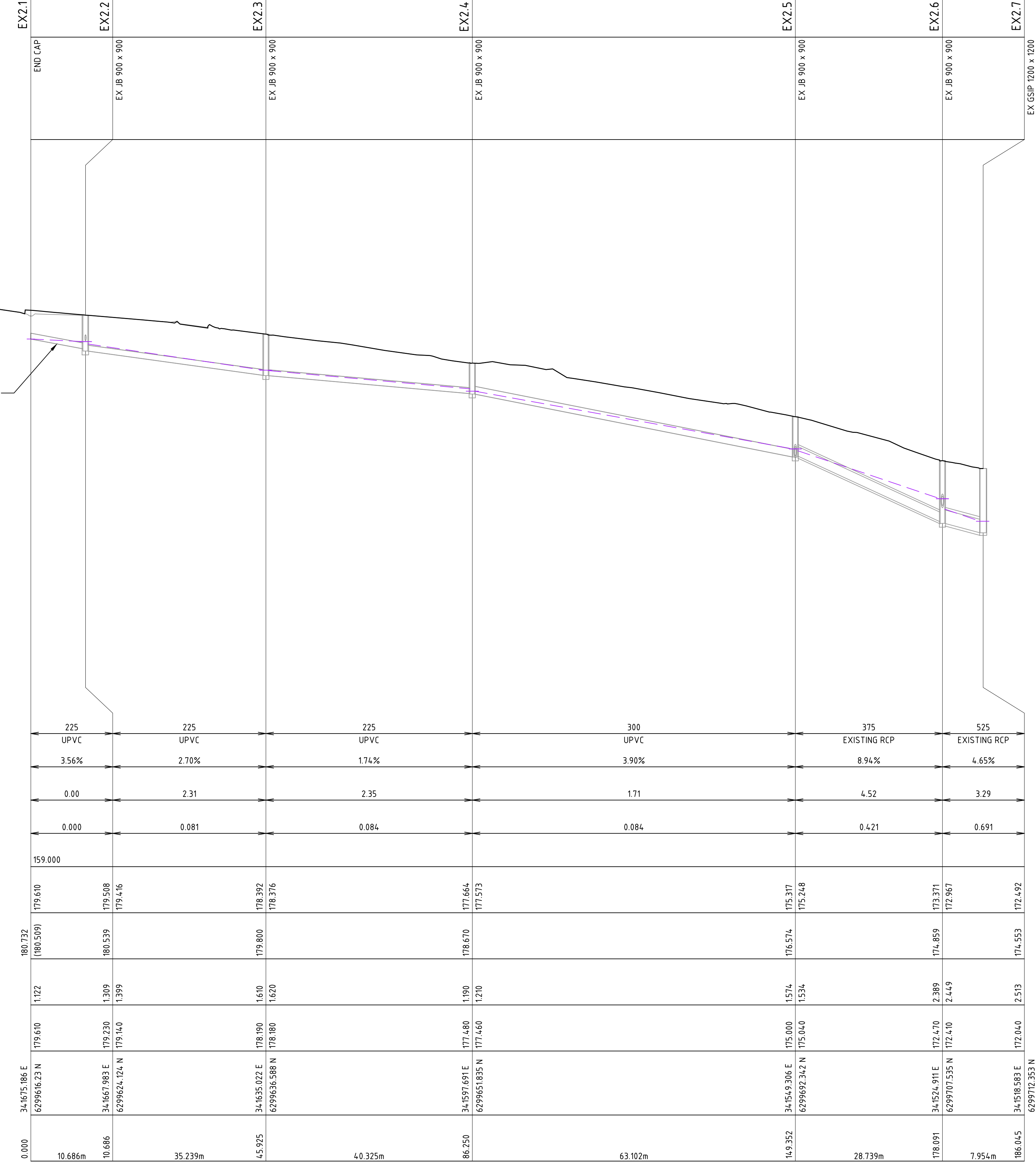
LINE 5



LINE 6



LINE EX1



LINE EX2

DRAWN: R. GREIVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20



**Hunter & Central Coast
Development
Corporation**

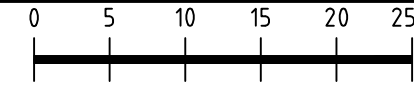
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**NORTHROP**
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

**MT PENANG PARKLANDS
KARIONG NSW 2250**
**FESTIVAL DRIVE AND
THE AVENUE UPGRADE**

DRAWING TITLE

CIVIL ENGINEERING PACKAGE
**STORMWATER LONGITUDINAL
SECTIONS - SHEET 2**

JOB NUMBER

NL191249

DRAWING NUMBER

01-C07.42

REVISION

2

DRAWING SHEET SIZE = A1



DRAWN: R. GREIVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

STRUCTURE NAME	EX2.7	EX GPT		EX2.8	EX2.9	EX2.10	EX2.11	EX2.12
STRUCTURE DESCRIPTION	EX GSIP 1200 x 1200			EX JB 900 x 900	EX GSIP 900 x 900	EX JB1200 x 1200	EX JB1200 x 1200	HEADWALL
PIPE SIZE (mm)	675		675	675	750	750	750	
PIPE CLASS & TYPE	EXISTING RCP		EXISTING RCP	EXISTING RCP	RCP CLASS 2	EXISTING RCP	EXISTING RCP	
PIPE GRADE (%)	2.30%		2.43%	0.50%	1.40%	1.00%	1.00%	
FULL PIPE VELOCITY (m/s)	3.41		2.36	2.15	2.30	2.28	2.30	
PIPE FLOW (cumecs)	0.691		0.691	0.769	1.009	1.009	1.009	
DATUM RL	155.000							
H.G.L.								
FINISHED (& EXISTING) SURFACE LEVEL	174.553		171.978 171.973 171.975	172.865 171.551 171.475	172.560 171.379 171.092	172.159 170.914 170.774	169.634 170.431 170.368	169.613 170.330
DEPTH TO INVERT	2.513 2.473		2.404 2.404	2.355 2.445	2.198 2.198	2.098 2.098	-0.008 -0.008	-0.000 -0.000
INVERT LEVEL	172.040 172.080		171.624 171.624	170.510 170.420	170.362 170.362	170.060 170.060	169.642 169.642	169.613 169.613
CO-ORDINATED SETOUT	34+1518.583 E 6299712.353 N		34+1502.897 E 6299724.473 N	34+1466.552 E 6299752.556 N	34+1460.979 E 6299762.622 N	34+1444.458 E 6299776.62 N	34+1437.836 E 6299817.943 N	34+1436.584 E 6299820.553 N
CHAINAGE	186+45 19.823m	205+868	4.5.931m	251+999	263+304 11.506m	284+958 21.654m	326+808 41.850m	329+703 2.895m

LINE EX2

EX3.1	EX3.2	EX3.3
EX 120m KIP	EX 120m KIP	HEADWALL
375	375	
EXISTING RCP	EXISTING RCP	
1.00%	1.00%	
1.02	1.32	
0.058	0.058	
163.000		
180.069 180.006		
	179.946 179.930	
		179.847
181.148	181.435	180.295
1298	1656 1656	0.597 0.597
179.850	179.779 179.779	179.698 179.698
34+1770.284 E 6299460.901 N	34+1776.406 E 6299460.747 N	34+1784.702 E 6299460.603 N
0.000	7.130m	8.133m

LINE EX3

EX4.1	EX2.5
EX JB 600 x 600	EX JB 900 x 900 (CONCRETE LID - CLASS D)
300	
UPVC	
3.94%	
0.11	
0.001	
159.000	
176.666 175.324	
14.08	
175.259	175.040 175.040
34+1551.372 E 6299467.192 N	34+1549.306 E 6299492.342 N
0.000	5.549m

LINE EX4



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250

FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

STORMWATER LONGITUDINAL
SECTIONS - SHEET 3

JOB NUMBER

NL191249

DRAWING NUMBER

01-C07.43

REVISION

2

DRAWING SHEET SIZE = A1

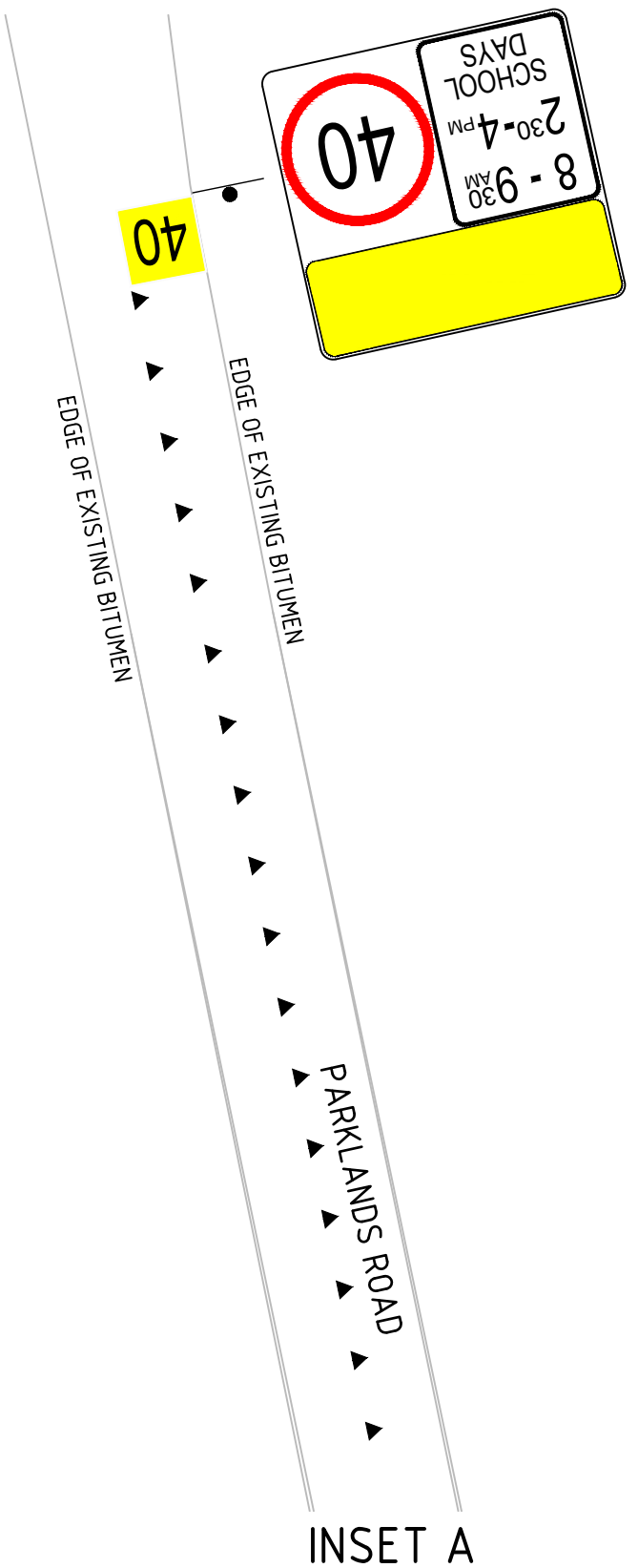
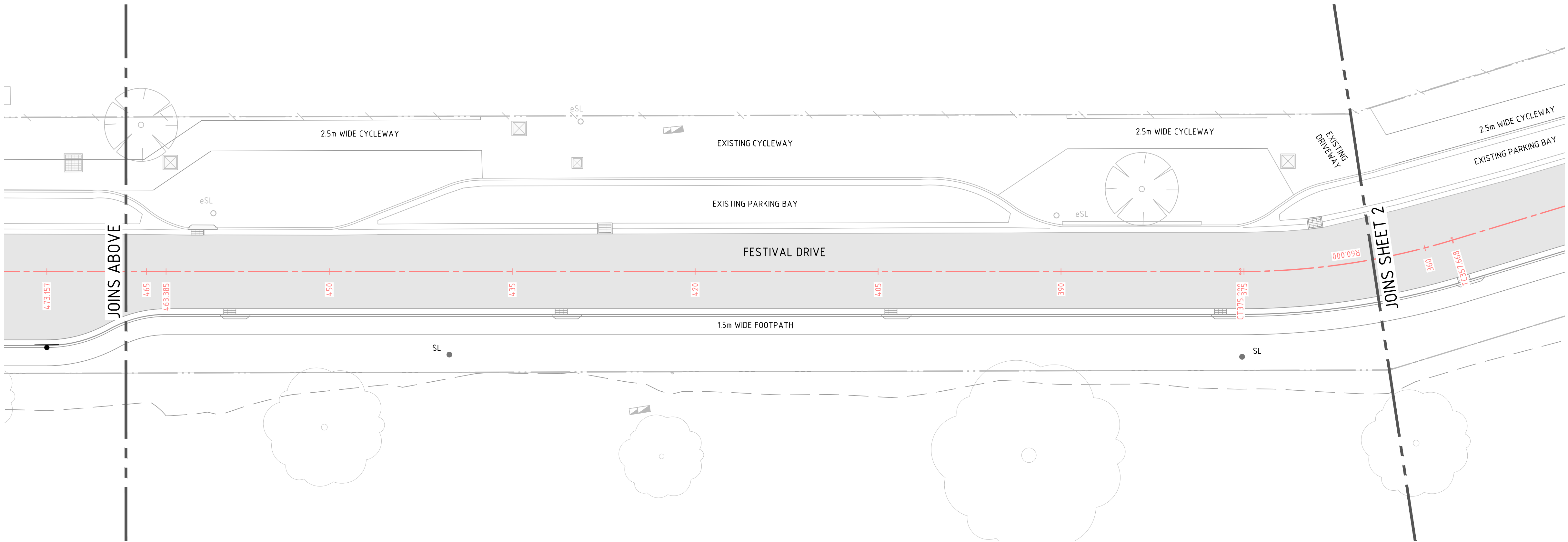
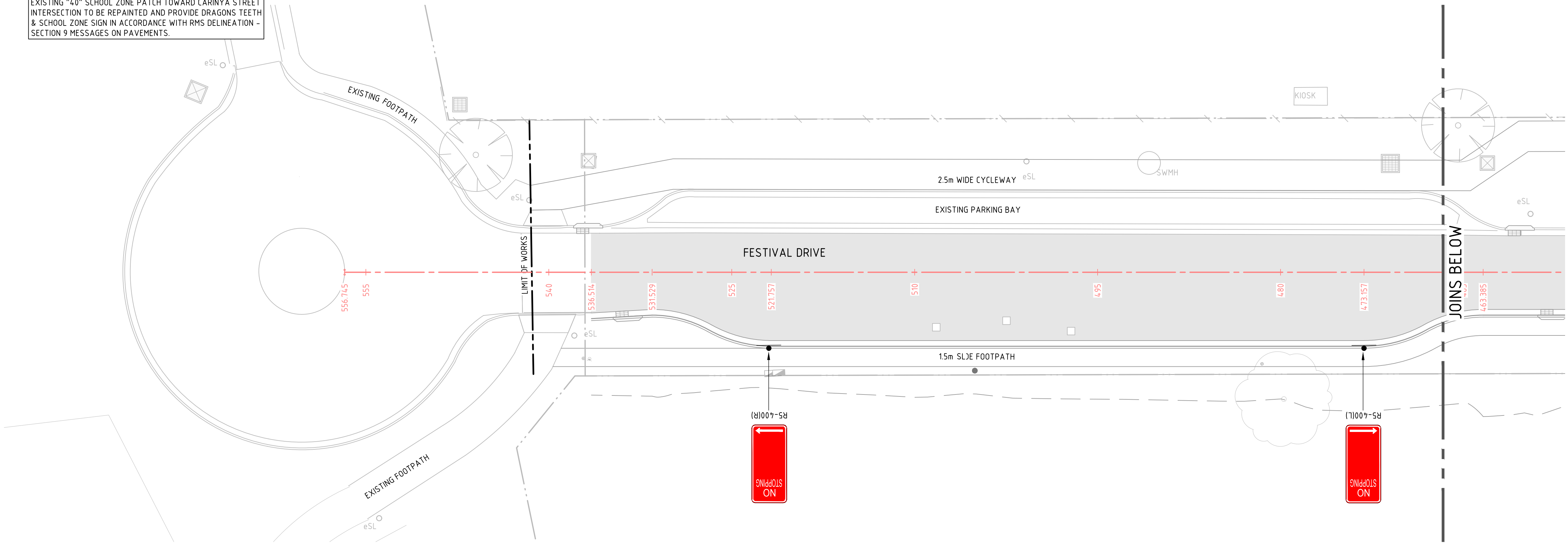
SEE INSET A:
EXISTING "40" SCHOOL ZONE PATCH TOWARD CARINYA STREET
INTERSECTION TO BE REPAINTED AND PROVIDE DRAGONS TEETH
& SCHOOL ZONE SIGN IN ACCORDANCE WITH RMS DELINEATION -
SECTION 9 MESSAGES ON PAVEMENTS.

LEGEND

- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- eXX EXISTING FEATURE (TYPE AS LABELLED)
- ROAD LAYOUT
- LINEMARKING TAG
- SIGN POST TO CCC STD SD0913
- PROPOSED STREET LIGHT POLE. PROPOSED SERVICES SUBJECT TO CHANGE. REFER TO CORRESPONDING DESIGN PLANS.
- MC01 ROAD SETOUT CONTROL LINE

NOTES

- INSTALL R8-2 SIGNS AT 500m INTERVALS ALONG SHARED PATHWAY.
- ALL NEW LINEMARKING TO PROVIDE RAISED REFLECTIVE PAVEMENT MARKINGS IN ACCORDANCE WITH RMS DELINEATION GUIDE.
- ALL NEW LINEMARKING SHALL BE THERMOPLASTIC PAVEMENT MARKING MATERIAL.
- LINEMARKING DIMENSIONS IN ACCORDANCE WITH RMS DELINEATION GUIDE.
- ALL PROPOSED SIGNS TO BE SIZE 'A' UNLESS OTHERWISE NOTED.
- ALL EXISTING SIGNS THAT ARE TO BE RETAINED ARE TO BE REPLACED WITH NEW SIGNS.



DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	SCHOOL ZONE INFORMATION ADDED	TS	BC	BC	18.12.19
3	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

CLIENT
NSW GOVERNMENT
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0 2 4 6 8 10m

NORTHROP
Newcastle
Level 1, 215 Pacific Hwy, Charlestown NSW 2290
Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT
MT PENANG PARKLANDS KARIONG NSW 2250
FESTIVAL DRIVE AND THE AVENUE UPGRADE

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SIGNAGE AND LINEMARKING PLAN - SHEET 1

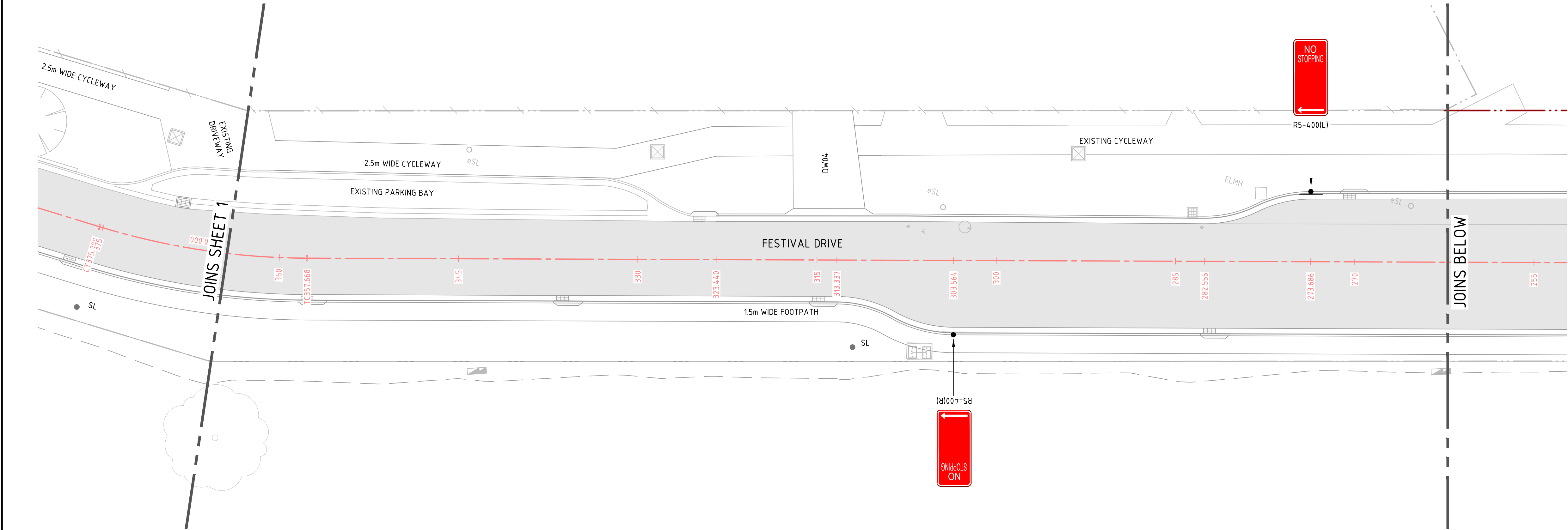
JOB NUMBER
NL191249

DRAWING NUMBER
01-C08.01

REVISION
3

DRAWING SHEET SIZE = A1

DRAWN: R. GREVE
DESIGNED: T. SOIRES
JOB MANAGER: B. CLARK
VERIFIER: B. CLARK



LEGEND

eXX

(XX)

●

○ SL

MC01

PROPOSED BOUNDARY

EXISTING BOUNDARY

EXISTING FEATURE (TYPE AS LABELLED)

ROAD LAYOUT

LINEMARKING TAG

SIGN POST
TO CCC STD SD0913

PROPOSED STREET LIGHT POLE.
PROPOSED SERVICES SUBJECT
TO CHANGE. REFER TO
CORRESPONDING DESIGN PLANS.

ROAD SETOUT CONTROL LINE

NOTES

1.

INSTALL R8-2 SIGNS AT 500m INTERVALS ALONG SHARED PATHWAY.

2.

ALL NEW LINEMARKING TO PROVIDE RAISED REFLECTIVE PAVEMENT MARKINGS IN ACCORDANCE WITH RMS DELINEATION GUIDE.

3.

ALL NEW LINEMARKING SHALL BE THERMOPLASTIC PAVEMENT MARKING MATERIAL.

4.

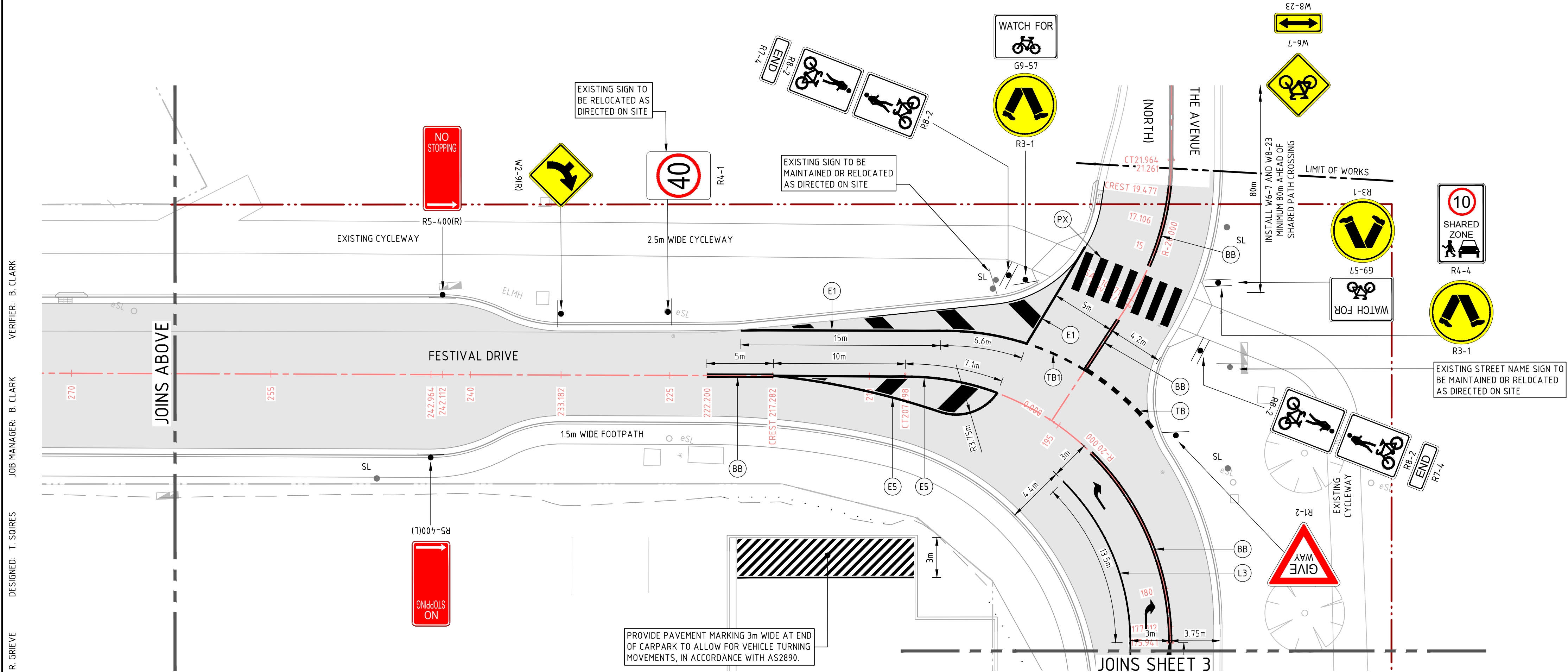
LINEMARKING DIMENSIONS IN ACCORDANCE WITH RMS DELINEATION GUIDE.

5.

ALL PROPOSED SIGNS TO BE SIZE 'A' UNLESS OTHERWISE NOTED.

6.

ALL EXISTING SIGNS THAT ARE TO BE RETAINED ARE TO BE REPLACED WITH NEW SIGNS.



REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

Hunter & Central Coast
Development
Corporation

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SCALE 1:200@A1

0

2

4

6

8

10m

Newcastle

Level 1, 215 Pacific Hwy, Charlestown NSW 2290

Ph (02) 4943 1777 Email newcastle@northrop.com.au

ABN 81 094 433 100

PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250

FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SIGNAGE AND LINEMARKING PLAN
- SHEET 2

DRAWING NUMBER

NL191249

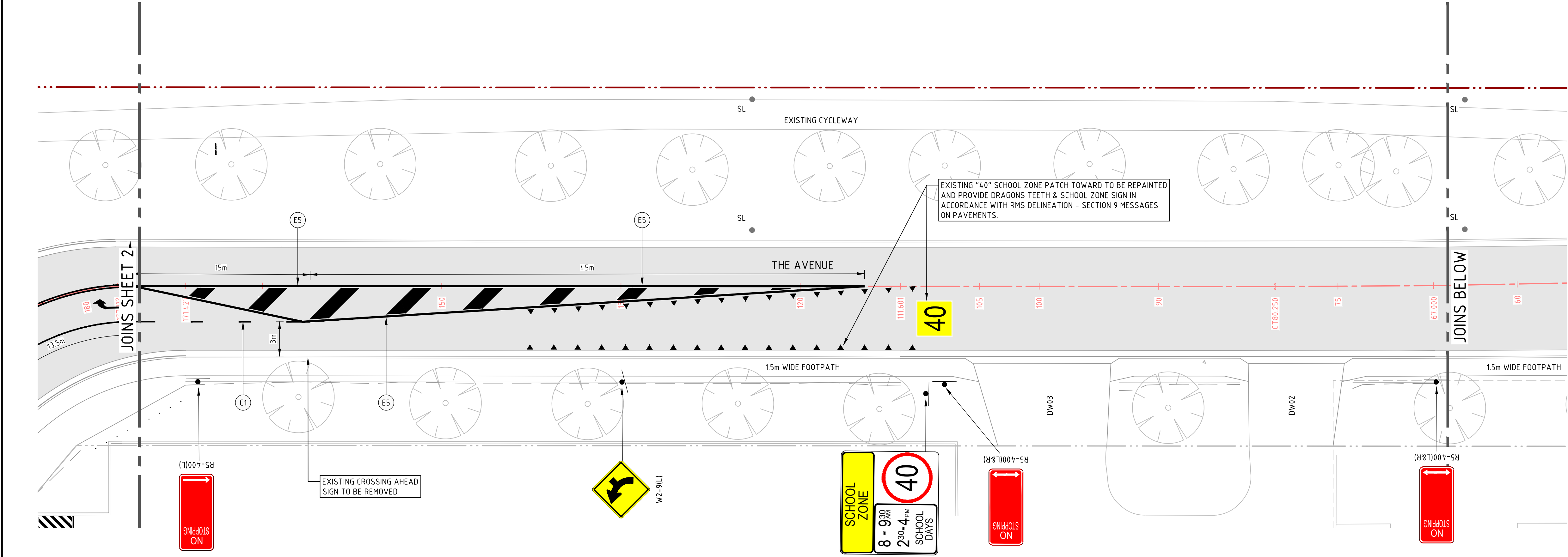
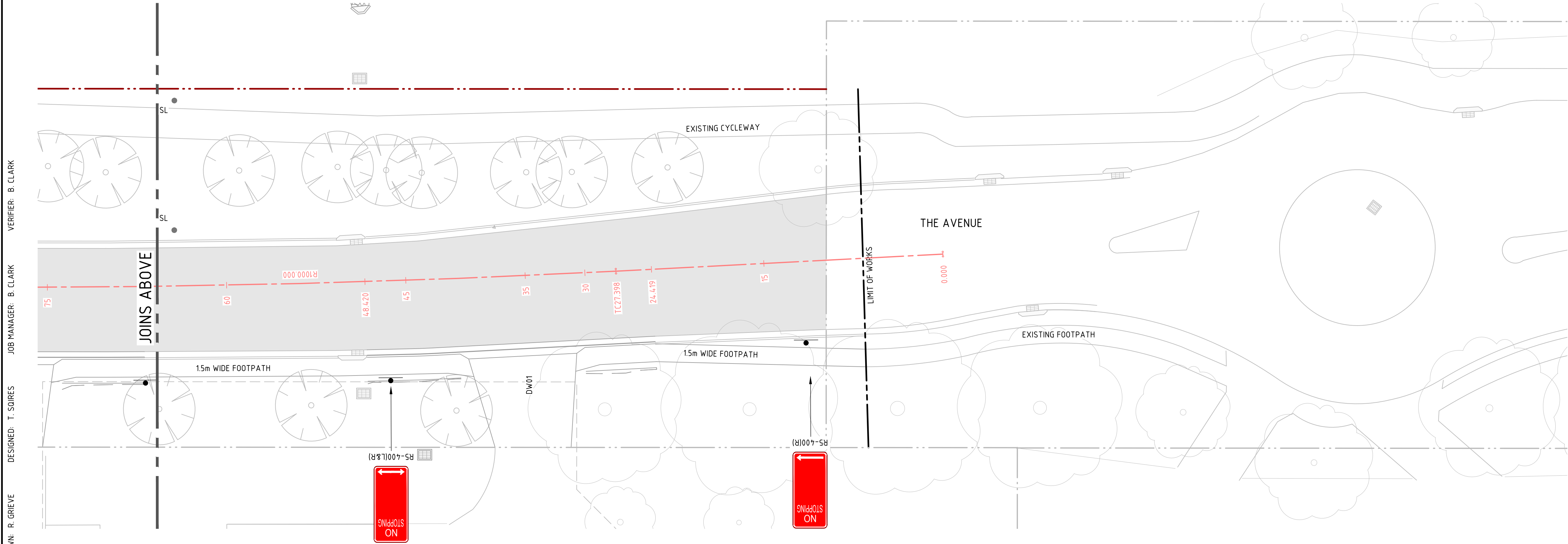
01-C08.02

DRAWING SHEET SIZE = A1

REVISION

2

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: T. SOIRES
DRAWN: R. GREVE



LEGEND

PROPOSED BOUNDARY

EXISTING BOUNDARY

eXX

EXISTING FEATURE (TYPE AS LABELLED)

ROAD LAYOUT

XX

LINEMARKING TAG

SIGN POST
TO CCC STD SD0913

SL

PROPOSED STREET LIGHT POLE.
PROPOSED SERVICES SUBJECT
TO CHANGE. REFER TO
CORRESPONDING DESIGN PLANS.

MC01

ROAD SETOUT CONTROL LINE

NOTES

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3.

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LINEMARKING DIMENSIONS IN ACCORDANCE WITH RMS DELINEATION GUIDE.

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	06.12.19
2	SCHOOL ZONE INFORMATION ADDED	TS	BC	BC	18.12.19
3	ISSUED FOR CONSTRUCTION APPROVAL	RG	BC	TS	04.02.20

NSW

GOVERNMENT

Hunter & Central Coast

Development Corporation

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ARCHITECT

SCALE 1:200@A1

0

2

4

6

8

10m

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Level 1, 215 Pacific Hwy, Charlestown NSW 2290

Ph (02) 4943 1777 Email newcastle@northrop.com.au

ABN 81 094 433 100

PROJECT

MT PENANG PARKLANDS
KARIONG NSW 2250

FESTIVAL DRIVE AND
THE AVENUE UPGRADE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SIGNAGE AND LINEMARKING PLAN
- SHEET 3

DRAWING NUMBER

NL191249

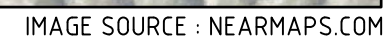
01-C08.03

DRAWING SHEET SIZE = A1

REVISION

3

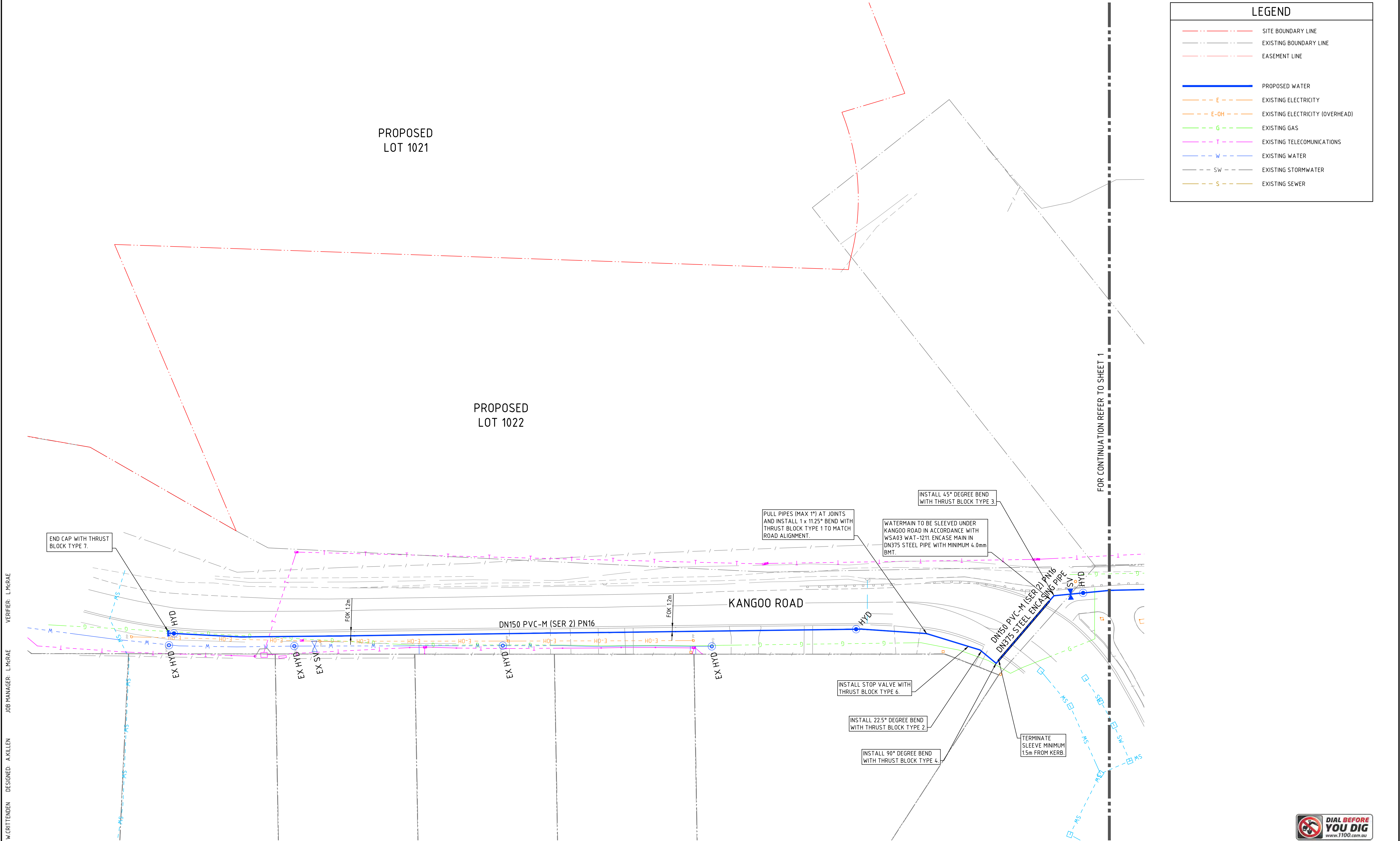
WATER RETICULATION WORKS CIVIL ENGINEERING PACKAGE



JOB NUMBER	
NL190249	
DRAWING NUMBER	REVISION
WAT-C01.01	2
DRAWING SHEET SIZE = A1	



VERIFIER: LMGRAE
JOB MANAGER: LMGRAE
DESIGNED: AKILLEN
DRAWN: W.CRITTENDEN




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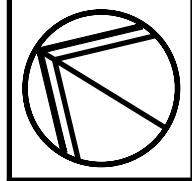
REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY ISSUE	WC		AK	21.10.19
2	ISSUED FOR APPROVAL	WC	LM	AK	06.12.19



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SCALE 1:500@A1





NORTHROP
Newcastle

Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT

MOUNT PENANG INDUSTRIAL ESTATE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

WATER RETICULATION PART PLAN - SHEET 2

JOB NUMBER

NL190249

DRAWING NUMBER

WAT-C03.02

REVISION

2

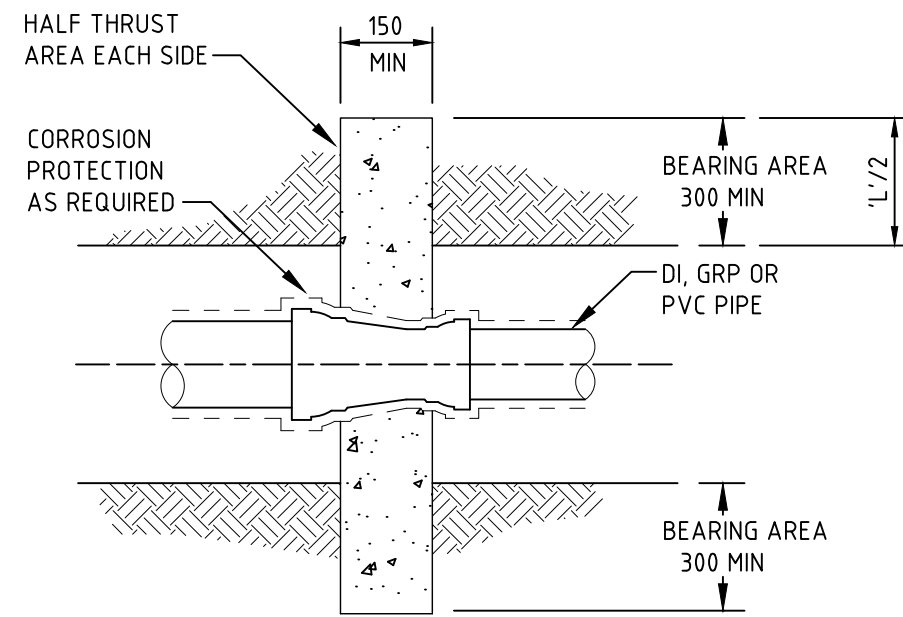
DRAWING SHEET SIZE = A1

1. CONCRETE THRUST BLOCKS ARE TO BE PROVIDED FOR ALL FITTINGS IN ACCORDANCE WITH THE TABLE BELOW.
2. THRUST BLOCK DIMENSIONS ARE BASED ON THE MINIMUM ALLOWABLE HORIZONTAL BEARING PRESSURES OF THE SOIL AS SHOWN IF GROUND CONDITIONS ENCOUNTERED INDICATE THAT THESE BEARING PRESSURES MAY NOT BE ACHIEVED THRUST BLOCK DESIGN TO BE REVISED.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
4. CAST THE THRUST AREA OF ALL THRUST BLOCKS AGAINST A CLEAN FACE OF UNDISTURBED NATURAL SOIL. THRUST BLOCKS NOT TO INTERFERE WITH OTHER SERVICES.
5. THE NOMINAL THRUST AREA 'N' TO BE ACHIEVED BY POURING CONCRETE THE FULL LENGTH OF THE FITTING AND EXTENDING FROM THE FLOOR OF THE TRENCH TO ABOVE THE FITTING (SEE ALSO NOTE 6).
6. FINISH THRUST BLOCKS APPROXIMATELY 100 ABOVE THE TOP OF THE FITTING OR BEARING PAD AND EXTEND TO THE FLOOR OF THE TRENCH OR DEEPER IF NECESSARY TO ACHIEVE THE REQUIRED THRUST AREA. MAXIMUM ENCASEMENT TO BE 180°.
7. WHEN POURING CONCRETE AGAINST FITTINGS PLACE A MEMBRANE OF POLYETHYLENE, PVC OR FELT BETWEEN THE FITTING AND CONCRETE TO PREVENT DAMAGE TO THE FITTING. JOINTS TO BE CLEAR OF CONCRETE.
8. CONCRETE THRUST BLOCKS TO BE GRADE S25 USING CEMENT TYPE "SR" TO AS3972. CONCRETE TO BE MECHANICALLY VIBRATED.
9. CONCRETE THRUST BLOCKS ARE TO BE CURED FOR A MINIMUM OF 7 DAYS BEFORE BEING SUBJECTED TO ANY THRUST LOAD.
10. REFER TO WAT-1205-V FOR GENERAL FITTING THRUST BLOCK ARRANGEMENTS
11. REFER TO WAT-1207-V FOR GENERAL VALVE THRUST BLOCK ARRANGEMENTS.

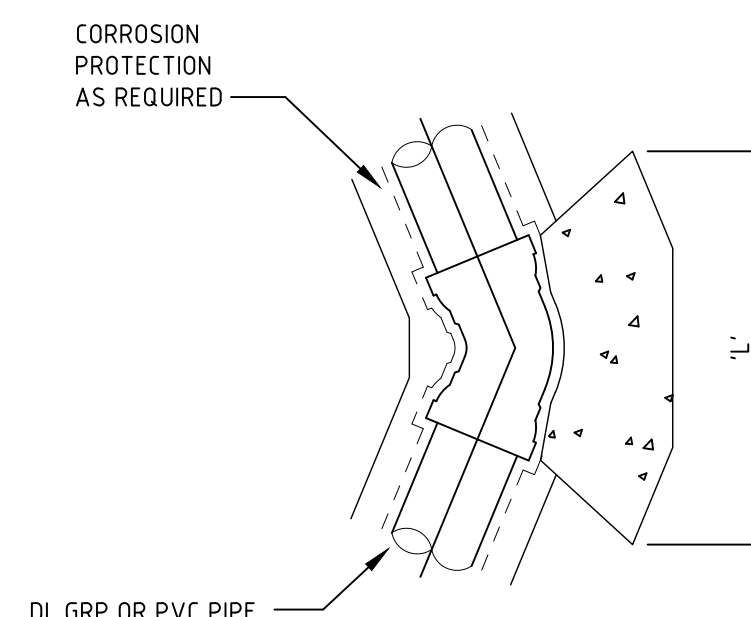
DESIGN AHBP - 50 KPA
DESIGN STP - 1000 KPA

THRUST BLOCK DETAILS						
NUMBER (#)	NOM DIA (DN mm)	FITTING	TA (m ² MIN)	L (m) MIN.	H (m) MIN.	W (m) MIN.
1	150	11.25" BEND	0.10	0.25	0.40	0.25
2	150	22.5" BEND	0.20	0.50	0.40	0.25
3	150	4.5" BEND	0.38	0.95	0.40	0.25
4	150	90° BEND	0.70	1.00	0.70	0.25
5	150	300-150 TAPER	1.37	1.45	0.95	0.25
6	150	STOP VALVE	0.50	XSV	XSV	0.25
7	150	END CAP	0.50	0.75	0.75	0.25

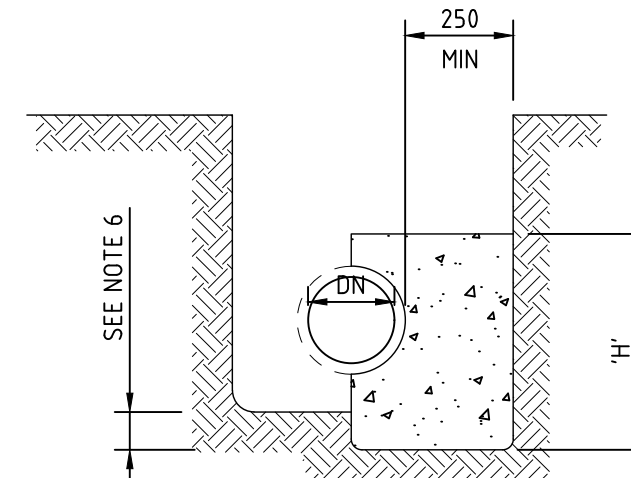
xSV - THRUST AREA TO BE ACHIEVED IN ACCORDANCE WITH STOP VALVE THRUST BLOCK DETAILS



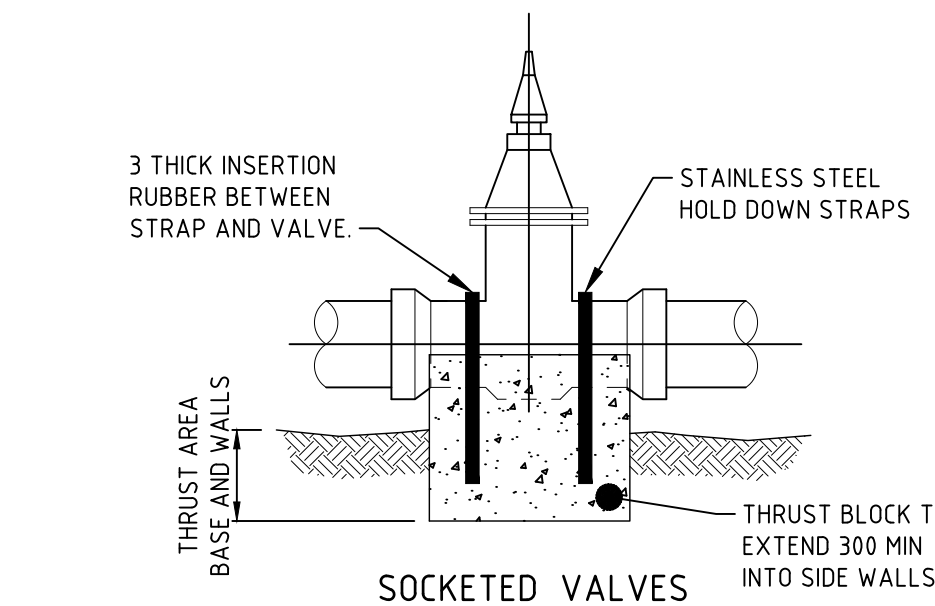
PLAN
(TYPE: TAPER)
TAPER THRUST BLOCK
(FOR HORIZONTAL THRUST)



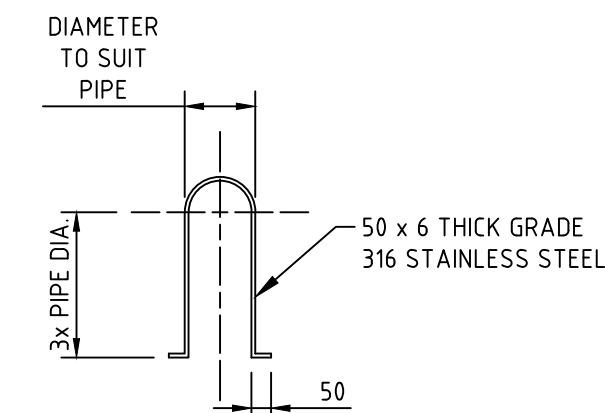
PLAN



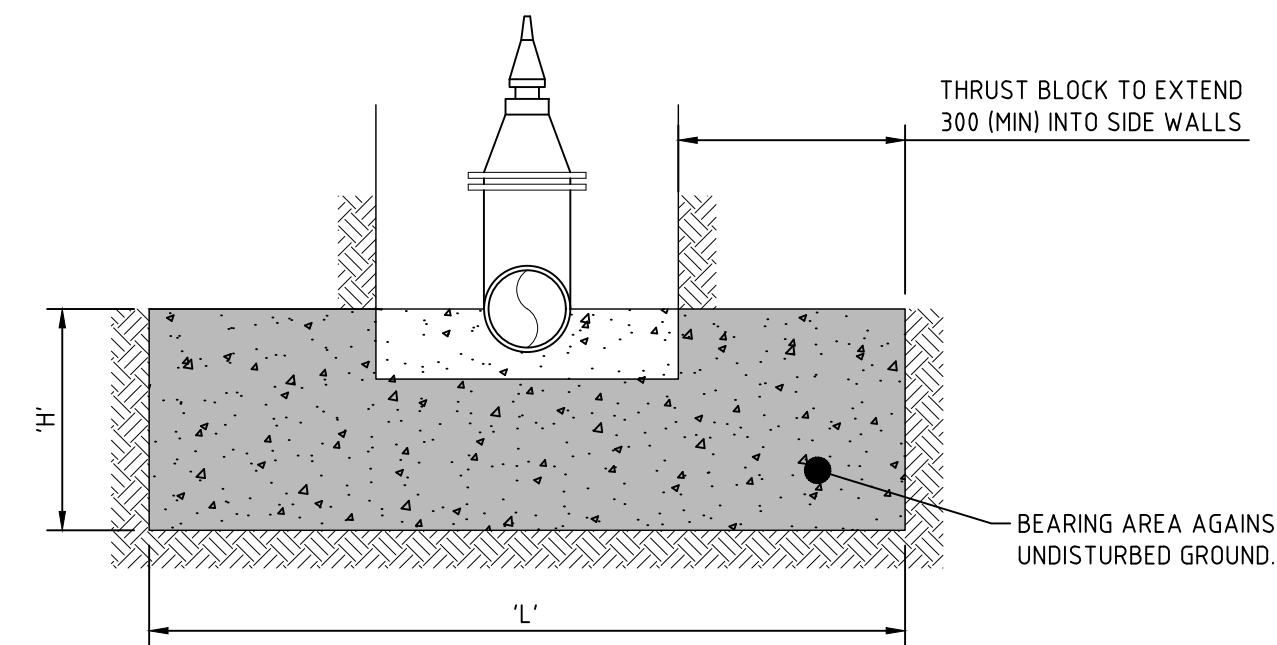
ELEVATION
(TYPE: BEND)
THRUST BLOCK FOR BENDS
(FOR HORIZONTAL THRUST)



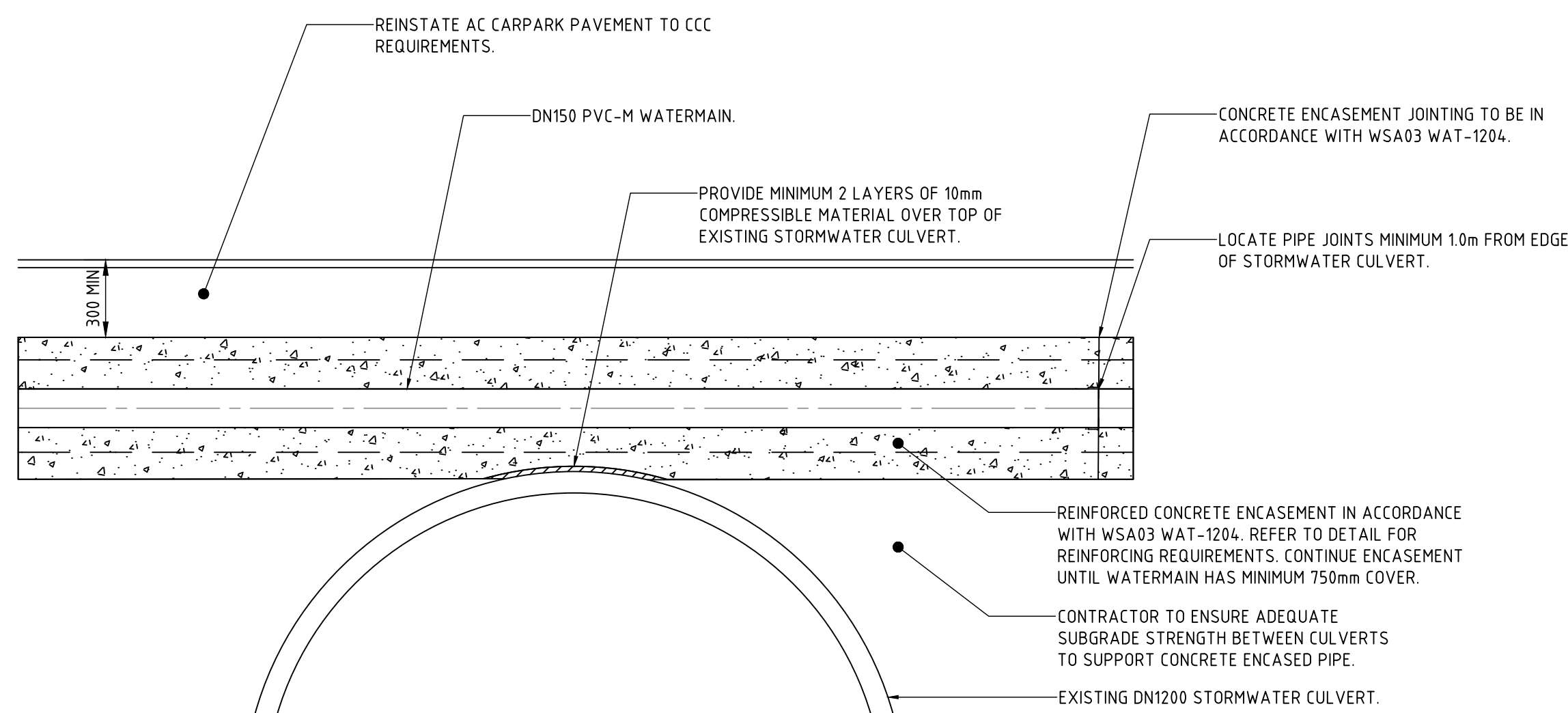
SOCKETED VALVES



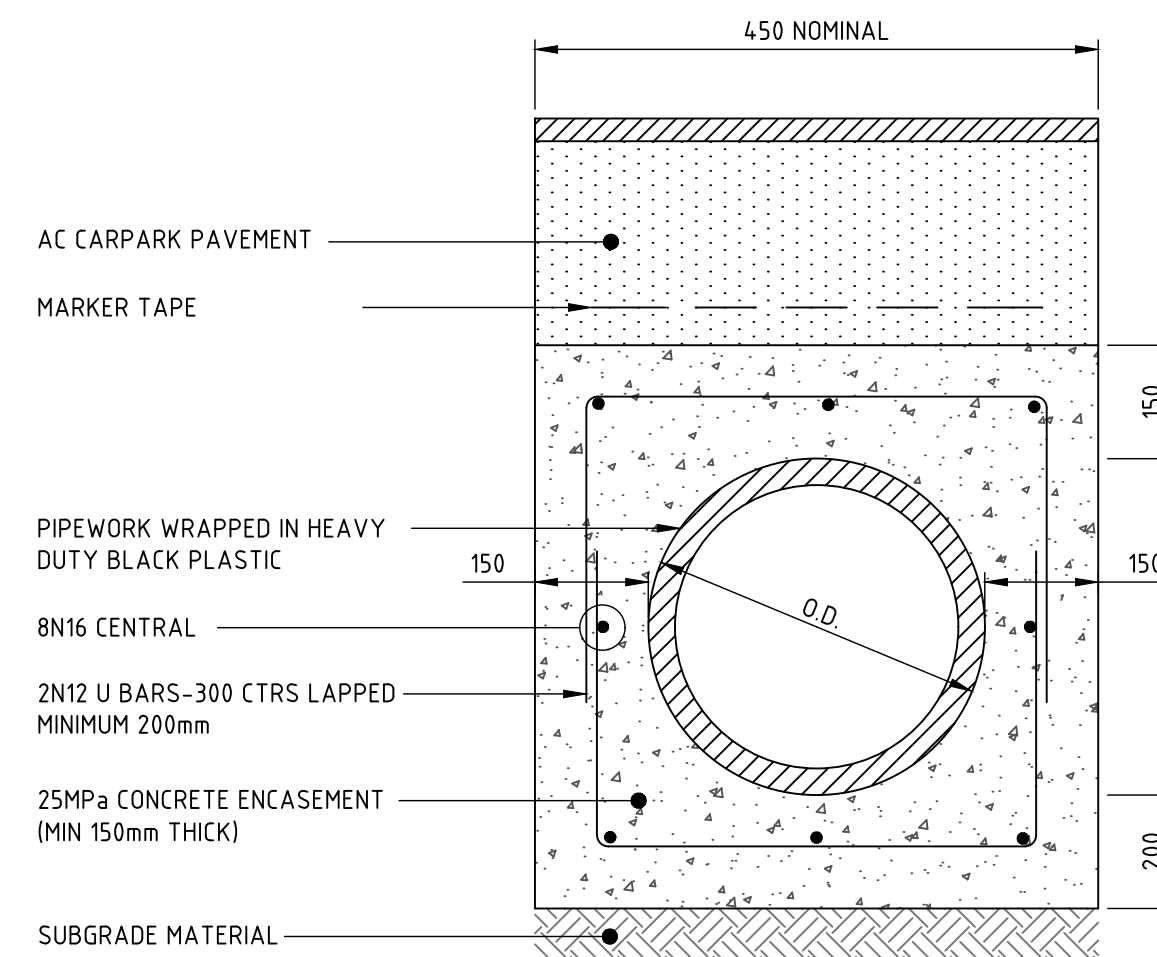
TYPICAL STAINLESS STEEL STRAP



END ELEVATION
SOCKETED VALVES
(TYPE: S.V.)
GATE/STOP VALVE THRUST BLOCK
(FOR HORIZONTAL THRUST)

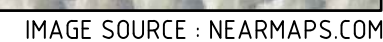


TYPICAL WATERMAIN ENCASEMENT OVER STORMWATER PIPE

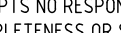





1. ENSURE 100mm MIN CLEARANCE IS ACHIEVED WHEN IN VICINITY OF EXISTING SERVICES.
2. PROVIDE 12mm THICK COMPRESSIBLE / DURABLE MEMBRANE AT FLEXIBLE JOINTS IN PIPE
3. ENSURE BACKFILLING COMPACTION MEETS CCC REQUIREMENTS FOR ROAD PAVEMENTS

SEWER RETICULATION WORKS CIVIL ENGINEERING PACKAGE

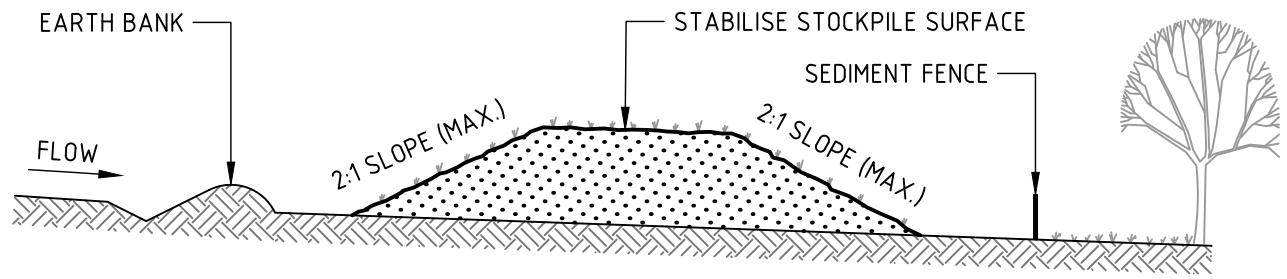


DWG No.	DRAWING TITLE
SEW-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
SEW-C02.01	EROSION AND SEDIMENT CONTROL PLAN AND DETAILS
SEW-C03.01	SEWER RETICULATION PART PLAN - SHEET 1
SEW-C03.02	SEWER RETICULATION PART PLAN - SHEET 2
SEW-C04.01	SEWER LONGITUDINAL SECTIONS - SHEET 1
SEW-C04.02	SEWER LONGITUDINAL SECTIONS - SHEET 2

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	AUTHORITY		PROJECT	DRAWING TITLE	JOB NUMBER
1	PRELIMINARY ISSUE	WC	LM	AK	21.10.19	 Hunter & Central Coast Development Corporation		 ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.	 NORTHROP Newcastle Suite 4, 215 Pacific Hwy, Charlestown NSW 2290 P.O. Box 180, Charlestown NSW 2290 Ph (02) 4943 1777 Fax (02) 4943 1577 Email newcastle@northrop.com.au ABN 81 094 433 100	CIVIL ENGINEERING PACKAGE	NL190249
2	ISSUED FOR APPROVAL	WC	LM	AK	06.12.19					COVER SHEET, DRAWING LIST AND LOCALITY PLAN	SEW-C01.01
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD				REVISION
											2
											DRAWING SHEET SIZE = A1



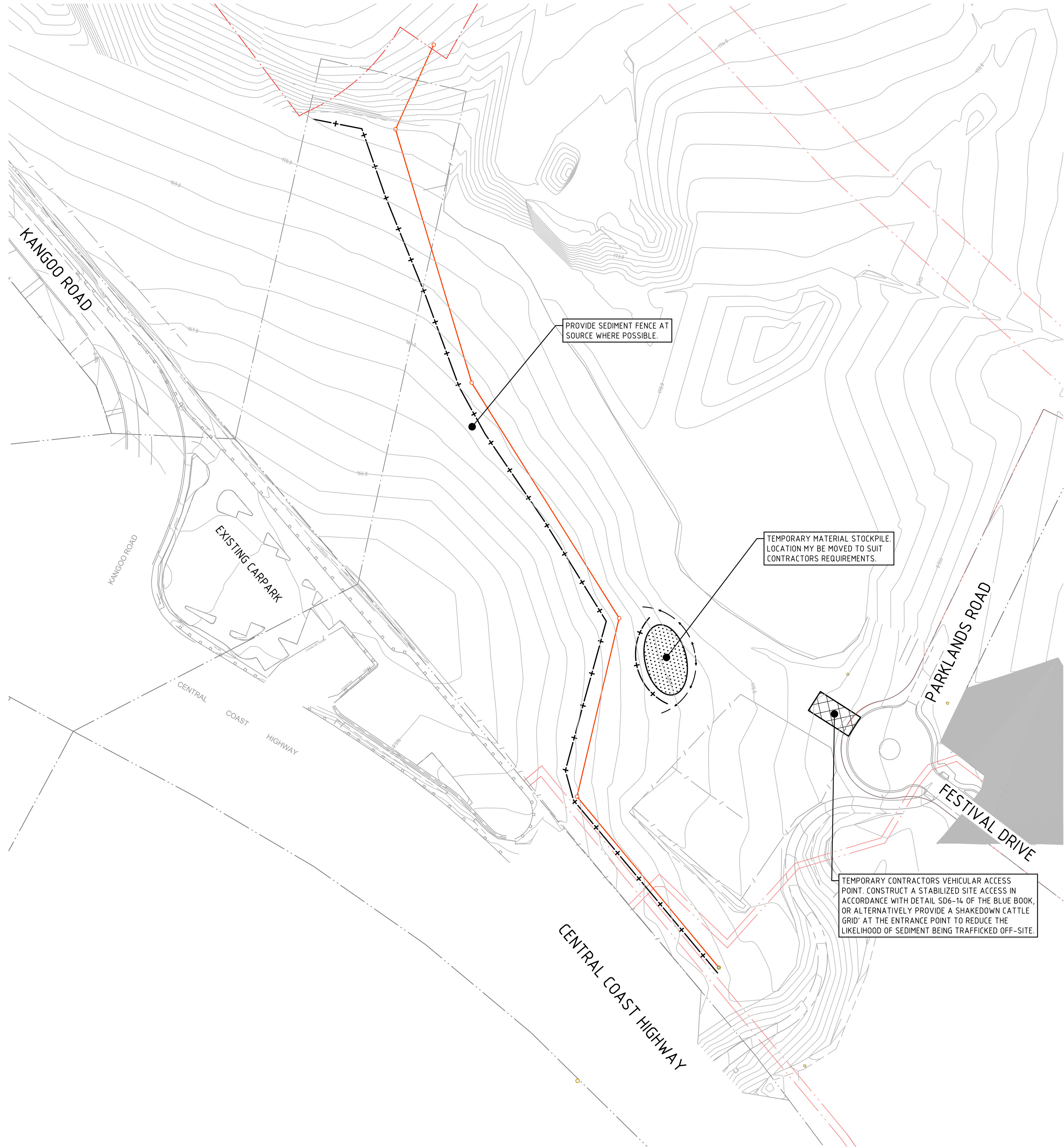
FOR APPROVAL - NOT FOR CONSTRUCTION



CONSTRUCTION NOTES

1. PLACE STOCKPILES MORE THAN 2m (PREFERABLY 5m) 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 2m 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 2m DOWNSLOPE.

STOCKPILES (SD 4-1)



LEGEND

- SITE BOUNDARY LINE
- EXISTING BOUNDARY LINE
- EASEMENT LINE
- EXISTING CONTOURS
- SEDIMENT FENCE REFER TO CCC SD0101
- DRAINAGE SWALE
- STABILISED CONSTRUCTION SITE ACCESS IN ACCORDANCE WITH CCC SD0101.
- STOCKPILE





EROSION AND SEDIMENT CONTROL NOTES:

1. DISTURBED AREAS TO BE KEPT TO A MINIMUM.
2. CONTROL CLEAN WATER FROM ABOVE THE SITE, THROUGH THE SITE OR AROUND THE SITE.
3. KEEP CLEAN WATER SEPARATE FROM DIRTY WATER.
4. CONSERVE ALL TOPSOIL, STOCKPILE AND PROTECT FOR RE-USE ON SITE.
5. PROTECT ALL DISTURBED AREAS FROM EROSION.
6. MINIMISE SEDIMENTATION.
7. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL COMPLETE REHABILITATION IS ACHIEVED.
8. EROSION/SEDIMENT CONTROL MEASURES TO CONFORM WITH EROSION AND SEDIMENT CONTROL PLAN FOR SUBDIVISION WORKS.

WARNING
UNLESS NOTIFIED TO THE CONTRARY IN WRITING, THE APPLICANT SHALL BE HELD RESPONSIBLE FOR ANY BREACHES OF THE PROTECTION OF ENVIRONMENT OPERATIONS ACT 1997. PLEASE NOTE: FAILURE TO IMPLEMENT OR MAINTAIN APPROPRIATE EROSION/SEDIMENT CONTROL MEASURES IS A BREACH OF THE ACT. SUCH A BREACH IS LIABLE FOR A ON-THE-SPOT FINE AND/OR PENALTY.

IT IS THE DEVELOPER'S RESPONSIBILITY TO OBTAIN WRITTEN CONSENT FROM ANY OTHER PROPERTY OWNERS AFFECTED BY THE WORKS. FAILURE TO DO SO SHALL VOID APPROVAL FROM COUNCIL TO CARRY OUT WORKS IDENTIFIED ON THIS PLAN.

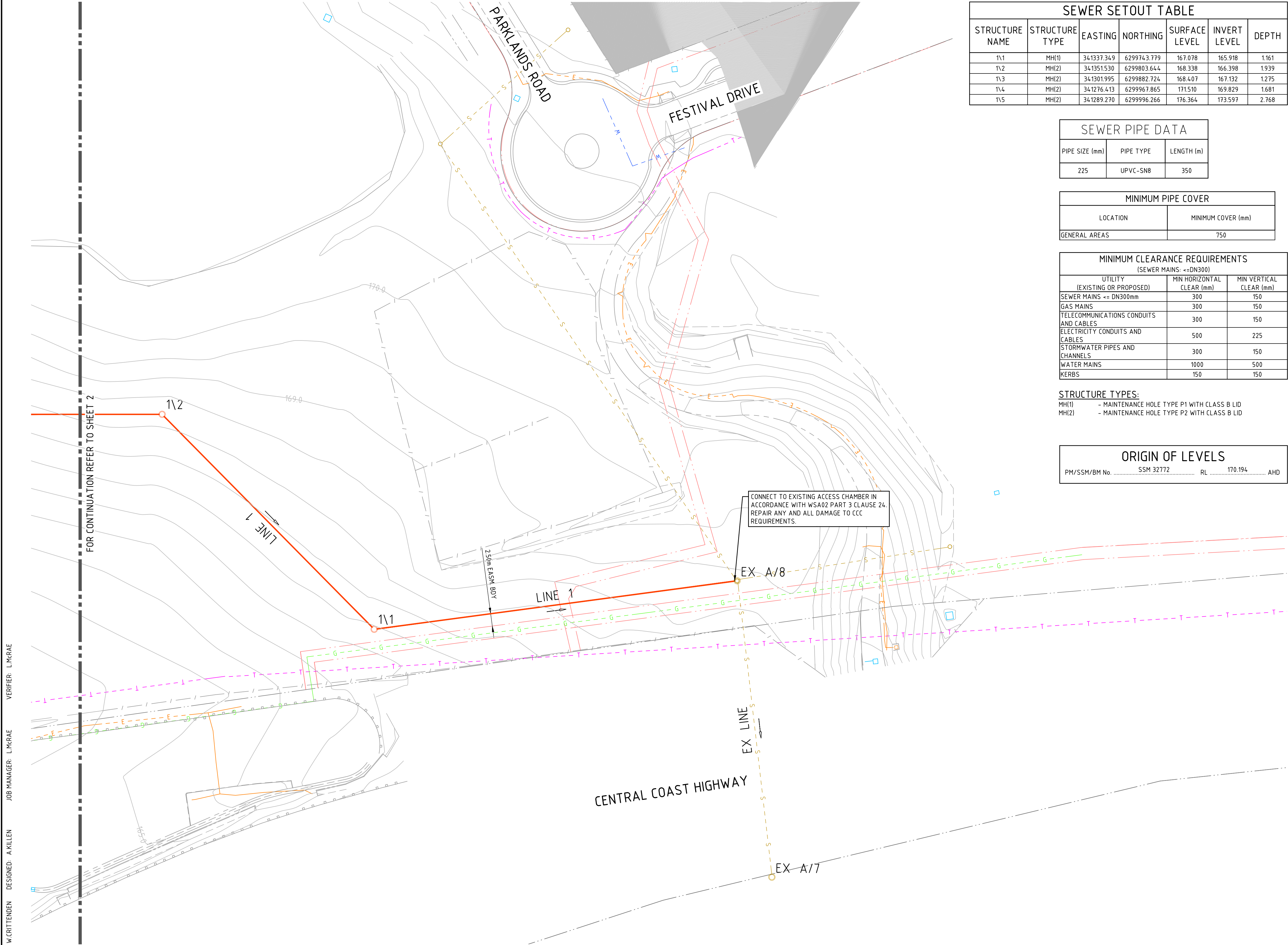
VERIFIER: LMGRAE
JOB MANAGER: LMGRAE
DESIGNED: AKILLEN
DRAWN: WCRITTENDEN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	AUTHORITY	SCALE	ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.	PROJECT	DRAWING TITLE	JOB NUMBER
1	PRELIMINARY ISSUE	WC	LM	AK	21.10.19	 		SCALE 1:800@A1	 <p>Suite 4, 215 Pacific Hwy, Charlestown NSW 2290 P.O. Box 180, Charlestown NSW 2290 Ph (02) 4943 1777 Fax (02) 4943 1577 Email newcastle@northrop.com.au ABN 81 094 433 100</p>	MOUNT PENANG INDUSTRIAL ESTATE	CIVIL ENGINEERING PACKAGE	NL190249
2	ISSUED FOR APPROVAL	WC	LM	AK	06.12.19							
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD				EROSION AND SEDIMENT CONTROL PLAN AND DETAILS	DRAWING NUMBER SEW-C02.01
												REVISION 2
DRAWING SHEET SIZE = A1												



FOR APPROVAL - NOT FOR CONSTRUCTION

DRAWN: W. CRITTENDEN
DESIGNED: A. KILLEN
JOB MANAGER: L. MCRAE
VERIFIER: L. MCRAE



SEWER SETOUT TABLE						
STRUCTURE NAME	STRUCTURE TYPE	EASTING	NORTHING	SURFACE LEVEL	INVERT LEVEL	DEPTH
1\1	MH(1)	34.1337.34.9	62.9974.3.77.9	167.078	165.918	1.161
1\2	MH(2)	34.1351.53.0	62.9980.3.64.4	168.338	166.398	1.939
1\3	MH(2)	34.1301.99.5	62.9988.2.72.4	168.407	167.132	1.275
1\4	MH(2)	34.1276.4.13	62.9996.7.86.5	171.510	169.829	1.681
1\5	MH(2)	34.1289.2.70	62.9999.6.26.6	176.364	173.597	2.768

SEWER PIPE DATA		
PIPE SIZE (mm)	PIPE TYPE	LENGTH (m)
225	UPVC-SN8	350

MINIMUM PIPE COVER	
LOCATION	MINIMUM COVER (mm)
GENERAL AREAS	750

MINIMUM CLEARANCE REQUIREMENTS (SEWER MAINS: <=DN300)		
UTILITY (EXISTING OR PROPOSED)	MIN HORIZONTAL CLEAR (mm)	MIN VERTICAL CLEAR (mm)
SEWER MAINS <= DN300mm	300	150
GAS MAINS	300	150
TELECOMMUNICATIONS CONDUITS AND CABLES	300	150
ELECTRICITY CONDUITS AND CABLES	500	225
STORMWATER PIPES AND CHANNELS	300	150
WATER MAINS	1000	500
KERBS	150	150

STRUCTURE TYPES:
MH(1) - MAINTENANCE HOLE TYPE P1 WITH CLASS B LID
MH(2) - MAINTENANCE HOLE TYPE P2 WITH CLASS B LID

ORIGIN OF LEVELS			
PM/SSM/BM No.	SSM 32772	RL	170.194
			AHD

LEGEND	
	SITE BOUNDARY LINE (PROPOSED)
	EXISTING BOUNDARY LINE
	EASEMENT LINE
	PROPOSED SEWER MAINTENANCE STRUCTURE
	PROPOSED SEWER MAIN
	EXISTING ELECTRICITY
	EXISTING ELECTRICITY (OVERHEAD)
	EXISTING GAS
	EXISTING TELECOMMUNICATIONS
	EXISTING WATER
	EXISTING STORMWATER
	EXISTING SEWER
	EXISTING CONTOURS

CONSTRUCTION NOTES - SEWER

- ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL'S "ADDENDUMS AND SYDNEY WATER EDITION OF THE WSAA SEWER CODE".
- CONTRACTORS SHALL ENSURE ALL EMPLOYEES HAVE APPROPRIATE CERTIFICATION PRIOR TO COMMENCING WORKS.
- THE CONTRACTOR SHALL SUPPLY THE FOLLOWING TO CENTRAL COAST COUNCIL.
 - CONSTRUCTION SCHEDULE IN BAR FORM WITH COMMENCEMENT AND COMPLETION DATES TWO (2) WEEKS PRIOR TO COMMENCEMENT.
 - A MATERIALS LIST.
 - COPY OF CONTRACTORS' INDEMNITY INSURANCE POLICY.
 - NAME AND DETAILS OF THE NOMINATED NATA ACCREDITED PIPE TESTER.
- MANHOLE (GATIC) LIDS ARE TO BE TYPE "B" OR TYPE "D" AS NOTED AND TO CONFORM TO FINISHED ROAD AND FOOTPATH LEVELS WHERE APPLICABLE.
- THE LOCATION OF ANY UNDERGROUND SERVICES, INCLUDING ELECTRICAL, COMMUNICATIONS, GAS, EXISTING SEWER RISING MAINS, WATER AND SEWER MAINS AND WATER SERVICES, TO BE DETERMINED PRIOR TO UNDERTAKING ANY EXCAVATION.
- SEWER JUNCTIONS ARE TO BE INSTALLED TO SERVICE EACH LOT AS NOTED ON DESIGN DRAWINGS, AND LOCATION AND DEPTH OF JUNCTION TO BE SHOWN ON WAE PLAN.
- COUNCIL TO BE NOTIFIED PRIOR TO BACKFILLING TO ENABLE INSPECTION TO BE CARRIED OUT.
- NOTICE OF COMMENCEMENT:** AT LEAST TWO (2) WEEKS PRIOR TO COMMENCEMENT OF THE WORKS THE DIRECTOR WATER AND SEWERAGE SHALL RECEIVE WRITTEN NOTICE OF INTENTION TO COMMENCE WORK, AND SHALL BE SUPPLIED WITH THE NAME OF THE SUPERVISING ENGINEER OR SURVEYOR, AND THE CONTRACTOR. IF WORK HAS TO CEASE FOR A PERIOD OF SEVEN (7) DAYS OR LONGER THE DIRECTOR WATER AND SEWERAGE SHALL BE NOTIFIED WITH AT LEAST TWO (2) WORKING DAYS NOTICE, WHEN WORK WILL RECOMMENCE.
- WORK-AS-EXECUTED DETAILS. SPECIFIC LINE NUMBERING DETAILS SHOULD BE OBTAINED FROM CENTRAL COAST COUNCIL, WATER SEWERAGE DESIGN OFFICE, TELEPHONE: (02) 4325 8327/(02) 4325 8820 PRIOR TO SUBMISSION OF WORK-AS-EXECUTED PLANS TO ALLEVIATE FUTURE AMENDMENTS TO THE WORK-AS-EXECUTED DRAWINGS. WORK-AS-EXECUTED DETAILS OF ALL WORK CARRIED OUT SHALL BE PREPARED AND SUBMITTED IN A MANNER APPROVED BY THE DIRECTOR WATER AND SEWERAGE AND SHALL BE CERTIFIED BY A REGISTERED SURVEYOR OR CONSULTING ENGINEER AS BEING A TRUE AND CORRECT RECORD OF THE WORK CARRIED OUT. THE ABOVEMENTIONED DETAILS SHALL BE SUBMITTED TO THE DIRECTOR WATER AND SEWERAGE PRIOR TO CARRYING OUT OF THE ACCEPTANCE TEST. COUNCIL WILL NOT COMMISSION THE WORK UNTIL WAE DETAILS ARE SUBMITTED. ANY AMENDMENTS TO THE APPROVED DESIGN DRAWINGS SHOWN ON THE WAE PLAN MUST BE DESCRIBED ON A COUNCIL REDESIGN FORM AND SIGNED BY THE DIRECTOR WATER AND SEWERAGE. A RESUBMISSION FEE, MINIMUM OF \$100, IS PAYABLE IN THE EVENT OF COUNCIL REQUIRING RESUBMISSION OF THE WAE PLANS.
- ORIGINAL JUNCTION SHEETS ARE TO BE SUBMITTED WITH WAE PLANS.
- INTERALLOTMENT DRAINAGE TO BE SHOWN ON SEWER WAE PLANS.
- MANHOLES AND DEAD ENDS TO BE TIED INTO TWO (2) PROPERTY BOUNDARIES AND SHOWN ON WAE PLANS.
- EROSION/SEDIMENTATION CONTROL TO CONFORM TO COUNCIL'S CODE OF PRACTICE.
- IT IS THE DEVELOPER'S RESPONSIBILITY TO OBTAIN WRITTEN CONSENT FROM ANY OTHER PROPERTY OWNERS AFFECTED BY THE WORKS. FAILURE TO DO SO SHALL VOID APPROVAL FROM COUNCIL TO CARRY OUT WORKS IDENTIFIED ON THIS PLAN.
- DEVELOPMENT CONSTRUCTED NEAR OR OVER THE SEWER MAIN AND/OR ADJACENT TO COUNCIL'S WATER MAIN SHALL COMPLY WITH COUNCIL'S GUIDELINES FOR 'BUILDING OVER OR NEAR COUNCIL SEWER AND WATER MAINS'.
- LAY PIPE IN ACCORDANCE WITH SUPPORT TYPE AS SHOWN ON LONG SECTION AND SEW-1251-S STANDARD TRENCH DETAILS.
- CONSTRUCT ALL MAINTENANCE HOLES IN ACCORDANCE WITH:
 - LONG SECTION LEVELS.
 - SEW-1300-V TYPE P1 OR TYPE P2 AS DOCUMENTED.
 - ALL COMPONENT JOINTS TO BE SEALED AS PER SEW-1300-V NOTE 11.
 - SEW-1302-V PIPE CONNECTIONS.
 - SEW-1303-V CHANNEL LEVELS AND EXTERNAL DROPS.
 - SEW-1304-V / SEW-1305-V CHANNEL ARRANGEMENTS.
 - SEW-1308-V COVER ARRANGEMENTS.



FOR APPROVAL - NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	PRELIMINARY ISSUE	WC	LM	AK	21.10.19
2	ISSUED FOR APPROVAL	WC	LM	AK	06.12.19

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SCALE 1:400@A1

Newcastle

Suite 4, 215 Pacific Hwy, Charlestown NSW 2290
P.O. Box 180, Charlestown NSW 2290
Ph (02) 4943 1777 Fax (02) 4943 1577
Email newcastle@northrop.com.au ABN 81 094 433 100

PROJECT

MOUNT PENANG
INDUSTRIAL ESTATE

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SEWER RETICULATION
PART PLAN - SHEET 1

JOB NUMBER

NL190249

DRAWING NUMBER

SEW-C03.01

REVISION


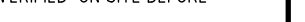



2

DRAWING SHEET SIZE = A1

TENURE		HCCDC LAND	
PIPE SIZE	225-UPVC SN8	225-UPVC SN8	
GRADE	3.00%	11.92%	
BEDDING TYPE	4 - REFER TO NOTE	4 - REFER TO NOTE	
BULKHEAD SPACING	-	8 m	
DATUM R.L.	154.0	88.90	31.18
DEPTH TO INVERT	1.275 1.245	1.680 1.630	2.770
INVERT LEVEL	167.130 167.160	169.830 169.880	173.595
FINISHED SURFACE	168.405	171.510	176.365
NATURAL SURFACE	168.255	171.510	176.365
CHAINAGE	229.450	318.350	349.525

DRAWN: W.CRITTENDEN	DESIGNED: A.KILLEN	JOB MANAGER: L.McRAE	VERIFIER: L.McRAE
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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	AUTHORITY	<div>  <p> NORTHROP Newcastle Suite 2, 215 Pacific Hwy, Charlestown NSW 2290 P.O. Box 180, Charlestown NSW 2290 Ph (02) 4943 1777 Fax (02) 4943 1577 Email newcastle@northrop.com.au ABN 81 094 433 100 </p> </div>	PROJECT	DRAWING TITLE	JOB NUMBER
1	PRELIMINARY ISSUE	WC	LM	AK	21.10.19	<div>  <p> Hunter & Central Coast Development Corporation </p> </div>	<div>  <p> Central Coast Council </p> </div>	<div>  <p> NORTHROP Newcastle Suite 2, 215 Pacific Hwy, Charlestown NSW 2290 P.O. Box 180, Charlestown NSW 2290 Ph (02) 4943 1777 Fax (02) 4943 1577 Email newcastle@northrop.com.au ABN 81 094 433 100 </p> </div>	MOUNT PENANG INDUSTRIAL ESTATE	CIVIL ENGINEERING PACKAGE	NL190249
2	ISSUED FOR APPROVAL	WC	LM	AK	06.12.19			<div>  <p> NORTHROP Newcastle Suite 2, 215 Pacific Hwy, Charlestown NSW 2290 P.O. Box 180, Charlestown NSW 2290 Ph (02) 4943 1777 Fax (02) 4943 1577 Email newcastle@northrop.com.au ABN 81 094 433 100 </p> </div>		SEWER RETICULATION LONGITUDINAL SECTION - SHEET 2	<div> <div>DRAWING NUMBER</div> <div>SEW-C04.02</div> </div> <div> <div>REVISION</div> <div>2</div> </div>
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD	<div> <div>SCALE 1:500 @ A1</div> <div>0 5 10 15 20 25m</div> </div> <div> <div>SCALE 1:100 @ A1</div> <div>0 1 2 3 4 5m</div> </div>			DRAWING SHEET SIZE = A1

MT PENANG PARKLANDS

LOT 1021 INTER-ALLOTMENT DRAINAGE CIVIL ENGINEERING PACKAGE



NOTE: ALL CIVIL ENGINEERING CONSTRUCTION WORKS TO BE CARRIED OUT IN ACCORDANCE WITH CENTRAL COAST COUNCIL (CCC) DEVELOPMENT GUIDELINES . READ IN CONJUNCTION WITH THE NOTES PROVIDED BELOW. IF CONFLICT ARISE , CENTRAL COAST COUNCIL (CCC) GUIDELINES AND SPECIFICATIONS TAKE PRECEDENCE. WHERE CENTRAL COAST COUNCIL (CCC) GUIDELINES AND SPECIFICATIONS ARE SILENT, THE SPECIFICATION NOTES BELOW TAKE PRECEDENCE

GENERAL	
1.	ALL WORKS TO BE IN ACCORDANCE WITH RELEVANT LOCAL COUNCIL SPECIFICATIONS, REGULATORY AUTHORITIES SPECIFICATIONS, ENGINEERING DRAWINGS AND NOTES, AUSTRALIAN STANDARDS, LANDCOM AND EPA SPECIFICATIONS AND THE LATEST VERSION OF NATSPEC SPECIFICATIONS. CONFLICTS BETWEEN THE ABOVE DOCUMENT SHALL BE REFERRED TO THE SUPERINTENDENT FOR DIRECTION.
2.	ALL CIVIL ENGINEERING DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS AND SPECIFICATION DOCUMENTATION, NAMELY LANDSCAPE.
3.	THE CONTRACTOR IS TO DESIGN, OBTAIN APPROVALS AND CARRY OUT REQUIRED TEMPORARY TRAFFIC CONTROL PROCEDURES BEFORE AND DURING CONSTRUCTION IN ACCORDANCE WITH ALL REGULATORY AUTHORITIES, INCLUSIVE OF LOCAL COUNCILS AND STATE AUTHORITIES AS REQUIRED.
4.	THE CONTRACTOR IS TO OBTAIN ALL AUTHORITY APPROVALS AS REQUIRED PRIOR TO COMMENCEMENT OF WORKS.
5.	RESTORE ALL PAVED, COVERED, GRASSED AND LANDSCAPED AREAS TO THEIR ORIGINAL CONDITION OR AS DIRECTED BY THE SITE SUPERINTENDENT ON COMPLETION OF ALL AND ANY WORKS. WHERE PLANTING OF NEW GRASS IS NECESSARY REFER TO LANDSCAPE ARCHITECT AND / OR ARCHITECT DOCUMENTATION.
6.	THE CONTRACTOR SHALL ARRANGE ALL SURVEY SETOUT TO BE CARRIED OUT BY A REGISTERED SURVEYOR PRIOR TO COMMENCEMENT OF WORKS.
7.	THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND EXISTING LEVELS ONSITE PRIOR TO LODGMET OF TENDER AND ONSITE WORKS. THE PRICE AS TENDERED SHALL BE INCLUSIVE OF ALL WORKS SHOWN ON THE TENDER PROJECT DRAWINGS. ADDITIONAL PAYMENTS FOR WORKS SHOWN ON THE TENDER PROJECT DRAWINGS WILL NOT BE APPROVED.
8.	DO NOT OBTAIN DIMENSIONS BY SCALING DRAWINGS.
9.	IN CASE OF DOUBT OR DISCREPANCY REFER TO SUPERINTENDENT FOR CLARIFICATION OR CONFIRMATION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
10.	WHERE NEW WORKS ABUT EXISTING SURFACES AND INFRASTRUCTURE, THE CONTRACTOR SHALL ENSURE THAT A SMOOTH EVEN PROFILE, FREE FROM ABRUPT CHANGES IS OBTAINED. MAKE SMOOTH TRANSITION TO EXISTING FEATURES AND MAKE GOOD WHERE JOINED.
11.	ALL CIVIL ENGINEERING DESIGN HAS BEEN DOCUMENTED UNDER THE ASSUMPTION THAT ALL NECESSARY SITE CONTAMINATION REMEDIATION WORKS HAVE BEEN SATISFACTORILY COMPLETED (IF APPLICABLE) AND THAT THE SITE IS NOT AFFECTED BY ANY SOIL STRATA OR GROUNDWATER TABLE CONTAMINATION.
12.	ORIGIN OF LEVELS SHOWN ON THE FOLLOWING DRAWINGS ARE ASSUMED TO BE TO AUSTRALIAN HEIGHT DATUM (AHD) AS PROVIDED BY SURVEY DATA. THE CONTRACTOR IS TO CONFIRM ALL LEVELS AND HEIGHT DATA PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
13.	ALL WORK SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE DETAILS SHOWN ON THE DRAWINGS AND THE DIRECTIONS OF THE SUPERINTENDENT.
14.	THE CONTRACTOR IS TO PROVIDE TEMPORARY DIVERSION DRAINS AND MOUNDS AS REQUIRED TO ENSURE THAT AT ALL TIMES EXPOSED SURFACES ARE FREE DRAINING AND WHERE NECESSARY EXCAVATE SUMPS AND PROVIDE PUMPING EQUIPMENT TO DRAIN EXPOSED AREAS.
15.	ANY AND ALL DAMAGE TO EXISTING INFRASTRUCTURE AND/OR PAVEMENTS SHALL BE REPORTED TO THE SUPERINTENDENT AND SHALL BE REPAIRED AND MADE GOOD BY THE CONTRACTOR TO MATCH NEATLY AND FLUSH TO EXISTING AT NO EXTRA COST TO THE PRINCIPAL OR NORTHPROP CONSULTING ENGINEERS.
16.	THE CONTRACTOR IS TO ENSURE ALL FINISHED SURFACE LEVELS DRAIN TOWARDS THE PROPOSED STORMWATER SYSTEM AND NO AREAS POND/HOLD WATER.
17.	THE CONTRACTOR SHALL ENSURE COUNCIL ASSETS AND UTILITIES ARE PROTECTED AT ALL TIMES. ANY AND ALL DAMAGE TO COUNCIL ASSETS AND/OR UTILITIES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF COUNCIL AND THE UTILITIES AUTHORITY AND AT NO COST TO THE PRINCIPAL OR NORTHPROP CONSULTING ENGINEERS.

EROSION AND SEDIMENTATION CONTROL NOTES	
1.	ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION, LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2.	THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3.	INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4.	ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5.	INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6.	ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7.	THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8.	ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9.	STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10.	CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11.	ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12.	PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13.	ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.

STORMWATER	
1.	ALL CONCRETE PIPES SHALL BE CLASS 2 RUBBER-RING JOINTED RCP U.N.O. ALL uPVC PIPES ARE TO BE SOLVENT WELD- JOINTED SEWER GRADE PIPES WITH THE FOLLOWING PIPE CLASS TO BE ADOPTED U.N.O.
1.1.	ø100mm OR LESS TO BE CLASS 'SN10'
1.2.	ø150mm AND ABOVE TO BE CLASS 'SN8'.
2.	FRC PIPES EQUAL TO THAT OF THE STEEL REINFORCED CONCRETE PIPE CLASS SPECIFIED ON THE DRAWINGS MAY BE USED SUBJECT TO APPROVAL FROM THE SUPERINTENDENT.
3.	ALL PIPE ARE TO BE LAID AT 10% MIN GRADE U.N.O. ALL
4.	ALL STORMWATER INLET PITS SHOWN ON THE CIVIL ENGINEERING DRAWINGS SHALL BE CAST IN-SITU REINFORCED CONCRETE PITS (U.N.O.). THE USE OF PRE-CAST CONCRETE STORMWATER DRAINAGE PITS ARE TO BE CONFIRMED AND APPROVED BY THE SUPERINTENDENT AND NORTHPROP CONSULTING ENGINEERS PRIOR TO THEIR PURCHASE AND INSTALLMENT ON SITE (U.N.O.)
5.	PIT COVERS
5.1.	USE HOT DIPPED GALVANISED COVERS AND GRATES COMPLYING WITH RELEVANT COUNCIL AND AUSTRALIAN STANDARDS U.N.O.
5.2.	ALL COVERS AND GRATES TO BE POSITION IN A FRAME AND MANUFACTURED AS A UNIT TO THE MINIMUM LOAD CLASS SPECIFIED.
5.3.	ALL COVERS AND GRATES TO BE FITTING WITH POSITIVE COVER LIFTING KEYS
5.4.	OBTAIN SUPERINTENDENTS APPROVAL FOR THE USE OF CAST IRON SOLID COVERS AND GRATES (U.N.O.). CAST IRON SOLID COVERS (IF APPROVED) TO CONSIST OF CROSS-WEBBED, CELLULAR CONSTRUCTION WITH THE RIBS UPPERMOST TO ALLOW INFILLING WITH CONCRETE. INSTALL POSITIVE COVER LIFTING KEYS AND PLASTIC PLUGS.
5.5.	UNLESS DETAILED OR SPECIFIED OTHERWISE, COVERS AND GRATES TO BE CLASS 'D' IN VEHICULAR PAVEMENTS AND CLASS 'B' ELSEWHERE.
5.6.	ALL GRATED TRENCH DRAINS SHOULD BE 'CLASS D' CAST IRON WITHIN VEHICULAR PAVEMENTS AND CLASS 'B' HEEL SAFE WITHIN PEDESTRIAN PAVEMENTS.
6.	THE CONTRACTOR IS TO ENSURE A SMOOTH TRANSITION BETWEEN ADJACENT PAVEMENT SURFACES AND STORMWATER PIT COVERS/GRATES
7.	ALL PIPE BENDS, JUNCTIONS, ETC ARE TO BE PROVIDED USING PURPOSE MADE FITTINGS OR STORMWATER PITS.
8.	ALL CONNECTIONS TO EXISTING DRAINAGE STRUCTURES SHALL BE MADE IN A TRADESMAN-LIKE MANNER AND CEMENT RENDERED TO ENSURE A SMOOTH, WATER TIGHT FINISH.
9.	STORMWATER PIPEWORK TO FINISH FLUSH WITH INTERNAL PIT WALLS AND MUST NOT PROTRUDE. CONNECTION TO BE NEATLY RENDER AND MADE NEAT.

STORMWATER	
10.	THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL FITTINGS AND SPECIALS INCLUDING VARIOUS PIPE ADAPTORS TO ENSURE PROPER CONNECTION BETWEEN DISSIMILAR PIPEWORK.
11.	U.N.O. MATERIAL USED FOR BEDDING OF PIPES SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED AND FREE OF ORGANIC AND CLAY MATERIAL.
12.	WHERE TRENCHES ARE IN ROCK, THE PIPE SHALL BE BEDDED ON A MIN 50mm CONCRETE BED (OR 75mm THICK BED OF 12mm BLUE METAL) UNDER THE BARREL OF THE PIPE. THE PIPE COLLAR AT NO POINT SHALL BEAR ON THE ROCK.
13.	MATERIAL USED FOR ALL PIPE BEDDING AND BACK FILL SHALL BE APPROVED NON-COHESIVE GRANULAR MATERIAL HAVING A HIGH PERMEABILITY AND HIGH STABILITY WHEN SATURATED, BE FREE FROM ORGANIC AND CLAY MATERIAL AND COMPLY WITH THE CURRENT VERSION OF AS3725. PIPE BEDDING SHALL BE TYPE HS2 U.N.O. UNDER ROADS AND H2 UNDER GENERAL AREAS U.N.O. AND BE IN ACCORDANCE WITH THE CURRENT VERSION OF AS3725.
14.	THE CONTRACTOR SHALL ENSURE AND PROTECT THE INTEGRITY OF ALL STORMWATER PIPES DURING CONSTRUCTION. ANY AND ALL DAMAGE TO THESE PIPES AS A RESULT OF THESE WORKS SHALL BE REPAIRED BY THE CONTRACTOR UNDER THE DIRECTION OF THE SUPERINTENDENT AND AT NO EXTRA COST.
SUBSOIL DRAINAGE	
15.	ALL SUBSOIL DRAINAGE LINES ARE TO BE ø100mm WITH NON-WOVEN GEOTEXTILE FILTER SOCK SURROUND SHALL BE CONNECTED TO A STORMWATER DRAINAGE PIT (AT MIN 1% LONGITUDINAL GRADE) AND PROVIDED IN THE FOLLOWING LOCATIONS;
15.1.	THE HIGH SIDE OF PROPOSED TRAFFICED PAVEMENT AREAS.
15.2.	ALL PLANTER AND TREE BEDS PROPOSED ADJACENT TO PAVEMENT AREAS.
15.3.	BEHIND RETAINING WALLS (IN ACCORDANCE WITH RETAINING WALL DETAILS).
15.4.	ALL OTHER AREAS SHOWN ON DRAWINGS.
16.	PROVIDE 3.0m LENGTH OF ø100 SUBSOIL DRAINAGE LINE WRAPPED IN NON-WOVEN GEOTEXTILE FILTER FABRIC TO THE UPSTREAM SIDE OF STORMWATER PITS AND HEADWALLS, LAID IN STORMWATER PIPE TRENCHES AND CONNECTED TO DRAINAGE PIT.
17.	IN AREAS WHERE DUMPED / HAND PLACED ROCK IS USED AS A MEANS OF SCOUR PROTECTION, CONTRACTOR IS TO EXCAVATE A MINIMUM OF 100mm FROM PROPOSED SURFACE, LEVEL AND COMPACT SUBGRADE AS SPECIFIED. ROCK TO THEN BE PLACED ON GEOTEXTILE FILTER FABRIC.

DRAWING LIST

DWG No.	DRAWING TITLE
02-C01.01	COVER SHEET, DRAWING LIST, LOCALITY PLAN AND SPEC NOTES
02-C02.01	CIVIL WORKS PLAN
02-C03.01	DETAILS






LOCALITY PLAN

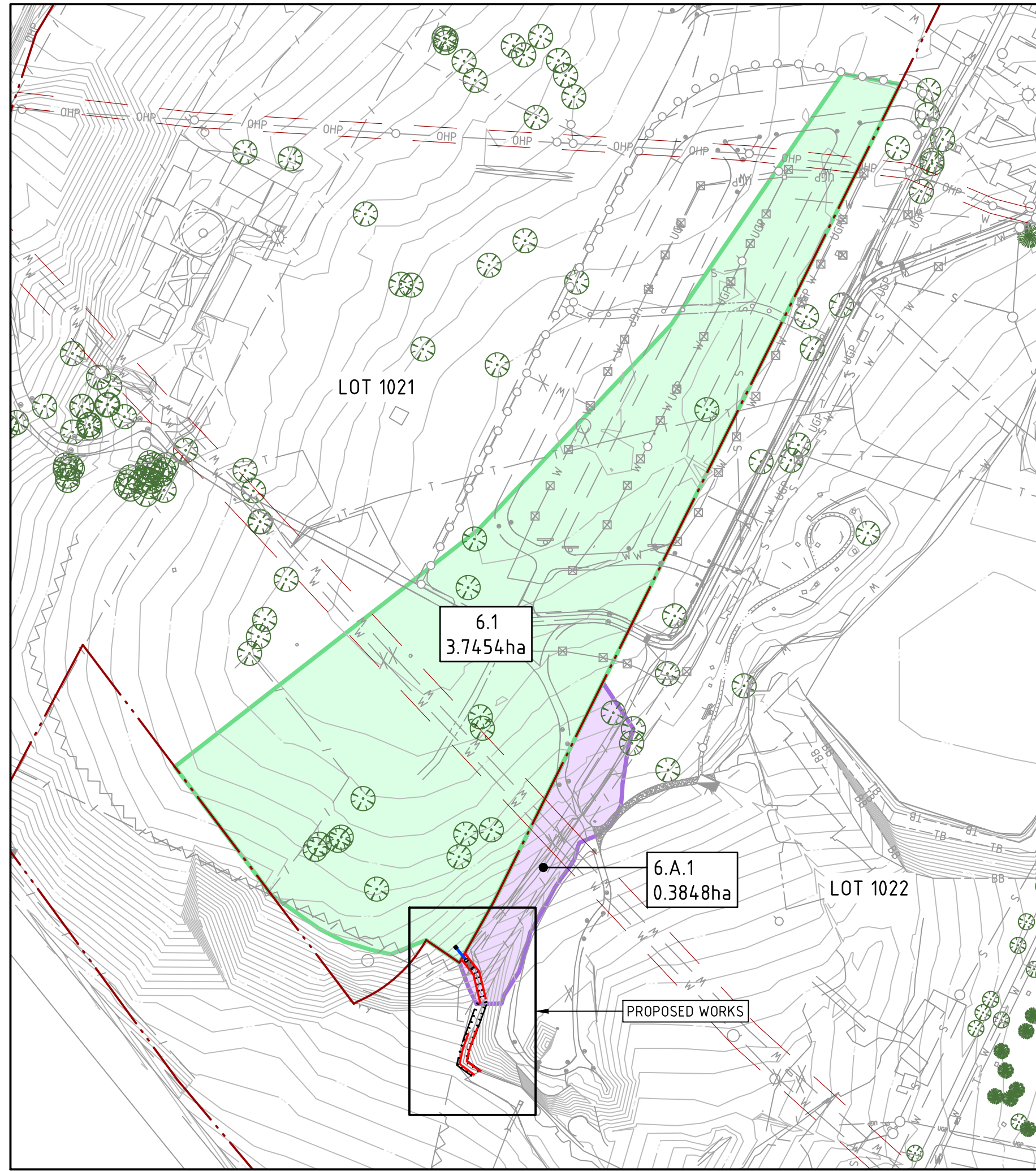
IMAGE SOURCE : NEARMAPS



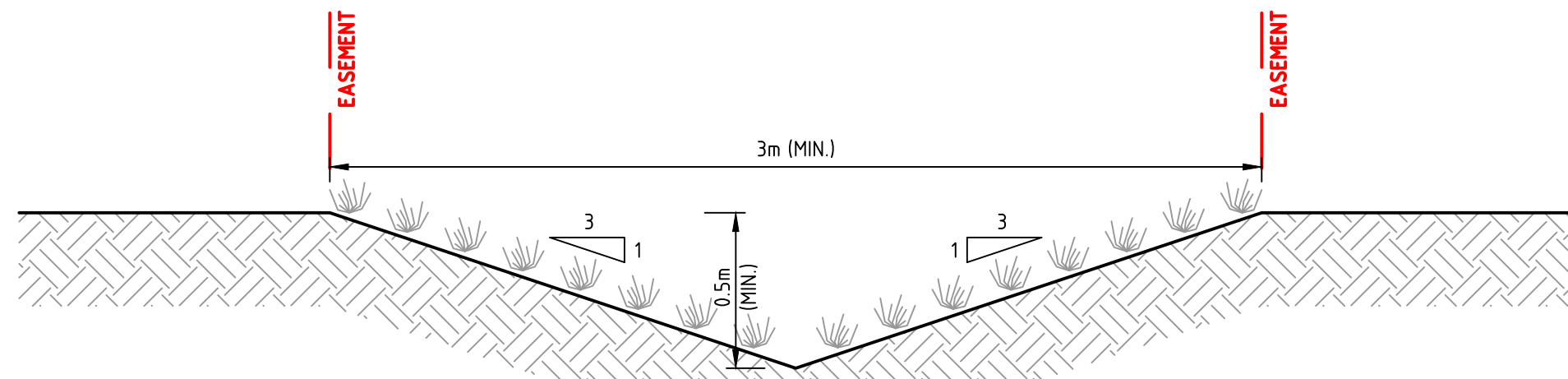
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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT	ARCHITECT	 <div>ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK. NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.</div>	PROJECT	DRAWING TITLE	JOB NUMBER		
1	ISSUED FOR CC APPROVAL	RG		BC	28.11.19	 <div>Hunter & Central Coast Development Corporation</div>	 <div>Level 1, 215 Pacific Hwy, Charlestown NSW 2290 Ph (02) 4943 1777 Email newcastle@northrop.com.au ABN 81 094 433 100</div>		MT PENANG PARKLANDS KARIONG NSW 2250	CIVIL ENGINEERING PACKAGE	NL191249		
												DRAWING NUMBER	REVISION
												02-C01.01	1
												DRAWING SHEET SIZE = A1	
						DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED	THE COPYRIGHT OF THIS DRAWING REMAINS WITH NORTHROP CONSULTING ENGINEERS PTY LTD		LOT 1021 INTER-ALLOTMENT DRAINAGE	COVER SHEET, DRAWING LIST, LOCALITY PLAN AND SPEC NOTES			

VERIFIER: B. CLARK
JOB MANAGER: B. CLARK
DESIGNED: A. KILLEN
DRAWN: R. GREVE

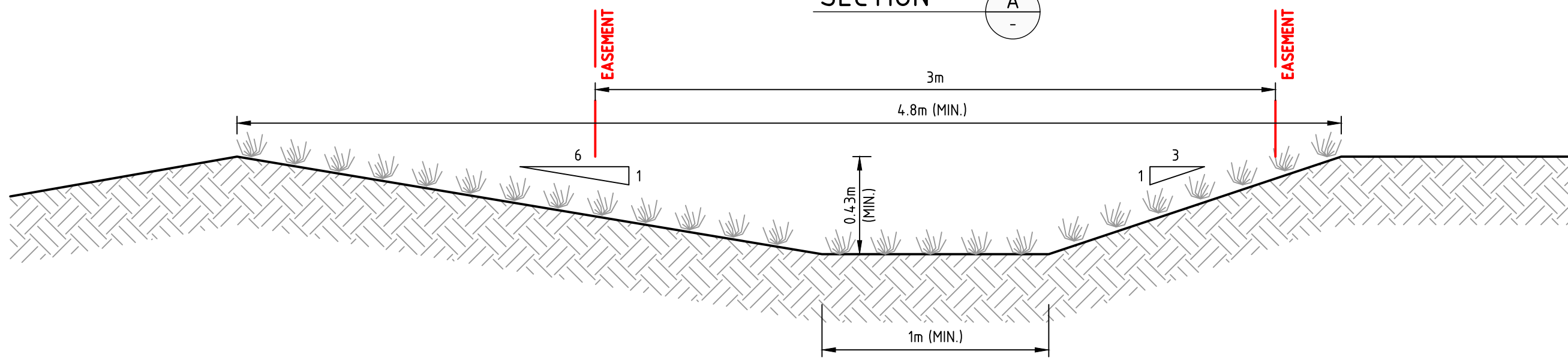


CATCHMENT PLAN
SCALE 1:2000



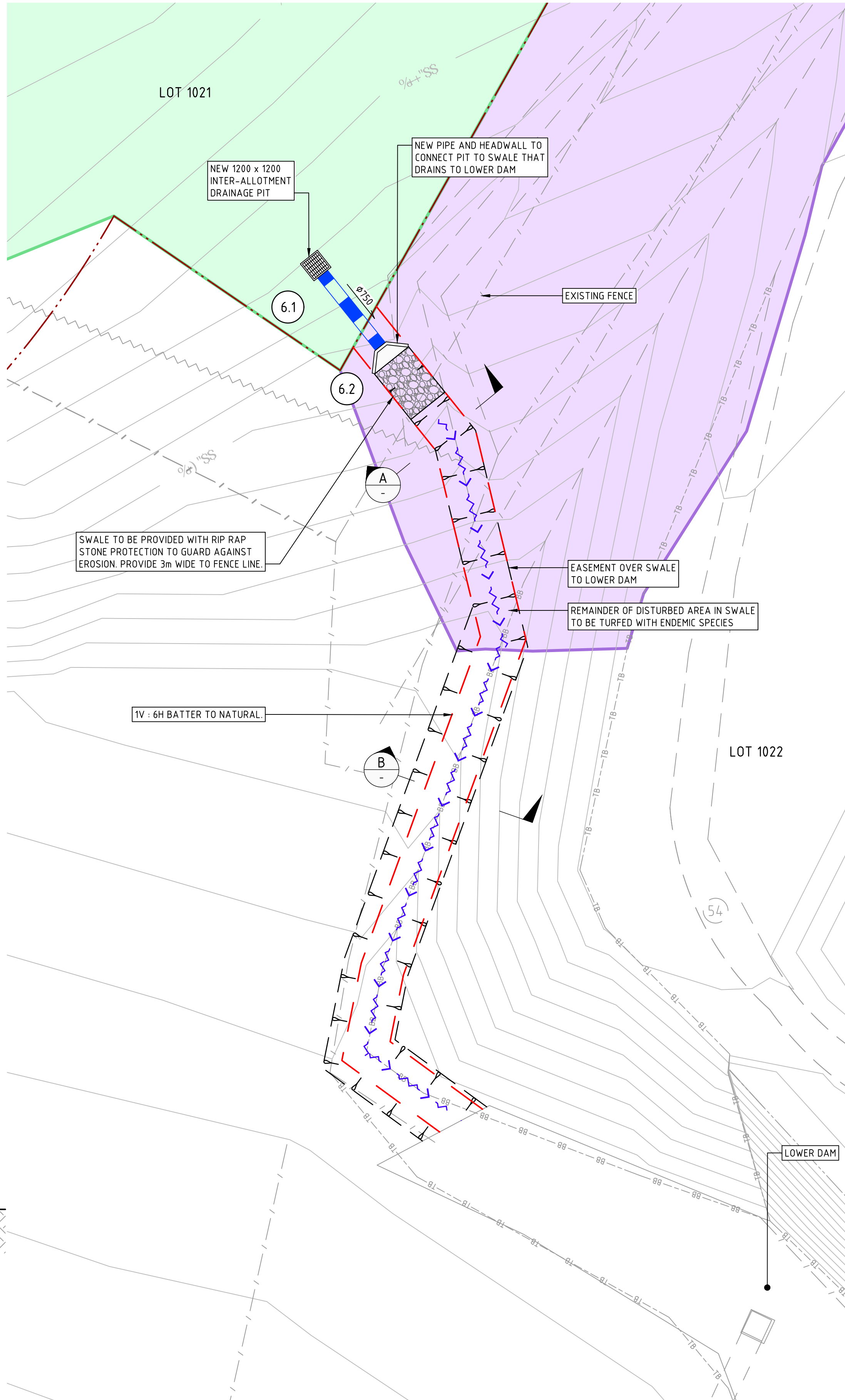
MINIMUM INDICATIVE CHANNEL SIZE TO PROVIDE
EXPECTED MAXIMUM 1% AEP FLOWS OF 2.2m³/s

SECTION A



SWALE TO GRADE AT MINIMUM 3% LONGITUDINALLY AND HAVE CAPACITY TO ACCOMMODATE
 $Q_{100} = 2.4 \text{ m}^3/\text{s}$ (MINIMUM DIMENSIONS SPECIFIED BASED ON MANNING EQUATION)

SECTION B



LEGEND	
	BOUNDARY
	PROPOSED EASEMENT FOR DRAINAGE (3m WIDE)
	STORMWATER PIPE
	INTER-ALLOTMENT DRAINAGE PIT TO CCC STD SD0414
	CONCRETE HEADWALL TO CCC STD SD0411
	OUTLET HEADWALL RIPRAP
	V-SHAPED CHANNEL



NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR CC APPROVAL	RG		BC	28.11.19

CLIENT
 Hunter & Central Coast Development Corporation

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SCALE 1:200@A1

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Newcastle
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Ph (02) 4943 1777 Email newcastle@northrop.com.au
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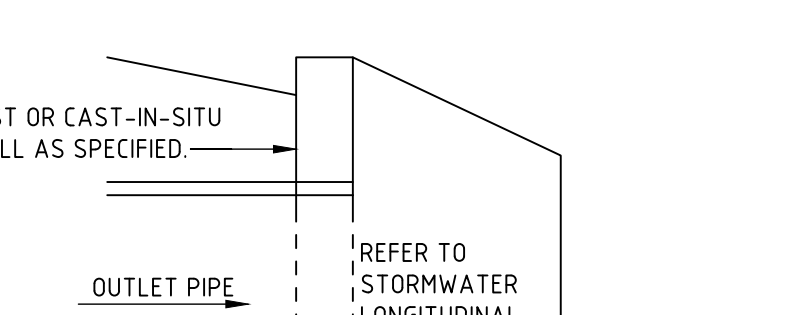
PROJECT
**MT PENANG PARKLANDS
KARIONG NSW 2250**
**LOT 1021
INTER-ALLOTMENT DRAINAGE**

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
CIVIL WORKS PLAN

JOB NUMBER
NL191249
DRAWING NUMBER
02-C02.01
REVISION
1
DRAWING SHEET SIZE = A1

A technical drawing of a door frame and handle assembly. The drawing shows a cross-section of a door frame with a handle mounted on it. The handle is a horizontal bar with a circular end. The frame is shown in a perspective view, with the handle mounted on the inner edge. The drawing is a black and white line drawing with some blue lines indicating the handle's position.

STORMWATER LONGITUDINAL SECTION

- 
- PRE-CAST OR CAST-IN-SITU HEADWALL AS SPECIFIED.
- OUTLET PIPE
- REFER TO STORMWATER LONGITUDINAL SECTION
- ENSURE RIPRAP IN CHANNEL IS NEATLY PLACED AROUND AND UP TO NEW HEADWALL.
- MASS CONCRETE EROSION KEY. 500mm DEEP x 200mm THICK (MIN).
- KEY GEOTEXTILE LAYER UNDER HEADWALL (TYPICAL).



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APPENDIX 3

FLORA AND FAUNA ASSESSMENT

MT PENANG PARKLANDS FLORA AND FAUNA ASSESSMENT

Prepared for Hunter and Central Coast
Development Corporation

Prepared by EPS

LOT 10 DP 1149050
1A CENTRAL COAST HIGHWAY KARIONG NSW 2250



Quality Assurance & Version Control Table

Project: Flora and Fauna Assessment – Mt Penang HCP Roadworks

Client: Hunter and Central Coast Development Corporation

Rev No.	Date	Our Reference	Authors	Reviewer
V01	30/07/2019	20190730 11371 Mt Penang Flora and Fauna Assessment Preliminary Draft Report V01	D. Landenberger	T. Lambert
V02	28/01/2020	20200128 11371 Mt Penang Flora and Fauna Assessment Preliminary Draft Report V02 Additional drainage works	D. Landenberger A Cavallaro P. Smith	A. Tipper
V02	17/03/2020	20200317 11371 Mt Penang Flora and Fauna Assessment Final Report V03	D. Landenberger A Cavallaro P. Smith	A.Cavallaro
Checked by	17/03/2020			A. Tipper
Approved by	17/03/2020			A.Tipper
EPS				
Hunter 9 Yacaaba Street, Nelson Bay NSW 2315 (02) 4981 1600		Sydney Level 33, 264 George Street, Sydney NSW 2000 (02) 9258 1985		
Website: www.enviroproperty.com.au				



EXECUTIVE SUMMARY

EPS has been engaged by the Hunter and Central Coast Development Corporation (HCCDC) to prepare a Flora and Fauna Assessment report for the proposed construction and operation of road, sewer, water, stormwater, electrical infrastructure and associated infrastructure on land within the Highway Commercial Precinct, Festival/Gardens Precinct, Kangoo Road Commercial Precinct and land outside the Mt Penang Parklands growth centre land located at 1A Central Coast Highway, Kariong NSW. This Flora and Fauna Assessment report will form part of the Review of Environmental Factors (REF) prepared for this project.

Three native Plant Community Types (PCTs) and four non-native vegetation communities were recorded within the study area and these include the following:

- PCT 1641 *Dwarf Apple – Scribbly Gum heathy low woodland*;
- PCT 1642 *Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland*;
- PCT 1699 *Heath-leaved Banksia – Coral Fern wet heath*;
- Planted Native Trees;
- Exotic Vegetation;
- Exotic Grassland; and
- Constructed Dam.


The proposal will involve the removal a total of 1.47 ha of native and non-native vegetation. The removal is comprised of:

- 0.13ha of PCT 1641 *Dwarf Apple – Scribbly Gum heathy low woodland*;
- 0.09 ha of PCT 1642 *Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland*;
- 0.17 ha of Planted Vegetation;
- 0.26 ha of Exotic Vegetation; and
- 0.82 ha of Exotic Grassland.

One TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion* listed as Endangered under both the BC and EPBC Acts was recorded within the study area, however this TEC will not be impacted under this proposal. This TEC has been mapped as PCT 1699 *Heath-leaved Banksia – Coral Fern wet heath* within the study area.

PCT 1642 and PCT 1699 have high potential to be groundwater dependent, however as there is no proposed draw down of groundwater and the proposal is unlikely to affect this GDE.

No threatened flora species were recorded within the study area. Twelve (12) threatened flora species have potential habitat within the study area (Appendix 4). Significance assessments for these potential threatened flora species was undertaken Appendix 9 and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.



No threatened fauna species were recorded within the study area. Thirty-two (32) threatened fauna species have potential habitat within the study area (Appendix 4). Significance assessments for these threatened fauna species was undertaken Appendix 9 and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.

No migratory species were recorded however, four species have potential habitat to within the study area. An assessment of the impact of the proposal on these species was conducted in the Section 4.7.5 and it was determined that study area is not classified as important habitat for any of the migratory species that have potential to occur within the study area.

Fifty-seven (57) hollow-bearing trees were recorded within the study area. A maximum of three (3) of these will be removed as part of the proposal. Of these 57 hollow-bearing trees, a total of 11 hollows are likely to be removed as part of the proposal. However, 54 hollow-bearing trees with a total of 196 hollows are to be retained overall.


No threatened aquatic species listed under the FM Act have potential habitat within the study area.

No areas of outstanding biodiversity value (AOBV) listed on the BC Act occur within the study area.

In conclusion, the proposal is unlikely to have a significant impact on threatened biodiversity and as such a Species Impact Statement or a referral to the Commonwealth under the EPBC Act is not required.

Recommendations are as follows:

- The northern option for the proposed water pipeline (or a version thereof) be chosen to avoid the endangered Coastal Upland Swamp;
- The Coastal Upland Swamp should be completely avoided if possible, as otherwise a Referral to the Commonwealth DoEE will be required for the proposal;
- A buffer zone as large as possible must be provided around the Coastal Upland Swamp in accordance with the EPBC Act conservation advice that refers to buffers being required;
- The design of any aspect of the proposal should avoid, minimise and manage any impacts to the Coastal Upland Swamp areas to the greatest extent possible;
- The proposed water pipeline alignment goes from north to south where the sewer pipeline ends. There is a cleared track that occurs to the east (Figure 4-2) and it is suggested that the water pipeline could utilise this track rather than removing intact native vegetation;
- Where possible minimise the removal of hollow-bearing trees within the study area. There is potential for three hollow-bearing trees (HB6, HB8 & HB10 Figure 4-2) to be



impacted upon in the northern portion (festival Drive) and Southern portion (The Avenue) of the proposal; and

- Targeted surveys for *Cryptostylis hunteriana* (Leafless Tongue Orchid) during the November to February flowering period are suggested if there are likely to be any future impacts to PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia Woodland. If this is not practical, then a pre-construction re-check is suggested.



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APPENDIX 7 Invasive Species Assessment


APPENDIX 8 Hollow-bearing Tree Data

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TERMS AND ABBREVIATIONS

Abbreviation	Description
AOBV	Areas of outstanding biodiversity value are areas listed on the BC Act.
API	Aerial Photographic Interpretation
BC Act	<i>Biodiversity Conservation Act 2016</i>
Biodiversity	Biodiversity is the genetic diversity, species diversity and ecosystem diversity. Biodiversity includes plants, animals, micro-organisms.
Bioregion	Division of Australia into bioregions based on dominant landscape attributes as defined by Thackway and Cresswell (1995)
BS Act	<i>Biosecurity Act 2015</i>
Critical Habitat	Critical Habitat is an area containing threatened ecological communities, populations, species that is listed on the EPBC Act
CMA	Catchment Management Authority
Disturbance footprint	The area of direct impacts including any ancillary construction impacts on by the proposal
DPI	Department of Primary Industries
DoEE	Commonwealth Department of Environment and Energy
DPI&E	NSW Department of Planning, Industry and Environment
Ecological Community	A set of species occupying a specific area
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GDE	Groundwater Dependant Ecosystems
FFA	Flora and Fauna Assessment
FM Act	<i>Fisheries Management Act 1994</i>
HCCDC	Hunter & Central Coast Development Corporation
IBRA	Interim Biogeographic Regionalisation of Australia
KTP	Key Threatening Process
LEP	Local Environment Plan
LGA	Local Government Area
LLS Act	<i>Local Land Services Act 2013</i>
Likely	A chance of possibility of occurring within the study area (OEH, 2004)
Locality	The area within 10km of the study area
Local population	Population of plants or animals within the study area, or within continuous habitat or enables exchange of genes
Migratory Species	Listed migratory species under the EPBC Act
MNES	Matters of National Environmental Significance
NSW	New South Wales
NPW Act	<i>National Parks and Wildlife Act 1974</i>
PCT	Plant Community Type



Abbreviation	Description
Mt Penang Growth Centre Land	The entire Mt Penang Parklands site boundary and the Kangoo Road works area
Proposal	The proposed roadworks and construction of the sewer and water pipelines
RAMSAR Wetland	Internationally Important Wetlands
Significant	Important as defined by the Threatened Species Assessment Guidelines (DEEC, 2007)
SEPP Coastal Management	Replaces SEPP14 wetlands, SEPP 26 littoral rainforest and manages all coastal environments, hazards and coastal use areas.
SEPP 44	State Environmental Planning Policy – Koala Habitat Protection
Study Area	The area studied as part of this Flora and Fauna Assessment.
TEC	Threatened Ecological Community listed on the BC Act and/or the EPBC Act.
Threatened biodiversity	Species, populations, communities that are listed under the BC Act and/or the EPBC Act



1. INTRODUCTION

EPS has been engaged by the Hunter and Central Coast Development Corporation (HCCDC) to prepare a Flora and Fauna Assessment report for the proposed construction and operation of road, sewer, water, stormwater, electrical infrastructure and associated infrastructure at Mt Penang Parklands, located at 1A Central Coast Highway, Kariong NSW. Figure 1-1 shows the location of the Mt Penang Growth Centre Land. This Flora and Fauna Assessment report will form part of the Review of Environmental Factors (REF) prepared for this project.

1.1. THE PROPOSAL

The proposal involves the construction and operation of road, sewer, water, stormwater, electrical infrastructure and associated infrastructure on land within the Highway Commercial Precinct, Festival/Gardens Precinct, Kangoo Road Commercial Precinct and land outside the Mt Penang Parklands growth centre land (Refer to Appendix 2).

The proposal is a vital component for the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other Mt Penang Parklands Precincts. The Study Area included as part of the assessment includes:

- The Avenue south road reserve up to but excluding The Avenue south roundabout servicing the Kariong Fire Station and the Central Coast Highway / The Avenue intersection (The Avenue south);
- Festival Drive reserve up to but excluding the Festival Drive road/Parkland road roundabout (Festival Drive);
- An area of vegetated and cleared land between a section of Kangoo Road, the Kariong Commuter Car Park, a section of Central Coast Highway and the Mt Penang Gardens lower water dam.

1.2. PROJECT AREA DESCRIPTION

The Mt Penang Growth Centre Land is situated within and adjacent to Mt Penang Parklands at Kariong to the east of the M1 Motorway and approximately 10 km to the west of Gosford within the Central Coast Council LGA.

Mt Penang Parklands consist of commercial businesses, sporting fields, parklands, heritage buildings and native bushland. Kariong Mountains High School occurs along Festival Drive with Central Coast Sports Cottage along Carinya Street. The township of Kariong occurs to the south west of the Mt Penang Growth Centre Land and Brisbane Water National Park occurs to the west of the Mt Penang Growth Centre Land.



1.3. AIMS AND OBJECTIVES

This Flora and Fauna Assessment will assess the impact of the proposal under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main aims of this report are as follows:

- Describe the existing biodiversity and existing environment;
- Identify and assess threatened biodiversity listed under *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) and/or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Assess the likely significance of impacts of the proposal; and
- Where warranted, to provide mitigation measures to reduce the impacts from the proposal upon biodiversity.

This proposal is to be assessed under Part 5 of the EP&A Act with Hunter and Central Coast Development Corporation (HCCDC) being the determining body. The format of this Flora and Fauna Assessment has been written with the ultimate aim of determining whether a Species Impact Statement (SIS) is required.

1.4. DEFINITIONS

The following definitions have been used as part of this report (refer to Figure 1-2):

- **Disturbance footprint** - The area of direct impacts for the proposed roadworks and construction of the sewer, water and drainage, including any ancillary construction impacts on by the proposal;
- **Mt Penang Growth Centre Land** - The entire Mt Penang Parklands site boundary and Kangoo Road area; and
- **Study area** - The area studied as part of this Flora and Fauna Assessment.

1.5. PERSONNEL

The field surveys and reporting completed for this Flora and Fauna Assessment were conducted by a qualified biodiversity team familiar with the locality, as outlined in Table 1-1 below.

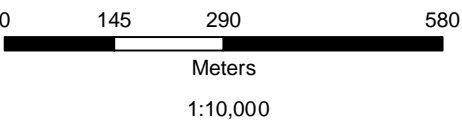
Table 1-1 Personnel

Personnel	Position	Qualifications	Role
Toby Lambert	Director – Ecology	BEnvSc Accredited BAM Assessor	Project Management Technical Review
Deborah Landenberger	Senior Ecologist	BSc (Hons) Accredited BAM Assessor	Field Surveys Reporting
Dr Alan Midgley	Ecologist	PhD BEnvMgt & Sc (Hons) Accredited BAM Assessor	Reporting
Sam Wilkin	GIS specialist	DipGIS	Mapping
Adam Cavallaro	Senior Ecologist (MJD Environmental)	BEnv Sc (Conservation Ecology) Accredited BAM Assessor	Project Management, Field Survey Reporting
Phoebe Smith	Ecologist (MJD Environmental)	BEnSc	Reporting
Ellen Saxon	GIS Coordinator (MJD Environmental)	BEnSc	Mapping

The field work component of this EA was conducted in accordance with a *National Parks and Wildlife Act 1974* ('NP&W Act') Section 132 (c) Scientific Licence (SL100772). The licence permits the undertaking of biodiversity assessments, Species Impact Statements, ecological surveys and abiotic sampling as part of flora and fauna survey work.



Mt Penang Parklands, Kariang
FIGURE 1-1: MT PENANG GROWTH CENTRE LAND LOCATION



- Legend**
- Study Area
 - Mt Penang Growth Centre Land



Aerial: NearMap (2019) | Data: MJD Environmental, EPS, (2020), NSW Spatial Services (2019) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 17/03/2020 | Version 2 | GIS19098 - Mt Penang Parklands, Kariang | This plan should not be relied upon for critical design dimensions.



2. LEGISLATIVE CONTEXT

2.1. COMMONWEALTH LEGISLATION

2.1.1. Environmental Protection and Biodiversity Conservation Act 1999

The primary objective of the EPBC Act is to 'provide for the protection of the environment, especially those aspects of the environment that are Matters of National Environmental Significance' ('Matters of NES'). Environmental approvals under the EPBC Act may be required for an 'action' that is likely to have a significant impact on Matters of NES being:


- World Heritage Areas;
- National Heritage Places;
- Ramsar wetlands of international importance;
- Nationally listed threatened species and ecological communities;
- Listed migratory species;
- Commonwealth marine areas;
- Nuclear actions;
- Great Barrier Reef Marine Park; and
- A water resource in relation to coal seam gas development and large coal mining development.

Of potential relevance to the study area are Matters of NES which include nationally listed threatened species, ecological communities and listed migratory species. Where there is the potential for a proposal to have a significant impact on any Matter of NES, a Referral under the EPBC Act is required to be submitted to the Department of the Environment and Energy (DoEE) for approval.

2.2. NSW STATE LEGISLATION

2.2.1. Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for NSW, providing a framework for the overall environmental planning and assessment of development projects. Various legislative instruments, such as the *NSW Biodiversity Conservation Act 2016* (BC Act), are integrated with EP&A Act and have been reviewed separately. Clause 5AA of the EP&A Act provides direction to the ecological matters



that must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats.

2.2.2. Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) aims to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act) or an activity (Part 5 of the EP&A Act) is likely to significantly affect threatened species and ecological communities or their habitat.

The *Biodiversity Conservation Act 2016* (BC Act) came into effect on 25th August 2017 and now supersedes the TSC Act. As a Part 5 activity under the EP&A Act, the BC Act outlines the following relevant clause.

Division 2 Biodiversity assessment requirements

7.8 Biodiversity assessment for Part 5 activity

(1) This section applies to environmental assessment under Part 5 of the Environmental Planning and Assessment Act 1979.

(2) For the purposes of Part 5 of the Environmental Planning and Assessment Act 1979, an activity is to be regarded as an activity likely to significantly affect the environment if it is likely to significantly affect threatened species.

(3) In that case, the environmental impact statement under Part 5 of the Environmental Planning and Assessment Act 1979 is to include or be accompanied by:

(a) a species impact statement, or

(b) if the proponent so elects—a biodiversity development assessment report.

(4) If the likely significant effect on threatened species is the only likely significant effect on the environment, an environmental impact statement may be dispensed with and Part 5 of the Environmental Planning and Assessment Act 1979 applies as if references to an environmental impact statement were references to a species impact statement or biodiversity development assessment report.

This proposal is to be assessed under Part 5 of the EP&A Act with Hunter & Central Coast Development Corporation (HCCDC) being the determining body. The format of this flora and fauna assessment has been written with the aim of determining whether a SIS is required.



2.2.3. Biosecurity Act 2015

The *Biosecurity Act 2015* (BSA Act) has replaced the *Noxious Weed Act 1993* and all previously noxious weeds are now regulated by the BSA Act. Noxious weeds are renamed as priority weeds and are now regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. These weeds reduce diversity of native plant and animal species. The BSA Act is implemented and enforced by the Local Control Area for the Central Coast Local Government Area (LGA).

2.2.4. Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims to conserve, develop and share the fisheries resources for the benefit of the state. These include conserving of key fish habitats, threatened aquatic species, populations and communities listed on the FM Act including Marine vegetation. The aims also include to promote ecologically sustainable development, viable commercial and recreational fishing, share fish resources and provide social and economic benefits for the wider community.

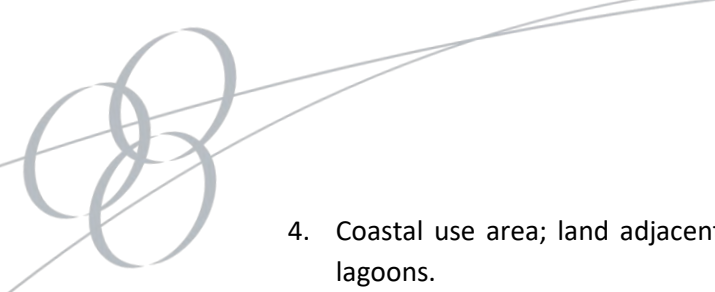
2.2.5. SEPP Coastal Management (2018)

If a proposal is likely to harm or damage threatened species, populations or ecological communities and its habitat or damage critical habitat a licence is required under Section 220ZW of the FM Act.

This SEPP consolidates the previous SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforest) and SEPP 71 (Coastal Protection) into one policy. The aim of this policy is to provide an integrated and coordinated approach to land use planning is promoted by the new SEPP. It defines the four coastal management areas through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The four coastal management areas are:

1. Coastal wetlands and littoral rainforests area; areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
2. Coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation.
3. Coastal environment area; areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.

- 
4. Coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The Mt Penang Growth Centre Land has not been mapped as any of the four coastal management areas listed above (Appendix 1).

2.2.6. SEPP – (Koala Habitat Protection) 2019

Assessment under SEPP (Koala Habitat Protection) 2019 does not apply in this instance, as the proposal is being assessed as an 'Activity' under Part 5 of the EP&A Act.

3. METHODOLOGY

3.1. DESKTOP ASSESSMENT

Table 3-1 outlines the database searches conducted as part of this report.

Table 3-1 Database Review

Database Reviewed	Date	Radius km/LGA
State Databases		
NSW BioNet Atlas	28/06/2019	10km
Threatened Species Database	28/06/2019	-
OEH vegetation information system (VIS) database	28/06/2019	-
NSW Seed Database https://datasets.seed.nsw.gov.au/dataset?q=&topic=Environment	28/06/2019	10 km
NSW Department of Primary Industries Weed wise database	28/06/2019	Central Coast LGA
NSW Department of Primary Industries Fish habitat records	28/06/2019	Central Coast LGA
NSW Government Biodiversity Values Map	17/07/2019	10 km
Federal Databases		
Department of Environment and Energy's Protected Matters Search Tool	28/06/2019	10km
Department of Environment and Energy's Weeds of National Significance	28/06/2019	All Listings
Department of Environment and Energy's directory of internationally important wetlands	28/06/2019	-
Bureau of Meteorology Groundwater Dependent Ecosystem Atlas http://www.bom.gov.au/water/groundwater/gde/map.shtml		10km

3.2. LITERATURE REVIEW

The following documents were reviewed prior to the field surveys:

- Review of the Gosford LGA vegetation mapping (Bell, 2009, 2013) to provide preliminary vegetation types to inform the field survey design;
- Review of Flora and Fauna Assessment of Mt Penang Parklands, Kariong (Travers Bushfire and Ecology, 2014);
- Review of aerial photographs to assist in stratifying the study area into vegetation types; and
- Provisional water and sewer pipeline and road upgrade plans provided by HCCDC.



3.3. FLORA SURVEY

The field survey was conducted on the 2nd, 10th, 22nd and 23rd July 2019. The following methodologies were used for the flora surveys:

- Random Meander surveys were conducted in accordance with Cropper (1993). These surveys consisted of walking in a random manner recording all plant species observed across the study area;
- Vegetation mapping and assessment of condition the vegetation assemblages across the study area
- Assigning vegetation communities into Plant Community Types (PCTs) in accordance with the Office of Environment and Heritage VIS classification database Version 2.1.

A walk over of the entire study area was initially inspected to provide a preliminary assessment of the vegetation types and the potential number of vegetation zones and their condition in accordance with the Biodiversity Assessment Methodology (2017). The vegetation was then mapped into type and condition, with each community assigned to PCTs in accordance with the VIS Classification database (2015), where possible.

3.4. HOLLOW-BEARING TREE SURVEY

A comprehensive hollow bearing tree survey was conducted throughout the study area. All hollow-bearing trees were recorded. For each tree the following attributes were recorded:

- Location recorded on GPS;
- Each tree was tagged;
- Tree species;
- Location of the hollow as follows:
 - Broken trunk;
 - Branch;
 - Trunk;
 - Split; and
 - Peel back.
- Hollow size and number:
 - Small hollow <10 cm;
 - Medium hollow 10 to 20 cm;
 - Large hollow 20-30 cm; and
 - Extra-large hollows >30cm.
- Diameter at breast height in cm;
- Presence of any scratches;
- Presence of any sap feeding scars; and
- Presence of any nests.



3.5. FAUNA HABITAT ASSESSMENT

To assess the fauna habitat, present within the study area, habitat data was collected to determine the range of fauna that may utilise the area for roosting, breeding and/or foraging. Throughout the study area habitat searches also involved opportunistic searches for fauna. The following habitat attributes were recorded:

- Presence of burrows, whitewash, owl pellets and nests/drays;
- Floristic structure of the canopy, mid stratum and ground layer;
- Depth and composition of leaf litter;
- Presence of rocks and rock shelves;
- Presence of fallen timber; and
- Aquatic habitat such as depressions.

3.6. SURVEY EFFORT

Table 3-2 below summarises the survey effort conducted as part of the field surveys.

Table 3-2 Survey Effort

Date	Survey Type	Approx. Person hours
02/07/2019 10/07/2019 22/07/2019 23/07/2019 05/12/2019	Initial site inspection; random meanders and vegetation mapping	31
02/07/2019 10/07/2019 22/07/2019 23/07/2019	Opportunistic fauna observations	6 and throughout other activities
02/07/2019 10/07/2019 22/07/2019 23/07/2019	Hollow-bearing Tree Survey	8
02/07/2019 10/07/2019 22/07/2019 23/07/2019 05/12/2019	Fauna Habitat Assessment	7



3.7. WEATHER CONDITIONS

Table 3-3 provides a summary of the weather conditions encountered during the field surveys.

Table 3-3 Weather Conditions

Date	Temperate (C°)	Rain (mm)	Wind Km/hr
02/07/2019	2.7 ⁰ to 19.2 ⁰	0	2km / SW
10/07/2019	3.6 ⁰ to 16.8 ⁰	0	7km / NNW
22/07/2019	7.2 ⁰ to 21.8 ⁰	0	9km / N
23/07/2019	7.9 ⁰ to 23.5 ⁰	0	9km / NW
05/12/2019	12.7 ⁰ to 34.0	0	19km / WSW

* Records from BOM web site for the Gosford weather station

3.8. LIMITATIONS

Field surveys are conducted over a relatively small period of time, and not all species can always be detected. These include mobile fauna species, migratory birds and fauna that utilise the resources on a seasonal basis. Flora species that are difficult to detect include cryptic orchids and species present in the seed bank. Therefore, the results in this report are a result of the time when the field surveys were completed.

Access to some areas within the Dwarf Apple – Scribbly Gum heathy woodland was restricted due to very dense areas of fallen *Banksia ericifolia* trees. Random meanders were undertaken as close as possible to ensure that the vegetation was of the same PCT and that any habitat for threatened flora species was inspected.

4. RESULTS

4.1. REGIONAL VEGETATION MAPPING

The broad-scale vegetation mapping of the Gosford LGA (Bell, 2013) mapped the following three vegetation community types as occurring throughout the study area:

- Exposed Hawkesbury Woodland;
- Hawkesbury *Banksia* Scrub Woodland; and
- Cleared or under scrubbed areas supporting only canopy trees, either with agricultural landscapes or in urban areas.

4.2. PLANT COMMUNITY TYPES

Three native Plant Community Types (PCTs) and four non-native vegetation types were recorded within the study area (Figure 4-1). The field verified PCTs have been named in accordance with the VIS Classification database (2015). A summary of each of the vegetation communities is provided in the section below. A constructed dam also occurs but is not included in the vegetation zones outlined below. One of the PCTs was considered to comprise a TEC, being Coastal Upland Swamp. This TEC is listed as endangered under both the EPBC Act and BC Act.

Table 4-1 Summary of Vegetation Zones

Vegetation type	BC Act	EPBC Act	Vegetation of Gosford LGA equivalent	BioBanking Condition	Area (ha)
PCT 1641 Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast	-	-	Hawkesbury <i>Banksia</i> Scrub Woodland	moderate to good – high quality	1.92
PCT 1642 Scribbly Gum – Red Bloodwood – Old Man <i>Banksia</i> heathy woodland of the Southern Central Coast	-	-	Exposed Hawkesbury Woodland	moderate to good – high quality	1.50
PCT 1699 Heath-leaved <i>Banksia</i> – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast	Endangered Coastal Upland Swamp in the Sydney Basin Bioregion	Endangered Coastal Upland Swamps in the Sydney Basin Bioregion	Sandstone Hanging Swamps	moderate to good – high quality	0.02
Planted Vegetation	-	-	-	-	0.47
Exotic Grassland	-	-	-	-	1.94
Exotic Vegetation	-	-	-	-	1.25
Constructed Dam	-	-	-	-	0.22



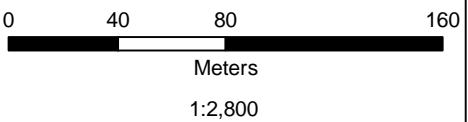
Mt Penang Parklands, Kariang
FIGURE 4-1: PLANT COMMUNITY TYPES

Legend


- Disturbance Footprint
- Study Area
- Mt Penang Growth Centre Land
- Cadastral Boundaries

Plant Community Types

- PCT 1641 Dwarf Apple - Scribbly Gum heathy low woodland
- PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland (Disturbed Canopy)
- PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland
- PCT 1699 Heath-leaved Banksia - Coral Fern wet heath
- Planted Vegetation
- Exotic Vegetation
- Exotic Grassland
- Man Made Dam



Aerial: NearMap (2019) | Data: MJD Environmental, EPS, (2020), NSW Spatial Services (2019) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 17/03/2020 | Version 2 | GIS19098 - Mt Penang Parklands, Kariang | This plan should not be relied upon for critical design dimensions.



4.2.1. PCT 1641 Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast

This PCT occurs in the north west of the study area (Figure 4-1, Plates 4-1 and 4-2) between the exotic vegetation and the Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland. This PCT consists of a dense heath with emergent eucalypt species.

This PCT is not consistent with any TEC listed under the BC Act and/or EPBC Act.

Area: 1.92 ha

Vegetation Formation: Sydney Coastal Heaths

Vegetation Class: Heathlands

- **Emergent:** height ranged from 10 to 15 m with percentage foliage cover of <5%
- **Canopy:** height ranged from 6 to 12 m with percent foliage cover of 20 - 95%.
- **Mid stratum:** height ranged from 2 to 3 m with percent foliage cover of 0-10%.
- **Groundcover:** height ranged from 0 to 1.5m with percent foliage cover of <5%.

Dominant species are:


- **Emergent Species:** *Eucalyptus haemastoma*,
- **Canopy:** *Banksia ericifolia* subsp. *ericifolia*, *Leptospermum polygalifolium* and *Kunzea ambigua*;
- **Mid stratum:** *Acacia oxycedrus*, *Hakea teretifolia*, *Callistemon citrinus* and *Acacia linifolia*.
- **Groundcover:** *Pimelea linifolia*, *Hibbertia fasciculata*, *Bauera rubioides*, *Lepidosperma laterale*, *Xanthorrhoea glauca* and *Gahnia sieberiana*.



Photo 4-1 Dwarf Apple - Scribbly Gum heathy low woodland



Photo 4-2 Dwarf Apple – Scribbly Gum heathy low woodland understorey



4.2.2. PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland of the Southern Central Coast, Sydney Basin Bioregion

This PCT is in the north west and north east of the study area (Figure 4-1, Photo 4-3) and has previously been mapped by Bell (2013) as Exposed Hawkesbury Woodland which is commensurate with this PCT. This PCT has an overstorey of eucalypt species with a heathy shrub layer.

In the northern portion of the study area (Figure 4-1, Photo 4-4) this PCT occurs as canopy only, with an understorey of introduced *Lantana camara* (Lantana), *Ehrharta erecta* (Panic Veldtgrass) and other pasture weeds.

This PCT is not consistent with any TEC listed under the BC Act and/or EPBC Act.

Area: 1.5 ha

Vegetation Formation: Sydney Coastal Dry Sclerophyll Forests

Vegetation Class: Dry Sclerophyll Forest (Shrubby sub-formation)

- **Canopy:** height ranged from 12m to 22m with percent foliage cover of 0-30%.
- **Mid stratum:** height ranged from 1m to 2m with percent foliage cover of 0-10%.
- **Groundcover:** height ranged from 0.1 to 1.2m with percent foliage cover of 0-70%.

Dominant species were:


- **Canopy:** *Eucalyptus haemastoma*, *Corymbia gummifera*, *Eucalyptus capitellata* and *Allocasuarina torulosa*
- **Mid stratum:** *Lambertia formosa*, *Grevillea sericea*, *Boronia ledifolia*, *Petrophile pulchella*, *Pimelea linifolia*, *Leucopogon juniperinus*, *Acacia suaveolens* and *Acacia oxycedrus*.
Groundcover: *Patersonia sericea*, *Anisopogon avenaceus*, *Actinotus minor*, *Xanthorrhoea resinifera*, *Lomandra obliqua*, *Dianella prunina*, *Lindsaea linearis*, *Cassytha pubescens* and *Entolasia stricta*.



Photo 4-3 Scribbly Gum – Red Bloodwood - Old Man Banksia – heathy woodland



Photo 4-4 Canopy with exotic understorey Scribbly Gum – Red Bloodwood – Old Man Banksia – heathy woodland



4.2.3. PCT 1699 Heath-leaved Banksia – Coral Fern Wet heath on sandstone ranges of the lower Central Coast

This community occurred in two wet locations adjoining Kangoo Road in the south of the study area (Figure 4-1). In the western patch it was in a depression on an old track and it is possible that this PCT occurs as a result of the previous clearing (Photo 4-5). However, it has the characteristic flora species that are representative of this PCT and may also have naturally occurred in this specific location previously. The eastern patch is likely to be naturally occurring as it contains a higher diversity of sedges, ferns and rushes (Photo 4-6).

This PCT is commensurate with Coastal Upland Swamp in the Sydney Basin Region which is listed as endangered under both the BC Act and the EPBC Act.

Area: 0.02ha

Vegetation Formation: Coastal Heath Swamps

Vegetation Class: Freshwater Wetlands

- **Emergent:** height ranged from 3 m to 18m with percent foliage cover of 0-5%.
- **Mid stratum:** Nil
- **Groundcover:** height ranged from 1 to 2m with percent foliage cover of 100%.

Dominant species are:

- **Emergent:** *Eucalyptus haemastoma*, *Banksia ericifolia* and *Hakea teretifolia*
- **Mid stratum:** Absent
- **Groundcover:** *Gleichenia dicarpa*, *Leptospermum polygalifolium*, *Leptospermum juniperinum*, *Baumea rubiginosa*, *Gahnia clarkei*, *Callistemon citrinus*, *Pteridium esculentum*, *Lindsaea linearis*, *Todea barbara* and *Histiopteris incisa*.



Photo 4-5 Heath-leaved Banksia – Coral Fern wet heath with Coral Fern overstorey

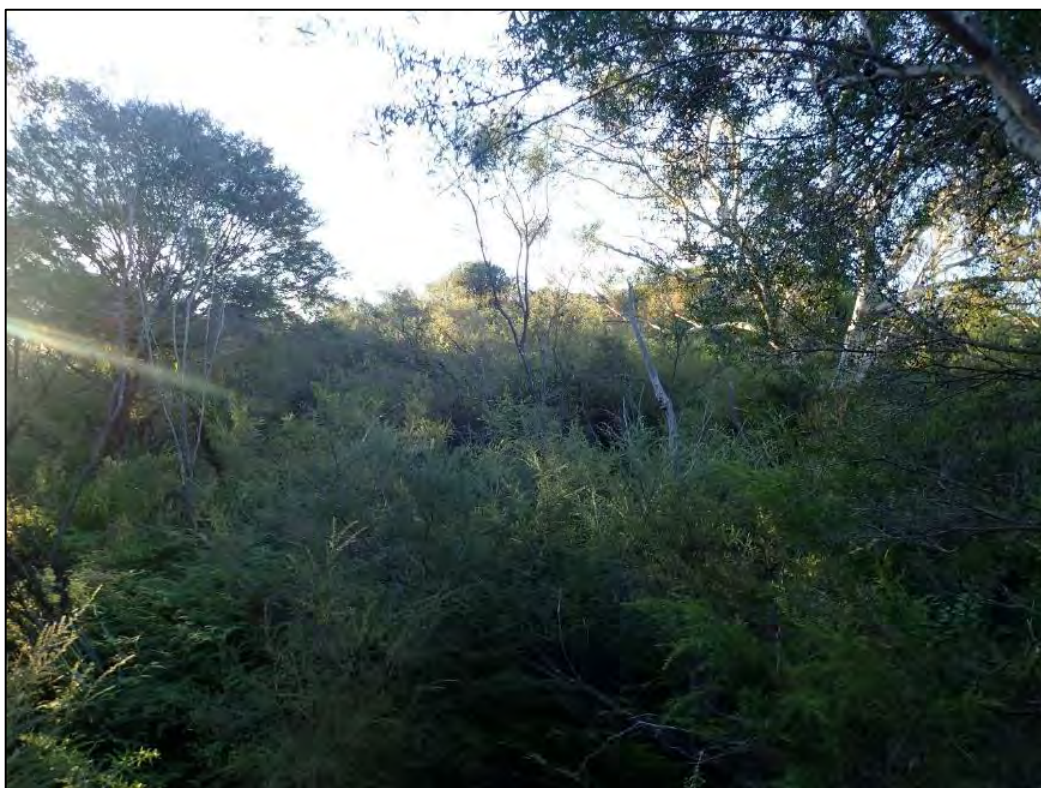


Photo 4-6 Heath-leaved Banksia – Coral Fern wet heath with tea tree overstorey



4.2.4. Planted Vegetation

The planted vegetation occurs along The Avenue and Festival Drive, with a small park located on the corner of The Avenue and the Central Coast Highway (Figure 4-1, Photo 4-7).

This vegetation assemblage consists of planted *Lophostemon confertus* (Brush Box), *Angophora costata* (Smooth-barked Apple), *Corymbia maculata* (Spotted Gum), *Pinus radiata* (Radiata Pine) and remnant *Eucalyptus haemastoma* (Scribbly Gum) trees. The groundlayer consists of a mixture of footpaths, planted gardens and lawn areas. Most of the remnant *Eucalyptus haemastoma* trees were large with nine of these trees containing hollows. Photo 4-8 shows hollow-bearing tree number 9 which contains 5 hollows of varying sizes.

Area: 0.47 ha

- **Canopy height** ranged from 10 to 20 m with percent foliage cover of 0-20%.
- **Mid stratum height** absent
- **Groundcover height** ranged from 0 to 0.3 m with percent foliage cover of 0-80%.

Dominant species are:

- **Canopy:** *Lophostemon confertus*, *Eucalyptus haemastoma*, *Corymbia maculata* and *Pinus radiata*
- **Mid stratum:** Absent
- **Groundcover:** *Cynodon dactylon*, *Cenchrus clandestinus*, *Ehrharta erecta* and *Lomandra longifolia*.



Photo 4-7 Planted Native Street Trees along The Avenue



Photo 4-8 Remnant *Eucalyptus haemastoma* tree in planted gardens adjoining Festival Drive



4.2.5. Exotic Vegetation

The exotic vegetation occurs to the south of the constructed dam and the car park on Kangoo Road (Figure 4-1).

This vegetation assemblage consists of an overstorey of introduced *Cinnamomum camphora* (Camphor Laurel) and *Erythrina sykesii* (Coral Tree) with a dense understorey of introduced *Ligustrum sinense* (Small-leaved Privet) (Photo 4-9). Scattered throughout this vegetation assemblage are open areas of native *Pteridium esculentum* (Bracken Fern) (Photo 4-10) with introduced *Rubus fruticosus* (Blackberry) and *Lantana camara* (Lantana) thickets. The cleared areas of *Pteridium esculentum* (Bracken Fern) were wet depressions with some areas containing pools of water. The area of exotic vegetation that occurs within the western portion of the study area contained a dense overstorey of introduced *Pinus radiata* (Radiata Pine) Figure 4-1 and Photo 4-11.

Area: 1.25 ha

- **Canopy:** height ranged from 9 to 12 m with percent foliage cover of 0-60%.
- **Mid stratum:** height ranged from 0.8 to 1.3 m with percentage foliage cover 20-90%
- **Groundcover:** height ranged from 0 to 0.3 m with percent foliage cover of 0-80%.

Dominant species are:

- **Canopy:** *Pinus radiata**, *Cinnamomum camphora** and *Erythrina sykesii**
- **Mid stratum:** *Solanum mauritianum**, *Ligustrum sinense**, *Rubus fruticosus** and *Lantana camara**
- **Groundcover:** *Pteridium esculentum*, *Ehrharta erecta**, *Zantedeschia aethiopica** and *Ageratina adenophora**

*denotes exotic species



Photo 4-9 Exotic Vegetation with dense understorey of *Ligustrum sinense*



Photo 4-10 Exotic Vegetation with cleared area of exotic Crofton Weed and native Bracken Fern



Photo 4-11 Exotic Vegetation with *Pinus radiata* dominant overstorey

4.2.6. Exotic Grassland

The exotic grassland occurs adjoining the cycleway and extends west to the exotic vegetation assemblage. A site compound (Photo 4-12) for current construction works is located within this community and is located just to the west of the cycleway.

The exotic grassland consists of mown areas of exotic grasses, pasture weeds and some scattered trees (Photo 4-13). Dominant exotic species include *Pinus radiata* (Radiata Pine), *Cenchrus clandestinus* (Kikuyu Grass), *Paspalum urvillei* (Vasey Grass), *Ehrharta erecta* (Panic Veldtgrass), *Stenotaphrum secundatum* (Buffalo Grass), *Senecio madagascariensis* (Fireweed), *Hydrocharis radicata* (Catsear), *Daucus carota* (Wild Carrot) and *Verbena bonariensis* (Purpletop).



Photo 4-12 Existing Site Compound



Photo 4-13 Exotic Grassland

4.2.7. Constructed Dam

This community occurred at the northern portion of the study area (Figure 4-1). A culvert from this dam occurred under the exotic grassland at the western portion of the study area. Aquatic vegetation recorded within this dam was *Azolla pinata*, *Cyperus eragrostis**, *Cyperus polystachyos*, *Juncus subsecundus* and *Juncus usitatus* (Photo 4-14). To the south of the culvert a small seep occurred and contained emergent aquatic species such as *Persicaria lapathifolium*, *Schoenoplectiella mucronata*, *Ponteria cordata* and *Pteridium esculentum* (Photo 4-15).



Photo 4-14 Constructed dam



Photo 4-15 Aquatic vegetation to the south of the constructed dam adjoining the culvert

4.3. FLORA SPECIES RECORDED

No threatened flora species were recorded.

One hundred and ninety-one (191) flora species were recorded during the field surveys from fifty families. One hundred and forty-two (142) were native and forty-nine (49) were exotic species. The most common families are Poaceae and Myrtaceae. The study area has a high floristic diversity, which is a result of the high-quality native vegetation and the large area of exotic grassland which contained a high number of pasture weeds. Refer to Appendix 2 for the full species list.

Of the 49 exotic flora species recorded within the study area, four are listed as priority weeds on the *Biosecurity Act, 2015* (BS Act) for the Central Coast LGA and all these weeds are classified as Weeds of National Significance (WONS).

Table 4-2 Listed Weeds Recorded

Flora Species	NSW BS Act for Central Coast LGA	Weed of National Significance (WONS)
<i>Asparagus aethiopicus</i> (Asparagus Fern)	Prohibition on dealings	Yes
<i>Rubus fruticosus</i> sp. Agg. (Blackberry)	Prohibition on dealings	Yes
<i>Lantana camara</i> (Lantana)	Prohibition on dealings	Yes
<i>Senecio madagascariensis</i> (Fireweed)	Prohibition on dealings	Yes

Department of Primary Industries specifies that priority weeds that area classified as Prohibition on dealings must not be imported into the state or sold

4.4. FAUNA HABITAT

Five fauna habitats were recorded within the study area as outlined in Table 4-3.

Table 4-3 Fauna Habitats

Fauna Habitat	Corresponding PCT
Open Forest	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland Planted Native Vegetation (Low quality)
Heath	Dwarf Apple – Scribbly Gum heathy low woodland Exotic Vegetation (Low quality)
Swamp	Heath-leaved Banksia – Coral Fern wet heath
Aquatic habitat	Constructed dam
Grassland	Exotic Grassland



4.4.1. Open Forest

The open forest habitat has high quality floristic and structural diversity providing fauna resources for a diverse range of fauna species. Canopy resources include blossom and nectar from the *Eucalyptus haemastoma* (Scribbly Gum) and *Corymbia gummifera* (Red Bloodwood) trees. The *Corymbia gummifera* (Red Bloodwood) provides potential sap resource for arboreal mammals such as gliders. A large stand of *Allocasuarina* trees are present within the upper mid stratum which occurred in the higher elevations of the study area, which provides foraging habitat for the Glossy Black-cockatoo. The canopy provides breeding, foraging and sheltering habitat for arboreal mammals (numerous hollows were recorded within this habitat), nectivorous birds and microchiropteran bats.

The understorey contains a sparse to moderate shrub layer which provides foraging habitat for primarily native birds. The groundlayer contains flowering shrubs, grasses and herbs which provides potential foraging, breeding and sheltering habitat for ground dwelling fauna, including the threatened Long-nosed Potoroo and the New Holland Mouse, reptiles and amphibians. A moderate to dense cover of dry leaf litter (30-50%) and fallen logs (<5%) providing sheltering and foraging habitat for ground dwelling fauna. Sandstone benches occurred within this habitat providing sheltering and basking habitat for reptiles.


The planted native street trees section of this habitat provides blossom habitat in the canopy for birds, microchiropteran bats and arboreal mammals. However, the understorey of the planted trees section lacks micro-habitat features restricting the habitat to provide resources mostly for commonly occurring bird species.

Fifty-seven hollow-bearing trees were recorded within this habitat providing good roosting and breeding habitat for hollow-dependent birds, bats and arboreal mammals.

4.4.2. Heath

This habitat contains a dense canopy layer *Banksia ericifolia* (Heath-leaved Banksia) and *Kunzea ambigua* (Tick Bush) with the occasional emergent *Eucalyptus haemastoma* (Scribbly Gum) trees.

The canopy of this habitat provides blossom, nectar and seeds from the *Banksia ericifolia* (Heath-leaved Banksia). The thickets provide potential sheltering, nesting and foraging habitat for small passerine birds, ground dwelling fauna and the threatened Eastern Pygmy Possum. The edges of the thickets and small open areas provide foraging habitat for invertebrates for birds and microchiropteran bats. Small patches of open areas occurred between the dense thickets which provides basking habitat for reptiles. Large areas of fallen timber occurred throughout this habitat in the groundlayer (Photo 4-3). These areas provide sheltering and



foraging for reptiles, ground dwelling mammals and small macropods, such as the Swamp Wallaby.

The exotic vegetation component provides limited habitat for fauna species, however sheltering and foraging habitat is available within the thickets of small-leaved privet for small passerine birds. The coral trees provide nectar habitat for honeyeaters, the Little Wattle Bird and the New Holland Honeyeater were observed foraging within these trees. The open fern areas occurred in wet depressions which provides habitat for frogs and snakes. The Spotted Marsh Frog was recorded calling from wet depressions.

4.4.3. Swamp

The swamp habitat contains emergent Eucalypts and Banksias with a varied understorey consisting of high-density cover of ferns, tea-tree thickets, sedges and rushes (Photos 4-5 and 4-6). The dense understorey contains sheltering and foraging habitat for small terrestrial mammals and macropods. The wet depressions provide foraging and sheltering habitat for reptiles and amphibians. The sedges and rushes provide seed resources for terrestrial mammals and birds, with the tea trees providing nectar resources for birds and microchiropteran bats.

4.4.4. Aquatic Habitat

A three-tiered weir has been constructed with the dam within the study area being the bottom dam. The open water contains floating aquatic species which provides foraging habitat water birds such as the Australian Wood Duck and the Eurasian Coot. The threatened microchiropteran bat species, Large-footed Myotis has previously been recorded by Anabat recording in 2009 and 2010 (Travers Bushfire and Ecology, 2014) adjoining the dam. The fringing vegetation provides foraging and nesting habitat for Grebes, ducks and the Purple Swamphen. The vegetated wetland areas that occurs to the south of the dam consists of sedges, emergent aquatic species and ferns provides habitat for birds, amphibians and reptiles.

4.4.5. Grassland

This habitat generally provides lower quality habitats for common species, or sub-optimal edge habitat for threatened species, such as microchiropteran bats, that are predominantly reliant on the remnant native forested areas. The grassland areas provide foraging habitat for commonly occurring birds and birds of prey, macropods and reptiles. The grassland habitat lacks a diversity of microhabitat and structural components. The threatened prey species, Little Eagle has previously been recorded foraging in this community in 2009 (Travers Bushfire and Ecology, 2014). Commonly occurring bird species recorded in this habitat included the Australian Magpie, Australian Wood Duck, Rainbow Lorikeet and the Pied Butcherbird. Rabbit scats and burrows were recorded along the edges of this habitat.



4.5. HOLLOW-BEARING TREE SURVEY RESULTS

Fifty-seven hollow-bearing trees were recorded within the study area during the field surveys. A total of 25 very small, 98 small, 16 medium and 8 large hollows were recorded (Appendix 8). These hollows provide potential breeding and roosting habitat for a variety of fauna including arboreal mammals, birds and microchiropteran bats. Figure 4-2 shows the locations of the hollow-bearing trees.

4.6. EPBC ACT KOALA ASSESSMENT

Eucalyptus haemastoma (Scribbly Gum) and *Eucalyptus punctata* (Grey Gum) have been recorded within the study area and are listed on the NSW SEPP (Koala Habitat Protection) 2019 as Feed tree species in the Central Coast koala management area of which the study area is located. Therefore, an assessment under the EPBC Act referral guidelines for the Vulnerable Koala (Department of the Environment, 2014) has been undertaken. As outlined in the Koala referral guidelines impact areas that score 4 or less are not critical to the survival to the Koala. The total score was 3 (Table 4-4) and therefore the study area is not critical to the survival of the Koala. In accordance with the flowchart on page 30 of the referral guidelines for the Koala a referral is therefore not required.

Table 4-4 EPBC Act Koala Habitat Assessment Tool

Attribute Score	Score	Inland	Coastal	Score
Koala Occurrence	+2 (high)	Evidence of one or more koalas within last 5 years	Evidence of one or more koalas within the last 2 years	-
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.	-
	0 (low)	None of the above	None of the above	0 last record was from 2006
Vegetation Composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Has forest or woodland with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	2 Has two Koala feed tree species of <i>Eucalyptus punctata</i> and <i>Eucalyptus haemastoma</i> present
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with 1 species of known koala feed tree.	Has forest or woodland with only 1 species of known koala food tree present.	-
	0 (low)	None of the above	None of the above	-
Habitat Connectivity	+2 (high)	Area is part of a contiguous landscape \geq 1000 ha	Area is part of a contiguous landscape \geq 500 ha.	-
	+1 (medium)	Area is part of a contiguous landscape < 1000 ha, but \geq 500 ha	Area is part of a contiguous landscape < 500 ha, but \geq 300 ha.	-
	0 (low)	None of the above	None of the above	0 the study area occurs in a small fragmented area of bushland
Key Existing Threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. OR Areas which score 0 for koala occurrence and have no dog or vehicle threat present		-

Attribute Score	Score	Inland	Coastal	Score
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.		1, likely some degree of dog or vehicle threat present
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack, OR Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.		-
Recovery Value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		-
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		-
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		0 habitat is unlikely to be important for achieving interim recovery objectives
Total Score				3

4.7. NSW THREATENED BIODIVERSITY

4.7.1. BC Act Threatened Ecological Communities

The Bionet database search identified Twenty-two (22) TECs that have potential or are known to occur within 10km of the study area.

One endangered ecological community Coastal Upland Swamp in the Sydney Basin Bioregion, listed as endangered under the BC Act, is commensurate with PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast that was recorded within the study area (Figure 4-1). Table 4-5 below provides an assessment of this TEC against the criteria set out in the scientific determination for this TEC.

Table 4-5 BC Act Coastal Upland Swamp assessment

Key Diagnostic Characteristic	Response
Does the community occur within the Sydney Basin Bioregion	Yes occurs in at Kariong in the Sydney Basin Bioregion
This TEC occurs on Hawkesbury sandstone plateaus and generally where mean annual rainfall exceeds 950mm	The study area occurs on the Hawkesbury sandstone plateau and Gosford weather station has a mean annual rainfall of between 1060 to 1670mm from 2014 to 2016 (BOM station 016425)
Coastal Upland Swamp is generally associated with soils that are acidic and vary from yellow or grey mineral sandy loams with a shallow organic horizon to highly organic spongy black peats with pallid subsoils	The community occurs on the Somersby soil landscape with the soils being acidic and are grey mineral sands within the study area (eSpade, 2019).
The vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structure forms that may include tall open scrub, tall closed scrub, closed heaths, open graminoid heaths, sedgeland and fernlands.	Heath-leaved Banksia – Coral Fern Wet Heath within the study area is composed of a mixture of tea tree closed heath and fernlands.
Does the community have the characteristic plant species as listed in the scientific determination?	The Heath-leaved Banksia – Coral Fern Wet Heath does contain characteristic species however the diversity is low but the foliage cover of these species is 80% to 100%. Species include, <i>Leptospermum juniperinum</i> , <i>Leptospermum polygalifolium</i> , <i>Gleichenia dicarpa</i> , <i>Gahnia clarkei</i> , <i>Chorizandra sphaerocephala</i> , with <i>Eucalyptus haemastoma</i> and <i>Banksia ericifolia</i> scattered throughout the community.
Does PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast within the study area meet the criteria for this TEC?	Yes

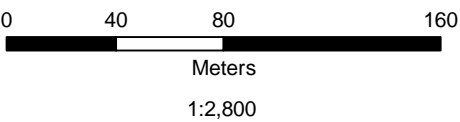
4.7.2. BC Act Threatened Flora Species

No threatened flora species listed under the BC Act were recorded within the study area during the field surveys.

The Bionet database search identified 19 threatened flora species known and or to have potential to occur within a 10km radius of the study area (Appendix 1). Of these 11 threatened flora species were identified as having habitat within the study area (Appendix 4). A list of the threatened flora species listed under the BC Act that have habitat within the study area are provided in Section 7 and a Test of Significance (ToS) was conducted and is provided in Appendix 9.



Mt Penang Parklands, Kariong
FIGURE 4-2: THREATENED ECOLOGICAL COMMUNITY AND HOLLOW BEARING TREES



- Legend**
- Hollow Bearing Trees
 - Disturbance Footprint
 - Study Area
 - Mt Penang Growth Centre Land
 - Cadastral Boundaries
 - Coastal Upland Swamps in the Sydney Basin Bioregion (EPBC 1999, BC 2016)



Aerial: NearMap (2019) | Data: MJD Environmental, EPS, (2020), NSW Spatial Services (2019) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 17/03/2020 | Version 2 | GIS19098 - Mt Penang Parklands, Kariong | This plan should not be relied upon for critical design dimensions.



4.7.3. BC Act Threatened Fauna Species

The OEH Bionet database search identified 41 threatened fauna species known and or to have potential to occur within a 10km radius of the study area (Appendix 1). Of these 29 threatened fauna species have been assessed as having potential habitat within the study area (Appendix 4). A list of the threatened fauna species listed under the BC Act that have potential habitat within the study area is provided in Section 7 and significance assessments were conducted and are provided in Appendix 9.

No threatened fauna species listed under the BC Act were recorded within the study area during the field surveys.

Travers Bushfire & Ecology (2014) have previously recorded four threatened fauna species all listed as vulnerable under the BC Act within the Mt Penang Parklands during 2009, 2010, 2012 and 2014 and these include:

- Little Eagle (2009);
- White-bellied Sea-eagle (2010);
- Glossy Black Cockatoo (2014);
- Grey-headed Flying Fox (2014); and
- Large-footed Myotis (2009, 2010).

4.8. COMMONWEALTH THREATENED BIODIVERSITY

4.8.1. EPBC Act Threatened Ecological Communities

The EPBC Act protected matters database search identified four TECs that have potential or are known to occur within 10km of the study area.

One TEC is present, being Coastal Upland Swamps in the Sydney Basin Bioregion is listed as endangered under the EPBC Act. This TEC occurs in PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast within the study area (Figure 4-2). Table 4-6 below provides an assessment of this TEC against the criteria set out in the conservation advice for this TEC.

Table 4-6 EPBC Act Coastal Upland Swamps assessment

Key Diagnostic Characteristic	Response
Does the community occur within the Sydney Basin Bioregion in the south Woronora plateau or in the north predominately on the Somersby-Hornsby plateau?	Yes occurs in Kariong in the Sydney Basin Bioregion on the Somersby plateau.
This TEC occurs on poorly permeable sandstone plateaux in low relief headwater valleys of streams and on sandstone benches with abundant seepage moisture.	Heath-leaved Banksia – Coral Fern Wet Heath occurs on the Hawkesbury sandstone plateau and in areas of low relief within a groundwater seepage.
Is vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structure forms that may include tall open scrub, tall closed scrub, closed heaths, open graminoid heaths, sedgelands and fernlands.	Heath-leaved Banksia – Coral Fern Wet Heath within the study area is composed of a mixture of tea tree closed heath and fernlands.
Does the community have the characteristic plant species as listed Table 1 of the Conservation Advice for this TEC?	The community does contain characteristic species however the diversity is low but the foliage cover of these species is 80% to 100%. Species include, <i>Leptospermum juniperinum</i> , <i>Leptospermum polygalifolium</i> , <i>Gleichenia dicarpa</i> , <i>Gahnia clarkei</i> , <i>Chorizandra sphaerocephala</i> , with <i>Eucalyptus haemastoma</i> and <i>Banksia ericifolia</i> scattered throughout the community.
Does PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast within the study area meet the criteria for this TEC?	Yes

4.8.2. EPBC Act Threatened Flora

The EPBC Act Protected Matters search identified 24 threatened flora species known and or to have potential to occur within a 10km radius of the study area (Appendix 1). Of these 7 were identified as having potential habitat within the study area (Appendix 4). A list of the threatened flora species listed under the EPBC Act that have habitat within the study area are provided in Section 7 and significance assessments were conducted in Appendix 9.

No threatened flora species listed under the EPBC Act were recorded during the field surveys.

4.8.3. EPBC Act Threatened Fauna

The EPBC Act protected matters database search identified 20 threatened fauna and 4 fish species known and or to have potential to occur within a 10km radius of the study area (Appendix 1). Of these 7 threatened fauna species were identified as having habitat within the study area (Appendix 4). A list of the threatened fauna species listed under the EPBC Act that have habitat within the study area are provided in Section 7.



No threatened fauna species listed under the EPBC Act were recorded during the field surveys.

Travers Bushfire & Ecology (2014) has previously recorded the Grey-headed Flying-fox listed as vulnerable under the EPBC Act, in 2014 within Mt Penang Parklands. A significance assessment was conducted in Appendix 9 for this species.

4.8.4. Migratory Species

The EPBC Act protected matters database search identified 14 migratory species with the potential to occur within the study area (Appendix 1). Marine species and migratory marine species have been excluded for this assessment. Of these 4 migratory species were identified as having habitat within the study area (Appendix 4).

These migratory species include:

- | | |
|---------------------------------|---------------------------|
| • <i>Ardea ibis</i> | Cattle Egret |
| • <i>Apus pacificus</i> | Fork-tailed Swift |
| • <i>Hirundapus caudacutus</i> | White-throated Needletail |
| • <i>Haliaeetus leucogaster</i> | White-bellied Sea Eagle |

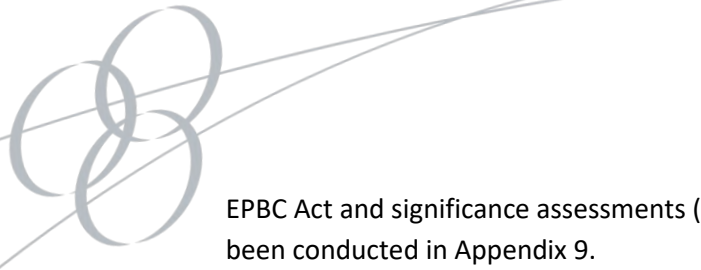
Under the EPBC Act listed migratory species have areas of important habitat. The EPBC Act Significant impact guidelines for Matters of National Significance (2013) defines important habitat for migratory species as:

- Habitat utilised by migratory species occasionally or periodically within a region that supports ecological significant proportion of the species; and /or
- Habitat that is of critical importance to the species at particular life-cycle stages; and/or
- Habitat utilised by a migratory species which is at the limit of the species range; and/or
- Habitat in an area where the species is declining.

The Fork-tailed Swift and White-throated Needletail forage aerially for insects therefore would likely to fly over the study area. The White-bellied Sea-eagle may visit the study area occasionally to forage within the grassland, aquatic, heath and open forest habitats. The Cattle Egret has foraging habitat within the grasslands.

The study area is not at the limit of any of the above species range, critical to the survival of these species nor in an area where the species is declining. Therefore, the habitat within the study area is unlikely to be classified as important habitat under the EPBC Act significant assessment guidelines (2013) for these species.

Two further migratory species being, the Swift Parrot and the Regent Honeyeater also have habitat within the study area, however these species are classified as threatened under the



EPBC Act and significance assessments (in accordance with the BC Act) for these species has been conducted in Appendix 9.



4.9. OTHER MATTERS OF NATIONAL SIGNIFICANCE

4.9.1. World Heritage

No world heritage properties or places were identified by the EPBC Act protected matters search.

4.9.2. Ramsar Wetland

No Ramsar Wetlands were identified by the EPBC Act protected matters search

4.9.3. Nationally Important Wetlands

One nationally important wetland of Brisbane Water Estuary was identified by the EPBC Act protected matters search as occurring within 10km of the study area. The Brisbane Water Estuary occurs approximately 9 km to the south east of the study area. The proposal is unlikely to impact upon this nationally important wetland due to the distance from the proposal area (9km to the south west) and the small area of impact as a result of the proposal.

No other MNES are relevant to this proposal.

4.10. GROUNDWATER DEPENDANT ECOSYSTEMS

Groundwater Dependent Ecosystems (GDEs) are ecosystem that are wholly dependent or partially dependent on groundwater for their water requirements (Hatton & Evans, 1998). The NSW State Groundwater Dependent Ecosystem Policy has outlined five principles to manage impacts to groundwater dependent ecosystems (GDEs) (Department of Land and Water Conservation 2002). These principles have been developed to protect and manage GDEs. These policies include avoidance of threats, management of groundwater extraction to ensure the health of the GDE is maintained, maintenance of water quality, adoption of the precautionary principle to protect GDEs and management of developments, land use activities should aim to maintain natural patterns of GDE water flow, not polluting or causing changes in water quality and rehabilitating of degraded GDEs systems where practical.

The search of the Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems atlas database has no groundwater data within the north western section of the study area as to whether there is potential for the vegetation to be groundwater dependant (Appendix 1). However, the area to the east of the study area has been mapped areas as having low to high potential to be groundwater dependant. PCT 1641 and 1699 have high potential to be groundwater dependant. The PCTs been classified in accordance with Appendix 2 of the Risk Assessment guidelines for groundwater dependent ecosystems (Serov & Kuginis *et. al.*) and are listed in Table 4-7.

Table 4-7 Groundwater Dependand Ecosystems

PCT	Aquifer Type	GDE Type	Potential to be Groundwater Dependand
PCT 1641 Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast	Consolidated porous sandstone aquifer	Phreatophytes – Terrestrial vegetation	High – occurs on the lower relief areas of the study area
PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland of the Southern Central Coast	Consolidated porous sandstone aquifer	Phreatophytes – Terrestrial vegetation	Low – occurs on the higher elevations on sandstone ridges.
PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast	Consolidated porous sandstone aquifer	Groundwater Dependand Wetlands	High – occurs in a groundwater seep within the study area.

5. PROPOSAL IMPACTS

The proposal has the potential to impact biodiversity during both the construction and operational phases. These potential impacts include:

- Vegetation and habitat loss;
- Impacts to Groundwater Dependant Ecosystems;
- Impacts to Hollow-bearing trees;
- Habitat fragmentation;
- Edge effects;
- Fauna injury and mortality;
- Increase in spread of weeds;
- Noise, vibration and light; and
- Impact on key threatening processes.

5.1. VEGETATION IMPACTS

The vegetation loss as a result of the proposal is predicted to be 0.22 ha of native vegetation and 1.25 ha of non-native vegetation (Table 5-1).

Table 5-1 Vegetation Removal

Plant Community Type	Zone Condition in accordance with BAM methodology	BC Act	EPBC Act	Proposed Area of impact (ha)
PCT 1641 Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast	Zone 1 Moderate to Good High quality	Not Listed	Not Listed	0.13
PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia Heath woodland of Southern Central Coast, Sydney Basin Bioregion	Zone 2 Moderate to Good High quality	Not Listed	Not Listed	0.09
Planted Vegetation	-	-	-	0.17
Exotic Vegetation	-	-	-	0.26
Exotic Grassland	-	-	-	0.82
Total Native Vegetation				0.22
Total All Vegetation				1.47



5.2. FAUNA HABITAT LOSS

Fauna habitat loss within the study area is predicted to amount to 1.47 ha (Table 5-2).

Table 5-2 Fauna Habitat Loss

Fauna Habitat	Corresponding PCT	Proposed area of removal (ha)
Open Forest	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland	0.26
	Planted Native Vegetation	
Heath	Dwarf Apple – Scribbly Gum heathy low woodland	0.39
	Exotic Vegetation	
Grassland	Exotic Grassland	0.82

5.3. COASTAL UPLAND SWAMP IMPACTS

The EPBC Act conservation advice recommends a buffer zone must be implemented to act as a barrier to further direct disturbances as a result of the proposal. It is recommended that a large as buffer as possible should be provided as part of the proposal.

5.4. GROUNDWATER DEPENDANT ECOSYSTEMS

Whilst the construction of the water pipeline will require ground disturbance, no groundwater drawdown is proposed as part of the proposal. The proposal is unlikely to impact substantially upon groundwater levels.


5.5. HOLLOW-BEARING TREES

Fifty-seven hollow-bearing trees were recorded within the study area during the field surveys. A total of 25 very small, 98 small, 60 medium, 16 large and 8 extra large hollows (Figure 4-2, Appendix 8).

Of these 57 hollow-bearing trees, a maximum of three (3) hollow bearing trees are likely to be removed as part of the proposal, with a total of 1 very small, 3 small, 3 medium, 2 large and 2 extra large hollows (Figure 4-2). Of these 57 hollow-bearing trees, a total of 54 hollow bearing trees are to be retained under this proposal, with a total of 196 hollows to be retained. Proposed mitigation measures are outlined in the mitigation section below.

5.6. HABITAT FRAGMENTATION

Habitat fragmentation can result in a barrier for fauna and flora to the function of ecosystems and species life cycles. Types of fauna impacted include mammals, both ground dwelling and



arboreal and sedentary fauna. Reduction in connectivity can impact upon access to resources, predator avoidance and breeding capacity (Roads and Maritime Services, 2011).

PCTs 1641 and 1642 located in the west of the study area (Figure 4-1) the subject site is restricted to the installation of a sewer and water pipelines which will be 20m in width. This small width is unlikely to fragment the vegetation due to the removal occurring along a narrow edge of the existing vegetation, and it is likely that the native vegetation will regenerate at the completion of construction works, due to the native soil seed bank that would be present.

5.7. EDGE AND BARRIER EFFECTS

The proposal has the potential to introduce new edge effects from the construction of the sewer and water pipelines. These edge effects may result in the spread of the exotic vegetation allowing infestations of weed species. Due to the small area of disturbance edge effects are unlikely to increase substantially by the proposal.

In the west of the study area the water pipeline adjoins Kangoo Road, and currently the Central Coast Highway and Kangoo Road are a barrier to fauna movement to the south to Brisbane Water National Park. The remainder of the sewer and pipeline disturbance footprints are unlikely to provide a barrier to ground dwelling fauna due to the small width (20 m). The Avenue and Festival Drive are currently a barrier to ground dwelling fauna and the widening of these roads is unlikely to increase substantially by the proposal.

5.8. FAUNA INJURY AND MORTALITY

Increase in fauna injury and mortality may occur, through collision with construction machinery and light vehicles during construction works and future development. Mobile species such as birds can avoid collision through moving out of the path of any vehicles during construction. However, species that roost in hollows and are nocturnal are likely to have difficulty in avoiding direct impact and moving out of the construction footprint. These species are most likely to sustain injury or mortality as a result of construction works.

Increased vehicle movement during construction works will have the potential to increase the mortality and injury to fauna within the study area.

Mitigation measures outlined in Section 6 will limit the effect of the proposal on such fauna species. Impact assessments for related threatened species have been undertaken in Appendix 9 to assess the impacts to threatened species.



5.9. WEEDS

Forty-nine (49) species of weed were recorded within the study area. Of these 4 weed species, being *Asparagus aethiopicus* (Asparagus Fern), *Rubus fruticosus* (Blackberry), *Lantana camara* (Lantana) and *Senecio madagascariensis* (Fireweed) are listed as priority weeds under the BS Act and are Weeds of National Significance (WONs).

Asparagus aethiopicus (Asparagus Fern) and *Senecio madagascariensis* (Fireweed) were recorded within the exotic grassland vegetation. The exotic grassland was composed of exotic pasture weeds and exotic grasses.

Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. Lat) is a key threatening process under the BC Act. The proposal is likely to remove some areas of *Lantana camara*, which will reduce the infestation in these areas. However, the proposal has the potential to further spread weeds throughout the study area and exacerbate this KTP.

The exotic vegetation contained a dense thicket of *Ligustrum sinense* (Small-leaved Privet) with some areas containing dense thickets of *Rubus fruticosus* (Blackberry) with a canopy cover of *Cinnamomum camphora* (Camphor Laurel). The proposal will remove small areas of these invasive weeds which will decrease the amount of these weeds to a small extent. However, during construction the proposal has the potential to spread weeds through the movement of heavy machinery and light vehicles.

If the mitigation measures outlined in Section 6 are followed, then the impact of the proposal is unlikely to increase the spread of weeds recorded within the study area.

5.10. NOISE

Sound is important for fauna for communication, navigation, foraging and detecting prey species or danger. Changes in noise through several human induced noises, such as vehicle traffic, can affect fauna species ability to function (Forman et al, 2000). Adaption by animals to noise in their natural environment such as wind or other animals can cause them to change their behavior to function within their environment (Eve, 1991).

Heavy machinery, vehicle movements and vegetation clearing will cause an increase in noise levels during the construction phase of the proposal. The study area adjoins the existing roads including the Central Coast Highway and roads within the Mt Penang Parklands.

The small increase in noise during construction works is unlikely add incrementally to the noise levels that are already occurring.



5.11. KEY THREATENING PROCESSES

The impact to Key Threatened Processes (KTPs) as a result of the proposal is provided in Appendix 6 and invasive species impacts are provided in Appendix 7. No significant contribution to a KTP is likely to occur as a result of the proposal.


6. MITIGATION MEASURES

Overall, construction impacts are likely to be relatively minor due to the small, narrow and linear area of impact during the construction phase of the proposal.

Mitigation measures to further reduce the residual impacts to the biodiversity values of the study area are outlined in Table 6-1 below.

Table 6-1 Mitigation Measures

Impact	Mitigation Measure	Responsibility	Timing
Vegetation Clearing	Limit vegetation clearing to a minimum necessary to construct works. Implement clearing protocols, including <ul style="list-style-type: none"> The boundaries of vegetation clearing to be clearly marked as 'no go zones', signposted and delineated to prevent unauthorised clearing and vehicular and foot traffic; Marking trees to be removed and prepare an inventory of trees to be removed; Pre-clearance surveys to be completed by an appropriately qualified ecologist; Relocate any bushrock and fallen timber within the vegetation clearing area into adjoining bushland; Stockpiles should be placed in cleared areas outside of the 'no go zones' 	Construction Contractor Ecologist	Pre-construction and construction
Hollow-bearing Tree Removal	It is recommended that the following mitigation measures be implemented for the removal of the hollow-bearing trees: <ul style="list-style-type: none"> Marking trees to be removed and preparing an inventory of trees and hollows to be removed; Prepare an inventory of all fauna interactions; Pre-clearance surveys to be completed by an appropriately qualified ecologist; A qualified ecologist should be present during the removal of hollow-bearing trees to relocate any displaced fauna; If practical, removal of hollow-bearing trees be undertaken outside of May – September which is the main breeding season for hollow-dependant fauna. 	Construction contractor Ecologist	Pre-construction and construction



Impact	Mitigation Measure	Responsibility	Timing
Spread of weeds and pathogens	<p>Implementation of a weed management control protocol. All equipment, vehicles and machinery wheels and tracks of excavators and other tracked machinery should be cleaned so that they are completely free of soil, seeds and plant material before entering the study area to prevent the introduction of further exotic plant species and pathogens.</p> <p>All topsoil from the exotic grassland and exotic vegetation assemblages should be disposed of offsite.</p>	Construction Contractor	<p>Construction</p> <p>Post construction</p>

7. SIGNIFICANCE ASSESSMENT SUMMARY

A summary of the impact assessments conducted for BC Act and EPBC Act threatened flora and fauna species is provided in Tables 7-1 and 7-2. The detailed impact assessments are provided in Appendix 9. No significant impacts were considered likely to occur upon any threatened biodiversity listed under the BC Act and/or the EPBC Act as a result of the proposal.


An assessment of migratory species that have potential habitat within the study area is provided in Section 4.7.4.

No Commonwealth MNES are considered likely to be significantly impacted by the proposal.

A referral to the Commonwealth is not required as no significant impact was determined for any threatened biodiversity or other MNES listed under the EPBC Act.

Table 7-1 Threatened Fauna Significance Assessments

Scientific Name	Common Name	BC Act	EPBC Act	Recorded (Y/N)	Significant impact likely?
Birds					
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE M	No	No
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	No	No
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	No	No
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V	-	No	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	No	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	No	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	V	M	No	No
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	No	No
<i>Lathamus discolor</i>	Swift Parrot	E1	CE M	No	No
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	No	No
<i>Ninox strenua</i>	Powerful Owl	V	-	No	No
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	No	No




Scientific Name	Common Name	BC Act	EPBC Act	Recorded (Y/N)	Significant impact likely?
<i>Dasyurus maculatus</i>	Spotted-tail Quoll	V	E	No	No
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	No	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	No	No
<i>Petauroides volans</i>	Greater Glider	-	V	No	No
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	No	No
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V		No	No
<i>Macropus parma</i>	Parma Wallaby	V	-		No
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	V	V	No	No
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	-	V	No	No
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	-	No	No
Bats					
<i>Austronomus australis</i>	Little Bentwing-bat	V	-	No	No
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	No	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	No	No
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bent wing-bat	V	-	No	No
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	No	No
<i>Myotis macropus</i>	Large-footed Myotis	V	-	No	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	No	No

* BC Act - V=Vulnerable, E1 = Endangered, CE = Critically Endangered

EPBC Act – V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory

Table 7-2 Threatened Flora and TEC Significance Assessments



Scientific Name	Common Name	BC Act Status	EPBC Act Status	Recorded (Y/N)	Significant impact likely?
<i>Coastal Upland Swamp</i>	-	E	E	Yes	No
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	No	No
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	No	No
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	V	No	No
<i>Darwinia glaucophylla</i>	-	V	-	No	No
<i>Diuris bracteata</i>	-	E1	EX	No	No
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		No	No
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	No	No
<i>Hibbertia procumbens</i>	Spreading guinea Flower	E1	-	No	No
<i>Prostanthera junonis</i>	Somersby Mintbush	E1	E	No	No
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	V	No	No
<i>Tetralthea glandulosa</i>	-	V	-	No	No
<i>Tetralthea juncea</i>	Black-eyed Susan	V	V	No	No

* BC Act - V=Vulnerable, E1 = Endangered, CE = Critically Endangered
 EPBC Act – V = Vulnerable, E = Endangered, CE = Critically Endangered



8. CONCLUSIONS AND RECOMMENDATIONS

8.1. CONCLUSIONS

Three native Plant Community Types (PCTs) and four non-native vegetation communities were recorded within the study area and these include the following:

- PCT 1641 Dwarf Apple – Scribbly Gum heathy low woodland;
- PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland;
- PCT 1699 Heath-leaved Banksia – Coral Fern wet heath
- Planted Native Trees;
- Exotic Vegetation;
- Exotic Grassland; and
- Constructed Dam.

The proposal will involve the removal a total of 1.47 ha of native and non-native vegetation. The removal is comprised of:

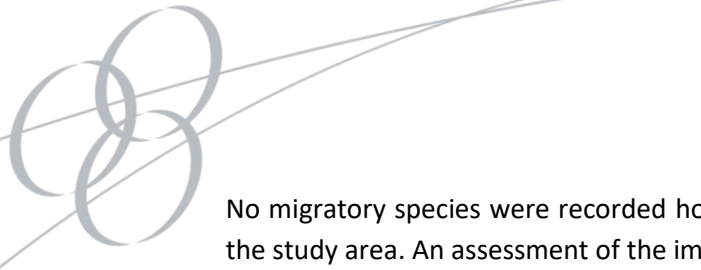
- 0.13 ha of PCT 1641 Dwarf Apple – Scribbly Gum heathy low woodland;
- 0.09 ha of PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland;
- 0.17 ha of Planted Vegetation;
- 0.26 ha of Exotic Vegetation; and
- 0.82 ha of Exotic Grassland.

One TEC - *Coastal Upland Swamp in the Sydney Basin Bioregion* listed as Endangered under both the BC and EPBC Acts was recorded within the study area, however this TEC will not be impacted under this proposal. This TEC has been mapped as PCT 1699 Heath-leaved Banksia – Coral Fern wet heath within the study area.

PCT 1642 and PCT 1699 have high potential to be groundwater dependent, however as there is no proposed draw down of groundwater and the proposal is unlikely to affect this GDE.

No threatened flora species were recorded within the study area. Twelve (12) threatened flora species have potential habitat within the study area (Appendix 4). Significance assessments for these potential threatened flora species was undertaken Appendix 9 and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.

No threatened fauna species were recorded within the study area. Thirty-two (32) threatened fauna species have potential habitat within the study area (Appendix 4). Significance assessments for these threatened fauna species was undertaken Appendix 9 and no significant impacts were considered likely due to the minor area of vegetation impact as a result of the proposal.



No migratory species were recorded however, four species have potential habitat to within the study area. An assessment of the impact of the proposal on these species was conducted in the Section 4.7.5 and it was determined that study area is not classified as important habitat for any of the migratory species that have potential to occur within the study area.

Fifty-seven (57) hollow-bearing trees were recorded within the study area. A maximum of three (3) of these will be removed as part of the proposal. Of these 57 hollow-bearing trees, a total of 11 hollows are likely to be removed as part of the proposal. However, 54 hollow-bearing trees with a total of 196 hollows are to be retained overall.

No threatened aquatic species listed under the FM Act have potential habitat within the study area.

No areas of outstanding biodiversity value (AOBV) listed on the BC Act occur within the study area.

In conclusion, the proposal is unlikely to have a significant impact on threatened biodiversity and as such a Species Impact Statement or a referral to the Commonwealth under the EPBC Act is not required.



8.2. RECOMMENDATIONS


Recommendations are as follows:

- The northern option for the proposed water pipeline (or a version thereof) be chosen to avoid the endangered Coastal Upland Swamp;
- The Coastal Upland Swamp should be completely avoided if possible as otherwise a Referral to the Commonwealth DoEE will be required for the proposal;
- A buffer zone as large as possible must be provided around the Coastal Upland Swamp in accordance with the EPBC Act conservation advice that refers to buffers being required;
- The design of any aspect of the proposal should avoid, minimise and manage any impacts to the Coastal Upland Swamp areas to the greatest extent possible;
- The proposed water pipeline alignment goes from north to south where the sewer pipeline ends. There is a cleared track that occurs to the east (Figure 4-2) and it is suggested that the water pipeline could utilise this track rather than removing intact native vegetation;
- Where possible minimise the removal of hollow-bearing trees within the study area. There is potential for three hollow-bearing trees (HB6, HB8 & HB10 Figure 4-2) to be impacted upon in the northern portion (festival Drive) and Southern portion (The Avenue) of the proposal; and
- Targeted surveys for *Cryptostylis hunteriana* (Leafless Tongue Orchid) during the November to February flowering period are suggested if there are likely to be any future impacts to PCT 1642 Scribbly Gum – Red Bloodwood – Old Man Banksia Woodland. If this is not practical, then a pre-construction re-check is suggested.



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APPENDIX 1

Database Searches

Data from the BioNet BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1Å°; ^^ rounded to 0.01Å°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -33.38 West: 151.25 East: 151.35 South: -33.48] returned a total of 2,551 records of 62 species.




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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Amphibia	Myobatrachida	3042	<i>Heleioporus australiacus</i>		Giant Burrowing Frog	V,P	V	63	
Animalia	Amphibia	Myobatrachida	3116	<i>Pseudophryne australis</i>		Red-crowned Toadlet	V,P		84	
Animalia	Amphibia	Hylidae	3169	<i>Litoria brevipalmata</i>		Green-thighed Frog	V,P		1	
Animalia	Reptilia	Cheloniidae	2004	<i>Caretta caretta</i>		Loggerhead Turtle	E1,P	E	1	
Animalia	Reptilia	Cheloniidae	2007	<i>Chelonia mydas</i>		Green Turtle	V,P	V	4	
Animalia	Reptilia	Varanidae	2287	<i>Varanus rosenbergi</i>		Rosenberg's Goanna	V,P		1	
Animalia	Aves	Ardeidae	0197	<i>Botaurus poiciloptilus</i>		Australasian Bittern	E1,P	E	1	
Animalia	Aves	Ardeidae	0196	<i>Ixobrychus flavicollis</i>		Black Bittern	V,P		2	
Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>		White-bellied Sea-Eagle	V,P	C	7	
Animalia	Aves	Accipitridae	0225	<i>Hieraetus morphnoides</i>		Little Eagle	V,P		1	
Animalia	Aves	Accipitridae	0230	<i>Lophoictinia isura</i>		Square-tailed Kite	V,P,3		1	
Animalia	Aves	Accipitridae	8739	<i>Pandion cristatus</i>		Eastern Osprey	V,P,3		8	
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>		Bush Stone-curlew	E1,P		71	
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>		Pied Oystercatcher	E1,P		6	
Animalia	Aves	Scolopacidae	0149	<i>Numenius madagascariensis</i>		Eastern Curlew	P	CE,C,J,K	3	
Animalia	Aves	Cacatuidae	0268	<i>Callocephalon fimbriatum</i>		Gang-gang Cockatoo	V,P,3		3	
Animalia	Aves	Cacatuidae	0265	<i>^Calyptorhynchus lathami</i>		Glossy Black-Cockatoo	V,P,2		29	
Animalia	Aves	Psittacidae	0260	<i>Glossopsitta pusilla</i>		Little Lorikeet	V,P		5	
Animalia	Aves	Psittacidae	0309	<i>Lathamus discolor</i>		Swift Parrot	E1,P,3	CE	8	
Animalia	Aves	Psittacidae	0302	<i>Neophema pulchella</i>		Turquoise Parrot	V,P,3		1	
Animalia	Aves	Strigidae	0246	<i>Ninox connivens</i>		Barking Owl	V,P,3		4	
Animalia	Aves	Strigidae	0248	<i>Ninox strenua</i>		Powerful Owl	V,P,3		26	
Animalia	Aves	Tytonidae	0250	<i>Tyto novaehollandiae</i>		Masked Owl	V,P,3		6	
Animalia	Aves	Tytonidae	9924	<i>Tyto tenebricosa</i>		Sooty Owl	V,P,3		13	
Animalia	Aves	Meliphagidae	0603	<i>Anthochaera phrygia</i>		Regent Honeyeater	E4A,P	CE	3	
Animalia	Aves	Neosittidae	0549	<i>Daphoenositta chrysoptera</i>		Varied Sittella	V,P		4	
Animalia	Aves	Artamidae	8519	<i>Artamus cyanopterus cyanopterus</i>		Dusky Woodswallow	V,P		1	
Animalia	Aves	Petroicidae	0380	<i>Petroica boodang</i>		Scarlet Robin	V,P		1	
Animalia	Mammalia	Dasyuridae	1008	<i>Dasyurus maculatus</i>		Spotted-tailed Quoll	V,P	E	56	
Animalia	Mammalia	Phascolarctidae	1162	<i>Phascolarctos cinereus</i>		Koala	V,P	V	15	
Animalia	Mammalia	Burramyidae	1150	<i>Cercartetus nanus</i>		Eastern Pygmy-possum	V,P		33	
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>		Squirrel Glider	V,P		3	
Animalia	Mammalia	Potoroidae	1175	<i>Potorous tridactylus</i>		Long-nosed Potoroo	V,P	V	3	
Animalia	Mammalia	Pteropodidae	1280	<i>Pteropus poliocephalus</i>		Grey-headed Flying-fox	V,P	V	40	
Animalia	Mammalia	Molossidae	1329	<i>Mormopterus norfolkensis</i>		Eastern Freetail-bat	V,P		12	
Animalia	Mammalia	Vespertilionidae	1353	<i>Chalinolobus dwyeri</i>		Large-eared Pied Bat	V,P	V	1	
Animalia	Mammalia	Vespertilionidae	1372	<i>Falsistrellus tasmaniensis</i>		Eastern False Pipistrelle	V,P		8	
Animalia	Mammalia	Vespertilionidae	1346	<i>Miniopterus australis</i>		Little Bentwing-bat	V,P		26	
Animalia	Mammalia	Vespertilionidae	1834	<i>Miniopterus schreibersii oceanensis</i>		Eastern Bentwing-bat	V,P		28	
Animalia	Mammalia	Vespertilionidae	1357	<i>Myotis macropus</i>		Southern Myotis	V,P		10	
Animalia	Mammalia	Vespertilionidae	1361	<i>Scoteanax rueppellii</i>		Greater Broad-nosed Bat	V,P		10	
Animalia	Mammalia	Vespertilionidae	1025	<i>Vespadelus trougtoni</i>		Eastern Cave Bat	V,P		2	
Animalia	Mammalia	Muridae	1466	<i>Pseudomys gracilicaudatus</i>		Eastern Chestnut Mouse	V,P		1	

Plantae	Flora	Dilleniaceae	2544	<i>Hibbertia procumbens</i>	Spreading Guinea Flower	E1		690	
Plantae	Flora	Elaeocarpaceae	6205	<i>Tetratheca glandulosa</i>		V		2	
Plantae	Flora	Ericaceae	7752	<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		2	
Plantae	Flora	Lamiaceae	9885	<i>Prostanthera askania</i>	Tranquility Mintbush	E1	E	43	
Plantae	Flora	Lamiaceae	9884	<i>Prostanthera junonis</i>	Somersby Mintbush	E1	E	616	
Plantae	Flora	Myrtaceae	4007	<i>Callistemon linearifolius</i>	Netted Bottle Brush	V,3		6	
Plantae	Flora	Myrtaceae	4028	<i>Darwinia glaucophylla</i>		V		363	
Plantae	Flora	Myrtaceae	4067	<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	9	
Plantae	Flora	Myrtaceae	4096	<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	1	
Plantae	Flora	Myrtaceae	6809	<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	58	
Plantae	Flora	Myrtaceae	4248	<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	4	
Plantae	Flora	Myrtaceae	4283	<i>Rhodamnia rubescens</i>	Scrub Turpentine	E4A		7	
Plantae	Flora	Myrtaceae	4293	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	6	
Plantae	Flora	Orchidaceae	4415	<i>^^Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V,P,2	V	1	
Plantae	Flora	Orchidaceae	4442	<i>^^Diuris bracteata</i>		E1,P,2	X	1	
Plantae	Flora	Poaceae	4746	<i>Ancistrachne maidenii</i>		V		1	
Plantae	Flora	Proteaceae	5400	<i>Grevillea shiressii</i>		V	V	132	
Plantae	Flora	Proteaceae	5458	<i>Persoonia hirsuta</i>	Hairy Geebung	E1,P,3	E	1	
Plantae	Flora	Restionaceae	10608	<i>Baloskion longipes</i>	Dense Cord-rush	V	V	2	

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Community				<i>Blue Gum High Forest in the Sydney Basin Bioregion</i>		Blue Gum High Forest in the Sydney Basin Bioregion	E4B	CE	K	
Community				<i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	V	K	
Community				<i>Coastal Upland Swamp in the Sydney Basin Bioregion</i>		Coastal Upland Swamp in the Sydney Basin Bioregion	E3	E	K	
Community				<i>Duffys Forest Ecological Community in the Sydney Basin Bioregion</i>		Duffys Forest Ecological Community in the Sydney Basin Bioregion	E3		K	
Community				<i>Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion</i>		Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion	E4B	E	K	
Community				<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community				<i>Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions</i>		Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E3		K	
Community				<i>Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion</i>		Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion	E4B		K	
Community				<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>		Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	CE	K	
Community				<i>Lower Hunter Spotted Gum“Ironbark Forest in the Sydney Basin Bioregion</i>		Lower Hunter Spotted Gum“Ironbark Forest in the Sydney Basin Bioregion	E3		K	
Community				<i>Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions</i>		Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	E3	CE	K	
Community				<i>Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion</i>		Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E3		K	
Community				<i>Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion</i>		Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion	E3		K	

Community	<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community	<i>Shale Sandstone Transition Forest in the Sydney Basin Bioregion</i>	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E4B	CE	K	
Community	<i>Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion</i>	Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3		K	
Community	<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	E	K	
Community	<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community	<i>Sydney Freshwater Wetlands in the Sydney Basin Bioregion</i>	Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E3		K	
Community	<i>Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions</i>	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3		K	
Community	<i>Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion</i>	Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion	E3		K	
Community	<i>Western Sydney Dry Rainforest in the Sydney Basin Bioregion</i>	Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE	P	

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Threat				<i>Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, Manorina melanocephala (Latham, 1802)</i>		Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, Manorina melanocephala (Latham, 1802)	KTP	KTP	P	
Threat				<i>Alteration of habitat following subsidence due to longwall mining</i>		Alteration of habitat following subsidence due to longwall mining	KTP		P	
Threat				<i>Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands</i>		Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P	
Threat				<i>Anthropogenic Climate Change</i>		Anthropogenic Climate Change	KTP	KTP	P	
Threat				<i>Bushrock removal</i>		Bushrock removal	KTP		P	
Threat				<i>Clearing of native vegetation</i>		Clearing of native vegetation	KTP	KTP	P	
Threat				<i>Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)</i>		Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	KTP	KTP	P	
Threat				<i>Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758</i>		Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	KTP	KTP	P	
Threat				<i>Competition from feral honey bees, Apis mellifera L.</i>		Competition from feral honey bees, Apis mellifera L.	KTP		P	
Threat				<i>Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners</i>		Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P	
Threat				<i>Herbivory and environmental degradation caused by feral deer</i>		Herbivory and environmental degradation caused by feral deer	KTP		P	
Threat				<i>High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition</i>		High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P	
Threat				<i>Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972</i>		Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	KTP	KTP	P	
Threat				<i>Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations</i>		Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P	

Threat	<i>Infection of frogs by amphibian chytrid causing the disease chytridiomycosis</i>	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P	
Threat	<i>Infection of native plants by Phytophthora cinnamomi</i>	Infection of native plants by Phytophthora cinnamomi	KTP	KTP	P	
Threat	<i>Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae</i>	Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	KTP		P	
Threat	<i>Introduction of the Large Earth Bumblebee Bombus terrestris (L.)</i>	Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	KTP		P	
Threat	<i>Invasion and establishment of exotic vines and scramblers</i>	Invasion and establishment of exotic vines and scramblers	KTP		P	
Threat	<i>Invasion and establishment of Scotch Broom (Cytisus scoparius)</i>	Invasion and establishment of Scotch Broom (Cytisus scoparius)	KTP		P	
Threat	<i>Invasion and establishment of the Cane Toad (Bufo marinus)</i>	Invasion and establishment of the Cane Toad (Bufo marinus)	KTP	KTP	P	
Threat	<i>Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.</i>	Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	KTP		P	
Threat	<i>Invasion of native plant communities by Chrysanthemoides monilifera</i>	Invasion of native plant communities by Chrysanthemoides monilifera	KTP		P	
Threat	<i>Invasion of native plant communities by exotic perennial grasses</i>	Invasion of native plant communities by exotic perennial grasses	KTP		P	
Threat	<i>Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW</i>	Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	KTP		P	
Threat	<i>Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)</i>	Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	KTP		P	
Threat	<i>Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants</i>	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	P	
Threat	<i>Loss of Hollow-bearing Trees</i>	Loss of Hollow-bearing Trees	KTP		P	
Threat	<i>Loss or degradation (or both) of sites used for hill-topping by butterflies</i>	Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P	
Threat	<i>Predation and hybridisation by Feral Dogs, Canis lupus familiaris</i>	Predation and hybridisation by Feral Dogs, Canis lupus familiaris	KTP		P	

Threat	<i>Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)</i>	Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP		P	
Threat	<i>Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)</i>	Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	KTP	KTP	P	
Threat	<i>Predation by the Feral Cat Felis catus (Linnaeus, 1758)</i>	Predation by the Feral Cat Felis catus (Linnaeus, 1758)	KTP	KTP	P	
Threat	<i>Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758</i>	Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	KTP	KTP	P	
Threat	<i>Removal of dead wood and dead trees</i>	Removal of dead wood and dead trees	KTP		P	



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 28/06/19 15:28:31

[Summary](#)

[Details](#)

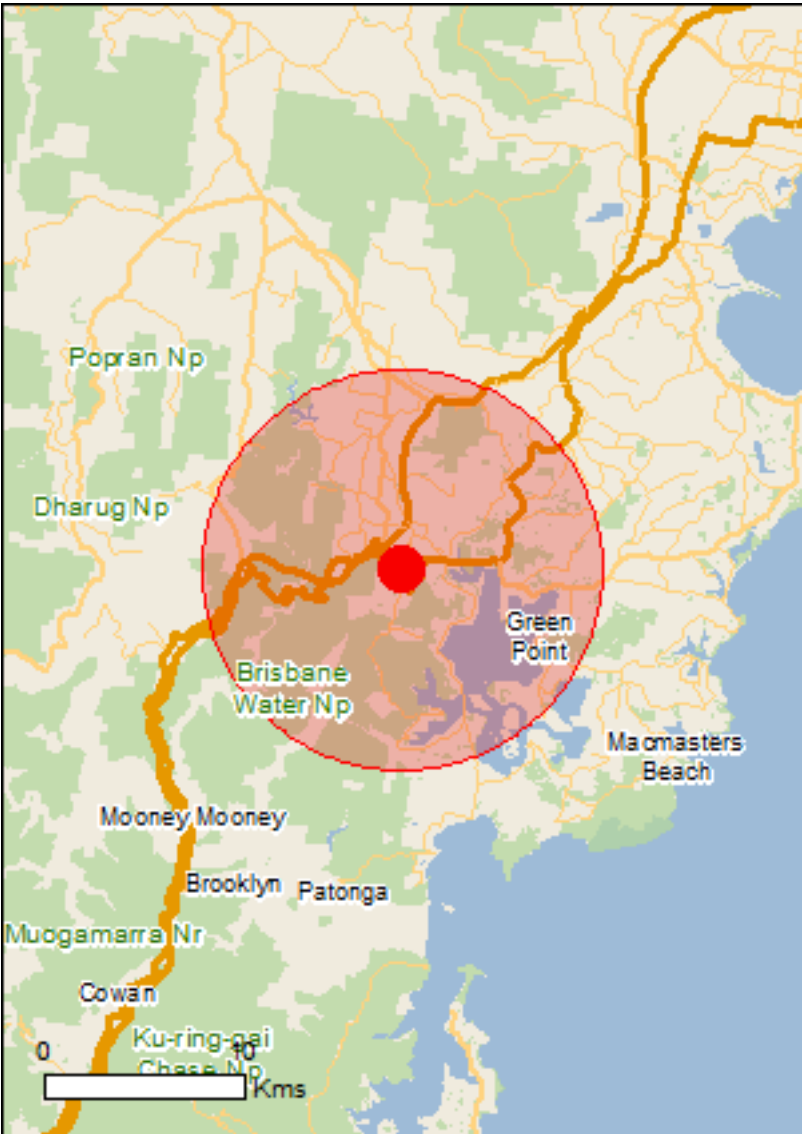
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

[Buffer: 10.0Km](#)



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	77
Listed Migratory Species:	57

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	9
Commonwealth Heritage Places:	None
Listed Marine Species:	57
Whales and Other Cetaceans:	5
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	9
Regional Forest Agreements:	1
Invasive Species:	49
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

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

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		

Name	Status	Type of Presence
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Litoria littlejohni Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area

Name	Status	Type of Presence
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Acacia pubescens Downy Wattle, Hairy Stemmed Wattle [18800]	Vulnerable	Species or species habitat may occur within area
Asterolasia elegans [56780]	Endangered	Species or species habitat may occur within area
Astrotricha crassifolia Thick-leaf Star-hair [10352]	Vulnerable	Species or species habitat known to occur within area
Baloskion longipes Dense Cord-rush [68511]	Vulnerable	Species or species habitat may occur within area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
Grevillea shiressii [19186]	Vulnerable	Species or species habitat known to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat may occur within area
Micromyrtus blakelyi [6870]	Vulnerable	Species or species habitat may occur within area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat likely to occur within area
Prostanthera askania Tranquillity Mintbush, Tranquillity Mintbush [64958]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Prostanthera junonis Somersby Mintbush [64960]	Endangered	Species or species habitat known to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Rutidosis heterogama Heath Wrinklewort [13132]	Vulnerable	Species or species habitat may occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
Tetratheca juncea Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hoplocephalus bungaroides Broad-headed Snake [1182]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area

Name	Threatened	Type of Presence
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Foraging, feeding or related behaviour known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

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

Name
Commonwealth Land -
Commonwealth Land - Airservices Australia
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Housing Authority
Commonwealth Land - Defence Service Homes Corporation
Commonwealth Land - Director of War Service Homes
Defence - ERINA GRES DEPOT
Defence - TS HAWKESBURY

Listed Marine Species	[Resource Information]
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* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area
Charadrius bicinctus Double-banded Plover [895]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]		Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]		Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]		Foraging, feeding or related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]		Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Foraging, feeding or related behaviour may occur within area
Gallinago megala Swinhoe's Snipe [864]		Foraging, feeding or related behaviour likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Foraging, feeding or related behaviour known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Foraging, feeding or related behaviour known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Lathamus discolor Swift Parrot [744]	Critically Endangered	within area Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Foraging, feeding or related behaviour likely to occur within area
Numenius phaeopus Whimbrel [849]		Foraging, feeding or related behaviour known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Foraging, feeding or related behaviour known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Brisbane Water	NSW
Forestry Management Areas in Morisset	NSW
Jilliby	NSW
LNE Special Management Zone No1	NSW
Palm Grove	NSW
Pelican Island	NSW
Popran	NSW
Rileys Island	NSW
Saratoga Island	NSW

Regional Forest Agreements	[Resource Information]
Note that all areas with completed RFAs have been included.	
Name	State
North East NSW RFA	New South Wales

Invasive Species	[Resource Information]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.	

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur

Name	Status	Type of Presence
within area		
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name		State
Brisbane Water Estuary		NSW

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-33.43029 151.29737

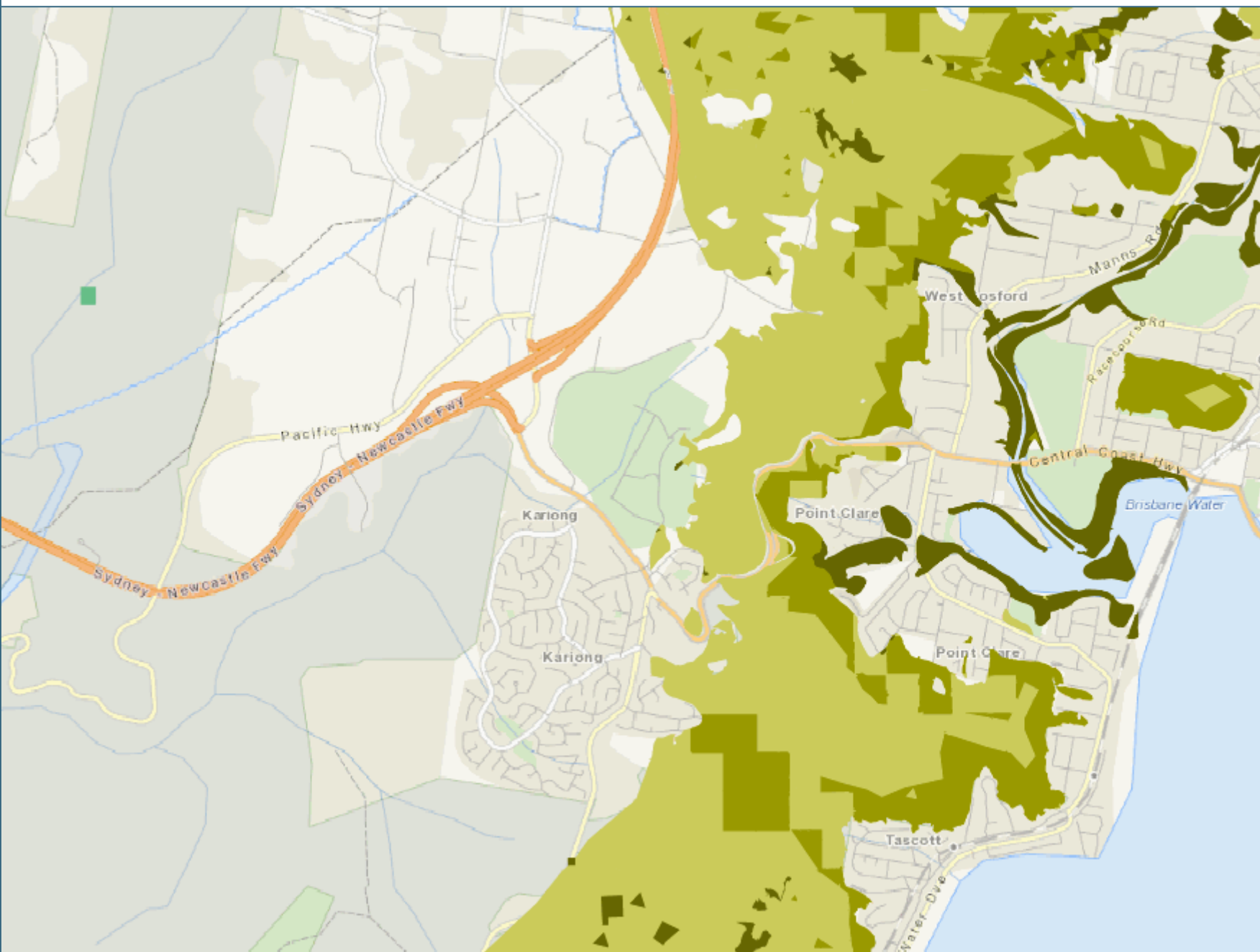
Acknowledgements

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

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

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

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



Terrestrial GDE (no data)



No ecosystems analysed

Terrestrial GDE



Known GDE
(regional study)



High potential GDE
(regional study)



Moderate potential GDE
(regional study)



Low potential GDE
(regional study)



Unclassified potential GDE
(regional study)



High potential GDE
(national assessment)



Moderate potential GDE
(national assessment)



Low potential GDE
(national assessment)



Unclassified potential GDE
(national assessment)



1:42,852

Kilometres 1

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: [Click here](#)

Australian Albers GDA94




Coastal Management SEPP 2018


Legend

- Coastal Wetlands
- Proximity Area for Coastal Wetlands
- Littoral Rainforests
- Proximity Area for Littoral Rainforests


Notes:




Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
TG	Tree	Araucariaceae	<i>Araucaria cunninghamii</i>	Hoop Pine	-	-
TG	Tree	Casuarinaceae	<i>Allocasuarina torulosa</i>	Forest Oak	-	-
TG	Tree	Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak	-	-
TG	Tree	Lamiaceae	<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum	-	-
TG	Tree	Meliaceae	<i>Melia azedarach</i>	White Cedar	-	-
TG	Tree	Myrtaceae	<i>Angophora costata</i>	Smooth-barked Apple	-	-
TG	Tree	Myrtaceae	<i>Corymbia gummifera</i>	Red Bloodwood	-	-
TG	Tree	Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum	-	-
TG	Tree	Myrtaceae	<i>Eucalyptus capitellata</i>	Brown Stringybark	-	-
TG	Tree	Myrtaceae	<i>Eucalyptus haemastoma</i>	Scribbly Gum	-	-
TG	Tree	Myrtaceae	<i>Eucalyptus piperita</i>	Sydney Peppermint	-	-
TG	Tree	Myrtaceae	<i>Eucalyptus punctata</i>	Grey Gum	-	-
TG	Tree	Myrtaceae	<i>Lophostemon confertus</i>	Brush Box	-	-
TG	Tree	Myrtaceae	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	-	-
TG	Tree	Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine	-	-
TG	Tree	Pittosporaceae	<i>Pittosporum undulatum</i>	Sweet Pittosporum	-	-
TG	Tree	Proteaceae	<i>Banksia integrifolia</i>	Coast Banksia	-	-
TG	Tree	Proteaceae	<i>Banksia serrata</i>	Old-man Banksia	-	-
TG	Tree	Phyllanthaceae	<i>Glochidion ferdinandi</i>	Cheese Tree	-	-
TG	Mallee Tree	Myrtaceae	<i>Angophora hispida</i>	Dwarf Apple	-	-
SG	Shrub	Caprifoliaceae	<i>Sambucus australasica</i>	Native Elder	-	-
SG	Shrub	Cunoniaceae	<i>Bauera rubioides</i>	Dog Rose	-	-
SG	Shrub	Dilleniaceae	<i>Hibbertia aspera</i>	-	-	-
SG	Shrub	Dilleniaceae	<i>Hibbertia fasciculata</i>	-	-	-
SG	Shrub	Dilleniaceae	<i>Hibbertia obtusifolia</i>	Hoary Guinea Flower	-	-
SG	Shrub	Ericaceae	<i>Woolfsia pungens</i>	-	-	-
SG	Shrub	Euphorbiaceae	<i>Homalanthus populifolius</i>	Bleeding Heart	-	-
SG	Shrub	Euphorbiaceae	<i>Ricinocarpos pinifolius</i>	Wedding Bush	-	-
SG	Shrub	Faboideae	<i>Bossiaea obcordata</i>	Spiny Bossiaea	-	-
SG	Shrub	Faboideae	<i>Dillwynia floribunda</i>	-	-	-
SG	Shrub	Faboideae	<i>Pultenaea villosa</i>	Hairy Bush Pea	-	-
SG	Shrub	Lamiaceae	<i>Westringia fruticosa</i>	Coastal Rosemary	-	-
SG	Shrub	Mimosoideae	<i>Acacia decurrens</i>	Green Wattle	-	-




Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
SG	Shrub	Mimosoideae	<i>Acacia echinula</i>	Hedgehog Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia elata</i>	Gosford Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia floribunda</i>	White Sally Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia implexa</i>	Hickory Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia longifolia</i>	-	-	-
SG	Shrub	Mimosoideae	<i>Acacia linifolia</i>	White Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia myrtifolia</i>	Red-stemmed Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia oxycedrus</i>	Spike Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia podalyriifolia</i>	Queensland Silver Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia suaveolens</i>	Sweet Wattle	-	-
SG	Shrub	Mimosoideae	<i>Acacia ulicifolia</i>	Prickly Moses	-	-
SG	Shrub	Myrtaceae	<i>Callistemon citrinus</i>	Crimson Bottlebrush	-	-
SG	Shrub	Myrtaceae	<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	-	-
SG	Shrub	Myrtaceae	<i>Kunzea ambigua</i>	Tick Bush	-	-
SG	Shrub	Myrtaceae	<i>Leptospermum juniperinum</i>	Prickly Tea-tree	-	-
SG	Shrub	Myrtaceae	<i>Leptospermum laevigatum</i>	Coast Teatree	-	-
SG	Shrub	Myrtaceae	<i>Leptospermum polygalifolium</i>	Tantoon	-	-
SG	Shrub	Phyllanthaceae	<i>Phyllanthus hirtellus</i>	Thyme Spurge	-	-
SG	Shrub	Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn	-	-
SG	Shrub	Proteaceae	<i>Banksia ericifolia</i> subsp. <i>ericifolia</i>	Heath-leaved Banksia	-	-
SG	Shrub	Proteaceae	<i>Banksia spinulosa</i>	Hairpin Banksia	-	-
SG	Shrub	Proteaceae	<i>Grevillea sericea</i>		-	-
SG	Shrub	Proteaceae	<i>Hakea dactyloides</i>	Finger Hakea	-	-
SG	Shrub	Proteaceae	<i>Hakea gibbosa</i>	Needlebush	-	-
SG	Shrub	Proteaceae	<i>Hakea teretifolia</i>	Dagger Hakea	-	-
SG	Shrub	Proteaceae	<i>Isopogon anemonifolius</i>	Drumsticks	-	-
SG	Shrub	Proteaceae	<i>Lambertia formosa</i>	Mountain Devil	-	-
SG	Shrub	Proteaceae	<i>Lomatia silaifolia</i>	Crinkle Bush	-	-
SG	Shrub	Proteaceae	<i>Persoonia isophylla</i>	-	-	-
SG	Shrub	Proteaceae	<i>Persoonia lanceolata</i>	Lance Leaf Geebung	-	-



Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
SG	Shrub	Proteaceae	<i>Personia levis</i>	Broad-leaved Geebung	-	-
SG	Shrub	Proteaceae	<i>Petrophile pulchella</i>	Conesticks	-	-
SG	Shrub	Rhamnaceae	<i>Pomaderris sp.</i>		-	-
SG	Shrub	Rutaceae	<i>Boronia ledifolia</i>	Sydney Boronia	-	-
SG	Shrub	Rutaceae	<i>Phebalium squamulosum</i>		-	-
SG	Shrub	Thymelaeaceae	<i>Pimelea linifolia</i>	Slender Rice Flower	-	-
SG	Heath Shrub	Ericaceae	<i>Epacris longifolia</i>	Fuchsia Heath	-	-
SG	Heath Shrub	Ericaceae	<i>Leucopogon appressus</i>	-	-	-
SG	Heath Shrub	Ericaceae	<i>Leucopogon juniperinus</i>	Prickly Beard-heath	-	-
SG	Heath Shrub	Ericaceae	<i>Leucopogon microphyllus</i>	Small-leaved White Beard	-	-
SG	Heath Shrub	Ericaceae	<i>Woolisia pungens</i>		-	-
GG	Tussock Grass	Poaceae	<i>Cynodon dactylon</i>	Couch	-	-
GG	Tussock Grass	Poaceae	<i>Digitaria parviflora</i>	Small-flower Finger Grass	-	-
GG	Tussock Grass	Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass	-	-
GG	Tussock Grass	Poaceae	<i>Entolasia stricta</i>	Wiry Panic	-	-
GG	Tussock Grass	Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	-	-
GG	Tussock Grass	Poaceae	<i>Imperata cylindrica</i>	Blady Grass	-	-
GG	Tussock Grass	Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	-	-
GG	Tussock Grass	Poaceae	<i>Opismenus aemula</i>	Basket Grass	-	-
GG	Tussock Grass	Poaceae	<i>Paspalidium distans</i>	-	-	-
GG	Tussock Grass	Poaceae	<i>Rytidosperma pallida</i>	Silvertop Wallaby Grass	-	-
GG	Tussock Grass	Poaceae	<i>Poa labillardierei</i>	Snowgrass	-	-
GG	Tussock Grass	Poaceae	<i>Themeda triandra</i>	Kangaroo Grass		
GG	Sedge	Cyperaceae	<i>Carex appressa</i>	Tall Sedge	-	-
GG	Sedge	Cyperaceae	<i>Caustis pentandra</i>	Thick Twist Rush	-	-
GG	Sedge	Cyperaceae	<i>Caustis recurvata</i>	-	-	-
GG	Sedge	Cyperaceae	<i>Chorizandra cymbaria</i>	-	-	-
GG	Sedge	Cyperaceae	<i>Eleocharis gracilis</i>	-	-	-




Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
GG	Sedge	Cyperaceae	<i>Gahnia clarkei</i>	Tall Saw-sedge	-	-
GG	Sedge	Cyperaceae	<i>Gahnia sieberiana</i>	Red-fruit Saw-sedge	-	-
GG	Sedge	Cyperaceae	<i>Isolepis inundata</i>	-	-	-
GG	Sedge	Cyperaceae	<i>Lepidosperma laterale</i>	Variable Sword-sedge	-	-
GG	Sedge	Cyperaceae	<i>Ptilothrix deusta</i>	-	-	-
GG	Sedge	Cyperaceae	<i>Schoenoplectiella mucronata</i>	-	-	-
GG	Rush	Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush	-	-
GG	Rush	Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	-	-
GG	Rush	Lomandraceae	<i>Lomandra multiflora</i>	Many-flowered Mat-rush	-	-
GG	Rush	Lomandraceae	<i>Lomandra obliqua</i>	-	-	-
GG	Rush	Restionaceae	<i>Leptocarpus tenax</i>	-	-	-
FG	Forb	Acanthaceae	<i>Pseuderanthemum variable</i>	Pastel Flower	-	-
FG	Forb	Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed	-	-
FG	Forb	Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily	-	-
FG	Forb	Apiaceae	<i>Actinotus minor</i>	Lessor Flannel Flower	-	-
FG	Forb	Apiaceae	<i>Centella asiatica</i>	Indian Pennywort	-	-
FG	Forb	Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	-	-
FG	Forb	Droseraceae	<i>Drosera peltata</i>	-	-	-
FG	Forb	Faboideae	<i>Hovea linearis</i>	-	-	-
FG	Forb	Goodeniaceae	<i>Dampiera stricta</i>	Blue Dampiera	-	-
FG	Forb	Haloragaceae	<i>Gonocarpus teucrioides</i>	Germander Raspwort	-	-
FG	Forb	Iridaceae	<i>Patersonia glabrata</i>	Leafy Purple-flag	-	-
FG	Forb	Onagraceae	<i>Ludwigia peploides</i>	Water Primrose	-	-
FG	Forb	Orchidaceae	<i>Acianthus fornicatus</i>	Pixie Caps	-	-
FG	Forb	Orchidaceae	<i>Cryptostylis subulata</i> ? leaf only	Large Tongue Orchid	-	-
FG	Forb	Phormiaceae	<i>Dianella caerulea</i> var. <i>producta</i>	A Blue Flax Lily	-	-
FG	Forb	Phormiaceae	<i>Dianella prunina</i>	-	-	-
FG	Forb	Polygonaceae	<i>Persicaria lapathifolium</i>	Knotweed	-	-
FG	Forb	Polygonaceae	<i>Rumex brownii</i>	-	-	-



Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
FG	Forb	Violaceae	<i>Viola hederacea</i>	Ivy-leaved Violet	-	-
EG	Fern	Blechnaceae	<i>Blechnum nudum</i>	Fishbone Water Fern	-	-
EG	Fern	Blechnaceae	<i>Telmatoblechnum indicum</i>	Swamp Water Fern	-	-
EG	Fern	Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken	-	-
EG	Fern	Dicksoniaceae	<i>Calochlaena dubia</i>	Rainbow Fern	-	-
EG	Fern	Gleicheniaceae	<i>Gleichenia dicarpa</i>	Pouched Coral Fern	-	-
EG	Fern	Dennstaedtiaceae	<i>Histiopteris incisa</i>	Bat's Wing Fern	-	-
EG	Fern	Lindsaeaceae	<i>Lindsaea linearis</i>	Screw Fern	-	-
EG	Fern	Selaginellaceae	<i>Selaginella uliginosa</i>	Clubmoss	-	-
OG	Palm & Palm Like	Doryanthaceae	<i>Doryanthes excelsa</i>	Gynea Lily	-	-
OG	Vine	Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod	-	-
OG	Vine	Faboideae	<i>Hardenbergia violacea</i>	False Sarsaparilla	-	-
OG	Vine	Dilleniaceae	<i>Hibbertia dentata</i>	Twining Guinea Flower	-	-
OG	Vine	Fabaceae	<i>Kennedia rubicunda</i>	Dusky Coral Pea	-	-
OG	Vine	Lauraceae	<i>Cassytha glabella</i>	Devils Twine	-	-
OG	Vine	Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry	-	-
OG	Vine	Menispermaceae	<i>Stephania japonica</i>	Snake Vine	-	-
OG	Vine	Passifloraceae	<i>Passiflora herbertiana</i>	Native Passionfruit	-	-
OG	Tree Fern	Cyatheaceae	<i>Cyathea australis</i>	Tree Fern	-	-
OG	Xanthorrhoea	Xanthorrhoeaceae	<i>Xanthorrhoea glauca</i>	-	-	-
OG	Xanthorrhoea	Xanthorrhoeaceae	<i>Xanthorrhoea media</i>	-	-	-
OG	Xanthorrhoea	Xanthorrhoeaceae	<i>Xanthorrhoea resinifera</i>	Grass Tree	-	-
HTE	-	Araliaceae	<i>Hedera helix</i>	English Ivy	-	-
HTE	-	Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	-	-
HTE	-	Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern	-	-
HTE	-	Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed	-	-
HTE	-	Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	-	-
HTE	-	Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	-	-
HTE	-	Faboideae	<i>Erythrina sykesii</i>	Coral Tree	-	-
HTE	-	Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel	-	-



Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
HTE	-	Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant	-	-
HTE	-	Oleaceae	<i>Ligustrum sinense</i>	Small-leaved Privet	-	-
HTE	-	Pinaceae	<i>Pinus radiata</i>	Radiata Pine	-	-
HTE	-	Poaceae	<i>Andropogon virginicus</i>	Whiskey Grass	-	-
HTE	-	Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	-	-
HTE	-	Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	-	-
HTE	-	Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	-	-
HTE	-	Poaceae	<i>Paspalum dilatatum</i>	Paspalum	-	-
HTE	-	Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	-	-
HTE	-	Rosaceae	<i>Rubus fruticosus sp. Agg.</i>	Blackberry complex	-	-
HTE	-	Verbenaceae	<i>Lantana camara</i>	Lantana	-	-
Exotic	-	Apiaceae	<i>Daucus carota</i>	Wild Carrot	-	-
Exotic	-	Araceae	<i>Zantedeschia aethiopica</i>	Arum Lily	-	-
Exotic	-	Araliaceae	<i>Hydrocotyle bonariensis</i>	Large-leaf Pennywort	-	-
Exotic	-	Asteraceae	<i>Ageratum houstonianum</i>	Blue Billygoat Weed	-	-
Exotic	-	Asteraceae	<i>Bidens pilosa</i>	Farmer's Friends	-	-
Exotic	-	Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	-	-
Exotic	-	Asteraceae	<i>Conyza bonariensis</i>	Fleabane	-	-
Exotic	-	Asteraceae	<i>Conyza canadensis</i>	Canadian Fleabane	-	-
Exotic	-	Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	-	-
Exotic	-	Asteraceae	<i>Hypochaeris radicata</i>	Catsear	-	-
Exotic	-	Asteraceae	<i>Onopordum acanthium</i>	Scotch Thistle	-	-
Exotic	-	Caryophyllaceae	<i>Stellaria media</i>	Common Chickweed	-	-
Exotic	-	Cyperaceae	<i>Isolepis prolifera</i>	-	-	-
Exotic	-	Faboideae	<i>Trifolium repens</i>	White Clover	-	-
Exotic	-	Faboideae	<i>Vicia sativa</i>	Common vetch	-	-
Exotic	-	Juncaceae	<i>Juncus cognatus</i>	-	-	-
Exotic	-	Liliaceae	<i>Lilium formosanum</i>	Formosan Lily	-	-
Exotic	-	Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	-	-
Exotic	-	Poaceae	<i>Holcus lanatus</i>	Yorkshire Fog	-	-
Exotic	-	Poaceae	<i>Panicum maximum</i>	Guinea Grass	-	-
Exotic	-	Poaceae	<i>Paspalum urvillei</i>	Vasey Grass	-	-




Growth Group	Growth Form	Family	Scientific Name	Common Name	BC Act	EPBC Act
Exotic	-	Poaceae	<i>Phalaris aquatica</i>	Phalaris	-	-
Exotic	-	Poaceae	<i>Setaria parviflora</i>	-	-	-
Exotic	-	Poaceae	<i>Setaria verticillata</i>	Whorled Pidgeon Grass	-	-
Exotic	-	Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	-	-
Exotic	-	Pontederiaceae	<i>Pontederia cordata</i>	Pickeral Weed	-	-
Exotic	-	Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	-	-
Exotic	-	Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco Bush	-	-
Exotic	-	Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	-	-
Exotic	-	Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	-	-



APPENDIX 3

Fauna Species Recorded



Life Form	Family	Species	Common Name	BC Act listed	EPBC Act listed	Introduced	Observation type
Bird	Anatidae	<i>Chenonetta jubata</i>	Australian Wood Duck	-	-	-	O W
Bird	Artamidae	<i>Cracticus tibicen</i>	Australian Magpie	-	-	-	O W
Bird	Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	-	-	-	O W
Bird	Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	-	-	-	O W
Bird	Cacatuidae	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-Cockatoo	-	-	-	O W
Bird	Cacatuidae	<i>Eolophus roseicapillus</i>	Galah	-	-	-	O
Bird	Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	-	-	-	O W
Bird	Cinclosomatidae	<i>Psophodes olivaceus</i>	Eastern Whipbird	-	-	-	W
Bird	Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	-	-	-	O
Bird	Corvidae	<i>Corvus coronoides</i>	Australian Raven	-	-	-	O W
Bird	Estrildidae	<i>Neochmia temporalis</i>	Red-browed Finch	-	-	-	O W
Bird	Meliphagidae	<i>Anthochaera chrysoptera</i>	Little Wattlebird	-	-	-	W
Bird	Meliphagidae	<i>Manorina melanocephala</i>	Noisy Miner	-	-	-	O W
Bird	Meliphagidae	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	-	-	-	W
Bird	Rallidae	<i>Porphyrio porphyrio</i>	Purple Swamphen	-	-	-	O
Bird	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	-	-	-	O
Bird	Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	-	-	-	O W
Mammal	Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit	-	-	Y	P
Frog	Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet	-	-	-	W

Observation Type Codes (Atlas of NSW Wildlife Database) O - seen, W - heard, OW = seen & heard call, P – scat



APPENDIX 4

Threatened Flora and Fauna Assessment



Species, populations and communities with a likelihood of occurrence of greater than or equal to Moderate have had potential impacts formally assessed using a 5-part test under the *Environmental Planning and Assessment Act 1979* and or a significance assessment under the EPBC Act (see Appendix 9).

BC Act = V = Vulnerable; E1 - Endangered; E2 - Endangered Population; E4 Critically endangered;

EPBC Act = V – Vulnerable; E – Endangered; CE – Critically Endangered; M = Migratory

P - Protected; K - Known occurrence; PR - Predicted occurrence;

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Amphibians							
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Distributed in south eastern NSW and Victoria, a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except clay based. Breeding habitat is generally soaks or pools within first or second order streams.	63	Low. No potential habitat for this species occurs within the study area	Low.
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1	V	Distributed from NSW north coast near Brunswick Heads, southwards along NSW coast to Victoria where it extends into east Gippsland. Inhabits marshes, dams and stream-sides, particularly those containing bulrushes or spikerushes. Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	PR	Low. No potential habitat for this species occurs within the study area	Low.
<i>Litoria littlejohni</i>	Littlejohn’s Tree Frog, Heath Frog	V	V	Distribution includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation.	PR	Low. No potential habitat for this species occurs within the study area	Low.
<i>Litoria brevipalmata</i>	Green-thighed Frog	V	-	Distribution in isolated localities along the coast and ranges of NSW from north of Wollongong to south-east Queensland. Occurs in habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Prefers wetter forests in the south of its range but extends into drier forests in northern NSW and southern QLD. Thought to forage in leaf-litter.	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Mixophyes balbus</i>	Stuttering Frog	E1	V	Stuttering Frogs occur along the east coast of Australia from southern Qld to north-eastern Victoria. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.	PR	Low. No potential habitat for this species occurs within the study area	Low.
<i>Mixophyes iteratus</i>	Giant Barred Frog	E1	E	Giant Barred Frogs forage and live amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000m. They breed around shallow, flowing rocky streams from late spring to summer. Females lay eggs onto moist creek banks or rocks above water level, from where tadpoles drop into the water when hatched.	PR	Low. No potential habitat for this species occurs within the study area	Low.



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	A brown to black frog with a bright red orange triangle on the head. Length is approx 30mm. The toadlet has restricted distribution, it is confined to the Sydney basin from Polkolbin in the north. Inhabits wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks amongst masses of dune vegetation or thick piles of leaf litter.	84	Low. No potential habitat for this species occurs within the study area	Low
Reptiles							
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	The Broad-headed Snake is largely confined to Triassic and Permian sandstones. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges. Moves from the sandstone rocks to shelters in hollows in large trees within 200m of escarpments in summer.	PR	Low. No potential habitat for this species occurs within the study area	
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V	-	Occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. Found in heath, open forest and woodland.	1	Low. No potential habitat for this species occurs within the study area	Low
Birds							
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E1	E	Inhabits terrestrial and estuarine wetlands, generally where there is permanent water. The species prefers wetlands with dense vegetation, including sedges, rushes and reeds.	1	Low. No potential habitat for this species occurs within the study area	Low.
<i>Ixobrychus flavicollis</i>	Black Bittern	V	-	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	2	Low. No potential habitat for this species occurs within the study area	Low.
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1	-	Wader-like bird that can be difficult to see in its lightly timbered, open forest or woodland habitat. Dry, open grassland and cropland, with cover nearby, may also provide habitat for the species.	71	Low. No preferred habitat occurs within the study area.	Low
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE	Primarily coastal distribution, species is found in all states including Tasmania. Rarely recorded inland, mainly found in estuaries such as Hunter river, Port Stephens, Clarence river and Richmond river.	3	Low. No preferred habitat occurs within the study area.	Low
<i>Pandion cristatus</i>	Eastern Osprey	V	M	Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	8	Low. No preferred habitat occurs within the study area.	Low
<i>Haematopus longirostris</i>	Pied Oystercatcher	E1	M	The species is distributed around the entire Australian coastline. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	6	Low. No preferred habitat occurs within the study area.	Low
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	-	Distributed from southern Victoria through south and central-eastern New South Wales. In summer, generally found in 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.	21	Moderate. Suitable foraging and breeding habitat are present within the study area.	Low.



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	-	Feeds almost exclusively on the seeds of <i>Casuarina</i> sp. and <i>Allocasuarina</i> sp. Open forest and woodlands up to 1000m with feed trees present.	29	Moderate. <i>Allocasuarina torulosa</i> trees were recorded within the study area.	Low
<i>Ninox connivens</i>	Barking Owl	V	-	Woodland and open forest including fragmented remnants and partly cleared farmland. Preferentially hunts small arboreal mammals such as squirrel gliders and ringtail possums. But as prey decreases becomes reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Large tree hollows are used for nesting.	4	Moderate. Suitable foraging and roosting habitat are present within the study area.	Low
<i>Ninox strenua</i>	Powerful Owl	V	-	Endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range. Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Nests in large tree hollows (at least 0.5 m deep).	3	High. Suitable foraging and roosting habitat are present within the study area.	Low
<i>Tyto novaehollandiae</i>	Masked Owl	V	-	Extends from the coast where it is most abundant to the western plains. Lives in dry eucalypt forests and woodlands from sea level to 1100m.	6	Moderate. Suitable foraging and roosting habitat are present within the study area.	Low
<i>Tyto tenebricosa</i>	Sooty Owl	V	-	Occurring on the coast, coastal escarpment and eastern tablelands. There is no seasonal variation in its distribution. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation.	8	Low. No potential habitat for this species occurs within the study area	Low
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	-	The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species.	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	-	Forages in flowering eucalypts and <i>Melaleuca</i> sp. Riparian habitats are particularly used, due to higher soil fertility and greater productivity. Nests in tree hollows.	5	Moderate. Eucalypt forest occurs within the study area to provide potential foraging, breeding and roosting habitat for this species.	Low
<i>Hieraaetus morphnoides</i>	Little Eagle	V	-	Found throughout the Australian mainland except in the most densely forested parts of the Dividing Range escarpment. Occupies open eucalypt forest, woodland or open woodland. Sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used.	1	Moderate. Eucalypt forest occurs within the study area to provide potential foraging habitat for this species. Tree hollows occur within the planted street trees.	Low
<i>Anthochaera phrygia</i>	Regent Honeyeater	E4	CE, M	Dry open forest and woodland. Particularly box-ironbark woodland and riparian forests of river sheoak. Feeds on the nectar from a wide range of eucalypts and mistletoes.	4	Moderate. Dry Eucalypt forest occurs within the study area to provide potential foraging habitat for this species.	Low
<i>Lathamus discolor</i>	Swift Parrot	E1	CE, M	Migrates to south-eastern mainland Mar-Oct. Winter-flowering trees such as <i>Eucalyptus robusta</i> , <i>Corymbia maculata</i> , <i>C. gummifera</i> , <i>E. sideroxylon</i> and <i>E. albens</i> are important. Breeds in Tasmania.	8	Moderate. Winter flowering species of <i>Corymbia gummifera</i> and <i>Corymbia maculata</i> occur within the study area.	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Neophema pulchella</i>	Turquoise Parrot	V	-	Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	1	Moderate. Dry Eucalypt forest occurs within the study area to provide potential foraging habitat for this species.	Low
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V	-	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (Eastern subspecies)	V	-	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains.	3	Low. No potential habitat for this species occurs within the study area	Low
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-	Eucalypt forests and woodlands, particularly those with rough-barked species, mature smooth-barked gums with dead branches, mallee and Acacia woodland.	4	Moderate. Preferred habitat of eucalypt open forest is present within the study area.	Low
<i>Pachycephala olivacea</i>	Olive Whistler	V	-	Inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes.	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	-	This species habitat is within woodlands and dry sclerophyll forests dominated by Eucalypts and Mallee associations. This species feeds on insects and other invertebrates captured on the wing. Occasionally feeds on nectar, fruit and seeds. Distribution of this species is widespread in NSW from the coast to inland including the western slopes and plains.	1	Moderate dry sclerophyll forest occurs within the study area	Low
<i>Petroica boodang</i>	Scarlet Robin	V	-	Dry eucalypt forests and woodland with open grassy understorey with few scattered shrubs. Occurs in both mature and regrowth forests and occasionally occurs in mallee, wet forests, wetlands and tea-tree swamps.	1	Moderate dry sclerophyll forest occurs within the study area	Low
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E1	E	Habitat is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. Age of habitat since fires (fire-age) is of paramount importance to this species; Illawarra and southern populations reach maximum densities in habitat that has not been burnt for at least 15 years.	PR	Low. Whilst the study area contains potential habitat the study area is out of the geographical range for this species.	Low
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Nomadic species and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	PR	Low. No potential habitat for this species occurs within the study area	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V, M	Recorded in all coastal regions of Qld and NSW. In Australia, this species is almost exclusively aerial, almost always foraging aerially. Although it has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows. Probably recorded most often above wooded areas, including open forest and rainforest.	PR	Moderate. Suitable foraging, roosting and breeding habitat are present within the study area.	Low
<i>Lophoictinia isura</i>	Square-tailed Kite	V	-	Timbered habitats including dry woodlands and open forests. Prefers timbered watercourses. Specialist hunter of passerines and insects.	1	Moderate. Potential habitat of open forest occurs within the study area.	Low
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	V	M	Distributed along the coastline of Australia, also extending inland along some larger waterways. Habitat includes large areas of open water. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland and forest. Breeding territories are close to water, mainly in tall open forest or woodland, although nests are sometimes located in other habitats such as dense forest, closed scrub or in remnant trees on cleared land.	7	Moderate. Potential habitat of open forest, heath, grassland and adjoining man made dam within the study area.	Low
<i>Rostratula australis</i>	Australian Painted Snipe	E1	E	Restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin. In NSW many records are from the Murray-Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	PR	Low. no potential habitat is present within the study area	Low
Migratory Birds							
<i>Apus pacidicus</i>	Fork-tailed Swift	-	M	In NSW, the species is recorded in all regions. Many records occur east of the Great Divide. The Fork-tailed Swift is almost exclusively aerial with them foraging and roosting aerially.	PR	Moderate. Suitable foraging habitat are present within the study area.	Low.
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	M	The Black-faced Monarch is widespread in eastern Australia. Mainly occurs in rainforest ecosystems although it can be found in gullies in mountain areas or coastal foothills, softwood scrub dominated by Brigalow (<i>Acacia harpophylla</i>), coastal scrub dominated by Coast Banksia (<i>Banksia integrifolia</i>) and Southern Mahogany.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Monarcha trivirgatus</i>	Spectacled Monarch	-	M	Inhabits dense rainforests and moist eucalypt forests of eastern and north-eastern Australia, the Spectacled Monarch sometimes also inhabits mangroves and other densely vegetated habitats.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Motacilla flava</i>	Yellow Wagtail	-	M	Non-breeding habitat only: mostly well-watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	M	The Satin Flycatcher is widespread in eastern Australia. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PR	Low. No potential habitat for this species occurs within the study area	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	M	The Rufous Fantail occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, this species mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood, Mountain Grey Gum, Narrow-leaved Peppermint, Mountain Ash, Alpine Ash, Blackbutt or Red Mahogany; usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests; for example near Bega in south-east NSW, where they are recorded in temperate Lilly Pilly rainforest, with Grey Myrtle, Sassafras and Sweet Pittosporum subdominants.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Ardea alba</i>	Great Egret, White Egret	-	M	Reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial).	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Ardea ibis</i>	Cattle Egret	-	M	Two major distributions have been located; from north-east WA to the Top End of the Northern Territory and around south-east Australia. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. Observed in moist, low-lying poorly drained pastures with an abundance of high grass; it avoids low grass pastures.	PR	Moderate. Potential habitat within the exotic grasslands occurs within the study area.	Low
<i>Merops ornatus</i>	Rainbow Bee-eater	-	M	The Rainbow Bee-eater is distributed across much of mainland Australia occurring mainly in open forests (usually dominated by eucalypts) and woodlands, shrublands, and in various cleared or semi-cleared habitats.	PR	Moderate. Suitable foraging and breeding habitat are present within the study area.	Low.
Fish							
<i>Epinephelus daemeli</i>	Black Rockcod	V - FM Act	V	The Black Rockcod is found in warm temperate and subtropical parts of the south-western Pacific. Adult Black Rockcod can grow to 2 m in length and at least 80 kg in weight, but it is more common to see smaller fish (up to 1m/30kg).	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Maccullochella peelii peelii</i>	Murray Cod	-	V	The Murray Cod utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW to slow-flowing, turbid lowland rivers and billabongs. Murray Cod are frequently found in the main channels of rivers and larger tributaries. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Macquaria australasiica</i>	Macquarie Perch	E – FM Act	E	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Prototroctes maraena</i>	Australian Grayling	E – FM Act	V	The Australian Grayling is diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas. Adults (including pre spawning and spawning adults) inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones.	PR	Low. No potential habitat for this species occurs within the study area	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Mammals							
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	A variety of vegetation such as rainforest, open forest, woodland, coastal heath, inland riparian forest. Have home ranges 750 - 3500 ha. Den sites may be located in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky cliffs.	3	Moderate. The species may use the study area as part of a larger home range.	Low
<i>Phascolarctos cinereus</i>	Koala	V	V	Found in eucalypt woodlands and forest foraging on preferred food trees.	20	Low. One preferred Koala feed tree of <i>Eucalyptus punctata</i> were recorded, however this species is less than 1% of canopy vegetation.	Low
<i>Petaurus australis</i>	Yellow-bellied Glider	V	-	Found in tall mature eucalypt forest, generally in areas with high rainfall and nutrient rich soils. Feed primarily on nectar, sap, honeydew and manna with pollen and insects also taken. Often leave a distinctive V-shaped feeding scar on tree trunks. Den in tree hollows of large trees.	11	Moderate. Preferred habitat occurs within the study area to provide potential habitat for this species. Tree hollows present within the study area.	Low
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Inhabits mature or old growth box, box-ironbark woodlands and river red gum forest west of the Great Dividing Range. Prefers mixed species stands with a shrub or Acacia midstorey. Uses tree hollows as den sites.	1	Moderate. The study area contains habitat and hollow-bearing trees provide roosting and breeding habitat.	Low
<i>Petauroides volans</i>	Greater Glider	-	V	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelters during the day in tree hollows.	11	Moderate. The study area contains habitat and hollow-bearing trees provide roosting and breeding habitat.	Low
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Variety of habitats from rainforest to dry sclerophyll forest and woodland to heath. In most areas they prefer woodlands and heath. Feeds on nectar and pollen from banksias, eucalypts and Callistemon sp., with insects also taken.	33	Moderate. The study area contains habitat for this species.	Low
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or Melaleucas. A sandy loam soil is also a common feature.	4	Moderate. The heath habitat provides a dense understorey for this species and the study area occurs on sandy soils.	Low
<i>Macropus parma</i>	Parma Wallaby	V	-	Range confined to the coast and ranges of central and northern NSW from the Gosford district to the QLD border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. Typically feeding at night, taking shelter in dense cover during the day.	3	Moderate. Thick, shrubby understorey does occur within the study area.	Low
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1	V	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges often facing north.	13	Low. no potential habitat is present within the study area	Low
<i>Pseudomys novaehollandiae</i>	New Holland Mouse, Pookila	-	V	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	PR	Moderate. Heath and open forest habitats occur within the study area.	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Pseudomys gracilicaudatus</i>	Eastern Chestnut Mouse	V	-	This species mainly occurs north from the Hawkesbury River area, however isolated records exist in the Jervis bay area. In NSW it is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously.	1	Moderate. Heath and open forest habitats occur within the study area.	Low
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	This species is generally found within 200 km of Australia's eastern coast. Generally 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 commonly found in gullies, close to water, in vegetation with a dense canopy.	2	Moderate. open forest and heath vegetation provides potential foraging habitat for this species.	Low
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V	-	The Eastern Freetail-bat is found along the east coast from south QLD to southern NSW. Occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark.	2	Moderate. Preferred foraging habitat occurs within the study area provides potential habitat for this species.	Low
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. Generally, roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	1	Moderate. Preferred foraging habitat, roosting, breeding and foraging habitat. Sixteen hollow-bearing trees occur within the study area.	Low
<i>Kerivoula papuensis</i>	Golden-tipped Bat	V	-	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Roost mainly in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests, also in tree hollows, dense foliage and epiphytes; located in rainforest gullies on small first and second-order streams.	18	Low. No potential habitat for this species occurs within the study area	Low
<i>Miniopterus australis</i>	Little Bentwing-bat	V	-	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	3	Moderate. Preferred foraging habitat, roosting, breeding and foraging habitat. Sixteen hollow-bearing trees occur within the study area.	Low
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Forages in a range of habitat types. Roosts in caves, derelict mines, culverts and other man-made structures. Form maternity colonies that are faithful to particular caves.	1	Moderate. Preferred foraging habitat occurs within the study area to provide potential habitat for this species.	Low
<i>Myotis macropus</i>	Large-footed Myotis	V	-	Forages over streams and pools catching insects and small fish by raking their feet across the water surface. Roost close to water in caves, mine shafts, tree hollows and man-made structures.	1	Moderate. Preferred foraging habitat occurs within the constructed dam within study area.	Low
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin, frequenting low to mid-elevation dry open forest and woodland close to these features. Also found in well-timbered areas containing gullies.	PR	Moderate. Preferred foraging habitat occurs within the study area to provide potential habitat for this species.	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. This species usually roosts in tree hollows.	1	Moderate. Preferred foraging habitat, roosting, breeding and foraging habitat. Sixteen hollow-bearing trees occur within the study area.	Low
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V	-	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	2	Low. No caves or cliffs or rocky overhangs occur within the study area.	

Flora

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
<i>Acacia bynoeana</i>	Bynoe's Wattle	E1	V	Occurs in heath or dry sclerophyll forest on sandy soils. Prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	3	Moderate. Potential habitat within the open forest and heath communities within the study area.	Low
<i>Acacia pubescens</i>	Downy Wattle	V	V	Occurs on alluviums, shales and at the intergrade between shales and sandstones. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River / Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	PR	Low No potential habitat for this species within the study area.	Low
<i>Ancistrachne maidenii</i>	-	V	-	Restricted to northern Sydney, around St Albans - Mt White - Maroota - Berowra areas and to the Shannon Creek area south-west of Grafton. Grows in dry sclerophyll forest on sandstone-derived soils.	1	Low No potential habitat for this species within the study area.	Low
<i>Asterolasia elegans</i>	-	E1	E	Occurs on Hawkesbury sandstone. Can be found in sheltered forests on mid to low slopes and valleys and in areas of sheltered forest.	PR	Low No potential habitat for this species within the study area.	Low
<i>Astrotricha crassifolia</i>	Thick-leaf Star-hair	V	V	Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouts from root suckers or basal stem buds after fire.	PR	Low. Potential habitat, however outside of distribution of this species.	Low
<i>Baloskion longipes</i>	Dense Cord-rush	V	V	Commonly found in swamps or depressions in sandy alluvium, sometimes growing with sphagnum moss. Also occurs in swales within tall forest, and in Black Gum (<i>Eucalyptus aggregata</i>) Woodland.	2	Low No potential habitat for this species within the study area.	Low
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid	E1	V	This species is endemic to mainland south-east Australia. Favours low, dry sclerophyll woodland with a heathy or sometimes grassy understorey on clay loams or sandy soils.	PR	Low. No nearby records and is outside of the known range for this species.	Low
<i>Callistemon linearifolius</i>	Netted Bottle Brush	V	-	Shrub up to 3-4m tall with linear to linear-lanceolate leaves. Flowers in typical "bottlebrushes". Red and usually 9-10cm long and approximately 50mm in diameter. Recorded from the Georges River to Hawkesbury River in the Sydney area to north of Nelson Bay area of NSW, also recorded in Yengo National Park. Grows in dry Sclerophyll forests on the coast and adjacent ranges. Flowers spring-summer.	6	Moderate. Potential habitat occurs within the Scribbly Gum- Hairpin Banksia – Dwarf Apple heathy woodland within the study area.	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum, Silvertop Ash, Red Bloodwood and Black Sheoak; appears to prefer open areas in the understorey and is often found in association with the Large Tongue Orchid and the Tartan Tongue Orchid.	1	Moderate. Potential habitat occurs within the Scribbly Gum- Hairpin Banksia – Dwarf Apple heathy woodland within the study area.	Low
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest, coastal tea tree and coastal banksia coastal scrub, forest red gum aligned open forest and woodland, spotted gum aligned open forest and woodland and bracelet honey myrtle scrub to open scrub. Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. Been recorded as far west as Merriwa in the upper Hunter river valley.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Darwinia glaucophylla</i>	-	V	-	Occurs between Gosford and the Hawkesbury River around Calga, Kariong and Mt Kariong. Habitat is on sandy heath, scrub and woodlands associated with rock platforms or near hanging swamps.	363	Moderate. Potential habitat occurs within the Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland within the study area.	Low
<i>Diuris bracteata</i>	-	E1	EX	For over 100 years <i>Diuris bracteata</i> was known only from the original collection made near Gladesville in northern Sydney. The complete absence of records for most of the 20th Century resulted in this species being listed as 'presumed extinct' on Part 4 of Schedule 1 of the Threatened Species Conservation Act. In recent years, however, extant populations from north-west of Gosford have been recorded and this area is now the only known area of occurrence of the species. All known plants fall within the Gosford and Wyong Local Government Areas.	1	Moderate. Potential habitat occurs within the Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland within the study area.	Low
<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V		An erect shrub 50 to 180 cm in height. Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan has been recorded to be 5-20 years.	2	Moderate. Potential habitat occurs within the Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland within the study area.	Low
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Occurs in poor coastal country in shallow sandy soils overlying Hawkesbury sandstone coastal heath mostly on exposed sandy ridges. Small scattered stands near the boundary of tall coastal heaths and low open woodlands of slightly more fertile inland areas. Associated species include stunted species of <i>E. oblonga</i> Narrow-leaved Stringybark, <i>E. capitellata</i> Brown Stringybark and <i>E. haemastoma</i> Scribbly Gum. Flowering period irregular, poor response to fires.	9	Moderate. Potential habitat occurs within the Scribbly Gum – Red Bloodwood – Old Man Banksia heathy woodland within the study area.	Low
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	V	Grows in grassy woodland and dry eucalypt forest on deep moderately fertile and well watered soils	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Genoplesium baueri</i>	Bauer's Midge Orchid	E1	E	The species has been recorded from locations between Ulladulla and Port Stephens. Grows in dry sclerophyll forest and moss gardens over sandstone.	PR	Low. No potential habitat for this species occurs within the study area	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
<i>Grevillea shiressii</i>	-	V	V	Known from two populations near Gosford, on tributaries of the lower Hawkesbury River north of Sydney (Mooney Mooney Creek and Mullet Creek). Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils. Flowers from July to December	132	Low. No potential habitat for this species occurs within the study area	Low
<i>Haloragis exalta subsp. exalata</i>	Wingless Raspwort	V	V	Wingless Raspwort occurs in four widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Requires protected and shaded damp situations in riparian habitats.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Hibbertia procumbens</i>	Spreading guinea Flower	E1	-	Distribution is on the Central Coast in the Wyong and Gosford LGAs. Majority of known populations occur within <i>Banksia ericifolia</i> – <i>Angophora hispida</i> – <i>Allocasuarina distyla</i> scrub/heath on skeletal sandy soils. May also be found associated with 'hanging swamp' vegetation communities on sandy deposits. Flowers in summer.	690	Moderate – High. Potential habitat within the open forest and heath communities and large numbers of this species recorded within 1 km of the study area.	Low
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	V	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	58	Low. No potential habitat for this species occurs within the study area	Low
<i>Melaleuca deanei</i>	Deane's Paperbark	V	V	The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Occurs in two distinct areas, in the Kuring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.	4	Low. No potential habitat for this species occurs within the study area	Low
<i>Micromyrtus blakelyi</i>	-	V	V	A low spreading shrub restricted to the Hawkesbury River, North of Sydney. Distribution extends from north of Maroota in the north to Cowan in the south. Occurs in heathlands in shallow sand soil in cracks and depressions of sandstone rock platforms.	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Persoonia hirsuta</i>	Hairy Geebung	E1	E	<i>Persoonia hirsuta</i> occurs in dry sclerophyll forest and woodland with a shrubby understorey. It also favours disturbed heath, shrubby thickets and sandstone scrubs. Vegetation associations where it has been found include Sydney Sandstone Ridge-top Woodland and Sydney Sandstone Open Forests.	1	Low. No potential habitat for this species occurs within the study area	Low
<i>Pimelea curviflora var. curviflora</i>	-	V	V	A small shrub with grows to 120cm in height. Confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. Occurs on shaley/lateritic soils over shale sandstone transition soils on ridgetops and upper slopes amongst woodlands. Also recorded in Illawarra Lowland Grassy Woodland habitat. Flowers in October to May.	PR	Low. No potential habitat for this species occurs within the study area	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
<i>Prostanthera askania</i>	Tranquillity Mintbush	E1	E	Occurs over a very restricted geographic range (of less than 12 km) in the upper reaches of creeks that flow into Tuggerah Lake or Brisbane Water within the Wyong and Gosford local government areas. Occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone and alluvial soils derived from it. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum <i>Eucalyptus saligna</i> and Turpentine <i>Syncarpia glomulifera</i> are usually present, though canopy species present can be highly variable.	43	Low - Moderate. Potential habitat in the open forest the within the study area.	Low
<i>Prostanthera junonis</i>	Somersby Mintbush	E1	E	Has a north-south range of approximately 19 km on the Somersby Plateau in the Gosford and Wyong local government areas. Is restricted to the Somersby plateau on Hawkesbury sandstone in low/open woodland and open shrubland.	616	Moderate. Potential habitat in the open forest the within the study area.	Low
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	V	E	Flowers from September to November. Little is known about the preferred habitat of this species, but apparently prefers Sclerophyll forest with a reasonably deep layer of organic litter. <i>Rhizanthella slateri</i> is restricted to New South Wales where it is currently known from 14 populations including Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. The <i>Rhizanthella slateri</i> population in the Great Lakes Local Government Area (LGA) occurs at the known northern limit of the species' range and is disjunct from other known populations of the species	PR	Low. No potential habitat for this species occurs within the study area	Low
<i>Rhodamnia rubescens</i>	Scrub Turpentine	E4		Currently known to occur from coastal districts north from Batemans Bay, approximately 280 km south of Sydney, to the Queensland (Qld) border. Populations of the species extend north to Maryborough, Qld. NSW populations of <i>R. rubescens</i> are mainly coastal and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm. Populations and individuals of <i>R. rubescens</i> are often found in wet sclerophyll associations in rainforest transition zones and creekside riparian vegetation	7	Low. No potential habitat for this species occurs within the study area	Low
<i>Rutidosis heterogama</i>	Heath Wrinklewort	V	V	Grows in heath on sandy soils and moist areas in open forest and has been recorded along disturbed roadsides.	PR	Moderate. Potential habitat in the form of Heath and open forest occur within the study area for this species.	Low
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E1	V	On the South Coast, the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the Central Coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	6	Low. No potential habitat for this species occurs within the study area	Low
<i>Tetratheca glandulosa</i>	-	V	-	Restricted to the following Local Government Areas: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Vegetation communities correspond broadly to Benson & Howell's Sydney Sandstone Ridgetop Woodland	2	Moderate. Potential habitat within the open forest and heath communities within the study area.	Low



Scientific Name	Common Name	BC Act	EPBC Act	Habitat Description	Records	Likelihood of Occurrence	Potential Impacts
<i>Tetradlea juncea</i>	Black-eyed Susan	V	V	Low shrub growing in clumps of single or multiple stems. Flowers face downwards and usually have 4 petals which range from white to pink to dark purple in colour. Born singly or twos along the stem. Stems are 30 to 60cm long, usually leafless with 2 to 3 narrow wings that give them an angular appearance. Confined to northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion, LGA's of Cessnock, Wyong, Lake Macquarie, Newcastle, Port Stephens and Great Lakes.	PR	Moderate. Potential habitat within the open forest occurs within the study area.	Low
<i>Thesium australe</i>	Austral Toadflax	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Grows in association with <i>Themeda triandra</i> and (less frequently) with <i>Poa</i> spp.	PR	Low. No potential habitat for this species occurs within the study area	Low



APPENDIX 5

Threatened Ecological Community Assessment



Species, populations and communities with a likelihood of occurrence of greater than or equal to moderate have had potential impacts formally assessed using a 5-part test under the *Environmental Planning and Assessment Act 1979* and/or significant assessment under the EPBC Act (see Appendix 9).

BC Act = V = Vulnerable ecological community; E3 - Endangered ecological community; E4 Critically endangered ecological community;

EPBC Act = V = Vulnerable ecological community; E – Endangered ecological community; CE – Critically endangered ecological community

P - Protected; K - Known occurrence; PR - Predicted occurrence;

Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Blue Gum High Forest in the Sydney Basin Bioregion EPBC Act – Blue Gum High Forest of the Sydney Basin Bioregion	E4	CE	Blue Gum High Forest is dominated by a tall canopy of eucalypts that may exceed 30 m in height. Its understorey is typically multi-layered with a midstorey of mesophyllous shrubs and small trees and a diverse ground layer of herbs, ferns and some grasses. Most stands of the community are in a state of regrowth after past clearing or logging activities, and consequently trees may be shorter, less dense or more dense than less disturbed stands. Blue Gum High Forest is dominated by either <i>Eucalyptus pilularis</i> (Black butt) or <i>E. saligna</i> (Sydney Blue Gum).	PR	Low. Not recorded within the study area.	Low.
Coastal Saltmarsh in New South Wales North Coast, Sydney Basin and South East Corner Bioregion EPBC Act – Subtropical and Temperate Saltmarsh	E3	V	Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Characteristic plants include <i>Baumea juncea</i> , Sea Rush (<i>Juncus kraussii</i> subsp. <i>australiensis</i>), Samphire (<i>Sarcocornia quinqueflora</i> subsp. <i>quinqueflora</i>), Marine Couch (<i>Sporobolus virginicus</i>), Streaked Arrowgrass (<i>Triglochin striata</i>), Knobby Club-rush (<i>Ficinia nodosa</i>), Creeping Brookweed (<i>Samolus repens</i>), Swamp Weed (<i>Selliera radicans</i>), Seablite (<i>Suaeda australis</i>) and Prickly Couch (<i>Zoysia macrantha</i>).	PR	Low. Not recorded within the study area.	Low.
Coastal Upland Swamp in the Sydney Basin Bioregion EPBC Act - Coastal Upland Swamp in the Sydney Basin Bioregion	E3	E	Varies in depth from a few centimetres to at least 4 metres. The vegetation is dominated by sclerophyll shrubs and/or sedges, with dynamic mosaics of structural forms that may include tall scrub, open heath and/or sedge land.	K	Recorded.	Moderate.
Duffy’s Forest Ecological Community in the Sydney Basin Bioregion	E3	-	Open-forest or woodland community dominated by Red Bloodwood (<i>Corymbia gummifera</i>), Black Ash (<i>Eucalyptus sieberi</i>), Smooth-barked Apple (<i>Angophora costata</i>), and frequently a stringybark (<i>E. capitellata</i>) or <i>E. oblonga</i> . Other understorey species include Myrtle Wattle (<i>Acacia myrtifolia</i>), Hairpin Banksia (<i>Banksia spinulosa</i>), Rusty Velet-bush (<i>Lasiopetalum ferrugineum</i>), Crinkle Bush (<i>Lomatia silaifolia</i>), Broad-leaf Geebung (<i>Persoonia levis</i>), Apple–berry (<i>Billardiera scandens</i>), Wiry Panic (<i>Entolasia stricta</i>), Twisted Mat-rush (<i>Lomandra obliqua</i>), <i>Micrantheum ericoides</i> and <i>Xanthorrhoea media</i> .	PR	Low. Not recorded within the study area.	Low.
Eastern Suburbs Scrub in the Sydney Basin Bioregion	E3	-	Predominantly a sclerophyllous heath or scrub community although, depending on site topography and hydrology, some remnants contain small patches of woodland, low forest or limited wetter areas. Common species include <i>Banksia aemula</i> , <i>B. ericifolia</i> , <i>B. serrata</i> , <i>Eriostemon australasius</i> , <i>Lepidosperma laterale</i> , <i>Leptospermum laevigatum</i> , <i>Monotoca elliptica</i> and <i>Xanthorrhoea resinifera</i> .	PR	Low. Not recorded within the study area.	Low.



Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Associated with coastal areas subject to periodic flooding. Those that lack standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5 metre tall and dominated by amphibious plants including <i>Paspalum distichum</i> (water couch), <i>Leersia hexandra</i> (swamp rice-grass), <i>Pseudoraphis spinescens</i> (mud grass) and <i>Carex appressa</i> (tussock sedge). Where they are subject to regular inundation and drying the vegetation may include large emergent sedges over 1 metre tall, such as <i>Baumea articulata</i> , <i>Eleocharis equisetina</i> and <i>Lepironia articulata</i> , as well as emergent or floating herbs such as <i>Hydrocharis dubia</i> (frogbit), <i>Philydrum lanuginosum</i> (frogsmouth), <i>Ludwigia peploides</i> subsp. <i>montevidensis</i> (water primrose), <i>Marsilea mutica</i> (nardoo) and <i>Myriophyllum</i> spp. (milfoils). As standing water becomes deeper or more permanent, amphibious and emergent plants become less abundant, while floating and submerged aquatic herbs become more abundant. These latter species include <i>Azolla filiculoides</i> var. <i>rubra</i> , <i>Ceratophyllum demersum</i> (hornwort), <i>Hydrilla verticillata</i> (water thyme), <i>Lemna</i> spp. (duckweeds), <i>Nymphaea gigantea</i> (giant waterlily), <i>Nymphoides indica</i> (water snowflake), <i>Ottelia ovalifolia</i> (swamp lily) and <i>Potamogeton</i> spp. (pondweeds). The threatened aquatic plants, <i>Aldrovand vesiculosa</i> and <i>Najas marina</i> , also occur within this community.	K	Low. Not recorded within the study area.	Low.
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregions	E3	-	Found between Muswellbrook, Beresfield, Mulbring and Cessnock in the Lower Hunter. Has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions. Occurs on Permian sediments of the Hunter Valley floors, with much of the remaining community fragmented and disturbed. Occurs on gentle slopes and depressions and drainage flats. Common canopy tree species are <i>Eucalyptus tereticornis</i> (Forest Red Gum) and <i>E. punctata</i> (Grey Gum). Other frequently occurring canopy species are <i>Angophora floribunda</i> (Rough-barked Apple), <i>E. crebra</i> (Narrow-leaved Ironbark), <i>E. moluccana</i> (Grey Box) and <i>Corymbia maculata</i> (Spotted Gum). The shrub layer is open and common shrub species include <i>Breynia oblongifolia</i> (Coffee Bush), <i>Leucopogon juniperinus</i> (Prickly Beard-heath), <i>Daviesia ulicifolia</i> (Gorse Bitter Pea) and <i>Jacksonia scoparia</i> (Dogwood). The ground cover typically comprises grasses and herbs with common species being <i>Microlaena stipoides</i> var. <i>stipoides</i> Forest Weeping Grass, <i>Pratia purpurascens</i> (Whiteroot), <i>Lomandra multiflora</i> (Many-flowered Mat-rush), <i>Cymbopogon refractus</i> (Barbed Wire Grass), <i>Cheilanthes sieberi</i> (Poison Rock Fern) and <i>Dichondra repens</i> (Kidney Weed).	PR	Low. Not recorded within the study area.	Low.
Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion	E4	-	Occurs on gently undulating areas on sandy soils of the Erina soil landscape. Open forest with a tree canopy dominated by some combination of <i>Eucalyptus racemosa</i> (Scribbly Gum), <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood), and <i>Syncarpia glomulifera</i> (Turpentine) and <i>Eucalyptus piperita</i> (Sydney Peppermint). <i>Allocasuarina littoralis</i> (Black Sheoak) and <i>Glochidion ferdinandi</i> (Cheese Tree) may be present in the subcanopy.	K	Low. Not recorded within the study area.	Low.
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EPBC Act – Littoral Rainforests and Coastal Vine Thickets of eastern Australia	E3	CE	Found along the NSW east coast, this EEC is considered very rare and occurs in many small stands. Predominantly rainforest species, where the canopy is dominated by scattered emergent individuals of sclerophyll species, such as <i>Angophora costata</i> , <i>Banksia intergrifolia</i> , <i>Eucalyptus botryoides</i> and <i>Eucalyptus tereticornis</i> . Several floristic variations between strands and in particular areas localised variants may be recognised.	K	Low. Not recorded within the study area.	Low.



Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
Lower Hunter Spotted Gum-Ironbark Forest in the Sydney Basin Bioregion	E3	-	Dominated by Spotted Gum <i>Corymbia maculata</i> and Broad-leaved Ironbark <i>Eucalyptus fibrosa</i> , while Grey Gum <i>E. punctata</i> and Grey Ironbark <i>E. crebra</i> occur occasionally. The understorey is marked by the tall shrub, <i>Acacia parvipinnula</i> , and by the prickly shrubs, <i>Daviesia ulicifolia</i> , <i>Bursaria spinosa</i> , <i>Melaleuca nodosa</i> and <i>Lissanthe strigosa</i> .	PR	Low. Not recorded within the study area.	Low.
Lowland Rainforest in the New South Wales North Coast and Sydney Basin Bioregions EPBC Act – Lowland Rainforest of Subtropical Australia	E3	CE	The Hawkesbury River notionally marks the southern limit of this EEC in the NSW North Coast and Sydney Basin Bioregions. This EEC is a community of subtropical rainforest and some related, structurally complex forms of dry rainforest. Lowland Rainforest in a relatively undisturbed state has a closed canopy, characterised by a high diversity of trees whose leaves may be mesophyllous and encompass a wide variety of shapes and sizes. Includes palms, vines, and vascular epiphytes. In disturbed strands of this community the canopy may be broken or the canopy be smothered by exotic vines.	K	Low. Not recorded within the study area.	Low.
Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion	E3	-	General structural form is open-forest but may now exist as woodland or remnant trees. The tree canopy layer is characterised by Spotted Gum <i>Corymbia maculata</i> and Grey Ironbark <i>Eucalyptus paniculata</i> and is associated with Smooth-barked Apple <i>Angophora costata</i> , Red Bloodwood <i>Corymbia maculata</i> , Broad-leaved White Mahogany <i>E. umbra</i> , Grey Gum <i>E. punctata</i> , Turpentine <i>Syncarpia glomulifera</i> , Bangalay <i>E. botryoides</i> , and Rough-barked Apple <i>Angophora floribunda</i> .	PR	Low. Not recorded within the study area.	Low.
Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion	E3	-	Dominated by <i>Eucalyptus racemosa</i> (Scribbly Gum). Other tree species present include <i>E. piperita</i> (Sydney Peppermint), <i>E. resinifera</i> (Red Mahogany), <i>Angophora costata</i> (Smooth-barked Apple) and <i>E. punctata</i> (Grey Gum). There is usually a well-developed shrub layer with common species being <i>Leptospermum trinervium</i> (Slender Tea-tree), <i>Acacia parvipinnula</i> (Silver-stemmed Wattle), <i>Persoonia linearis</i> (Narrow-leaved Geebung) and <i>Leptospermum polygalifolium</i> (Tantoon).	K	Low. Not recorded within the study area.	Low.
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	E3	-	Found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, (may exceed 40m), but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include <i>Eucalyptus tereticornis</i> (forest red gum), <i>E. amplifolia</i> (cabbage gum), <i>Angophora floribunda</i> (rough-barked apple) and <i>A. subvelutina</i> (broad-leaved apple). <i>Eucalyptus baueriana</i> (blue box), <i>E. botryoides</i> (Bangalay) and <i>E. elata</i> (river peppermint) may be common south from Sydney, <i>E. ovata</i> (swamp gum) occurs on the far south coast.	K	Low. Not recorded within the study area.	Low.
Shale Sandstone Transition Forest in the Sydney Basin Bioregion EPBC Act - Shale Sandstone Transition Forest in the Sydney Basin Bioregion	E3	CE	The main tree species include Forest Red Gum (<i>Eucalyptus tereticornis</i>), Grey Gum (<i>E. punctata</i>), stringybarks (<i>E. globoidea</i> , <i>E. eugenoides</i>) and ironbarks (<i>E. fibrosa</i> and <i>E. crebra</i>).	PR	Low. Not recorded within the study area.	Low.
Southern Sydney sheltered forest on transitional sandstone soils in the Sydney Basin Bioregion	E3	-	The dominant trees include <i>Angophora costata</i> , <i>Eucalyptus piperita</i> and occasionally <i>Eucalyptus pilularis</i> . <i>Corymbia gummifera</i> occurs frequently. Occurrences include <i>Eucalyptus pilularis</i> , <i>Acacia binervata</i> , <i>Elaeocarpus reticulatus</i> , <i>Pittosporum undulatum</i> and its relatively dense groundcover of ferns, grasses, rushes, lilies and forbs.	PR	Low. Not recorded within the study area.	Low.
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South	E3	E	Found on the coastal floodplains of NSW occurring on the fringes of coastal estuaries on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Associated with	K	Low. Not recorded within the study area.	Low.




Community Name	NSW status	Comm. status	Habitat Description	Records	Likelihood of occurrence	Potential Impacts
East Corner Bioregion						
EPBC Act - Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community			grey-black clay-loams and sandy loams where the groundwater is saline or sub-saline. Characterised by a sparse layer of <i>Casuarina glauca</i> (swamp oak) is the dominant species northwards from Bermagui. Other trees including <i>Acmena smithii</i> (lilly pilly), <i>Glochidion spp.</i> (cheese trees) and <i>Melaleuca spp.</i> (paperbarks) may be present as subordinate species and are found most frequently in stands of the community northwards from Gosford. Tree diversity decreases with latitude, and <i>Melaleuca ericifolia</i> is the only abundant tree in this community south of Bermagui.			
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion	E3	-	Occurs along the NSW coastal districts. Found on humic clay loams and sandy loams on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Characterised <i>Eucalyptus robusta</i> (swamp mahogany), <i>Melaleuca quinquenervia</i> (paperbark) and, south from Sydney, <i>Eucalyptus botryoides</i> (bangalay) and <i>Eucalyptus longifolia</i> (woollybutt).	K	Low. Not recorded within the study area.	Low.
Sydney Freshwater Wetlands in the Sydney Basin Bioregion	E3	-	Found on the Warriewood and Tuggerah soil landscapes, this community is largely restricted to freshwater swamps in swales and depressions on sand dunes and low nutrient sandplains. Characterised by the lack of saline influence and complex vegetation types restricted of freshwater swamps in coastal areas. Species include sedges and aquatic plants such as <i>Baumea</i> species, <i>Eleocharis sphacelata</i> , <i>Gahnia</i> species, <i>Ludwigia peploides</i> subsp. <i>montevidensis</i> and <i>Persicaria</i> species. Areas of open water may occur where drainage conditions have been altered and there may also be patches of emergent trees and shrubs.	K	Low. Not recorded within the study area.	Low.
Themeda grassland on seacliffs and coastal headlands in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	E3	-	<i>Themeda triandra</i> is the dominant species in the Themeda Grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner bioregion ecological community. <i>Banksia integrifolia</i> subsp. <i>integrifolia</i> , <i>Westringia fruticosa</i> and <i>Acacia sophorae</i> occurs as an emergent shrub or as a dense cover where they have recruited over grasslands.	K	Low. Not recorded within the study area.	Low.
Umina Coastal Sandplain Woodland in the Sydney Basin Bioregion	E3	-	Largely restricted to coastal sands on the Umina, Woy Woy and Ettalong Sandplain. A low woodland dominated by trees of <i>Eucalyptus botryoides</i> and <i>Angophora floribunda</i> with a diverse understorey of sclerophyllous shrubs species including <i>Banksia integrifolia</i> , <i>Banksia serrata</i> , <i>Monotoca elliptica</i> , <i>Macrozamia communis</i> , <i>Acacia ulicifolia</i> , <i>Platysace lanceolata</i> , <i>Acacia suaveolens</i> and <i>Allocasuarina littoralis</i> .	K	Low. Not recorded within the study area.	Low.
Western Sydney Dry Rainforest in the Sydney Basin Bioregion	E3	CE	Canopy trees include Prickly Paperbark (<i>Melaleuca styphelioides</i>), Hickory Wattle (<i>Acacia implexa</i>) and Native Quince (<i>Alectryon subcinereus</i>). There are many rainforest species in the shrub layer, such as Mock Olive (<i>Notolaea longifolia</i>), Hairy Clerodendrum (<i>Clerodendrum tomentosum</i>) and Yellow Pittosporum (<i>Pittosporum revolutum</i>). The shrub layer combines with vines, such as Gum Vine (<i>Aphanopetalum resinosum</i>), Wonga Vine (<i>Pandorea pandorana</i>) and Slender Grape (<i>Cayratia clematidea</i>).	PR	Low. Not recorded within the study area.	Low.




APPENDIX 6


Key Threatening Process (KTP) Assessment



Key Threatening Process	NSW status	Comm. status	Likelihood of occurrence	Potential Impacts
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i>	KTP	KTP	Low.	Low.
Alteration of habitat following subsidence due to longwall mining	KTP	-	Low. Proposal does not involve longwall mining.	Low.
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP	-	Low. No alteration to natural hydrological regimes will occur.	Low.
Anthropogenic Climate Change	KTP	KTP	Low - Moderate. The project will have a minor contribution to overall greenhouse gas emission during construction. However, this will be quite small.	Low.
Bushrock removal	KTP	-	Low - Moderate. The study area contains bushrock, which is also present in adjoining habitats. The establishment of the proposed infrastructure will alter a negligible amount of bushrock within the study area.	Low.
Clearing of native vegetation	KTP	KTP	Moderate. The proposed activity will require the removal of a very minor portion of native vegetation (0.22 ha).	Low.
Competition and grazing by the feral European Rabbit, <i>Oryctolagus cuniculus</i> (L.)	KTP	KTP	Low. The proposed activity will not exacerbate the competition and grazing by rabbits.	Low.
Competition and habitat degradation by Feral Goats, <i>Capra hircus</i> Linnaeus 1758	KTP	KTP	Low. The proposed activity will not exacerbate the competition and grazing by goats.	Low.
Competition from feral honey bees, <i>Apis mellifera</i> L.	KTP	-	Low. The proposed activity will not exacerbate the competition by feral honeybees as no hollows will be removed.	Low.



Key Threatening Process	NSW status	Comm. status	Likelihood of occurrence	Potential Impacts
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP	-	Low. The proposed activity will not provide further habitat for Bell Miners.	Low
Herbivory and environmental degradation caused by feral deer	KTP	-	Low. The proposed activity will not exacerbate herbivory by feral deer.	Low.
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP	-	Low. The proposed activity will not include high frequency fire management.	Low.
Importation of Red Imported Fire Ants <i>Solenopsis invicta</i> Buren 1972	KTP	KTP	Low. The proposed activity does not include importing fire ants.	Low.
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	Low. The proposed activity does not expect to transmit bird diseases.	Low.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	Low. No aquatic habitat occurs within the study area.	Low.
Infection of native plants by <i>Phytophthora cinnamomi</i>	KTP	KTP	Moderate. The proposed activity may facilitate the transmission of plant diseases through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	KTP	-	Moderate. The proposed activity may facilitate the transmission of exotic plant fungi through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Introduction of the Large Earth Bumblebee <i>Bombus terrestris</i> (L.)	KTP	-	Low. The proposed activity does not include importing bees or any associated activities that could cause introduction of bees.	Low.



Key Threatening Process	NSW status	Comm. status	Likelihood of occurrence	Potential Impacts
Invasion and establishment of exotic vines and scramblers	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Invasion and establishment of Scotch Broom (<i>Cytisus scoparius</i>)	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Invasion and establishment of the Cane Toad (<i>Bufo marinus</i>)	KTP	KTP	Low. The proposed activity will not involve the transportation of frogs.	Low.
Invasion of native plant communities by African Olive <i>Olea europaea</i> L. subsp. <i>cuspidata</i> (Wall ex G. Don Cirferri)	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Invasion of native plant communities by <i>Chrysanthemoides monilifera</i>	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Invasion of native plant communities by exotic perennial grasses	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Invasion of the Yellow Crazy Ant, <i>Anoplolepis gracilipes</i> (Fr. Smith) into NSW	KTP	-	Low. The proposed activity does not include importing fire ants or any associated activities that could lead to the invasion of yellow crazy ants.	Low.



Key Threatening Process	NSW status	Comm. status	Likelihood of occurrence	Potential Impacts
Invasion, establishment and spread of Lantana (<i>Lantana camara</i> L. sens. Lat)	KTP	-	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	Low - Moderate. The proposed activity may facilitate the transmission of plant parts through machinery transportation during construction.	Low. Equipment washdowns and hygiene protocols have been recommended.
Loss of Hollow-bearing Trees	KTP	-	Low. only three Hollow-bearing trees will require removal as part of the proposal.	Low.
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP	-	Low - Moderate. The proposed activity will occupy only a small area and is unlikely to exacerbate this KTP.	Low.
Predation and hybridisation by Feral Dogs, <i>Canis lupus familiaris</i>	KTP	-	Low. The proposed activity is unlikely to enhance this KTP.	Low.
Predation by <i>Gambusia holbrooki</i> Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP	-	Low. The study area is not located near a waterway.	Low.
Predation by the European Red Fox <i>Vulpes Vulpes</i> (Linnaeus, 1758)	KTP	KTP	Low. The proposed activity is unlikely to enhance this KTP.	Low.
Predation by the Feral Cat <i>Felis catus</i> (Linnaeus, 1758)	KTP	KTP	Low. The proposed activity is unlikely to enhance this KTP.	Low.
Predation, habitat degradation, competition and disease transmission by Feral Pigs, <i>Sus scrofa</i> Linnaeus 1758	KTP	KTP	Low. The proposed activity is unlikely to enhance this KTP.	Low.
Removal of dead wood and dead trees	KTP	-	Low-moderate. Some fallen logs and tree stumps will require removal as part of the proposal, however, these will be moved outside of the impact zone.	Low.




APPENDIX 7


Invasive Species Assessment




Scientific Name	Common Name	NSW status	Comm. status	Assessment
<i>Acridotheres tristis</i>	Common Myna, Indian Myna	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Alauda arvensis</i>	Skylark	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Anas platyrhynchos</i>	Mallard	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Carduelis carduelis</i>	European Goldfinch	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Columba livia</i>	Rock Pigeon	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Lonchura punctulata</i>	Nutmeg Mannikin	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Passer domesticus</i>	House Sparrow	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Passer montanus</i>	Eurasian Tree Sparrow	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Streptopelia chinensis</i>	Spotted Turtle-Dove	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Sturnus vulgaris</i>	Common Starling	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Turdus merula</i>	Common Blackbird	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Rhinella marina</i>	Cane Toad	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Bos Taurus</i>	Domestic Cattle	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Canis lupus familiaris</i>	Domestic Dog	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Felis catus</i>	Cat	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
Feral Deer	Deer	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Lepus capensis</i>	Brown Hare	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Mus musculus</i>	House Mouse	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Oryctolagus cuniculus</i>	Rabbit	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Rattus norvegicus</i>	Brown Rat	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Rattus rattus</i>	Black Rat	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP



Scientific Name	Common Name	NSW status	Comm. status	Assessment
<i>Vulpes vulpes</i>	Fox	-	Invasive Species	Proposed activity unlikely to exacerbate this KTP
<i>Alternanthera philoxeroides</i>	Alligator Weed	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Anredera cordifolia</i>	Maderia Vine		Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Asparagus aethiopicus</i>	Asparagus Fern	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Asparagus asparagoides</i>	Bridal Creeper	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Asparagus plumosus</i>	Climbing Asparagus Fern	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Asparagus scandens</i>	Asparagus Fern	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Chrysanthemoides monilifera</i>	Bitou Bush	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Cabomba caroliniana</i>	Cabomba	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP



Scientific Name	Common Name	NSW status	Comm. status	Assessment
<i>Chrysanthemoides monilifera</i> subsp. <i>monilifera</i>	Boneseed	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Cytisus scoparius</i>	Broom	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Dolichandra unguis-cati</i>	Cat's Claw Vine	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Eichhornia crassipes</i>	Water Hyacinth	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Genista</i> sp. x <i>Genista monspessulana</i>	Broom	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Lantana camara</i>	Lantana	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Nassella neesiana</i>	Chilean Needle Grass	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Lycium ferocissimum</i>	African Boxthorn	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Opuntia</i> spp.	Prickly Pear	-	Invasive Species	We have recommended equipment wash-down and




Scientific Name	Common Name	NSW status	Comm. status	Assessment
				hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Pinus radiata</i>	Radiata Pine	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Rubus fruticosus aggregate</i>	Blackberry	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Sagittaria platyphylla</i>	Delta Arrowhead	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii</i>	Willows	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Salvinia molesta</i>	Salvinia	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Senecio madagascariensis</i>	Fireweed	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP
<i>Ulex europaeus</i>	Gorse	-	Invasive Species	We have recommended equipment wash-down and hygiene protocol and as such the proposed activity is considered unlikely to exacerbate this KTP



APPENDIX 8


Hollow-bearing Tree Data



HBT #	Tagged	DBH (cm)	Species	Number & Size of Hollows					Notes
				Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB1	Yes	120	<i>Eucalyptus haemastoma</i>	-	6	1	-	-	-
HB2	Yes	90	<i>Eucalyptus haemastoma</i>	-	4	2	4	-	-
HB3	Yes	83	Stag	-	2	-	1	-	-
HB4	Yes	60	Stag	-	2	-	-	1	-
HB5	Yes	130	<i>Eucalyptus haemastoma</i>	-	2	1	-	-	-
HB6	No	140	<i>Eucalyptus haemastoma</i>	1	3	1	-	1	Close to high school
HB7	Yes	85	<i>Eucalyptus haemastoma</i>	1	2	2	-	-	In flower Rainbow Lorikeets foraging
HB8	Yes	110	<i>Eucalyptus haemastoma</i>	-	-	2	1	1	-
HB9	Yes	75	<i>Eucalyptus haemastoma</i>	1	-	1	2	1	-
HB10	Yes	105	<i>Eucalyptus haemastoma</i>	-	-	-	1	-	-
HB11	No	60	<i>Eucalyptus haemastoma</i>	-	-	1	-	-	No tag on Council Land
HB12	Yes	84	<i>Eucalyptus haemastoma</i>	-	1	1	-	-	-
HB13	Yes	50	<i>Eucalyptus haemastoma</i>	1	1	-	-	-	-
HB14	Yes	55 40	<i>Eucalyptus haemastoma</i>	-	1	1	-	-	Two Trunks
HB15	Yes	35	<i>Eucalyptus capitellata</i>	-	1	-	-	-	Half dead
HB16	Yes	82	<i>Eucalyptus haemastoma</i>	-	1	1	-	-	-
HB19	Yes	96	<i>Eucalyptus haemastoma</i>	1	-	-	-	-	-
HB20	Yes	79.5	<i>Eucalyptus haemastoma</i>	1	-	2	-	-	Trunk hollow
HB21	Yes	34	Stag	1	3	2	-	-	-
HB22	Yes	47.5	<i>Eucalyptus haemastoma</i>	-	1	-	-	-	-
HB23	Yes	45.5	<i>Eucalyptus haemastoma</i>	1	4	1	-	-	-
HB24	Yes	74.5	Stag	1	-	1	1	-	-
HB25	Yes	38	<i>Eucalyptus haemastoma</i>	-	4	1	-	-	-
HB26	Yes	50	<i>Corymbia gummifera</i>	-	1	2	-	-	-
HB27	Yes	31	<i>Corymbia gummifera</i>	-	-	1	-	-	Trunk hollow



HBT #	Tagged	DBH (cm)	Species	Number & Size of Hollows					Notes
				Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB28	Yes	36	Stag	-	2	-	-	-	-
HB29	Yes	64	<i>Eucalyptus haemastoma</i>	-	1	1	-	1	-
HB30	Yes	95	<i>Eucalyptus haemastoma</i>	-	2	1	-	-	-
HB31	Yes	92	<i>Eucalyptus haemastoma</i>	-	1	-	-	1	-
HB32	Yes	65	<i>Eucalyptus capitellata</i>	-	2	-	-	-	-
HB33	Yes	52	Stag / <i>Corymbia gummifera</i>	-	2	-	1	-	-
HB34	Yes	79	<i>Eucalyptus haemastoma</i>	3	2	2	-	1	-
HB35	Yes	125	<i>Eucalyptus haemastoma</i>	-	2	3	-	-	-
HB36	Yes	65	<i>Corymbia gummifera</i>	-	-	1	-	-	-
HB37	Yes	94	Stag	1	1	1	-	-	-
HB38	Yes	61	<i>Corymbia gummifera</i>	-	3	1	-	-	-
HB39	Yes	68	<i>Eucalyptus capitellata</i>	-	-	-	1	-	-
HB40	Yes	36	Stag	1	2	1	-	-	-
HB41	Yes	58	<i>Corymbia gummifera</i>	3	2	-	-	-	-
HB42	Yes	61	<i>Corymbia gummifera</i>	-	-	2	-	-	-
HB43	Yes	81.5	<i>Corymbia gummifera</i>	2	2	-	-	-	-
HB44	Yes	81	<i>Eucalyptus haemastoma</i>	1	5	3	1	-	-
HB45	Yes	89	<i>Eucalyptus haemastoma</i>	-	5	2	-	-	-
HB46	Yes	36	<i>Corymbia gummifera</i>	1	1	-	1	-	-
HB47	Yes	57	Stag	-	2	-	-	-	-
HB50	Yes	63+37	<i>Eucalyptus haemastoma</i>	2	1	-	-	-	-
HB51	Yes	51+49	<i>Eucalyptus haemastoma</i>	-	3	1	-	-	-
HB52	Yes	27+42	<i>Corymbia gummifera</i>	-	5	1	-	-	-
HB53	Yes	46	<i>Eucalyptus haemastoma</i>	-	1	1	-	-	-
HB54	Yes	77	<i>Eucalyptus haemastoma</i>	-	3	1	-	1	-
HB55	Yes	74	<i>Eucalyptus haemastoma</i>	-	1	-	1	-	-
HB56	Yes	27	<i>Eucalyptus haemastoma</i>	-	-	2	-	-	-
HB57	Yes	41.5	<i>Eucalyptus haemastoma</i>	-	-	4	-	-	-
HB58	Yes	43	<i>Eucalyptus haemastoma</i>	-	1	2	-	-	-
HB59	Yes	51+61+63	<i>Eucalyptus haemastoma</i>	1	4	2	1	-	-



HBT #	Tagged	DBH (cm)	Species	Number & Size of Hollows					Notes
				Very Small < 5cm	Small 5 – 10cm	Medium 10 – 20cm	Large 20 – 30cm	Extra Large 30cm+	
HB60	Yes	56	<i>Eucalyptus haemastoma</i>	-	1	3	-	-	Nest
HB61	Yes	69	<i>Eucalyptus haemastoma</i>	-	2	1	-	-	-
Totals				25	98	60	16	8	217


* Note HBTs 17 & 18 are not located within the updated study area and are not shown in the above list

HBTs 48 & 49 are a result of number discrepancies during the field surveys and are not present within the study area.



APPENDIX 9

Test of Significance



Considerations of the effects of the proposed development under Part 7.3 of the BC Act for threatened species or ecological communities considered to have a greater than or equal to moderate likelihood of occurrence (see Appendices 4 - 6 for likelihood of occurrence assessment) are given below. For the purposes of the Five-part test, threatened species have been grouped into functional 'guilds' based on similar habitat or ecological requirements.

The following threatened species, populations and / or ecological communities have been considered:

Terrestrial mammal species

- | | |
|-----------------------------|----------------------|
| • <i>Dasyurus maculatus</i> | Spotted-tailed Quoll |
| • <i>Macropus parma</i> | Parma Wallaby |

Terrestrial mammal species associated with dense understorey &/or groundcover

- | | |
|------------------------------------|------------------------|
| • <i>Potorous tridactylus</i> | Long-nosed Potoroo |
| • <i>Pseudomys gracilicaudatus</i> | Eastern Chestnut Mouse |
| • <i>Pseudomys novaehollandiae</i> | New Holland Mouse |

Hollow-dependent Fauna

- | | |
|-----------------------------------|-----------------------|
| • <i>Cercartetus nanus</i> | Eastern Pygmy Possum |
| • <i>Petaurus australis</i> | Yellow Bellied Glider |
| • <i>Petaurus norfolcensis</i> | Squirrel Glider |
| • <i>Petauroides volans</i> | Greater Glider |
| • <i>Callocephalon fimbriatum</i> | Gang-gang Cockatoo |
| • <i>Calyptorhynchus lathami</i> | Glossy Black-Cockatoo |
| • <i>Glossopsitta pusilla</i> | Little Lorikeet |

Hollow-dwelling Microbats

- | | |
|-------------------------------------|---------------------------|
| • <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle |
| • <i>Micronomus norfolkensis</i> | Eastern Freetail-bat |
| • <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat |

Cave-dwelling Microbats

- | | |
|--|----------------------|
| • <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat |
| • <i>Miniopterus australis</i> | Little Bent-wing bat |
| • <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat |
| • <i>Myotis macropus</i> | Large-footed Myotis |

Highly Mobile Nectarivorous Species

- | | |
|---------------------------------|------------------------|
| • <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox |
| • <i>Anthochaera phrygia</i> | Regent Honeyeater |
| • <i>Lathamus discolor</i> | Swift Parrot |



Woodland Birds

- | | |
|--|-------------------|
| • <i>Artamus cyanopterus cyanopterus</i> | Dusky Woodswallow |
| • <i>Daphoenositta chrysoptera</i> | Varied Sittella |
| • <i>Neophema pulchella</i> | Turquoise Parrot |
| • <i>Petroica boodang</i> | Scarlet Robin |

Aerial Birds

- | | |
|--------------------------------|---------------------------|
| • <i>Hirundapus caudacutus</i> | White-throated Needletail |
|--------------------------------|---------------------------|

Forest Owls

- | | |
|-------------------------------|--------------|
| • <i>Ninox connivens</i> | Barking Owl |
| • <i>Ninox strenua</i> | Powerful Owl |
| • <i>Tyto novaehollandiae</i> | Masked Owl |

Raptors

- | | |
|---------------------------------|-------------------------|
| • <i>Haliaeetus leucogaster</i> | White-bellied Sea-eagle |
| • <i>Hieraaetus morphnoides</i> | Little Eagle |
| • <i>Lophoictinia isura</i> | Square-tailed Kite |

Flora Species


- | | |
|--|-------------------------|
| • <i>Acacia bynoeana</i> | Bynoe's Wattle |
| • <i>Callistemon linearifolius</i> | Netted Bottle Brush |
| • <i>Cryptostylis hunteriana</i> | Leafless Tongue-orchid |
| • <i>Darwinia glaucophylla</i> | |
| • <i>Diuris bracteata</i> | |
| • <i>Epacris purpurascens</i> var. <i>purpurascens</i> | |
| • <i>Eucalyptus camfieldii</i> | Camfield's Stringybark |
| • <i>Hibbertia procumbens</i> | Spreading Guinea Flower |
| • <i>Prostanthera junonis</i> | Somersby Mintbush |
| • <i>Rutidosia heterogama</i> | Heath Wrinklewort |
| • <i>Tetratheca glandulosa</i> | |
| • <i>Tetratheca juncea</i> | Black-eyed Susan |

Threatened Ecological Communities

- *Coastal Upland Swamp in the Sydney Basin Bioregion*

Five - part tests - factors of assessment

The proposal will require the clearing of a maximum of 0.22ha of native vegetation and 1.25 ha of non-native vegetation for the proposed construction of water and sewer infrastructure and a road upgrade at Mt Penang Parklands. The potential impacts of this proposal on threatened species, populations and ecological communities considered likely to occur within the study area are considered below.



(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

- *Dasyurus maculatus* (Spotted-tailed quoll)

Dasyurus maculatus may occur within the study area on occasion as part of a larger home range.

This species is known to be a generalist predator and will feed on various small mammal species (gliders, possums, rats) that are known to inhabit the wider locality. The proposal seeks to remove 0.22ha of native vegetation, which may provide potential denning and foraging habitat for this nocturnal predator. Up to three (3) hollow bearing trees containing suitable denning habitat will be removed and up to 54 will be retained within the study area under this proposal. The study area lies within a larger tract of contiguous native forest, which has connectivity to large tracts of state forest and national park land in the region. It is considered that the area of clearing that represents a reduction in potential area of denning and foraging habitat is unlikely to be significant within the context of this species home range (F=750ha and M=3500ha) and would not lead to an adverse effect on the life cycle of this species such that a viable local population of Spotted-tailed Quoll is likely to be placed at risk of extinction.

- *Macropus parma* (Parma Wallaby)

Macropus parma may occur within the study area on occasion as part of a larger home range. The proposal will remove only a very small portion (maximum of 0.22ha) of the habitat available to the species. As such the proposal is not considered likely to have an adverse effect on the life cycle of *M. parma* such that a viable local population will be placed at risk of extinction.

Terrestrial mammal species associated with dense understorey &/or groundcover

- | | |
|------------------------------------|------------------------|
| • <i>Potorous tridactylus</i> | Long-nosed Potoroo |
| • <i>Pseudomys gracilicaudatus</i> | Eastern Chestnut Mouse |
| • <i>Pseudomys novaehollandiae</i> | New Holland Mouse |

The study area contains heathland, comprising a dense understorey and/or groundcover vegetation. All the above-mentioned terrestrial species rely on such habitat for shelter and foraging. The proposal will remove only a very small portion (maximum of 0.22ha) of this marginal dense understorey habitat available to these species. As such the proposal is not considered likely to have an adverse effect on the life cycle of these species such that a viable local population will be placed at risk of extinction.



Hollow-dependent Fauna

- | | |
|-----------------------------------|-----------------------|
| • <i>Cercartetus nanus</i> | Eastern Pygmy Possum |
| • <i>Petaurus australis</i> | Yellow Bellied Glider |
| • <i>Petaurus norfolcensis</i> | Squirrel Glider |
| • <i>Petauroides volans</i> | Greater Glider |
| • <i>Callocephalon fimbriatum</i> | Gang gang Cockatoo |
| • <i>Calyptorhynchus lathami</i> | Glossy-black Cockatoo |
| • <i>Glossopsitta pusilla</i> | Little Lorikeet |

Fifty-seven hollow-bearing trees were recorded within the study area during the field surveys. A total of 25 very small, 98 small, 60 medium, 16 large and 8 extra-large hollows (Figure 4-2, Appendix 8).

Of these 57 hollow-bearing trees, up to three (3) (HB 6, 8 & 10) are likely to be removed containing 1 very small, 3 small, 3 medium, 2 large and 2 extra-large hollows. Additionally, up to 54 will be retained within the study area under this proposal (Figure 4-2). These hollows may provide nesting habitat for all the above-mentioned fauna plus other hollow dependent fauna such as hollow-dwelling bats. Therefore, roosting or breeding habitat for these hollow-dependent species will still be available within the immediate vicinity. Additionally, the three (3) habitat trees to be removed are located within the disturbed area mapped as 'Planted Vegetation' situated adjacent to a road, and the majority of the retained habitat trees are located within higher-quality native vegetation

The study area provides a small area of potential foraging habitat for all the above-mentioned hollow-dependent fauna species in the form of open forest, heath and swamp.

The proposal will reduce habitat connectivity on a very minor scale. No areas will be cleared to a width greater than 35m, and as such no hostile connections will be created for glider species.

The proposal will remove only a very small portion (maximum of 0.22ha) of this potential foraging and roosting habitat available to these species. As such the proposal is not considered likely to have an adverse effect on the life cycle of these species such that a viable local population will be placed at risk of extinction.



Hollow-dwelling Micro Bats

- | | |
|-------------------------------------|---------------------------|
| • <i>Falsistrellus tasmaniensis</i> | Eastern False Pipistrelle |
| • <i>Micronomus norfolkensis</i> | Eastern Freetail-bat |
| • <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat |

The proposal seeks to remove 0.22ha of native vegetation, which may provide potential foraging habitat for these microbat species. Up to three (3) hollow bearing trees will be removed under this proposal. Additionally, up to 54 will be retained within the study area under this proposal (Figure 4-2). Therefore, roosting or breeding habitat for these hollow-dependent species will still be available within the immediate vicinity.

Given that the study area is part of a large area of contiguous bushland surrounding the site, and the modification of habitat will not prevent these species from continuing to overfly and forage in the area, it is considered that the area of clearing that represents a minor reduction in potential area of foraging habitat is unlikely to lead to an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Cave Roosting Micro Bats

- | | |
|--|----------------------|
| • <i>Chalinolobus dwyeri</i> | Large-eared Pied Bat |
| • <i>Miniopterus australis</i> | Little Bent-wing bat |
| • <i>Miniopterus schreibersii oceanensis</i> | Eastern Bentwing-bat |
| • <i>Myotis macropus</i> | Large-footed Myotis |

These species require specific roosting habitat but forage more generally, inhabiting various vegetation communities whilst foraging. The study area does not have suitable roosting habitat that is required by these bats, such as caves. The proposal seeks to remove 0.22ha of native vegetation, which may be potential foraging habitat for these microbat species. Given that the study area is part of a large area of contiguous bushland surrounding the site, and the modification of habitat will not prevent these species from continuing to overfly and forage in the area, it is considered that the area of clearing that represents a minor reduction in potential area of foraging habitat is unlikely to lead to an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.



Highly mobile nectarivorous species

- | | |
|---------------------------------|------------------------|
| • <i>Pteropus poliocephalus</i> | Grey-headed Flying-fox |
| • <i>Anthochaera phrygia</i> | Regent Honeyeater |
| • <i>Lathamus discolor</i> | Swift Parrot |

It is considered that the study area may provide potential foraging habitat for the abovementioned highly mobile nectarivorous species.

No flying-fox camps or areas of potential camp habitats were observed within or in-close proximity to the study area.

Key foraging tree species for the Grey-headed Flying-fox, Regent Honeyeater and Swift Parrot occur within the study area including; *Corymbia gummifera*, *C. maculata*, *Banksia ericifolia*, *B. integrifolia*, *B. serrata* and *B. spinulosa*. Species such as *C. maculata* and *C. gummifera* provide potential foraging habitat during the Swift Parrot's non-breeding dispersal. While the proposal will result in the loss of a very minor (0.22ha) patch of potential winter foraging habitat for this species, extensive tracts of similar forests will remain in the areas immediately surrounding the site and in the wider region.


The utilisation of forests on site is likely intermittent, coinciding with major flowering events in the area, and as such the site is likely to be inconsistently utilised in its current condition. Additionally, the proposal will remove only a very small portion (maximum of 0.22ha) of this potential foraging habitat. On this basis, it is considered that the area of clearing represents a small loss of seasonal foraging habitat which is not likely to lead to an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at risk of extinction.

Woodland Birds

- | | |
|--|-------------------|
| • <i>Artamus cyanopterus cyanopterus</i> | Dusky Woodswallow |
| • <i>Daphoenositta chrysoptera</i> | Varied Sittella |
| • <i>Neophema pulchella</i> | Turquoise Parrot |
| • <i>Petroica boodang</i> | Scarlet Robin |

It is considered that the study area may provide potential habitat for four (4) woodland bird species. No nests were observed.

The Dusky Woodswallow is often found within open woodlands dominated by Eucalypts with a sparse understorey of Acacia and heath species. The study area contains a small area of open forest that may provide habitat for foraging or nesting of the Dusky Woodswallow. Land immediately adjacent to the study area offers optimal foraging habitat associated with clearing along the forest edge with potential nesting occurring in forks or branches of trees.



The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. The vegetation to be cleared within the study area is relatively open forest which would be most suitable for this species to nest, however the clearing will result in a very minor loss of potential nesting habitat. Similar and higher quality nesting habitat is abundant in the surrounding region.

The Varied Sittella is known to frequent eucalypt forest that contain rough-bark species and mature smooth bark eucalypts with dead branches. The proposal will result in the removal of remnant vegetation that contains some rough-bark species and other eucalypts which may be potential habitat for this bird species, both for foraging and nesting. While the proposal will result in a minor loss of this habitat due to the clearing of trees, this habitat is widespread in the immediate surroundings of the study area and the wider region, and combined with areas of vegetation to be retained within the study area, the Varied Sittella is unlikely to face extinction of a local population as a result of the proposal.

The Turquoise Parrot lives on the edges of eucalypt woodland adjoining clearings which occur within the study area. Land immediately adjacent to the study area offers optimal foraging habitat associated with clearing along the forest edge with potential nesting occurring in forks or branches of trees. The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. The vegetation to be cleared within the study area is relatively open forest which would be most suitable for this species to nest, however the clearing will result in a very minor loss of potential nesting habitat. Similar and higher quality nesting habitat is abundant in the surrounding region.

The Scarlet Robin occurs in moderate dry sclerophyll forest which occurs within the study area. The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. The vegetation to be cleared within the study area is relatively open forest which would be most suitable for this species to nest, however the clearing will result in a very minor loss of potential nesting habitat. Similar and higher quality nesting habitat is abundant in the surrounding region.


The area of clearing on site represents a minor loss of foraging habitat and a very small loss of marginal nesting habitat (0.22ha).

On this basis, the proposal is unlikely to affect or lead to an adverse effect on the life cycle of these species such that a viable local population of the species is likely to be placed at risk of extinction.

Aerial Birds

- *Hirundapus caudacutus* *White-throated Needletail*

Although, this species is almost exclusively aerial, it has been recorded roosting in trees in forests and woodlands, both among dense foliage in the canopy or in hollows, which occur within the study area. This species also uses wooded areas, including open forest and rainforest to forage over.



The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. Similar and higher quality nesting habitat is abundant in the surrounding region.

The area of clearing on site represents a minor loss of foraging habitat and a very small loss of marginal nesting habitat (0.22ha). On this basis, the proposal is unlikely to affect or lead to an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Forest Owls

- | | |
|-------------------------------|--------------|
| • <i>Ninox connivens</i> | Barking Owl |
| • <i>Ninox strenua</i> | Powerful Owl |
| • <i>Tyto novaehollandiae</i> | Masked Owl |

The Forest Owls are known to inhabit dry sclerophyll forest which are present in minor forms across the study area. The existing condition of dry sclerophyll vegetation within the study area is generally moderate to high quality of native vegetation (0.22ha). Consequently, three (3) hollow bearing trees containing 4 suitable hollows (+20cm) for nesting by these species are to be removed under this proposal. Additionally, 14 hollow bearing trees suitable for nesting for the Forest Owl species are to be retained under this proposal, which contain up to 20 suitable hollows (20cm+). These retained hollow bearing trees are located within higher quality habitat, while the three (3) habitat trees to be removed are located within lower-quality vegetation mapped as 'Planted Vegetation'. A total of 57 hollow bearing trees were recorded within the study area, indicating good quality habitat for medium sized arboreal mammals which are important prey for the Forest Owls.


However, given the small size of potential foraging habitat (including open exotic grassland) to be removed (1.47ha) and the large number of suitable hollows to be retained within the study area (immediate vicinity), the proposal is unlikely to affect or lead to an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

Raptors

- | | |
|---------------------------------|-------------------------|
| • <i>Haliaeetus leucogaster</i> | White-bellied Sea-eagle |
| • <i>Hieraaetus morphnoides</i> | Little Eagle |
| • <i>Lophoictinia isura</i> | Square-tailed Kite |

It is considered that the study area provides potential habitat for three (3) raptor species.

Haliaeetus leucogaster habitat is characterised by the presence of large areas of open water including larger rivers, swamps, lakes and the sea. This habitat does not occur within the study area. However the closest large water body is approximately 2.5km away. This species could potentially roost within the study area, particularly within one of the stags. The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not



significantly diminish nesting habitat for this and will result in a minor loss of potential nesting habitat. Similar and higher quality nesting habitat is abundant in the surrounding region.

Hieraaetus morphnoides occupies open eucalypt forest, woodland or open woodland. This species also nests in tall living trees within remnant patches. Marginal suitable foraging habitat occurs within the study area. The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. Similar and higher quality nesting habitat is abundant in the surrounding region.

Lophoictinia isura inhabits a variety of habitats including dry woodlands and open forests, with a particular preference for timbered watercourses. Marginal suitable foraging habitat in the form of open forest occurs within the study area. The proposal will clear a small patch of remnant forest to accommodate the proposal. This clearing will not significantly diminish the foraging potential for this species. Similar and higher quality nesting habitat is abundant in the surrounding region.

The area of clearing on site represents a minor loss of foraging habitat and a very small loss of marginal nesting habitat (0.22ha). On this basis, the proposal is unlikely to affect or lead to an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.


Flora Species

- | | |
|--|-------------------------|
| • <i>Acacia bynoeana</i> | Bynoe's Wattle |
| • <i>Callistemon linearifolius</i> | Netted Bottle Brush |
| • <i>Cryptostylis hunteriana</i> | Leafless Tongue-orchid |
| • <i>Darwinia glaucophylla</i> | |
| • <i>Diuris bracteata</i> | |
| • <i>Epacris purpurascens</i> var. <i>purpurascens</i> | |
| • <i>Eucalyptus camfieldii</i> | Camfield's Stringybark |
| • <i>Hibbertia procumbens</i> | Spreading Guinea Flower |
| • <i>Prostanthera junonis</i> | Somersby Mintbush |
| • <i>Rutidosia heterogama</i> | Heath Wrinklewort |
| • <i>Tetratheca glandulosa</i> | |
| • <i>Tetratheca juncea</i> | Black-eyed Susan |

It is considered the study area provides potential habitat for twelve (12) flora species.

However, the subject site comprises only 0.22ha of native vegetation, a portion of which is disturbed.

No targeted flora surveys were conducted within the study area, however none of the above listed threatened flora species were recorded during comprehensive vegetation surveys within the study area. The proposal seeks to remove 0.22ha of native vegetation of which 0.09ha is representative of a forest or woodland structure, 0.13ha as heath and 0.17ha of Planted Vegetation. Notwithstanding the subject site minor spatial area of vegetation, there will be no direct/ indirect impacts within the broader landholding, and consideration of the



historic land use has also informed a limited likelihood of occurrence for these species within the impact area.

On this basis, it is considered that the area of clearing (0.22ha) that represents a minor reduction in potential area of occupation for these species and, as such the proposal is not likely to lead to an adverse effect on the life cycle of these species such that a viable local population of each species is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) 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

(ii) 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

One endangered ecological community Coastal Upland Swamp in the Sydney Basin Bioregion, listed as endangered under the BC Act, is commensurate with PCT 1699 Heath-leaved Banksia – Coral Fern Wet Heath on sandstone ranges of the Lower Central Coast was recorded within the study area (Figure 4-1). However, this community will not be directly impacted/removed under this proposal and is therefore not located within the subject site (Figure 4-2)

(c) in relation to the habitat of a threatened species or ecological community:


(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

The proposal will remove or modify a maximum of 0.22ha of native vegetation and 1.25ha of non-native vegetation with three hollow-bearing trees requiring removal. All fallen timber (habitat logs) are to be relocated outside of the study area.

(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

The proposal will impact PCTs 1641 and 1642 located in the west of the study area (Figure 4-1) the subject site is restricted to the installation of a sewer and water pipelines which will be 20m in width. This small width is unlikely to fragment the vegetation, and it is likely that the native vegetation will regenerate due to the native soil seed bank that would be present.

The proposal has the potential to introduce new edge effects from the construction of the sewer and water pipelines. These edge effects may result in the spread of the exotic vegetation allowing infestations of weed species. Due to the small area of disturbance edge effects are unlikely to increase substantially by the proposal.



In the west of the study area the water pipeline adjoins Kangoo Road, and currently the Central Coast Highway and Kangoo Road are a barrier to fauna movement to the south to Brisbane Water National Park. The remainder of the sewer and pipeline disturbance footprints are unlikely to provide a barrier to ground dwelling fauna due to the small width (20 m). The Avenue and Festival Drive are currently a barrier to ground dwelling fauna and the widening of these roads is unlikely to increase substantially by the proposal.

(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

The proposal will remove or modify a maximum of 0.22ha of intact native vegetation, a portion of which is disturbed and 1.25ha of non-native vegetation with three hollow-bearing trees requiring removal.

Considering the area of clearing represents a minor reduction in potential area of occupation for all assessed threatened species, and given higher quality vegetation containing similar habitat is present within the immediate vicinity, the proposal is not likely to lead to an adverse effect on the life cycle of these species such that a viable local population of each species is likely to be placed at risk of extinction.

The three (3) hollow bearing trees to be removed are located alongside an existing roadside within disturbed vegetation mapped as Planted Vegetation. The majority of the remaining 54 hollow bearing trees to be retained are located in higher-quality vegetation occurring within intact forest.

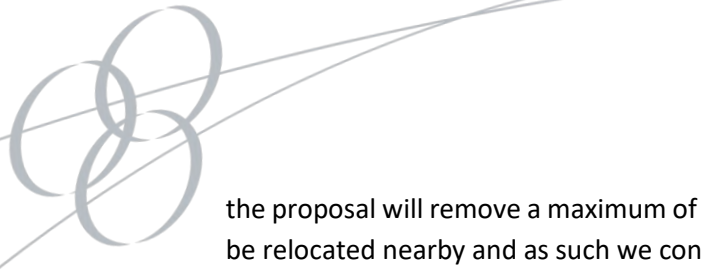
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

Areas of Outstanding Biodiversity Value (AOBV) declared in accordance with the BC Act were not identified within the investigation area.

(e) 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.

The potential of key threatening processes (KTPs) to impact the threatened species considered likely to occur within the site have been considered in **Appendix 6** above.

The proposal may increase the operation of the KTPs “clearing of native vegetation”, “removal of dead wood and dead trees”, “loss of hollow-bearing trees” and may potentially contribute to “infection of native plants by *Phytophthora cinnamomi*”, listed under the BC Act. However,



the proposal will remove a maximum of 0.22ha of native vegetation and any fallen timber will be relocated nearby and as such we consider that this is a very small contribution to this KTP.

The proposal has the potential to result in the operation of the “Infection of native plants by *Phytophthora cinnamomi*” KTP. However, we have recommended wash-down and equipment hygiene protocols to minimise the operation of this KTP (refer to section 8.2 Recommendations).



APPENDIX 4

STATEMENT OF HERTIAGE IMPACT

Project Number: 19060403



MT PENANG STATEMENT OF HERITAGE IMPACT KARIONG

12 / 02 / 2019 FINAL

E P S

9 Yacaaba St, Nelson Bay NSW 2315

Attn: Alina Tipper

alinatipper@enviroproperty.com.au

C O N T A C T

hello@heritagenow.com.au

0425 250 310

www.heritagenow.com.au



Executive Summary

Heritage Now has been engaged by EPS on behalf of the Hunter and Central Coast Development Corporation (HCCDC) to prepare a Statement of Heritage Impact (SoHI) for non-Indigenous (European) heritage for a portion of the State Heritage Listed Mount Penang Parklands.

The project is to enable the Highway Commercial Precinct (HCP) and the proposed Kangoo Road subdivision enabling works which includes water and drainage infrastructure. This SoHI is to inform the Mount Penang HCP Roadworks Review of Environmental Factors (REF), as well as to support a s60 application for the water and drainage works under the NSW *Heritage Act 1977*.

Part of the Project Area is within the State Heritage Register listing: Mount Penang Parklands (SHR#01667). It is also listed under the Gosford Local Environmental Plan 2014 as the Mount Penang Heritage Conservation Area (C1) and heritage item (I66) and is listed as state significant.

A Conservation Management Plan (CMP) for Mount Penang Parklands was prepared by Godden Mackay Logan in 2001 and this has been endorsed by the Heritage Council. Another CMP was prepared by EJE in 2012, which was then superseded in 2018 by a CMP prepared by Extent Heritage; which does not yet appear to have been endorsed by the Heritage Council.

The Project Area for this SoHI incorporates Lot 10, DP1149050 and Lot 1 DP715442. The Proposal Area is located within the Project Area and extends from the western end of Festival Drive, Kariong. The Proposal Area covers the construction footprint of the Proposal as well as a buffer to include potential stockpile locations and lay down areas.

The Proposal involves the construction and operation of sewer, water, stormwater and associated infrastructure on land within the Highway Commercial Precinct, Festival/Gardens Precinct, Kangoo Road Commercial Precinct and land outside the Mt Penang Parklands growth centre land. The Proposal is a vital component for the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other Precincts. The Proposal involves enabling works which will require drainage as well as water and sewer installation to the west of the termination of Festival Drive. The water and sewer installation will require trenching approximately 1 m wide by 1 m in depth, as well as a service road alongside the pipeline.

There is an existing s60 approval (S60/2018/054) for water and road works along The Avenue and Festival Drive within the Mount Penang Parklands, which is for land to the east of the current works for the Proposal Area, but within the Project Area.

The Proposal works will be primarily below ground and will occur outside the identified archaeological zones identified in the CMPs (EJE 2012, Extent 2018) and in an area with nil to low archaeological sensitivity. The Proposal works will not physically impact the built heritage associated with the heritage listings. There will be a temporary minor visual impact during construction while the pipes are being laid and a very minor permanent visual impact as a result of the access road.

The below recommendations are provided in consideration of the findings of this report and in accordance with the relevant legislative requirements.

Recommendation 1

An approval under s60 of the Heritage Act is required prior to works commencing. This SoHI should be submitted as part of the application package to Heritage NSW. Following determination of the approval works should be undertaken in accordance with any conditions provided by Heritage NSW.

Recommendation 2

The excavation for the water infrastructure can proceed with caution. Should suspected archaeological material be identified then works are to stop in that area. The heritage consultant is to be contacted to make an assessment and to devise, in consultation with Heritage NSW, a management strategy for the area and potentially a modification under s65A.

Recommendation 3

A heritage induction is to be provided to all on-site personnel undertaking ground disturbing works so that they understand their obligations to report the discovery of archaeological material and their obligations under the *Heritage Act 1977*.

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1 Introduction

Heritage Now has been engaged by EPS on behalf of the Hunter and Central Coast Development Corporation (HCCDC) to prepare a Statement of Heritage Impact (SoHI) for non-Indigenous (European) heritage for a portion of the State Heritage Listed Mount Penang Parklands. The Proposed works are for the Highway Commercial Precinct (HCP) and the proposed Kangoo Road enabling works.

The Proposed works are to enable the Highway Commercial Precinct (HCP) and the proposed Kangoo Road subdivision enabling works which includes water and drainage infrastructure. This SoHI is to inform the Mount Penang HCP Roadworks Review of Environmental Factors (REF), as well as to support a s60 application for the water and drainage works.

1.1 The Project and Proposal Area

The Project Area incorporates Lot 10, DP1149050 and Lot 1 DP715442. The Proposal Area is located within the Project Area and extends from the western end of Festival Drive, Kariong (Figure 1). The Proposal area incorporates the construction footprint of the Proposal as well as potential stockpile locations and lay down areas. The Project Area is located within the Central Coast Local Government Area.



LEGEND

Project Area Proposal Area
Pipeline Works Area Interallotment Drainage

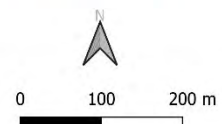


Figure 1 Project Area

1.2 Project Proposal

The Proposal involves the construction and operation of sewer, water, stormwater and associated infrastructure on land within the Highway Commercial Precinct, Festival/Gardens Precinct, Kangoo

Road Commercial Precinct and land outside the Mt Penang Parklands growth centre land. The Proposal is a vital component for the future redevelopment of the Kangaroo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other existing Project Area Precincts. The Proposal involves enabling works that will require drainage as well as water and sewer installation to the west of the termination of Festival Drive. The water and sewer installation will require trenching approximately 1 m wide by 1 m in depth, as well as a service road alongside the pipeline. The ground disturbance works are located within the Proposal Area.

1.3 Background and Heritage Listing

The Project Area is part of the State Heritage Register listing: Mount Penang Parklands (SHR#01667) and is also listed under the Gosford Local Environmental Plan 2014 as the Mount Penang Heritage Conservation Area (C1) and heritage item (I66) (Figure 2).

A Conservation Management Plan (CMP) for Mount Penang Parklands was prepared by Godden Mackay Logan in 2001 and this has been endorsed by the Heritage Council. Another CMP was prepared by EJE in 2012, which was then superseded in 2018 by a CMP prepared by Extent Heritage; which does not yet appear to have been endorsed by the Heritage Council.

Previous correspondence from Heritage NSW (DOC19/66381) for the enabling works to the east of the current Proposal Area indicated that a s60 was required because works exceed the parameters of the Standard Exemptions under s57. A s60 permit has subsequently been approved for these works (S60/2018/054).

This SoHI has been written to support a s60 application for the Proposal Area (works west of Festival Drive).



Figure 2 Project Area, Proposal Area, State Heritage Register Curtilage and Conservation Area and Heritage Item under Gosford Local Environmental Plan

1.4 Methodology

This document has been prepared in accordance with the relevant Heritage Division guidelines, including, but not limited to:

- Assessing Heritage Significance (OEH 2015)
- Statements of Heritage Impact (OEH, formerly Heritage Office 2002)

This Statement of Heritage Impact includes:

- An overview of the heritage significance of features concerning the project proposal
- What impact the proposed works will have on that significance
- What measures have been proposed to mitigate negative impacts
- Why more sympathetic solutions are not viable

1.5 Authorship

This report has been written by Tessa Boer-Mah, Principal Heritage Consultant at Heritage Now and reviewed by Senior Heritage Consultant, Claire Rayner.

2 Historic Context

This historic context has been adapted from information contained in the GML CMP (2001) and the Extent CMP (2018).

In the mid-twentieth century, the Mount Penang Juvenile Justice Centre was the largest of its type in Australia. It housed 170 male juvenile offenders with the aim of rehabilitating them through schooling and vocational-technical training. The principles of rehabilitation through a combination of education and physical labour were enshrined in the centre's doctrine from its inception. Indeed, the construction of its initial buildings in 1912 and 1922 relied on the physical labour of the inmates. The design of some of the earliest buildings resemble the below-deck areas of large timber ships and this has its links to the very first attempts at rehabilitation of juvenile offenders aboard disused navy warships which preceded the inception of the centre at Mount Penang.

2.1 The Nautical School Ships (1866-1911)

The Industrial Schools Act was passed in the NSW parliament in 1866 in an effort to control wayward or destitute children. It was modelled on the Industrial Schools in England which would remove children who were homeless, neglected or involved in crime and place them in reformatories with the ultimate aim of giving them a rudimentary education and trade skills so they could be apprenticed out and start their lives as 'useful' citizens.

The ex-navy sailing ship, the *Vernon*, was the first to be converted for this purpose and could accommodate up to 500 boys. It combined a system of education and military-style self-discipline. In 1890 the *Vernon* was replaced by the *Sobraon*, which was used until 1911 when it became clear that the ship was no longer usable as a Nautical School Ship.

2.2 Gosford Farm Home for Boys (1912 - 1922)

In 1905, the *Neglected Children and Juvenile Offenders Act* was passed to replace the former *Industrial and Reformatory Schools Acts* of 1866 and this spurred on the development of Mount Penang as a reformatory school.

On 1 July 1912, approximately 100 boys aged between 10 and 16 began clearing a site at Mount Penang to build a new State-controlled farm school for wayward boys. The boys had come from the *Sobraon* and were supervised by the former probation officer of the Nautical School Ship, Herbert Charles Wood.

Mount Penang had been selected for its isolation, as a similar institution, the Brush Farm at Eastwood had been encroached upon by residential development. Its isolation, along with the steep access track presented difficulties for construction. The high cost of transport for bricks meant that local hardwood and sandstone were quarried as building materials, and concrete was also used.

The priorities for construction were: dormitories, a dining room, staff quarters, offices, a kitchen, storerooms for supplies and equipment, and accommodation for the tradesmen and Clerk of Works. The foundation stone of No.1 Dormitory was laid in December 1912 by the Minister for Public Instruction. By September 1913 the No.1 Dormitory had been completed along with the Assistant Superintendent's residence and four weatherboard cottages to accommodate married staff members; these cottages are still extant on the site.

Works continued on the site until 1922 and included additional dormitories, a concrete reservoir, a store, an office, a windmill, five galvanised tanks for water storage, a carpentry workshop, a 300-yard trolley truck for transporting stone from the quarry site and a permanent dam.

2.3 Gosford Training School (1923-1944)

In 1923, the State Government passed the *Child Welfare Act*, repealing and consolidating a variety of provisions that existed in legislation relating to the care and management of children under State care. The Act was designed to place greater emphasis on children's health, welfare and rehabilitation and provided a more lenient treatment of young people under State care and kept them away from the harsh environment of the NSW criminal justice system. As part of this, the Gosford Farm Home was classified as an Industrial school and the schooling component was controlled by the Education Department. To reflect this, the name of the Gosford Farm Home was changed to the Gosford Training School.

Between 1923 and 1940 the living conditions at the centre gradually improved along with the amenities. The building program was continued, which allowed the boys to get trades experience which could be used upon their release, while at the same time upgrading the centre. Electric lighting and a hot water system were installed in 1936 and the following year a refrigeration service. By the end of 1937, there were four dormitories, a recreation hall for concerts and movies, a dining and kitchen block, a hospital, a bathing and sanitary block, as well as outbuildings which included a dairy and accommodation for staff.

2.4 Mount Penang Training School for Boys (1944-1960)

In 1944 a sub-institution was built on the site and was originally designed as a maximum-security sub-institution for unresponsive boys. However, in 1948, it became a privilege cottage representing a more incentive-driven system of reformation rather than a punitive one.

Superintendent Vincent Heffernan set about reinvigorating the institution between 1944 and 1947, buying new equipment for trade rooms, establishing a boot shop to supply shoes, upgrading the pastures and raising the pigs and cows to stud standard. From the 1940s the Gosford Training School began to show their livestock and began winning prizes at local events and the Royal Easter Show in Sydney.

In 1946, the name of the Institution was changed from the Gosford Training School to Mount Penang Training School for Boys, Gosford.

2.5 Mount Penang (1960 -2000)

During the 1960s five new buildings were erected including an assembly hall, a gymnasium, a new kitchen/dining room, a laundry, a boiler house and a storeroom. An additional sports ground was also built.

Additional buildings and improvements were made in the subsequent decades, including a new hospital block and nurse's quarters (to replace the original 1920s hospital) and a 50 m swimming pool.

The name of the centre was changed to the Mount Penang Detention Centre in 1988, reflecting a new emphasis on court-based sentencing and children's welfare being largely managed by the

Department of Family and Community Services. By 1991 the government adjusted its policies and the institutions name changed to the Mount Penang Juvenile Justice Centre and later to 'Girrakool'.

Also in 1991, the Kariong Juvenile Justice Centre was opened in the north-east corner of the site (now outside the curtilage). This Centre was for serious juvenile offenders and was a high-security prison, with Mount Penang functioning as a low-security justice centre. The Frank Baxter Juvenile Justice Centre was opened in the north-west corner in 1999 and inmates of Mount Penang were progressively relocated to this institution allowing the wider Mount Penang facilities to be transferred to local Council for community uses. Ownership was transferred to the Festival Development Corporation which was formed under the *Growth Centres (Development Corporations) Act 1974*.

2.6 Mount Penang Parklands (2000 onwards)

The site now contains an events park, sports precinct, retail/commercial areas, future business park, Mount Penang Gardens, Kariong High School, NAISDA the National Indigenous Dance College and bushland.

2.7 History of the Proposal Area





According to the parish map there are no recorded structures at Mount Penang that were extant in 1911 (Figure 3). The historic records focus on the buildings and structures associated with the Mount Penang Training School. The Proposal Area was on the edge of the training school and appears only to have been used as grounds and potentially as fenced animal enclosures, although part of the pipeline crosses the one of the early entry roads to the site. The entry road to the site is marked on the 1954 and 1965 aerial, but appears to have fallen into disuse by 1984 (Figure 4-Figure 7). Aerial imagery from 1954 shows the area as grassland and vegetation (Figure 4). By 1965 the eastern portion of the Proposal Area is still grassland and the western portion has been cleared for what could be fenced animal enclosures (Figure 5). The western area appears only to have been used for this purpose until the early 1970s, as by 1976, the aerial imagery shows the vegetation growing back over this area (Figure 6) and by 1984 the area has been completely covered by vegetation (Figure 7). The central portion of the Proposal Area contained a tributary of Piles Creek as well as grassland from at least 1954 up until the 1990s. The current dam north of the Proposal Area appears to have been constructed c2005. The portion to the east of the creek tributary in 1965 appears to have hay bales and thus may have been used for a grass based crop, but there is no evidence for this use on later aerials (Figure 5).



Figure 3 Parish Map 1911 (Source: Crown Plan 4712.2111)



LEGEND

-  Project Area
-  Pipeline
-  Pipeline Area
-  Interallotment Drainage

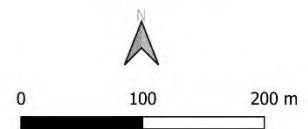






Figure 4 1954 Aerial Image with Proposal



LEGEND

-  Project Area
-  Pipeline
-  Pipeline Area
-  Interallotment Drainage







0 100 200 m

Figure 5 1965 Aerial Image with Proposal



LEGEND

-  Project Area
-  Pipeline
-  Pipeline Area
-  Interallotment Drainage



0 100 200 m

Figure 6 1976 Aerial Image with Proposal



LEGEND

- Project Area
- Pipeline
- Pipeline Area
- Interallotment Drainage



0 100 200 m

Figure 7 1984 Aerial Image with Proposal

2.8 Summary

The Proposal Area is associated with the Mount Penang Parklands and its use as a juvenile rehabilitation centre for the majority of the 20th century. The analysis of available aerial imagery suggests that the Proposal Area was used for agricultural purposes in the late 1950s through to the early 1970s. Apart from the entry road, there is no evidence to suggest that substantial structures were constructed within the Proposal Area.

3 Legislative Context and Heritage Listing

This section provides a brief overview of the relevant legislation and listings pertaining to the Project Area. The legislative overview is provided solely as contextual information for the proponent and does not constitute legal advice.

3.1 Legislative Context

Non-Indigenous heritage in NSW is protected under the *Heritage Act 1977* (the Heritage Act) and the *Environmental Planning & Assessment Act 1979* (the EP&A Act). With regard to heritage items of State significance, the State Heritage Register (SHR) is maintained under Part 3A of the Heritage Act and comprises a list of places and objects of particular importance to the people of NSW. Heritage items may be valued by particular groups in the community such as Aboriginal communities, religious groups or people with a common ethnic background. Local heritage items are registered by local councils in accordance with the EP&A Act and listed in Local Environmental Plans (LEPs).

Archaeological material is protected under the relics provision of the Heritage Act 1977, it includes any deposit, artefact, or material evidence that:

- a. *Related to the settlement of the area that comprises New South Wales, not being of Aboriginal settlement, and*
- b. *Is of State or local significance*

Items that do not meet these criteria are known as ‘moveable objects’ or ‘works’. Moveable objects are defined simply as items that are not relics; works can refer to past evidence of infrastructure that is buried and therefore archaeological in nature. Examples of works may include but are not limited to former road surfaces or infrastructure associated with rail or trams. Exposure of such items does not trigger the reporting obligations under the relics provisions of the Heritage Act (Division 9).

Section 57 and Section 60 of the Heritage Act state that exemptions or permits may be required when excavating land in NSW when an interim heritage order, or listing on the State Heritage Register applies to a place, building, work, relic, moveable object, precinct, or land within the proposal. Where works are minor in nature and will have minimal impact on the heritage significance of a place, a Section 57 exemption may be granted. If the proposal is not exempt under Section 57, a permit under Section 60 would be required to carry out the activities.

Section 139 and 140 of the Heritage Act state that an excavation permit is required in certain circumstances, including where there is reasonable cause to suspect that a relic (not listed on an Interim Heritage Order or the State Heritage Register) may be discovered, exposed, moved or damaged, or where a relic has already been discovered or exposed. The Heritage Council may issue exceptions to this section where an archaeological assessment approved by the Heritage Council has indicated that there is little potential for relics to occur.

Under Section 170 of the Heritage Act, government agencies are required to maintain a register of their heritage assets which is known as a s170 heritage register.

3.2 Heritage Listings and other Relevant Instruments and Guidelines

The Project Area is part of the State Heritage Register listing: Mount Penang Parklands (SHR#01667) and is also part of the Mount Penang Parklands Heritage Conservation Area listed under the Gosford Local Environmental Plan 2014 (Table 1). The Project Area is also within the curtilage of local heritage item/s, likely part of the McCabe complex (I66), however, the LEP mapping is not clear enough to identify the individual boundaries of each heritage item.

Table 1 Summary of Heritage Listings

Listing	Item	Significance	Item Number
State Heritage Register	Mount Penang Parklands	State	1667
Gosford LEP 2014	Mount Penang Parklands Heritage Conservation Area	State	C1
Gosford LEP 2014	Landscape associated with Mount Penang Parklands	State	*

*The LEP mapping does not clearly show which item number pertains to the Project Area there are multiple listings which appear to be attached to the same area, however, analysis of listing descriptions show that the Project Area is part of the general landscape of Mount Penang Parklands, rather than a specific feature or building.

Three Conservation Management Plans (CMPs) have been written to guide conservation policies at the site and a site specific Development Control Plan (DCP) has also been developed based on these CMPs amongst other studies (Table 2).

Table 2 Other relevant instruments/guidelines

Instrument/Guideline	Notes
GML CMP 2001	Endorsed by Heritage Council
EJE Architecture CMP 2012	Includes archaeological assessment
Extent CMP 2018	Updated CMP, not yet endorsed by Heritage Council
Gosford DCP 2013	Specific development controls for the site

3.2.1 Significance

The below statement of significance derives from the updated CMP (Extent, 2018, p. 46). It combines previous statements from the GML CMP (2001) and the EJE CMP (2012).

The Mount Penang Juvenile Justice Centre has been the most important juvenile detention centre for NSW for most of the twentieth century and is a direct continuation of the nineteenth-century system of reformatory training ships.

The design of the early buildings, their configuration and the layout of the site itself and its landscaping, collectively and individually illustrate juvenile penal philosophies and practices of the period and their subsequent evolution over eighty-five years of operation. The location of the Centre is a feature in the historical expansion of the city of Sydney into its rural hinterland and its operations are an element in the development of Gosford and the Central Coast.

The Centre has notable aesthetic qualities associated with its site and the available views, the layout of the low-scale buildings and the landscaping. The earlier buildings are attractive, human-scaled structures which, while of an institutional character, utilise colonial homestead architectural forms appropriate to their setting and construction techniques of particular interest. The most recent buildings reproduce these forms to reinforce the characteristic appearance of the complex, whilst the McCabe Cottages group is an excellent example of the Inter-War Functionalist architectural style.

The siting and relationship of buildings to each other and to the sports fields, paddocks and vistas are all components of the operational requirements and practices of the Centre. These relationships provide technical information regarding juvenile detention and reformatory practices.

Mt Penang is very important to the many boys and young men who were detained there over the course of nearly a century. For most detainees, Mt Penang is a place where unforgettable experiences occurred - experiences which strongly influenced the course of their lives. The place is also important to the many men and women who lived and worked at the former detention centre. For many of these people, it is a place of substantial personal and professional achievement. Mt Penang is also important to the local community as a landmark of historical and aesthetic importance. The place has functioned as a community meeting point, with many links between the wider community and the detainees and staff.

Mount Penang also has significance for the local Aboriginal people both pre and post-contact, and during the time when Mt Penang was used as a juvenile detention centre and accommodated a number of Aboriginal detainees for whom the site would have profound associations.

3.2.2 Conservation Management Plans

Three Conservation Management Plans (CMPs) have been written for the site. The first was written by GML (2001) and has been endorsed by the NSW Heritage Council. The second was written by EJE Architecture 2012 and the third was written by Extent 2018 and is not clear if it has been endorsed by NSW Heritage Council.

The relevant conservation policy that relates to the new uses and adaptive uses of the Mount Penang Parklands includes:

The establishment of viable future uses that will ensure the retention of the key heritage values in the long term should be a primary objective for the site. (Extent 2018:75)

3.2.3 Development Control Plan

The DCP for the site is listed as Kariong Mount Penang Parklands 5.3 under the Gosford DCP 2013 and generally conforms with the Gosford LEP 2014. The DCP provides detailed development principles and controls for the site, along with the objectives and requirements.

The vision in the DCP (Section 5.3.2.6) is:

Mount Penang is to be an ecologically sustainable development that complements the existing heritage character and landscape setting. A vibrant mix of uses is proposed to enhance the quality of life for people on the Central Coast by providing new opportunities for

employment, recreation, education, business, speciality retail, accommodation, festivals and events. Extensive gardens, event venues, sports facilities, picnic and bushland areas are to be established as a focus and amenity for the new facilities and the region.

The relevant principles and controls for the site in relation to the Proposal are outlined in Section 3.3.2.

3.3 The Proposal – Water, Sewer and Drainage Infrastructure

This section examines the Proposal in relation to the relevant statutory instruments and guidelines.

3.3.1 Conservation Management Plans in relation to the Proposal

The Proposal crosses four heritage precincts as identified by the EJE Architecture and the Extent CMP (Figure 8). These precincts are:

- Precinct 1 - Western Playing Fields,
- Precinct 5 - Mount Penang Gardens,
- Precinct 6 - the School (south),
- Precinct 16- Degraded Bushland

The CMP identified specific conservation polices for these precincts (Extent 2018:80-81):

Precinct 1 – Western Playing Fields

Change of use or development in this precinct may be considered. The group of pine trees behind the McCabe Cottage complex should be assessed by a qualified arborist and a strategy for their management implemented.

Precinct 5 – Mount Penang Gardens

Continue to manage as the Garden's. The south eastern corner of this precinct may be suitable for appropriate future development.

Precinct 6 – the School (south)

Conserve remnants of the former avenue of mature trees along the western boundary, the scribbly gums in its central southern section. Appropriate development of this precinct is feasible provided heritage landscape items are included within future design.

Precinct 16 Degraded Bushland

This bushland is substantially degraded and did not contribute significantly to the operation of the former Mount Penang Juvenile Justice Centre. Any future development in this precinct should be positioned behind a suitable setback to ensure the site maintains a bushland presence to Kangoo Road.

The portions of Precincts 5, 6, and 16 within the Proposal Area are identified as being of low significance, with Precinct 1 having moderate significance (Figure 8).

The CMPs (Extent 2018 and EJE 2012) identified three areas of archaeological potential:

- A1 – Dairy and Piggery Precinct,
- A2 - Core Development Precinct,

- A3 - Staff Cottage Precinct.

The Proposal Area is not located within any of the areas of archaeological potential, the closest archaeological precinct is A3 and is located 200m to the west (Figure 10).

There are no built heritage or landscape features listed in the Proposal Area (Figure 11). The closest built heritage features are the Carinya House (21) and Maintenance building (22) as well as Sports Field 1 which are located approximately 160 metres north-east of the Proposal and have high significance. The residential cottages (1-5) are the next closest built heritage features and are 240 metres east of the Proposal Area. The residential cottages are listed as having moderate significance (Figure 11).

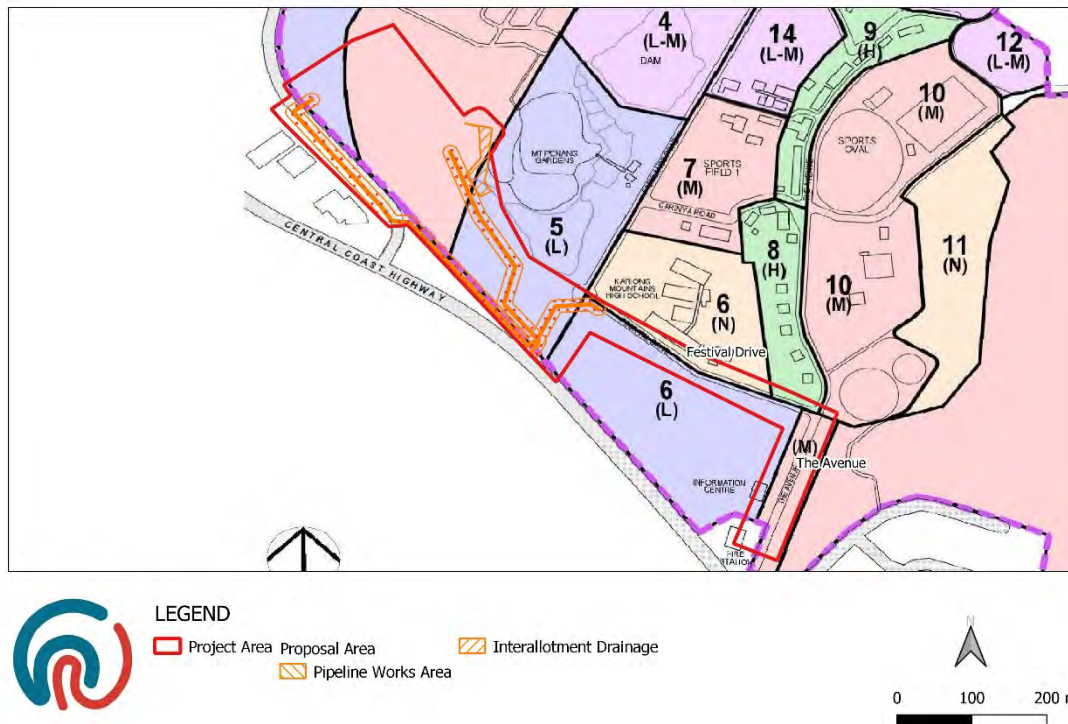


Figure 8: Significance of Precincts, Proposal Area marked in orange (Source of Precinct Information: EJE Architects, 2012, p.29)

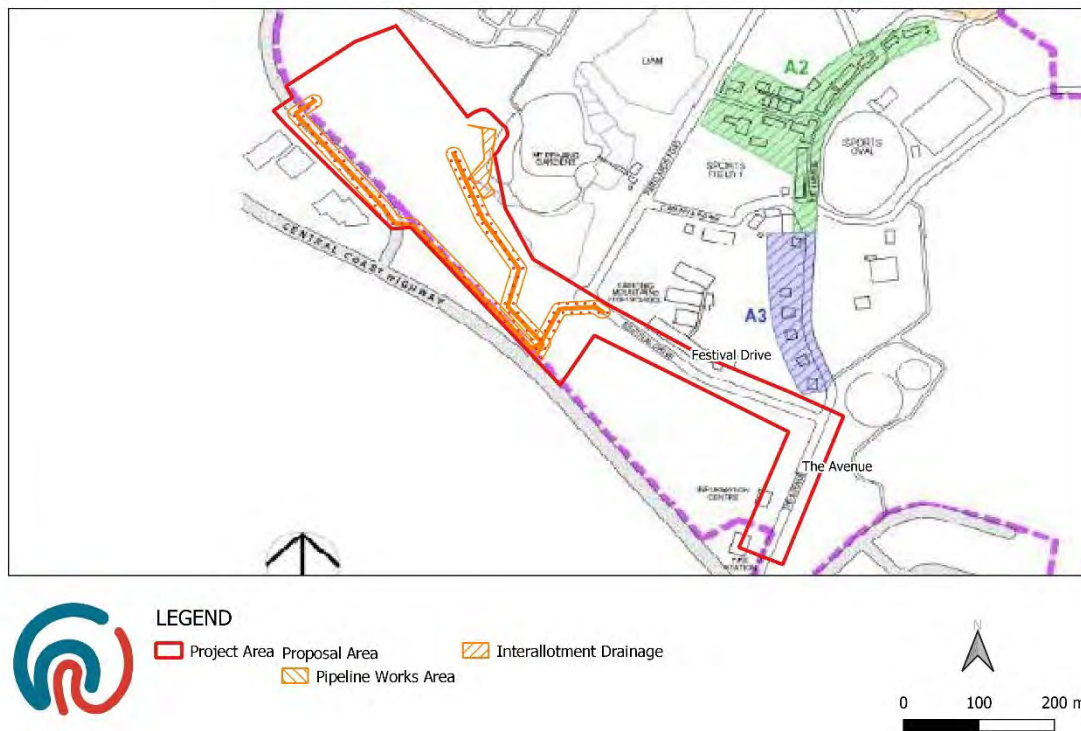


Figure 9: Archaeology Sensitivity shown shaded in orange, green and purple, location Proposal Area marked in orange.
(Source of Precinct Information: EJE Architects, 2012, p.29)

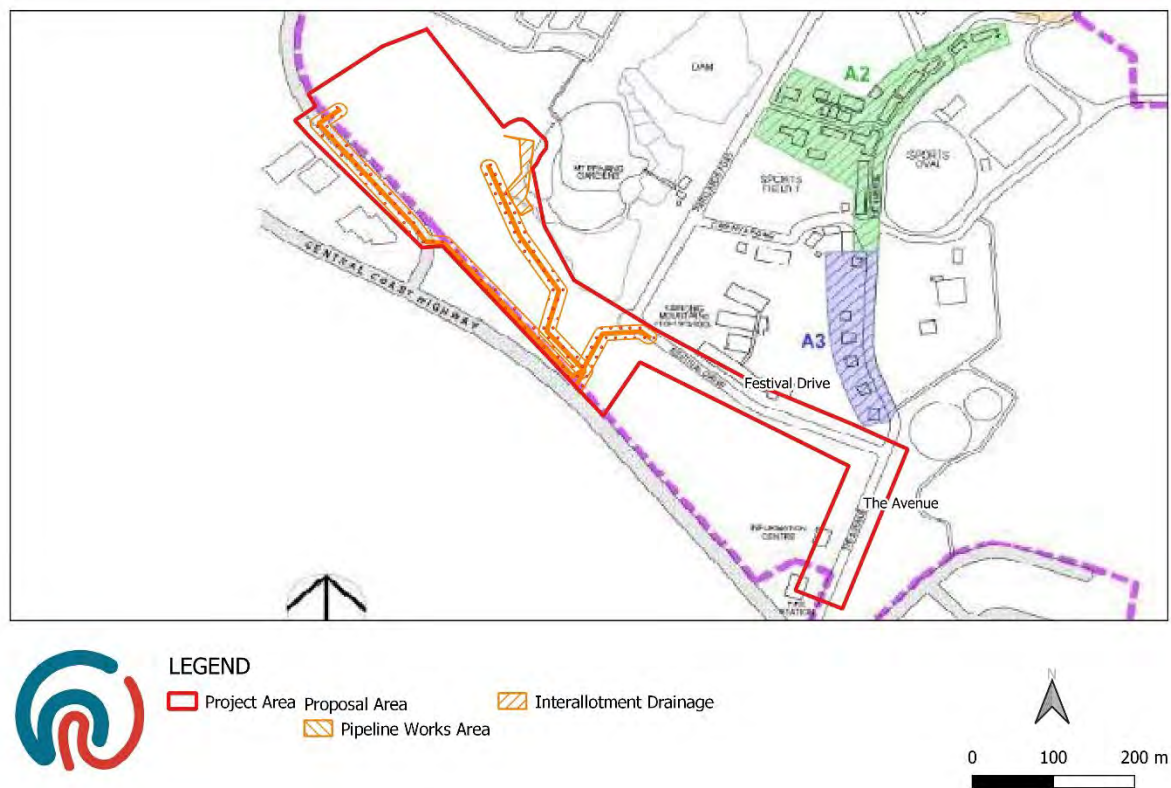


Figure 10 Archaeological Precincts and Proposal Area

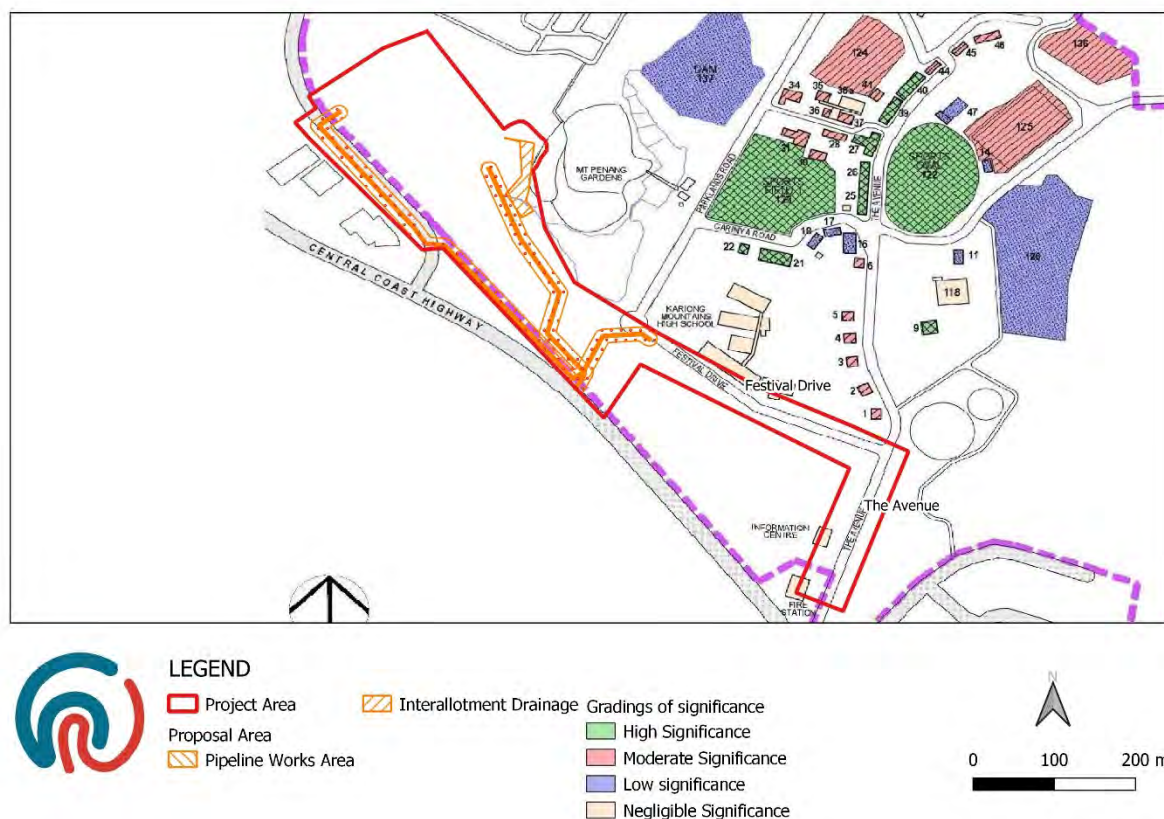


Figure 11: Built Heritage and Proposal Area maked in orange. (Source of Precinct Information: EJE Architects, 2012, p.29)

3.3.2 Development Control Plan in relation to Proposal

The DCP states that the “overall site is to continue to be ‘read’ and interpreted in future as the Gosford Farm Home for Boys – that is, essentially a rural site”

Of relevance to the Water Infrastructure proposal is to the following under Section 5.3.3.4 states:

Landscape precincts and elements should be dealt with in accordance with their assessed cultural significance by:

- Retaining and respecting its semi-rural character and ambience;*
- Preserving the natural bushland below the plateau to heavily vegetated nature and original setting of the Farm.*

3.4 Summary

Part of the Project Area is within the State Heritage Register listed Mount Penang Parklands (SHR#01667). It is also listed under the Gosford LEP 2014 as the Mount Penang Heritage Conservation Area (C1) and heritage item (I66) and is listed as state significant.

There are no built heritage items or landscape items within the Proposal Area. The Proposal Area is not located within the archaeological precincts identified in the CMPs.

4 Physical Assessment

The Proposal Area was inspected on 2 July 2019 by Tessa Boer-Mah, Principal Heritage Consultant Heritage Now. The aim of the inspection was to identify any built and/or archaeological heritage values associated with the Proposal Area.

The eastern portion of the Proposal Area is landscaped with pedestrian pathways (Plate 1). The Proposal Area in the eastern portion is adjacent to the southernmost dam in the Mount Penang Parklands. The overflow for the dam (previous catchment of Piles Creek tributary) is thickly vegetated by bracken fern (Plate 2). The proposed inter-allotment drainage and the pipeline adjacent has an unsurfaced track running through it which leads up to the grassy fields to the north of the inter-allotment drainage (Plate 3).

No evidence for posts or boundaries associated with the previous fence lines were identified which may be related to the agricultural use of the area. No evidence for the early entry road was observed and no archaeological features or deposit were identified.

The southern pipeline is largely outside the heritage listed area and within the road easement of Kangoo Road.

4.1 Summary

No built heritage structures were identified during the physical assessment, nor any indicators of archaeological features or deposit.

The Proposal Area is assessed to have nil-low potential for archaeological evidence relating to the Mount Penang Training School and there is no evidence for built structures associated with the Mount Penang Training School.

5 Statement of Heritage Impact

This SoHI addresses the heritage significance of the features concerning the Proposal, the impact the proposed works may have on that significance, the measures proposed to mitigate impacts and why more sympathetic solutions are not viable.

5.1 The Proposal

The Proposal involves enabling works that will require drainage as well as water and sewer installation to the west of the termination of Festival Drive. Prior to installation, vegetation will be removed to clear the area, but will be kept to a minimum. The water and sewer installation will require trenching approximately 1 m wide by 1 m in depth and will be undertaken by machine. Temporary laydown areas will be directly adjacent to the pipeline. There will be a service road along side the pipeline that will comprise a dirt track but may include stabilisation gravels where necessary.

5.1.1 Significance Overview

Mount Penang Parklands has significance as a training school and detention site for young offenders from 1912-1999. It has values associated with the layout of the low-scale buildings and its rural landscape. The Proposal Area forms part of the rural landscape associated with Precincts 1, 5, 6 and 16 as defined by the CMPs for the item (Extent 2018, EJE 2012, GML 2001). Precinct 1 has moderate significance with respect to the overall site, while Precincts 5, 6 and 16 have low significance as identified by the EJE CMP (Figure 8).

There are no built structures in the Proposal Area and it has been assessed that this area has nil potential to retain archaeological evidence pertaining to the Mount Penang Training School agricultural activities and low potential for containing evidence for the early entry road.

5.1.2 Enhancement of Heritage Item

The following aspects of the proposal respect or enhance the heritage significance of the item or conservation area for the following reasons.

The Proposal will enhance the Mount Penang Parklands by providing vital infrastructure for the activation of the HCP and the Kangoo Road development. Both these uses are needed as viable future uses for the site and thus adhere to the conservation policy regarding new uses (Extent 2018:75) and provide for the retention of key heritage values. Once installed the pipeline route will be restored to its original rural setting and thus maintain the rural values, whilst ensuring viable long-term use of the site.

5.1.3 Detrimental Impact on Heritage Item

The following aspects of the proposal could detrimentally impact on heritage significance.

The works are primarily below ground. There will be a temporary visual impact during construction while the pipes are being laid and temporarily detract from the rural character of the area. There will be no permanent impact to the rural character of the area. There is no foreseen impact to archaeological resources. Once the pipeline works are remediated, the site will continue to be interpretable as a rural landscape. The Proposal Area will maintain its rural landscape values and will be in accordance with the views and vistas conservation policies (Extent 2018:69).

5.1.4 Mitigation Measures Proposed

The access road for the pipeline will not be a formalised road and mainly comprise dirt track except where gravels need to be laid for stability. Its reduced impact as an unformed road will mitigate visual impacts to the heritage precincts. Vegetation removal for the pipeline will be kept to a minimum. The pipeline footprint will be remediated. The pipeline excavation trench will be backfilled and resurfaced with grass or pavement, as appropriate to its immediate surrounds. The Proposal Area will maintain its rural landscape values and will be in accordance with the views and vistas conservation policies (Extent 2018:69).

5.1.5 Alternatives

The following sympathetic solutions have been considered and discounted for the following reasons.

The Proposal will not impact the significance of the Mount Penang Parkland and thus no other sympathetic solutions have been considered. There are also no other viable alternatives available for the installation of the water infrastructure, the pipes and access track. The Proposal has avoided areas of archaeological sensitivity.

5.2 Summary

The proposed works are primarily below ground and will occur outside the identified archaeological zones and in an area with nil to low archaeological sensitivity. There will be a temporary minor visual impact during construction while the pipes are being laid and a permanent very minor visual impact as a result of the access road. Upon the completion of the works, the Proposal Area will maintain its rural landscape values and will be in accordance with the views and vistas conservation policies (Extent 2018:69).

6 Conclusions and Recommendations

The Proposal works will primarily be below ground and will occur outside the identified archaeological zones identified in the CMPs (EJE 2012, Extent 2018) and in an area with nil to low archaeological sensitivity. There will be a temporary minor visual impact during construction while the pipes are being laid and a very minor permanent visual impact as a result of the access road.

The below recommendations are to be followed.

Recommendation 1

An approval under s60 of the Heritage Act is required prior to works commencing. This SoHI should be submitted as part of the application package to Heritage NSW. Following determination of the approval works should be undertaken in accordance with any conditions provided by Heritage NSW.

Recommendation 2

The excavation for the water infrastructure can proceed with caution. Should suspected archaeological material be identified then works are to stop in that area. The heritage consultant is to be contacted to make an assessment and to devise, in consultation with Heritage NSW, a management strategy for the area and potentially a modification under s65A.

Recommendation 3

A heritage induction is to be provided to all on-site personnel undertaking ground disturbing works so that they understand their obligations to report the discovery of archaeological material and their obligations under the *Heritage Act 1977*.

7 References

EJE. (2012). *Conservation Management Plan Mount Penang Parklands*.

Extent. (2018). *Mount Penang Parklands: Conservation Management Plan*. Report to Central Coast Regional Development Corporation.

GML. (2001). *Conservation Management Plan: Mount Penang*. Report to Festival Development Corporation by Godden Mackay Logan.

Gosford Council. (2013). *Kariong Mount Penang Parklands Development Control Plan*.

NSW Heritage Office. (1998). *How to Prepare Archival Records of Heritage Items*.

8 Plates



Plate 1 Eastern Portion of Proposal Area - Landscaping and pedestrian pathways



Plate 2 Central Portion - Central portion of Project Area thickly vegetated



Plate 3 Northern portion of inter-allotment drainage area across grassy field

9 Acronyms and Definitions

Acronym	Definition
CMP	Conservation Management Plan
DCP	Development Control Plan
HCCDC	Hunter and Central Coast Development Corporation
HCP	Highway Commercial Precinct
REF	Review of Environmental Factors
OEH	Office of Environment and Heritage
SHR	State Heritage Register
SoHI	Statement of Heritage Impact




APPENDIX 5

INFRASTRUCTURE SEPP CONSULTATION REQUIREMENTS

ISEPP CONSULTATION REQUIREMENTS

Requirement	Consultation Required	Comment
Section 13 Consultation with councils—development with impacts on council-related infrastructure or services (1) This clause applies to development carried out by or on behalf of a public authority that this Policy provides may be carried out without consent if, in the opinion of the public authority, the development:		
(a) will have a substantial impact on stormwater management services provided by a council, or	No consultation with Central Coast Council is required.	The proposal will not have a substantial impact on stormwater management services provided by council. The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).
(b) is likely to generate traffic to an extent that will strain the capacity of the road system in a local government area, or	No consultation with Central Coast Council is required.	The proposal is unlikely to generate traffic to an extent that will strain the capacity of the road system in a local government area. The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).
(c) involves connection to, and a substantial impact on the capacity of, any part of a sewerage system owned by a council, or	No consultation with Central Coast Council is required.	The proposal does involve connection to part of a sewerage system owned by a council however at this stage the proposal will not have a substantial impact on the capacity of, any part of a sewerage system owned by a council. The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).



(d) involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council, or

No consultation with Central Coast Council is required.

The proposal does involve connection to part of a water system owned by a council however at this stage the proposal will not have a substantial impact on the capacity of, any part of a water system owned by a council.
The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).

(e) involves the installation of a temporary structure on, or the enclosing of, 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, or

No consultation with Central Coast Council is required.

The proposal may involve the installation of a temporary structure on, or the enclosing of, 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.
The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).

(f) involves excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the Roads Act 1993 (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).

No consultation with Central Coast Council is required.

The proposal may involve excavation of the surface of, or a footpath adjacent to, a road for which a council is the roads authority under the Roads Act 1993 (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).
The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council for the proposal (section 17 (1)(a)).

(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies unless the authority or the person has:

(a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and

(b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

Section 14 Consultation with councils—development with impacts on local heritage

(1) This clause applies to development carried out by or on behalf of a public authority if the development:

(a) is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential, and

No consultation with Central Coast Council is required.

The proposal is unlikely to affect the heritage significance of a local heritage item in a way that is more than minor or inconsequential.

The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council for the proposal (section 17 (1)(a)).

(b) is development that this Policy provides may be carried out without consent.

No consultation with Central Coast Council is required.

The proposal is unlikely to affect the heritage significance of a local heritage item in a way that is more than minor or inconsequential.

The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).

(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies unless the authority or the person has:

(a) had an assessment of the impact prepared, and

(b) given written notice of the intention to carry out the development, with a copy of the assessment and a scope of works, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and

(c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

15 Consultation with councils—development with impacts on flood liable land

(1) In this clause, flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government and as in force from time to time.

(2) A public authority, or a person acting on behalf of a public authority, must not carry out, on flood liable land, development that this Policy provides may be carried out without consent and that will change flood patterns other than to a minor extent unless the authority or person has:

- (a) given written notice of the intention to carry out the development (together with a scope of works) to the council for the area in which the land is located, and
- (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

No consultation with Central Coast Council is required.

The proposal will not be carried out on flood liable land.
The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).

15AA Consultation with State Emergency Service—development with impacts on flood liable land

(1) A public authority, or a person acting on behalf of a public authority, must not carry out development on flood liable land that may be carried out without development consent under a relevant provision unless the authority or person has -

- (a) given written notice of the intention to carry out the development (together with a scope of works) to the State Emergency Service, and
- (b) taken into consideration any response to the notice that is received from the State Emergency Service within 21 days after the notice is given.

(2) Any of the following provisions in Part 3 is a *relevant provision*—

- (h) Division 17 (Roads and traffic),
- (i) Division 20 (Stormwater management systems)

No consultation with State Emergency Service is required.

The proposal will not be carried out on flood liable land.

15A Consultation with councils—development with impacts on certain land within the coastal zone

(1) This clause applies to development on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land.

(2) A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies, which this Policy provides may be carried out without development consent, unless the authority or person has:

- (a) given written notice of the intention to carry out the development to the council for the local government area in which the land is located, and**
- (b) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.**

No consultation with Central Coast Council is required.

The proposal will not be carried out in a coastal vulnerability area.
The consultation requirements do not apply because HCCDC is required to give notice of the intention to carry out the proposal to Central Coast Council because an approval is required from Central Coast Council (section 17 (1)(a)).

16 Consultation with public authorities other than councils

(1) A public authority, or a person acting on behalf of a public authority, must not carry out specified development that this Policy provides may be carried out without consent unless the authority or person has:

- (a) given written notice of the intention to carry out the development (together with a scope of works) to the specified authority in relation to the development, and**
- (b) taken into consideration any response to the notice that is received from that authority within 21 days after the notice is given.**

(2) For the purposes of subclause (1), the following development is specified development and the following authorities are specified authorities in relation to that development:

(a) development adjacent to land reserved under the National Parks and Wildlife Act 1974 or to land acquired under Part 11 of that Act—the Office of Environment and Heritage,

No consultation with the Office of Environment and Heritage (or equivalent), is required.

The proposal is not adjacent to land reserved under the National Parks and Wildlife Act 1974 or to land acquired under Part 11 of that Act.

(b) development on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone—the Office of Environment and Heritage,

No consultation with the Office of Environment and Heritage (or equivalent), is required.

The proposal is not on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone.

(c) development adjacent to an aquatic reserve or a marine park declared under the Marine Estate Management Act 2014—the Department of Industry,	No consultation with the Department of Industry (or equivalent), is required.	The proposal is not adjacent to an aquatic reserve or a marine park declared under the Marine Estate Management Act 2014.
(d) development in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998—the Sydney Harbour Foreshore Authority,	No consultation with the Sydney Harbour Foreshore Authority (or equivalent) is required.	The proposal is not in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998.
(e) development comprising a fixed or floating structure in or over navigable waters—Roads and Maritime Services,	No consultation with Roads and Maritime Services (or equivalent), is required.	The proposal does not include a fixed or floating structure in or over navigable waters.
(f) development for the purposes of a health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act)—the NSW Rural Fire Service,	No consultation with the NSW Fire Service (or equivalent), is required.	The proposal is not for the purposes of a health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land (as defined by the Act).
(g) development that may increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map—the Director of the Observatory,	No consultation with the Director of the Observatory (or equivalent), is required.	The proposal is not on land within the dark sky region as identified on the dark sky region map.
(h) development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument—the Secretary of the Commonwealth Department of Defence,	No consultation with the Secretary of the Commonwealth Department of Defence (or equivalent), is required.	The proposal is not on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument.
(i) development on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961—the Mine Subsidence Board.	No consultation with the Mine Subsidence Board is (or equivalent), required.	The proposal is not on land in a mine subsidence district within the meaning of the Mine Subsidence Compensation Act 1961.

APPENDIX 6

CLAUSE 228 FACTORS CHECKLIST

Checklist of Clause 228 Factors

Factor	Impact
(a) any environmental impact on a community?	Minor short-term environmental impacts on a small part of the community may be experienced during the proposal's construction period from noise, vibration, traffic and dust. Safeguards and mitigation measures have been proposed.
(b) any transformation of a locality?	Minor short-term impacts on a small part of the locality may be experienced from the proposal's construction works e.g. removal of vegetation and trenching. Safeguards and mitigation measures have been proposed.
(c) any environmental impact on the ecosystems of the locality?	Minor short-term impacts on a small part of the ecosystems of the locality may be experienced from the proposal's construction works e.g. removal of vegetation and trenching. Safeguards and mitigation measures have been proposed.
(d) any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Minor short-term impacts may reduce, aesthetic, recreational and/or scientific quality or value for a small part of the locality from the proposal's construction works e.g. removal of vegetation and trenching. Safeguards and mitigation measures have been proposed.
(e) any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Minor short-term impacts on a place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations may be experienced from the proposal's construction works e.g. removal of vegetation and trenching. Safeguards and mitigation measures have been proposed.
(f) any impact on the habitat of protected animals (within the meaning of the Biodiversity Conservation Act 2016)?	Impacts are not expected, and mitigation measures are proposed. Refer to Flora and Fauna Assessment Report.
(g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	Impacts are not expected, and mitigation measures are proposed. Refer to Flora and Fauna Assessment Report.
(h) any long-term effects on the environment?	The proposal provides for safe and efficient transfer of water/wastewater and upgrades public services/utilities. The proposal will have a positive long-term effect.
(i) any degradation of the quality of the environment?	The proposal provides for safe and efficient transfer of water and wastewater and upgrades

	public services/utilities. The proposal will have a positive long-term effect.
(j) any risk to the safety of the environment?	The proposal provides for safe and efficient transfer of water/wastewater and upgrades public services/utilities. The proposal will have a positive long-term effect.
(k) any reduction in the range of beneficial uses of the environment?	The proposal will be in part located underground and will in part upgrade existing public services/utilities therefore will not impact on the beneficial uses of the environment. It will allow development to be serviced in the Project area.
(l) any pollution of the environment?	The proposal provides for safe and efficient transfer of wastewater preventing it from polluting the environment. The proposal will have a positive long-term effect.
(m) any environmental problems associated with the disposal of waste?	The proposal provides for safe and efficient transfer of wastewater. The proposal will have a positive long-term effect.
(n) any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	Nil.
(o) any cumulative environmental effect with other existing or likely future activities?	Nil.
(p) any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Nil.



APPENDIX 7

ARBORIST REPORT

Arborist Report

Mt Penang Parklands

MARA
CONSULTING
Design & Communication

Prepared for

Hunter and Central
Coast Development
Corporation

Date: 09-03-2020 - C



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1 Introduction

Mara Consulting have been engaged by Hunter Central Coast Development Corporation to undertake an assessment of heritage listed trees located on Lot 10 DP 1149050, 1A Central Coast Highway, Kariong. The tree assessment is in relation to proposed services and roadworks upgrades in the vicinity of the subject trees.

2 Assessing Arborist

Name:	Shaun King
Company:	Mara Consulting
Address:	Level 1, 161 King Street, Newcastle, NSW 2300
Phone:	4965 4317
Email:	shaun@maraconsulting.com.au
Qualifications	Diploma of Horticulture (Landscape Design) Diploma of Horticulture (Arboriculture) AQF level 5 Certificate No. C0045006

3 Methodology

The site was visited on the 2nd of July 2019. The following methods have been employed in preparing this report:

- Visual Tree Inspection (VTA) (Mattheck & Breloer, 1994) was undertaken. Trees located on the site were inspected and assessed from the ground. The visual tree inspection included all visible above ground parts of the tree including exposed roots, trunk, branches and foliage. No below ground inspections or analyses was undertaken in the root zone. No internal inspections or tissue analyses was undertaken on the subject trees. No aerial inspections were undertaken.
- Calculation of tree sustainability using ULE, Useful Life Expectancy. Refer to Appendix 3.
- Calculation of Tree Retention Value of the trees using Couston, Mark & Howden, Melanie (2001) *Tree Retention Values Table* Footprint Green Pty Ltd, Sydney Australia. The significance of the trees in the landscape is considered and the significance crossed against the ULE of the tree giving a retention value for each of the trees
- Calculation of the Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) using *AS 4970 Protection of trees on development sites*. Refer to Appendix 4.
- Gosford Development Control Plan 2013, Chapter 6.6 Preservation of Trees or Vegetation.

4 Site

The site consists of Lot Lot 10 DP 1149050, 1A Central Coast Highway, Kariong and is part of the Mt Penang Parklands. The subject trees form an avenue within the road verge along an internal road called The Avenue. The avenue of trees is listed as a state significant heritage item.



Figure 1. Approximate study area outlined in red.

5 Proposed Development

The proposal consists of road widening, footpaths and upgrades to services along The Avenue and Festival Drive. Most of the proposed works in the vicinity of heritage trees is located on the western side of The Avenue. These works generally consist of the installation of a 1.5m wide footpath.

6 Tree Assessment

Seven of the assessed trees appear to be original plantings. These being Trees 1, 2, 3, 4, 7, 9 and 10. The remaining trees are more recent with some being relatively young. These may have been planted to replace original plantings that have died.

The original plantings and some of the newer plantings have been pollarded which is a pruning method used to top the canopy to a uniform height. This method is generally used only on deciduous species. The earlier pollarding has now resulted in a less than desirable branch structure with long upright branches and narrow branch unions. These attributes can lead to failure in high winds.

An electrical conduit associated with uplights maybe associated with the poor health of Trees 9 and 10. Tree 9 is almost dead, and Tree 10 has die-back. Junction boxes are located between 0.5m and 2m from the trunks of Trees 4, 5, 6, 7, 8, 9, 10, 11 and 12 and it is presumed the conduit runs directly under. Other trees located along the conduit may also decline in the future.

Tree 12 one of the more recent plantings has suffered a root plate failure in the sometime in the past with the main trunk now parallel with the ground and a branch now acting as the trunk.

Refer to Appendix 2 Tree Assessment Sheet for further detailed information on each tree.

Tree Retention Value Matrix

	Landscape Significance Reading						
Tree Sustainability	1	2	3	4	5	6	7
Greater than 40 years	High Retention Value						
15-40 years			Moderate				
5-15 years				Low			
Less than 5 years					Very Low Retention Value		
Dead or hazardous							

Ref:- Modified by A Morton from Couston, Mark & Howden, Melanie (2001) Tree Retention Values Table Footprint Green Pty Ltd, Sydney Australia

Retention Value of Trees				
Tree No.	Species	Sustainability Period (Years)	Landscape Significance Rating	Retention Value
1	<i>Lophostemon confertus</i>	15-40	Significant	High
2	<i>Lophostemon confertus</i>	5-15	Significant	High
3	<i>Lophostemon confertus</i>	15-40	Significant	High
4	<i>Lophostemon confertus</i>	15-40	Significant	High
5	<i>Lophostemon confertus</i>	>40	Very High	High
6	<i>Lophostemon confertus</i>	>40	High	High
7	<i>Lophostemon confertus</i>	15-40	Very High	High
8	<i>Lophostemon confertus</i>	>40	Moderate	Moderate

9	<i>Lophostemon confertus</i>	<5	Very High	Moderate
10	<i>Lophostemon confertus</i>	5-15	Very High	Moderate
11	<i>Lophostemon confertus</i>	>40	High	High
12	<i>Lophostemon confertus</i>	<5	Low	Very Low
13	<i>Lophostemon confertus</i>	>40	Moderate	Moderate
14	<i>Lophostemon confertus</i>	15-40	Moderate	Moderate

Eight trees have a High Retention Value. These eight trees generally consist of the original plantings. Five trees have a Moderate Retention Value. One tree has a Very Low Retention Value.

7 Impacts of Development

Trees 13 and 14 will be directly affected by the proposed works as they are located within the proposed road realignment and will require removal. These are newer plantings and not part of the original avenue planting. The proposed works are well within the Tree Protection Zones (TPZs) of the remaining twelve trees. The works also impinge upon the Structural Root Zones of most of the trees. The proposed foot path is to be 100mm thick with a thin layer of sand between the concrete and existing ground. It is thought that this will have little to no impact upon the trees as there are no visible exposed roots on the eastern side of the trees and areas that were scraped back revealed a mulch layer of approximately 100mm with no root growth. It is also anticipated that most roots were severed during the installation of the electrical conduit which is located between the trees and the proposed path. Two other trees, Trees 9 and 12 should also be removed as Tree 12 has blown over at some point in the past and may become structurally unsound in maturity. Tree 9 is almost dead and could pose a risk to pedestrians and car park users in the future by dropping dead wood.

8 Recommendations

- Remove Trees 9, 12, 13 and 14. Tree removal to be undertaken in accordance with WorkCover *Amenity Tree Industry Code of Practice 1998*.
- Tree remains to be mulched and used within the proposed landscaping works. Any residual mulch to be disposed of in a legal manner.
- Protect remaining trees in accordance with AS4970 Protection of trees on development sites.
- Monitor trees 4, 5, 6, 7, 8, 9, 10 and 11 for any further decline caused by the installation of the electrical conduit.
- Proposed works include the removal of the uprights and conduits. Conduits and wires will have to be disconnected and left in the ground to prevent further disturbance of the tree's root systems. Lights and other above ground electricals can be removed.
- Undertake replacement planting of Trees 9 and 12 with 200 litre sized *Lophostemon confertus* (Brush Box).
- Undertake crown maintenance to remove dead wood. All pruning to be in accordance with AS 4373-2007 Pruning of amenity trees.

- Undertake a fertilising regime us a slow release fertiliser suitable for Australian native plants. This will help increase the vigour of the trees and their longevity.
- Maintain mulch levels at 75-100mm depth to encourage microbial activity in the soil.

9 Site Images



Figure 2. Trees 1 and 2.



Figure 3. Tree 3.



Figure 4. Trees 4, 5 and 6. Left to right.



Figure 5. Tree 7.



Figure 6. Trees 8, 9, 10 and 11. Left to right.



Figure 7. Trees 13 and 14.



Figure 8. Tree 9, almost dead.



Figure 9. Tree 10 showing signs of decline. Note twiggy dieback. Note electrical junction box location.

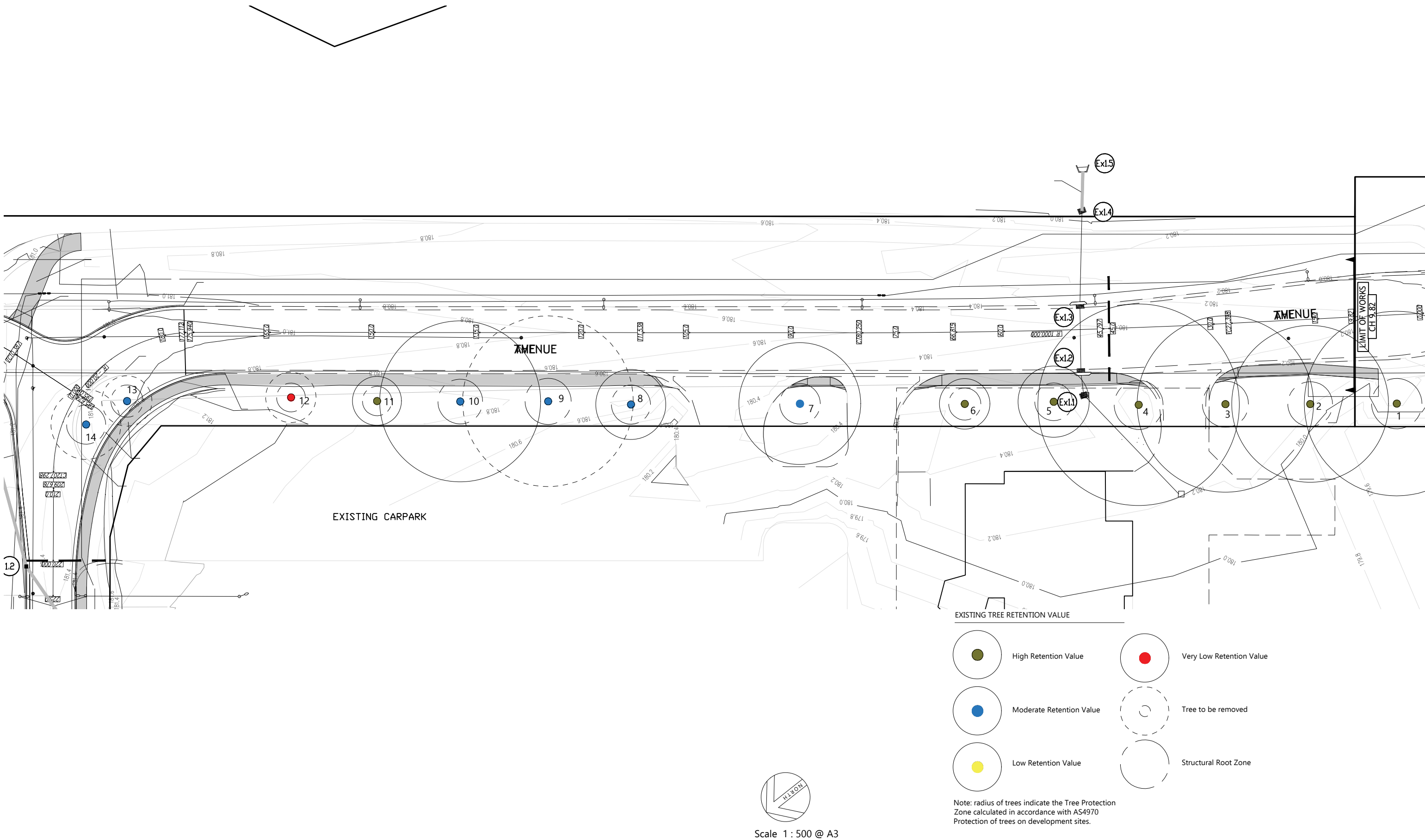


Figure 10. Tree 12 has suffered a root plate failure and branches now form the main trunk.

10 Bibliography

- Barrell, J *Pre-development Tree Assessment from Trees and Building Sites*, Eds. Watson & Neely, International Society of Arboriculture, Illinois (1995)
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- Standards Australia *Australian Standard AS 4970 Protection of Trees on Development Sites*. (September 2009)
- Standards Australia *Australian Standard AS 4373 Pruning of amenity trees* (March 2007)

11 Appendix 1 Site Plan



MARA Consulting Pty Ltd
Design | Communication
Level 1, 161 King Street, Newcastle NSW 2300
t: 02 4965 4317
e: mara@maraconsulting.com.au
W: maraconsulting.com.au

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Revisions		
Issue	Details	Date
	Draft Issue	12.07.19

Client:
Hunter Central Coast
Development Corporation

Lots 10 DP 1149050

Title:
Tree Protection Zones

Project:
Mt Penang Parklands

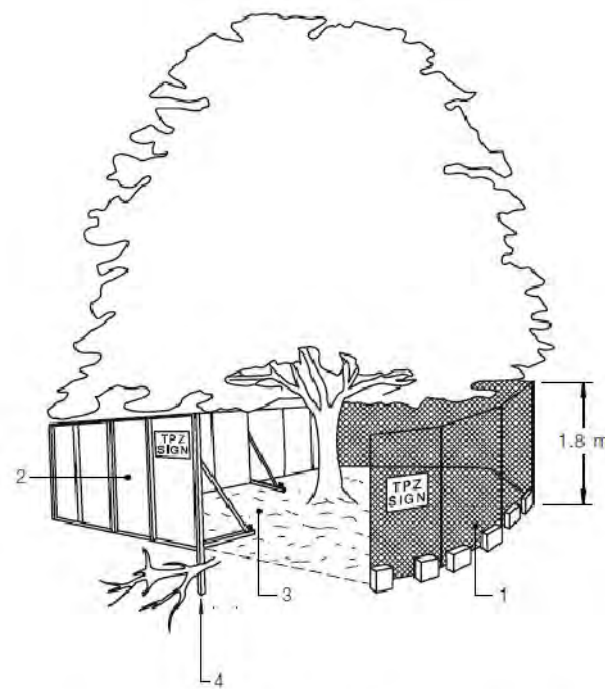
Site: 1A Central Coast Highway,
Kariong

Date: 12 July 2019
Job No: 1932
Revision:

Sheet:

Draft

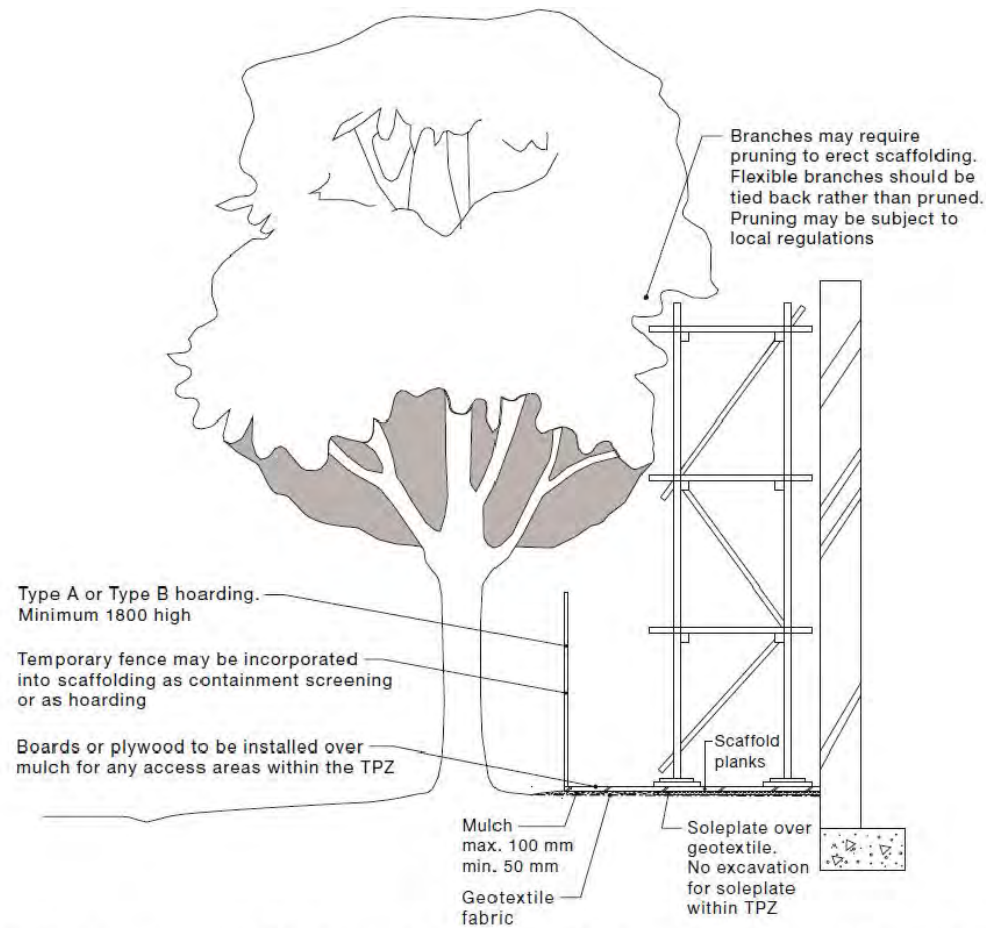
01



- LEGEND:**
- 1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
 - 2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
 - 3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
 - 4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Protective Fencing

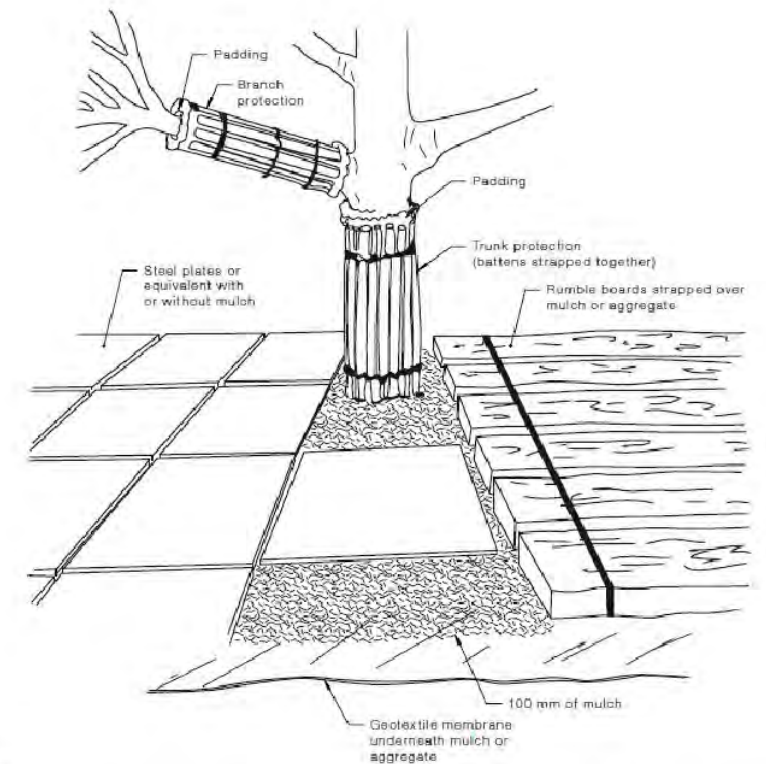
Scale NTS @ A3



NOTE: Excavation required for the insertion of support posts for tree protection fencing should not involve the severance of any roots greater than 20 mm in diameter, without the prior approval of the project arborist.

Scaffolding within the TPZ

Scale NTS @ A3



NOTES:

- 1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
- 2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

Trunk, Branch and Ground Protection

Scale NTS @ A3



Protective Fencing Signage

Scale NTS @ A3



MARA Consulting Pty Ltd
Design | Communication
Level 1, 161 King Street, Newcastle NSW 2300
t: 02 4965 4317
e: mara@maraconsulting.com.au
W: maraconsulting.com.au

Revisions		
Issue	Details	Date
	Draft Issue	12.07.19

Client:
Hunter Central Coast
Development Corporation

Lots 10 DP 1149050

Title:
Tree Protection Details

Project:
Mt Penang Parklands

Site: 1A Central Coast Highway,
Kariong

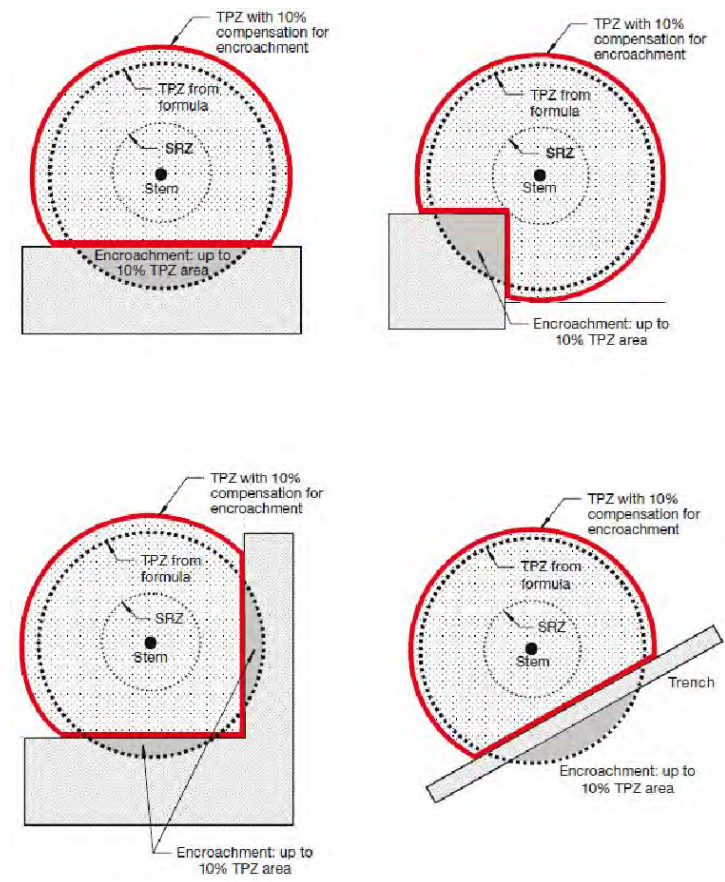
Date: 12 July 2019

Job No: 1932

Revision: Sheet:

Draft

02



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

Examples of Minor Encroachment into the TPZ

Scale NTS @ A3

Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH × 12.

TPZ = DBH × 12

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 m nor greater than 15m (except where crown protection is required). The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1m outside the crown projection.

Variations to the TPZ

General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

Minor encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ (see Clause 3.3.5), detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors.

Major encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods.

Tree Protection Measures

General

Tree protection measures include a range of activities and structures. Structures are used to identify and isolate the TPZ. These measures are identified in the arboricultural impact assessment and tree protection plan. The TPZ is a restricted area usually delineated by protective fencing (or use of an existing structure such as an existing fence or wall). It is installed prior to site establishment and retained intact until completion of the works. Some works and activities within the TPZ may be authorized by the determining authority. These must be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress must be reviewed by the project arborist and be acceptable to the determining authority before being carried out. Approved tree removal and pruning should be carried out before the installation of tree protection measures.

Activities Restricted within the TPZ

Activities generally excluded from the TPZ include but are not limited to—

- (a) machine excavation including trenching;
- (b) excavation for silt fencing;
- (c) cultivation;
- (d) storage;
- (e) preparation of chemicals, including preparation of cement products;
- (f) parking of vehicles and plant;
- (g) refuelling;
- (h) dumping of waste;
- (i) wash down and cleaning of equipment;
- (j) placement of fill;
- (k) lighting of fires;
- (l) soil level changes;
- (m) temporary or permanent installation of utilities and signs, and
- (n) physical damage to the tree.

Protective Fencing

Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ should be secured to restrict access. AS 4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing.

Signs

Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site. The lettering on the sign should comply with AS 1319.

Maintaining the TPZ

Mulching

The area within the TPZ should be mulched. The mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required.

Watering

Soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system should be installed and maintained by a competent individual.

Weed removal

All weeds should be removed by hand without soil disturbance or should be controlled with appropriate use of herbicide.

Construction

Pre-Construction

Tree removal and pruning

Trees for removal or transplanting should be marked onsite as per the approved tree protection plan. Before removal, the project arborist should confirm that all marked trees correspond with those shown on the schedule or plan. Other tree work may be specified in the tree protection plan. Tree removal should be carried out prior to erection of protection fencing. Contractors should be instructed to avoid damage to trees within protection areas when removing or pruning trees. This may include restrictions of vehicle movements. Any approved pruning required to allow for works should be done at this stage. AS 4373 specifies requirements for pruning. Stumps to be removed from within a TPZ must be removed in a manner that avoids damaging or disturbing roots of trees to be retained. The project arborist should supervise tree removal, transplanting and pruning and certify the works on completion.

Installing Tree Protection Fencing and other Protection Measures

Fencing and other protection measures are to be installed as detailed in the tree protection plan. Protection measures are to be certified by the project arborist.

Construction Stage

General

In order to ensure that protection measures are being adhered to during the pre-construction and construction stages, there should be a predetermined number of site inspections carried out by the project arborist. Matters to be monitored and reported should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans. If there is non-compliance with tree protection measures or if trees have been damaged, a timeframe for compliance and remedial works should be specified by the project arborist. The determining authority may need to be notified of non-compliance issues. Monitoring, reporting and certification should be carried out at the following critical stages of construction.

Site Establishment

The project arborist will monitor the impacts of demolition, bulk earth works, installation of temporary infrastructure including bunding, sediment control works and drainage works. The construction management plan (site establishment plan) should be checked for compliance with the tree protection plan. The construction management plan normally includes location of site sheds, stockpile areas, temporary access roads and sediment control devices. At completion of site establishment, the project arborist should certify that tree protection measures comply with the tree protection plan.

Construction Work

The project arborist will monitor the impacts of general construction works on retained trees. Monitoring should be done at regular intervals or in consultation with the site manager. Monitoring is to be recorded for inclusion in certification at practical completion. Critical stages typically include installation of services, footings and slabs, scaffolding, works within the TPZ and at completion of building works.

Landscape Works

The landscape plan should be checked for compliance with the tree protection plan. The project arborist may need to approve the staged removal of protection measures required to allow for landscape works. The project arborist should supervise any works within TPZs, including retaining walls, irrigation and lighting installation, topdressing, planting and paving. The project arborist should specify any remedial works above and below ground. Monitoring is to be recorded for inclusion in certification at practical completion.

Practical Completion

Practical completion assumes that all construction and landscaping works are finished. At practical completion all remaining tree protection measures should be removed. The project arborist should assess tree condition and provide certification of tree protection.

Post Construction

Defects liability period

Completion of outstanding building or landscaping works following the construction period must not injure trees.

Final Certification

The project arborist should assess the condition of trees and their growing environment, and make recommendations for any necessary remedial actions. Following the final inspection and the completion of any remedial works, the project arborist should certify (as appropriate) that the completed works have been carried out in compliance with the approved plans and specifications for tree protection. Certification should include a statement on the condition of the retained trees, details of any deviations from the approved tree protection measures and their impacts on trees. Copies of monitoring documentation may be required.

Revisions		
Issue	Details	Date
	Draft Issue	12.07.19

Client:
Hunter Central Coast
Development Corporation

Lots 10 DP 1149050

Title:
Tree Protection Details

Project:
Mt Penang Parklands

Site: 1A Central Coast Highway,
Kariong

Date: 12 July 2019
Job No: 1932
Revision:

Sheet:

Draft

03

12 Appendix 2 Tree Assessment Data Sheet

Tree Assessment Table – Mt Penang Parklands

Tree No.	Species	Common Name	DBH (mm)	TPZ (M)	DRB (mm)	SRZ (M)	Height (M)	Crown Spread (M)				Health	Structure	Age Class	LS	ULE	RV	Notes
								N	E	S	W							
1	<i>Lophostemon confertus</i>	Brushbox	1100	13.2	1100	3.6	18	7	7	8	7	A	F	M	S	2D	H	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Moderate sized dead wood in the lower canopy.
2	<i>Lophostemon confertus</i>	Brushbox	940	11.2	940	3.2	18	8	7	7	8	F	F	M	S	3D	H	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Die back on the western side of the crown. One main leader dead.
3	<i>Lophostemon confertus</i>	Brushbox	1050	12.6	1050	3.3	19	6	9	6	6	F	F	M	S	2D	H	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Moderate sized dead wood in the lower canopy.
4	<i>Lophostemon confertus</i>	Brushbox	1200	14.4	1200	3.5	19	9	10	7	6	F	F	M	S	2A	H	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Electrical conduit 1.8m from the trunk.
5	<i>Lophostemon confertus</i>	Brushbox	430	5.1	650	2.7	12	4	4	4	4	A	A	M	VH	1A	H	A relatively recent planting. Electrical conduit 1.8m from the trunk.
6	<i>Lophostemon confertus</i>	Brushbox	300	3.6	440	2.3	8	3	3	3	3	A	A	SM	H	1A	H	A relatively recent planting. Electrical conduit 1.8m from the trunk.
7	<i>Lophostemon confertus</i>	Brushbox	730	8.7	730	2.9	13	4	7	8	4	F	F	M	VH	2D	M	Tree has been pollarded in the past resulting in low multiple trunks and newer

LEGEND									
DBH – Diameter at Breast Height (1.4m)	DRB– Diameter Above Root Buttress	TPZ - Tree Protection Zone 12xDBH	SRZ – Structural Root Zone (DRB x 50) ^{0.42} x 0.64	Health P -Poor F -Fair A -Average E -Excellent	Structure P -Poor F -Fair A -Average E -Excellent	Age Class I -Immature – Recently Planted or Sapling Growth SM -Semi Mature - <20% life expectancy M -Mature – 20-80% life expectancy OM -Over Mature/Senescent >80% life expectancy	LS – Landscape Significance S -Significant VH -Very High H -High M -Moderate L -Low VL -Very Low I -Insignificant	ULE – Useful Life Expectancy (Sustainability in years) Refer to appendices for more detailed explanation 1 ->40 2 -15-40 3 -5-15 4 -<5	RV – Retention Value H -High M -Moderate L -Low VL -Very Low
Note: Trees that are pollarded have the same DBH and DRB measurement due to the large number of branches occurring at 1.4m. Measurements were taken at the point below the branching and above buttressing.									

Tree Assessment Table – Mt Penang Parklands

Tree No.	Species	Common Name	DBH	TPZ	DRB	SRZ	Height	Crown Spread (M)				Health	Structure	Age Class	LS	ULE	RV	Notes
			(mm)	(M)	(mm)	(M)	(M)	N	E	S	W							
																		upright leaders with some narrow branch unions. Die back in the upper canopy and appears low in vigour. Electrical conduit 1.2 from trunk.
8	<i>Lophostemon confertus</i>	Brushbox	420	5	690	2.8	13	4	4	4	4	A	F	M	M	1A	M	Relatively recent planting. Tri-dominant leaders with small bark inclusion. Electrical conduit 1.2m from trunk
9	<i>Lophostemon confertus</i>	Brushbox	1020	12.2	1020	3.3	14	8	7	7	7	P	P	OM	VH	4B	M	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Tree is almost dead. Electrical conduit 1m from trunk.
10	<i>Lophostemon confertus</i>	Brushbox	960	11.5	960	3.2	14	7	6	5	4	P	F	M	VH	3A	M	Tree has been pollarded in the past resulting in low multiple trunks and newer upright leaders with some narrow branch unions. Twiggy die back and tree appears to be declining. Electrical conduit 1m from trunk.
11	<i>Lophostemon confertus</i>	Brushbox	290	3.5	370	2.1	6	2	2	2	2	A	F	SM	H	1A	H	Recent planting. Electrical conduit 1m from trunk.
12	<i>Lophostemon confertus</i>	Brushbox	200 200 100	3.6	250	1.8	7	2	4	2	2	F	P	SM	L	4D	VL	Relatively recent planting. Tree has suffered a root plate failure in the past. The former main trunk is on the ground and a branch has now become the upright trunk. The tree may not mature to be structurally sound. Electrical conduit 0.5m from trunk.

LEGEND									
DBH – Diameter at Breast Height (1.4m)	DRB– Diameter Above Root Buttress	TPZ - Tree Protection Zone 12xDBH	SRZ – Structural Root Zone (DRB x 50) ^{0.42} x 0.64	Health P -Poor F -Fair A -Average E -Excellent	Structure P -Poor F -Fair A -Average E -Excellent	Age Class I -Immature – Recently Planted or Sapling Growth SM -Semi Mature - <20% life expectancy M -Mature – 20-80% life expectancy OM -Over Mature/Senescent >80% life expectancy	LS – Landscape Significance S -Significant VH -Very High H -High M -Moderate L -Low VL -Very Low I -Insignificant	ULE – Useful Life Expectancy (Sustainability in years) Refer to appendices for more detailed explanation 1 ->40 2 -15-40 3 -5-15 4 -<5	RV – Retention Value H -High M -Moderate L -Low VL -Very Low
Note: Trees that are pollarded have the same DBH and DRB measurement due to the large number of branches occurring at 1.4m. Measurements were taken at the point below the branching and above buttressing.									

Tree Assessment Table – Mt Penang Parklands

Tree No.	Species	Common Name	DBH	TPZ	DRB	SRZ	Height	Crown Spread (M)				Health	Structure	Age Class	LS	ULE	RV	Notes
			(mm)	(M)	(mm)	(M)	(M)	N	E	S	W							
13	<i>Lophostemon confertus</i>	Brushbox	300	3.6	430	2.3	9	3	3	3	3	A	A	SM	M	1A	M	Relatively recent planting.
14	<i>Lophostemon confertus</i>	Brushbox	420	5	710	2.8	9	3	5	4	5	A	A	M	M	2A	M	Relatively recent planting. Located within 1m of the kerb.

LEGEND									
DBH – Diameter at Breast Height (1.4m)	DRB– Diameter Above Root Buttress	TPZ - Tree Protection Zone 12xDBH	SRZ – Structural Root Zone (DRB x 50) ^{0.42} x 0.64	Health P -Poor F -Fair A -Average E -Excellent	Structure P -Poor F -Fair A -Average E -Excellent	Age Class I -Immature – Recently Planted or Sapling Growth SM -Semi Mature - <20% life expectancy M -Mature – 20-80% life expectancy OM -Over Mature/Senescent >80% life expectancy	LS – Landscape Significance S -Significant VH -Very High H -High M -Moderate L -Low VL -Very Low I -Insignificant	ULE – Useful Life Expectancy (Sustainability in years) Refer to appendices for more detailed explanation 1 ->40 2 -15-40 3 -5-15 4 -<5	RV – Retention Value H -High M -Moderate L -Low VL -Very Low
Note: Trees that are pollarded have the same DBH and DRB measurement due to the large number of branches occurring at 1.4m. Measurements were taken at the point below the branching and above buttressing.									

13 Appendix 2 Useful Life Expectancy (ULE)

ULE CLASSIFICATIONS

1 **LONG ULE : GREATER THAN 40 YEARS [>40]**

TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR MORE THAN 40 YEARS

- A** Structurally sound trees located in positions that can accommodate future growth.
- B** Storm damaged or defective trees that could be made suitable for retention by remedial tree surgery.
- C** Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2 **MEDIUM ULE : MORE THAN 15 YEARS, LESS THAN 40 YEARS [15 - 40]**

TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR 15 TO 40 YEARS

- A** Trees that may only live between 15 and 40 more years
- B** Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals
- C** Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons
- D** Storm damaged or defective trees that can be made suitable for retention by remedial work

3 **SHORT ULE : MORE THAN 5 YEARS, LESS THAN 15 YEARS [5 - 15]**

TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR 5 TO 15 YEARS

- A** Trees that may only live between 5 and 15 more years
- B** Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals
- C** Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons
- D** Storm damaged or defective trees that require substantial remedial work to make safe, and are only suitable for retention in the short term

4 **REMOVE : LESS THAN 5 YEARS [<5]**

TREES WITH A HIGH LEVEL OF RISK THAT WOULD NEED REMOVING WITHIN THE NEXT 5 YEARS

- A** Dead trees
- B** Dying or suppressed and declining trees through disease or inhospitable conditions
- C** Dangerous trees through instability or recent loss of adjacent trees
- D** Dangerous trees through structural defects, including cavities, decay, included bark, wounds or poor form
- E** Damaged trees that are considered unsafe to retain
- F** Trees that will become dangerous after removal of others for the reasons given in A to E

14 Appendix 3 Extract from AS 4970

Extract from AS 4970

3.1 Tree Protection Zone (TPZ)

The tree protection zone is the principal means of protecting trees on development sites. The TPZ is a combination of root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its Diameter at Breast Height (DBH) x 12

$$\text{TPZ} = \text{DBH} \times 12$$

DBH= Trunk diameter measured at 1.4m above ground.

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2m nor greater than 15m (Except where crown protection is required).

The TPZ of palms and other monocots, cycads and tree ferns should not be less than 1m outside of the crown projection.

3.3 Variations to the TPZ

3.3.1 General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

3.3.2 Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors listed in clause 3.3.4.

3.3.2 Major Encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree would remain viable. The area lost to the encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non destructive methods and consider relevant factors listed in clause 3.3.4.

3.3.5 Structural Root Zone

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when major encroachment into the TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks or footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula. Root investigation may provide more information on the extent of these roots SRZ radius.

$$\text{SRZ radius} = (D \times 50)^{0.42} \times 0.64$$

where

D = trunk diameter, in metres, measured above the root buttress

The SRZ for trees with trunk diameters less than 0.15 will be 1.5 metres

15 Appendix 4 Addendum 1 – Additional Tree

Client	Hunter and Central Coast Development Corporation	Inspection Date	18-02-2020
Address	Festival Drive, Kariong NSW	LGA	Central Coast Council
Location	Festival Drive in front of Kariong Mountains High School		

Description						
No	Botanical Name			Common Name		
15	<i>Eucalyptus haemastoma</i>			Scribbly Gum		
Height (M)	DBH (mm)	DRB [mm]	Spread North	Spread East	Spread South	Spread West
15	1260	1423	6	9	8	6
Age Class		Structure		Health		
M		F		F		
Sustainability/ULE		Landscape Significance		Tree Retention Value		
2D		H		Moderate		

DBH – Diameter at Breast Height (1.4m)	DRB– Diameter Above Root Buttress	TPZ - Tree Protection Zone 12xDBH	SRZ – Structural Root Zone (DRB x 50) ^{0.42} x 0.64	Health P-Poor F-Fair A-Average E-Excellent
Structure P-Poor F-Fair A-Average E-Excellent	Age Class I-Immature – Recently Planted or Sapling SM-Semi Mature - <20% life expectancy M-Mature – 20-80% life expectancy OM-Over Mature/Senescent >80% life expectancy	LS – Landscape Significance S-Significant VH-Very High H-High M-Moderate L-Low VL-Very Low I-Insignificant	ULE – Useful Life Expectancy (Sustainability in years) Refer to appendices for more detailed explanation 1->40 2-15-40 3-5-15 4-<5	RV – Retention Value H-High M-Moderate L-Low VL-Very Low

Summary History
<p>Large tree likely to be remnant. The tree appears to be healthy, however there are many hollows present which generally involves decayed wood which can eventually lead to branch failure. A retaining wall has been built on the southern side of the tree within two metres of the trunk. This is well within the trees SRZ. The wall appears to be around 20 years old considering the type of concrete blocks used in its construction. To the north of the tree is a change in soil level. Survey drawings indicate a stormwater pipe running in the approximate area of the level change. There are also large exposed roots in this area that have been severed indicating trenching has occurred to install the stormwater infrastructure. This is a similar situation to trees previously inspected onsite located nearby on The Avenue. The subject tree has been rated as having a ULE of 15-40 years due to its reasonably healthy condition, A landscape significance rating of High due to it being a locally indigenous species representative of the original vegetation and its benefit to local wildlife.</p>

Condition	
Mechanical/Fire Damage	None observed.
Soil Level Change	Yes, retaining wall on the southern side of the tree is approximately two metres from the trunk. A stormwater drain runs along the northern side of the tree and it appears roots have been severed where there is a soil level change.
Root Damage	As above in Summary History.
Branch Loss/Storm Damage	Yes, past branch failure evident with numerous large hollows present as a result of these failures.
Included Bark	Minor.
Fractures/Cracks	None observed.

Wounds	Yes, from past branch failures and a large hollow in the base of the trunk.
Decay	Some decay evident which is associated with hollows.
Cavities	Yes, numerous hollows.
Dieback	Minor.
Insect Damage	None observed.
Epicormic Growth	None observed.

Proposed Works
A 2.5m wide shared pathway is proposed along the northern side of the tree. There is an existing concrete path approximately 1.4m wide in this location. The existing path connects to full verge width pavement to the east and west of the tree. This area between the full width pavement is proposed to be widened. The proposed path will be located right on the edge of the trees SRZ. It is noted that the existing path shows no sign of cracking or lifting.

Conclusions/Recommendations
<ul style="list-style-type: none"> It appears roots were severed during the installation of the stormwater infrastructure given the severed surface roots present and the level change. These roots are located just outside of the pathway footprint. It is likely that new roots have 're-shot' extending beyond the previous trenching works. Demolition of the existing path should be undertaken in a way that does not disturb the soil around the tree. A small excavator should be used to pull up the concrete and excavate the soil where the proposed widening is to go while using the existing path as a pad as it works. The new path to be installed no lower the existing path level. Excavation for the additional path width to be done carefully and be no deeper than required to match the adjacent path base level. It would be desirable to slightly lift the levels of the path if possible. Any roots encountered to be severed using sharp sterile tools. Excavator buckets are not to be used to sever the roots as this can severely impact upon roots metres away from the point of severance. Undertake tree protection measures in accordance with AS 4970-2009 Protection of trees on development sites. This includes no washing of concreting tools within the trees TPZ. Undertake crown maintenance to remove dead wood in accordance with AS4373-2007 Pruning of amenity trees.

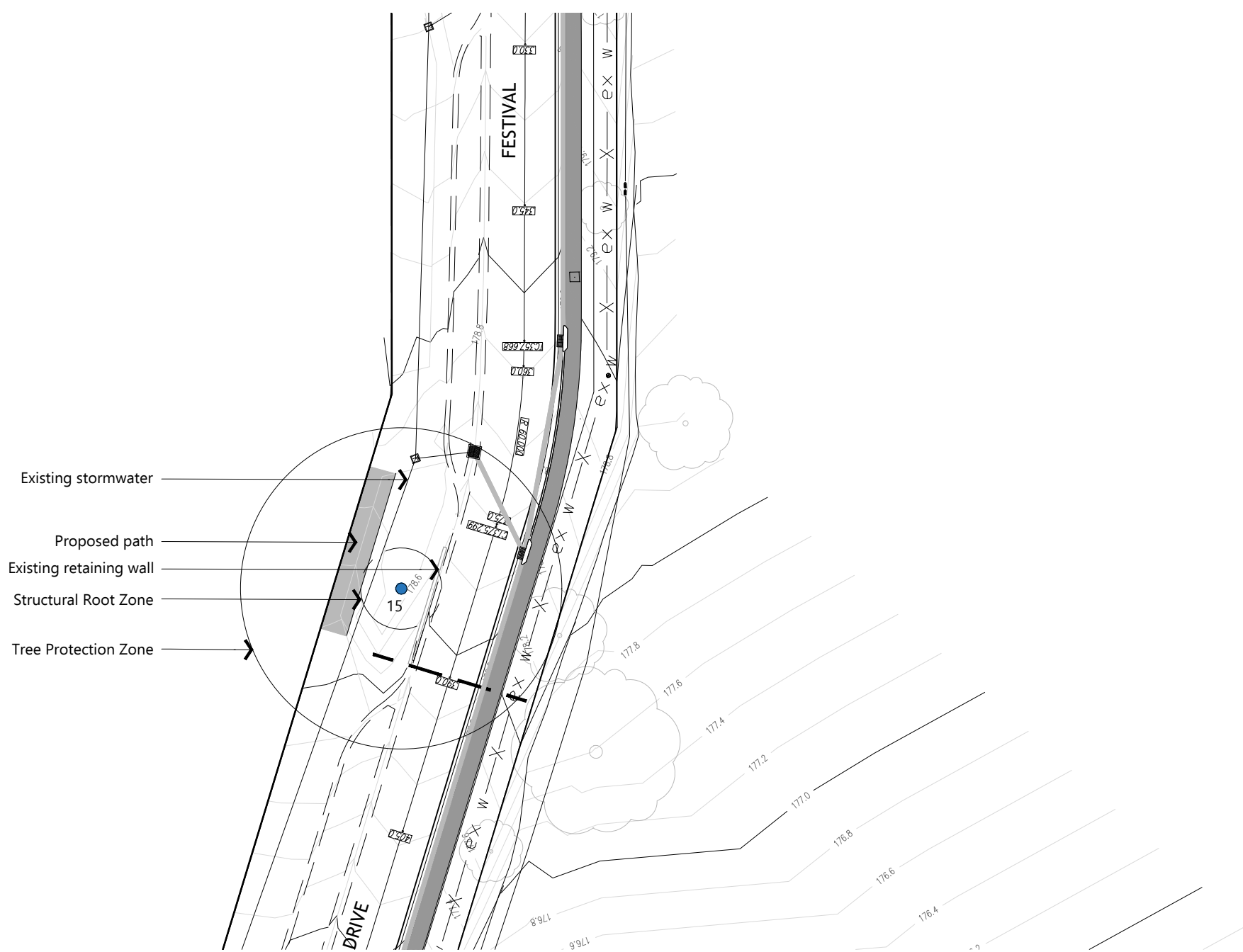


Figure 1. The subject tree. Note the retaining wall.



Figure 2. The blue line indicates the approximate edge of the proposed shared pathway. Note severed roots to the right of the blue line.

Site Plan



EXISTING TREE RETENTION VALUE

High Retention Value

Moderate Retention Value

Low Retention Value

Very Low Retention Value

Tree to be removed

Structural Root Zone

Note: radius of trees indicate the Tree Protection Zone calculated in accordance with AS4970 Protection of trees on development sites.

Scale 1 : 500 @ A3

Revisions		
Issue	Details	Date
	Draft Issue	20.02.20

Client:

Hunter Central Coast Development Corporation

Lots

10 DP 1149050

Title:

Tree Protection Zones

Project:

Mt Penang Parklands

Site:

Festival Drive, Kariong

Date:

20 February 2020

Job No:

1932

Revision:

Sheet:

01

Draft



APPENDIX 8

DUE DILLIGENCE ASSESSMENT

Project Number: 19060403



MT PENANG ABORIGINAL DUE DILIGENCE ASSESSMENT KARIONG

29 / 03 / 2019 FINAL

E P S

9 Yacaaba St, Nelson Bay NSW 2315

Attn: Alina Tipper

alinatipper@enviroproperty.com.au

HERITAGE NOW

hello@heritagenow.com.au

0425 250 310

www.heritagenow.com.au

Executive Summary

Heritage Now has been engaged by EPS on behalf of the Hunter and Central Coast Development Corporation (HCCDC) to prepare an Aboriginal Due Diligence Assessment Report. The project is to enable the subdivision enabling works for the Highway Commercial Precinct (HCP) and the proposed Kangoo Road subdivision. This assessment is to inform the Mount Penang HCP Roadworks Review of Environmental Factors (REF).

The Project Area incorporates Lot 10, DP1149050 and Lot 1 DP715442, The Avenue and Festival Drive, Kariong along with the land to the north-west along Kangoo Road.

The Proposal involves the construction and operation of sewer, water, stormwater and associated infrastructure on land within the Highway Commercial Precinct, Festival/Gardens Precinct, Kangoo Road Commercial Precinct and land outside the Mt Penang Parklands growth centre land. The Proposal is a vital component for the future redevelopment of the Kangoo Road Commercial Precinct and the Highway Commercial Precinct areas and continued effective operation of the other Precincts.

There are two aspects to the project proposal: Roadworks and Water Infrastructure. The roadworks will occur along The Avenue and Festival Drive. The roadworks include: installation of footpaths, decommissioning lighting and the installation of new lighting, as well as water, sewer and drainage. The proposed footpath will be 1.5 m wide and its base will be compacted earth to reduce ground disturbance, the concrete portion of the path will be 0.1 m in thickness. Ground lighting will be decommissioned. Overhead lighting will be replaced, but the same conduits will be used so there will be minimal soil disturbance.

The water and sewer extend from the roundabout at the western end of Festival Drive and proceed in a north-west direction towards the proposed Kangoo Road development. The water and sewer installation will require trenching approximately 1 m wide and up to 4 metres in depth, as well as a service road alongside the pipeline.

A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken and identified that one Aboriginal site a rock engraving (AHIMS#45-3-1289), plots within the Project Area, however, the site description places the site on the other side of the Central Coast Highway and landform groundtruthing of this area was undertaken.

One Aboriginal artefact was identified during the survey, it was in two parts and scattered 10 m apart (HN MP A1 – Mount Penang Artefact 1), additional artefacts in the vicinity of this location may be present, but are obscured by vegetation and loose sediment. In addition, sandstone sheets which have the potential for Aboriginal engravings were identified. A full assessment of the sandstone sheets could not be made on the account of the extensive leaf litter and vegetation; however, based on the information from surrounding Aboriginal sites, these areas have been identified as being archaeologically sensitive.

Barry Williams from Darkinjung Local Aboriginal Land Council participated in the survey. He indicated that the stone artefact present in Survey Unit 1 was important for demonstrating Aboriginal occupation of the area and that the sandstone sheet areas had potential for engravings/grinding grooves and therefore were archaeologically sensitive. He also indicated that Darkinjung Local

Aboriginal Land Council would like to inspect the area after the vegetation is removed and collect any Aboriginal artefacts identified.

The Proposal is to avoid the archaeologically sensitive sandstone area and surface artefacts associated with HN-MP-A1; however, there is potential for unidentified Aboriginal objects to be present in association with HN-MP-A1 and thus an AHIP for the collection of these artefacts is to be sought.

The remainder of the development area is considered to have low sensitivity for Aboriginal objects, works in these areas are to be covered by the provisions in the Due Diligence Code, excluding sandstone sheet 1.

All three recommendations below are to be followed.

Recommendation 1

An AHIP covering potential artefacts associated with HN-MP-AS1 (as per Figure 7) is to be applied for, and approved, before the disturbance of the ground surface can commence in the AHIP area. Community collection of artefacts is to be undertaken once vegetation is removed, in consultation with the RAPs.

Recommendation 2

All on-site personnel are to be made aware of their obligations under the National Parks and Wildlife Act 1974, through an onsite induction or other suitable format.

Recommendation 3

High visibility barrier fencing is to be erected around the identified artefacts at HN-MP-A1 and the sandstone sheeting archaeologically sensitive areas. The high visibility barrier fence is to be erected prior to construction and remain in place until the cessation of construction.

Recommendation 4

In the unlikely event, that Aboriginal or suspected Aboriginal objects are identified during works outside the AHIP area, then the heritage consultant and RAPs are to be contacted to identify if it is an Aboriginal object. Suitable management and mitigation measures are to be implemented, and modifications made to the AHIP, as necessary.

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1 Introduction

Heritage Now has been engaged by EPS on behalf of the Hunter and Central Coast Development Corporation (HCCDC) to prepare an Aboriginal Due Diligence Assessment Report. The project is to enable the subdivision enabling works for the Highway Commercial Precinct (HCP) and the proposed Kangoo Road subdivision. This assessment is to inform the Mount Penang HCP Roadworks Review of Environmental Factors (REF).

1.1 Project Area

The Project Area incorporates Lot 10, DP1149050 and Lot 1 DP715442, The Avenue and Festival Drive, Kariong along with the land to the north-west along Kangoo Road (Figure 1). It is located within the Central Coast Local Government Area and the Darkinjung Local Aboriginal Land Council boundary.



Figure 1: Project Area

1.2 Project Proposal

There are two aspects to the project proposal: Roadworks and Water and Sewer Infrastructure. The roadworks will occur along The Avenue and Festival Drive. The roadworks include: installation of footpaths, decommissioning lighting and the installation of new lighting. The proposed footpath will be 1.5 m wide and its base will be compacted earth to reduce ground disturbance, the concrete portion of the path will be 0.1 m in thickness. Ground lighting will be decommissioned. Overhead

lighting will be replaced, but the same conduits will be used so there will be minimal soil disturbance.

The water and sewer extend from the roundabout at the western end of Festival Drive and proceed in a north-west direction towards the proposed Kangoo Road development. The water and sewer installation will require trenching approximately 1 m wide and up to 4 m in depth, as well as a service road alongside the pipeline.

1.3 Aboriginal Consultation

Darkinjung Local Aboriginal Land Council was consulted for this assessment. Barry Williams, Senior Culture and Heritage Officer, Darkinjung Local Aboriginal Land Council attended the visual inspection.

2 Environmental Context

This section provides context for the assessment of past Aboriginal occupation in the Project Area.

2.1 Geology and Soils

The geological formations of the local area can provide valuable information regarding the stone resources that may have been available to Aboriginal people in the area.

The Project Area is located on Hawkesbury Sandstone formation, consisting of medium to coarse-grained quartz sandstone, minor laminated mudstone and siltstone lenses (Geological Survey of NSW, 1966). Large sandstone outcrops were often used for rock art/engravings. Larger outcrops often provided rockshelter which could be used as campsites with natural protection from the weather. Sandstone with a nearby water source was also used for sharpening and grinding stone tools, leaving axe-grinding groove sites.

The Project Area is in the Somersby Soil Landscape which is characterised by deeply weathered, friable, Hawkesbury sandstone. The soil profile in this area consists of an A1 Horizon of brown coarse sand to a depth of 0.25 m (NSW Soil and Land Information System, 1994). The second layer (A2 Horizon) consists of a light yellowish-brown coarse clayey sand to a depth of 0.45 m, while the B1 Horizon features a black sandy clay loam to a depth of 0.82 m.

2.2 Topography and Hydrology

Mount Penang is part of a large north-south running ridge known as the Hunter Range which has been used as an access route for Aboriginal people travelling in the hinterland parallel to the coast (Attenbrow, Archaeological Report on Mangrove Creek Environmental Impact Statement, 1979).

The Project Area is situated on a sandstone plateau between 180 and 200 metres AHD (Australian Height Datum). A first-order creek runs in a south-west direction across the Project Area. It is a tributary of Piles Creek, approximately 1 km to the west. The first-order creek may have provided an ephemeral source of drinking water while Piles Creek is likely to have provided a more reliable source of drinking water.

2.3 Flora and Fauna

The dominant original vegetation type in the Project Area was likely similar to the Sydney Coastal Heath.

Sydney Coastal Heath usually inhabits exposed coastal sandstone plateau areas and is dominated by emergent mallees up to 4 m tall and shrubs up to 1.5 m tall. Trees present would normally include mallee forms of red bloodwood, heart-leaved stringy-bark, yellow-top ash and Port Jackson mallee, while shrubs include scrub she-oak, dwarf apple, heath banksia, old man banksia, cone-seeds, egg and bacon pea, coral heath, dagger hakea, broad-leaved drumsticks, pink tea-tree, flaky-barked tea-tree, small-leaved white beard, lance-leaved geebung and grass-trees. Ground cover includes the lesser flannel flower and wiry panic (Keith, 2006). Some of these species would have been used as raw materials for implements and weaving, as well as food and medicine. Geebung, for instance, has known antiseptic properties and some varieties produce edible fruit.

Fauna normally associated with this environment includes wallabies, lizards, frogs, bats and flying foxes, pygmy possums, owls, snakes, spotted-tail quoll, pademelons, potoroos, black cockatoos, squirrel gliders and parrots and were potentially sources of food for Aboriginal people in the area.

2.4 Land Use

The land in the direct vicinity has been used for roads, commercial, residential and other purposes.

2.5 Synthesis

Overview of the environmental context indicates that while there would have been an abundance of useful resources, such as food and useful vegetation, it would not have had a reliable permanent source of water, thereby making it unsuitable for a place of permanent settlement or campsite. The high elevation also meant that it was probably quite an exposed area, subjected to coastal winds. Large sandstone outcrops were often used for rock art/engravings. Sandstone with a nearby water source was also used for sharpening and grinding stone tools, leaving axe-grinding groove sites. The area may have been used for ceremonial purposes and/or collecting resources. There is potential for archaeological deposit in areas where soils remain deep and undisturbed, such as in rockshelters, or open areas with limited disturbance.

3 Heritage Context

This section outlines the Aboriginal heritage context of the Project Area. It includes a general outline of Aboriginal occupation in Australia and the region, an analysis of search results from the Aboriginal Heritage Information Management System (AHIMS), as well as relevant heritage studies.

3.1 Outline of Aboriginal Occupation

Aboriginal people have occupied Australia for at least 50,000 years, with potential evidence for earlier occupation. Evidence for earlier occupation is limited by the lower preservation of archaeological deposits extending back in time, but is also limited by the types of scientific dating techniques available. In the local region, Aboriginal occupation has been dated to 11,050 years before present which precedes the rise of sea levels around 6000 years before present (Attenbrow, Archaeological Report on Mangrove Creek Environmental Impact Statement, 1979).

3.2 Ethnographic and Historical Records

The early Europeans kept written records of their observations of Aboriginal culture, including the use of tools, resources, particular places, and in some instances, even recorded indigenous language. These records have become important sources of information, although it must be remembered they also contain cultural and historical biases. These primary sources used in conjunction with archaeological sources and traditional knowledge can reveal much about Aboriginal society, history, lifestyle and use of resources.

3.2.1 Food Resources

Aboriginal people not only survived but thrived in the harsh and changing Australian environment for thousands of years. Some European observers, when recording the life of Aboriginal people, recognised that “The forest in its natural state, affords them everything necessary for their subsistence” (Dawson, 1831, p.203).

Many plants were used for food, some needing to be processed to remove toxins before being safe to eat. Plants were also used for medicinal and manufacturing purposes. One plant of particular value was the grass-tree (*Xanthorrhoea australis*), as its flowering spike was used for spear making, its nectar as a sweet drink, its resin as an adhesive, and its dried stems as fire-sticks (Brayshaw, 1987).

Drinking water was obtained from rivers, creeks and lagoons. Early Europeans observed the skill of Aboriginal people finding fresh potable water even in times of drought. Pastoralist Robert Dawson observed Aboriginal people finding water by digging into the ground and then filtering it through the grass. He noted that “they would walk miles rather than drink bad water. Indeed, they were such excellent judges of water, that I always depended upon their selection when we encamped any distance from a river, and was never disappointed” (Dawson, 1831, p.150).

3.2.2 Aboriginal Material Culture

The material culture of Aboriginal people was made from natural materials sourced from their local environment, or traded with other groups from where the resource could be found. Stone, trees, plants and grasses, clays, shells, as well as parts of animals, were utilised in making shelter, fire,

tools, weapons, implements, apparel and ceremonial equipment. This is a broad summary of some of the material culture, there are many more examples in the literature and from oral histories.

Spears and Spear Throwers

Spears for hunting, fishing and battle were made from slightly different materials. The shaft of the most spears was made using grass-tree stem, gigantic lily, ironbark hardwood prongs and grass tree gum. Hunting spears had bone points. Battle spears had quartz or chert pieces added, while fishing spears often had four hardwood prongs attached with bark thread and tipped with bone or stone barbs.

Throwing sticks or wommera, used in conjunction with spears, were made from hardwood Eucalyptus species.

Shields and Weapons

The historic records indicate shields were often made from the buttress of the giant nettle tree (*Dendrocnide excelsa*) or fig tree (*figus spp*). Usually about 1 m long and 0.5 m wide, with a handle on the inner side and soft paperbark padding. The shields were often painted with white pipe clay and a red ochre border and cross pattern (Brayshaw, 1987, pp. 63-64). The removal of bark to create such shields often left a distinctive scar on the tree and occasionally old trees known as scarred trees (sometimes also referred to as modified trees) bear the evidence of such uses.

Hunting sticks, throwing sticks, digging sticks, boomerangs and clubs were all crafted from hardwood Eucalyptus species.

Containers – Coolamons, Nets, Baskets

Bark containers, woven bags, Coolamons, netting and wooden bowls were essential parts of the toolkits of Aboriginal women, who used them for gathering and collecting food, water and other resources. While they were common items used by local people, the direct survival of these objects archaeologically is unlikely unless buried in an anaerobic condition such as peat. The wooden bowls and coolamons; however, would leave evidence of scarring on the tree. The wooden bowls were often made from protuberance of a tree and sometimes from insect galls. Coolamons were ovate shaped and would leave oval shaped scarring on the tree.

Rock Engravings

Rock engravings were usually made on flat sandstone sheets and the engravings represented hundreds of spiritual figures including ancestral beings (sky heroes) and a wide range of animals and objects and normal-sized human beings. There is very little historical account of their use, as it appears they were often/mainly used for ceremonial activities and thus under Aboriginal custom their use was not openly discussed. However, from the few accounts given to white settlers from the mid-late 1800s suggests they had an important place in Aboriginal ceremony (Attenbrow, Sydney's Aboriginal Past, 2003, pp. 134-135).

3.2.3 Summary of Material Culture

Historic records and oral history demonstrate there was a vast array of material culture. Not all of the materials used by Aboriginal people would survive particularly well in archaeological contexts. This is partly due to the wet-dry effect of Australian soils, as well as the nature of the organic material. An exception to this would be if the artefacts were buried in an anaerobic environment,

such as a peat swamp, which would enable the preservation and survival of organic material such as wood and fibre.

Of the tools outlined above, the stone component, such as the stone barbs, or other stone components are most likely to survive in an archaeological deposit. The extraction of bark for shields or coolamons also can be seen on scarred trees and the rock engravings can be seen on sandstone sheets (when not covered in soil).

3.3 Aboriginal Heritage Information Management System (AHIMS)

The AHIMS database was searched on 28 June 2019. The search was based on the following coordinates: Latitude -33.415 to 33.435, Longitude 151.27 to 151.33 and returned a result of 81 Aboriginal sites (Appendix 1). The AHIMS sites were plotted according to the latitude and longitude co-ordinates in the extensive search (Figure 2).

AHIMS#45-3-1289 is a rock engraving site which plots within the Project Area; however, this location does not match the location described in the site card and it is probable that it was plotted in GDA co-ordinates in AHIMS rather than AGD. It is likely that it is located to the south west in the vicinity of AHIMS#45-3-1287 (Figure 3). It is described as being 84 m south of the Pacific Highway and is on a sandstone platform elevated from the creek 20m and is 100 m north of the creek, some of the other location details on the site card contradictory. The sandstone platform is described as being 50 m in length and 20m in width. The engraving is a figure with a headdress is 5 m in length and 1 m wide. The southern side of the Central Coast highway in the vicinity of AHIMS#45-3-1289 was inspected and extensive sandstone sheets were confirmed. AHIMS#45-3-1289 was not located due to thick vegetation, but another site, Whale Shelter 1 was located (AHIMS#45-3-1290), further details are provided in Section 4.1.

The majority of the AHIMS sites (>85%) are associated with sandstone formations, with rock engravings being the most common, followed by rockshelters and axe-grinding grooves (Table 1). Rock engravings can be made on flat or vertical sheets of sandstone and are usually made on slabs that are relatively flat and uniform. Rock engravings are particularly important as they were often associated with ceremonial or learning activities and were sites that would be repeatedly visited and maintained.

Rockshelters occur where sandstone is large enough to provide shelter from the elements and the floor is flat enough to be used as a campsite. Rockshelters are important because they often contain in-situ archaeological deposit which has a detailed record of Aboriginal occupation in an area.

Axe grinding grooves can be found in sandstone sheets associated with streams or adjacent to waterholes. Open sites with artefact/s are not common in the local area; however, this may be related to visibility and land uses in the area, rather than to archaeological patterning.

Table 1: AHIMS Site Summary

Site Type	Associated with Sandstone Formation	Number	Percent
Rock Engraving	✓	26	32.10%
Rockshelter	✓	14	17.28%
Axe Grinding Groove, Rock Engraving	✓	12	14.81%
Axe Grinding Groove	✓	11	13.58%
Midden		7	8.64%
Art	✓	4	4.94%
Scarred Tree		3	3.70%
Artefact/s		1	1.23%
Rock Engraving, Stone Arrangement	✓	1	1.23%
Midden, Rock Engraving	✓	1	1.23%
Aboriginal Ceremony and Dreaming		1	1.23%
Total		81	100%

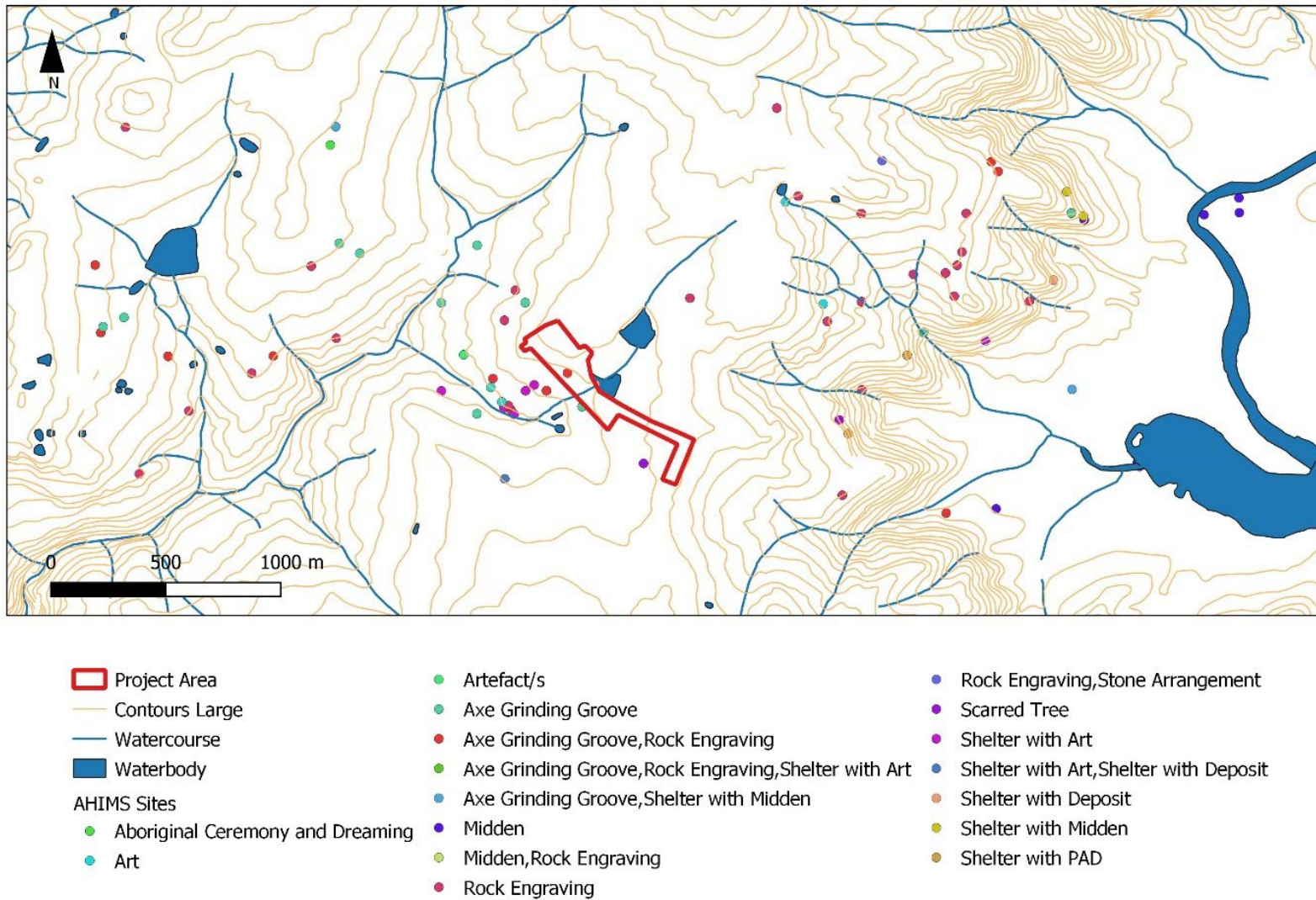
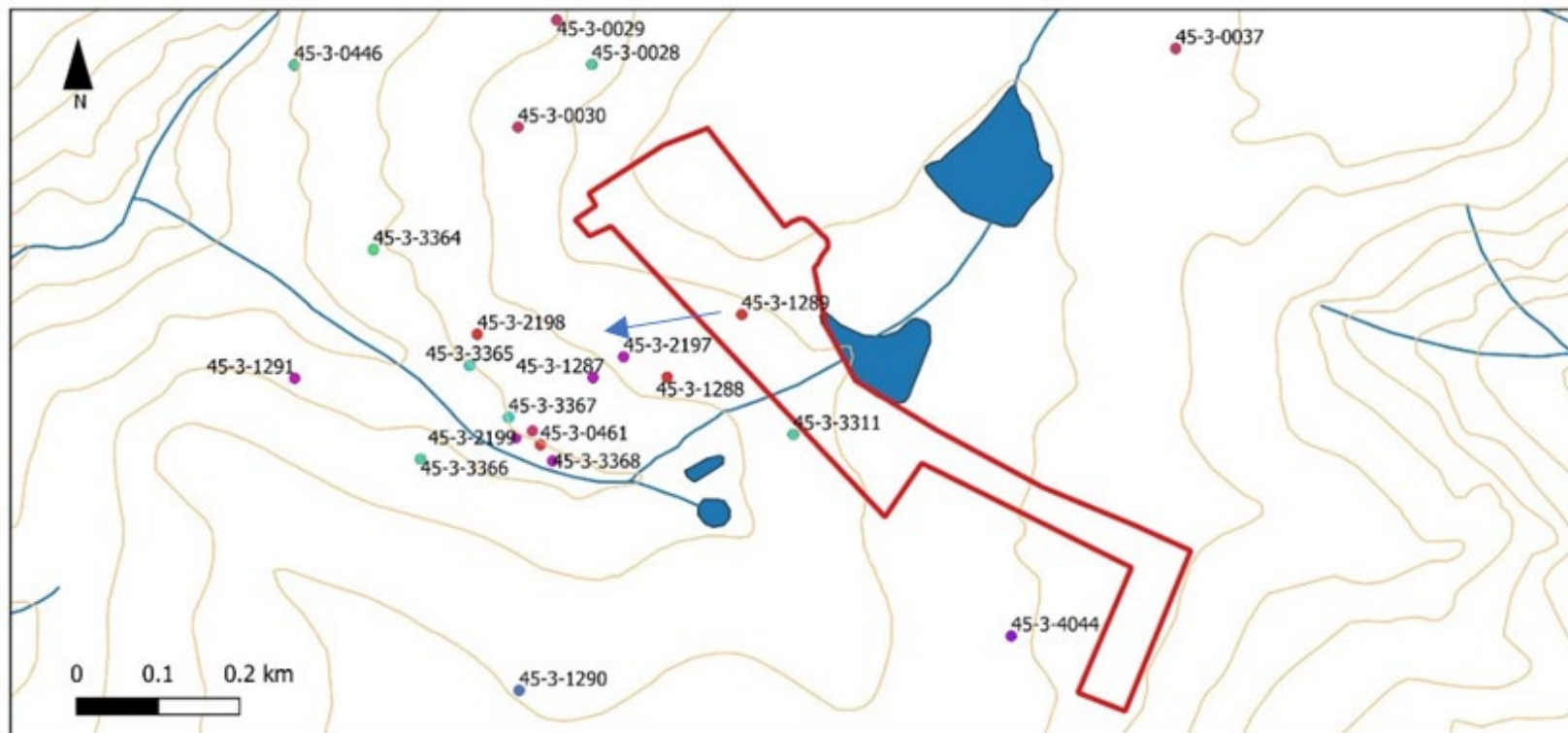


Figure 2 AHIMS Map



- | | | |
|---|--|--|
| Project Area | ● AHIMS Sites | ● Axe Grinding Groove, Rock Engraving, Shelter with Art |
| — Contours Large | ● Art | ● Rock Engraving |
| — Watercourse | ● Artefact/s | ● Scarred Tree |
| Waterbody | ● Axe Grinding Groove | ● Shelter with Art |
| | ● Axe Grinding Groove, Rock Engraving | ● Shelter with Art, Shelter with Deposit |

Figure 3 AHIMS Map with AHIMS labels and likely location of AHIMS#45-3-1289

3.4 Heritage Report Summaries

This section has summarised the findings of relevant heritage reports in the local area.

Jo McDonald Cultural Heritage Management (JMCHM) 1997 Archaeological Survey - Mount Penang Juvenile Justice Centre

The Project Area was previously surveyed in 1997 by archaeologists Jo McDonald and Huw Barton (JMCHM 1997). No Aboriginal sites were identified, however, their observations suggested that some of the sites may have been buried. JMCHM observed the current landscape of the Project Area is different from that which existed before European settlement. JMCHM states that the creek line “has been completely cleared and has evidence for extreme rates of sedimentation – up to 1 m of modern (sandy) alluvium was observed in an exposed section adjacent to a small dam... any sandstone or open sites which once occurred along this water course would be well and truly buried by this sediment” (JMCHM, 1997, p. 12).

Biosis 2008 Archaeological Survey – Kangoo Road to Langford Drive, Kariong

Biosis surveyed the area immediately south of the current Project Area approximately 0.0004 square kilometres. They did not identify any Aboriginal sites, but they did note exposed sandstone in the creek with a natural pothole which potentially was a source of drinking water in drier seasons (Biosis, 2008, p. 30). Sandstone was of a high enough quality that it could have been utilised for Aboriginal engraving or grinding purposes, although no evidence of this was identified by the survey. The tributary that the sandstone and potholes were identified is the southern portion of the stream that runs through the current Project Area. It is possible that similar quality sandstone exists in the current Project area, but has been covered by silt as noted by JMCHM (1997, p. 12).

Dallas 1981 Archaeological Survey and Rockshelter Excavation - Kariong

Dallas (1981) surveyed a three square kilometre area immediately south of the current Project Area. Thirteen Aboriginal sites were identified mainly comprising engravings (8), three rockshelters (3), an axe-grinding groove site (1) and an isolated find (1). One historic site comprising the collapsed chimney of a house was also identified. Four chert artefacts were excavated from a 50 cm x 50 cm trench in Whale Shelter 1 (AHIMS#45-3-1290) (Dallas, 1981, pp. 11-13) and was identified as a location warranting further research. If the listed location in AHIMS is correct it appears that this shelter was destroyed in the subdivision of suburb of Kariong.

Du Cross and Rich 1986 Archaeological Survey – Mount Penang

Du Cross and Rich (1986) surveyed approximately 0.0005 square kilometres immediately west of the current Project Area. They identified the location of an engraving site AHIMS#45-3-0029. This engraving site was on a platform that measured 20 m x 7 m and about 1 m high. Most of the platform was noted to be actively weathering and in places had a build-up of soil and plant growth, however, the surface that the engraving on was dark grey in colour and was not weathering in the same manner as some of the surrounding material (Du Cros & Rich, 1986, p. 15).

AMBS 2000 Archaeological Survey Mount Penang

AMBS conducted an Aboriginal archaeological survey of Mount Penang for the Festival Development Corporation. While they surveyed a portion of the current Project Area (AMBS, 2000, p. 14), their main area of focus was the eastern slopes which is outside the current Project Area. Thirteen

Aboriginal sites were identified, including nine engraving sites (AHIMS#45-3-0031, AHIMS#45-3-0035, AHIMS#45-3-0037, AHIMS#45-3-0304, AHIMS#45-3-1495, AHIMS#45-3-2435, AHIMS#45-3-2437, AHIMS#45-6-1599, AHIMS#45-3-3219 [PN-EN-1 and PN-EN-2 appear to have been registered as one site]), one grinding groove and engraving site (AHIMS#45-6-1598), one grinding groove site (PN-GG-1), one midden/engraving site (AHIMS#45-3-0031) and one rockshelter with PAD (PN-PAD-1). A grinding groove site PN-GG-1 and a PAD PN-PAD-1 appear not to have been registered with AHIMS.

3.5 Synthesis

Aboriginal rock engravings are the most common site type in the local area, followed by axe-grinding grooves (some associated with engravings) and rockshelters. It appears three rockshelter sites have been excavated, of which one, Whale Shelter 1 (AHIMS#45-3-1290) contained evidence of Aboriginal occupation from 30 cm below ground surface and was identified as a location warranting further research. If the listed location in AHIMS is correct it appears that this shelter was destroyed in the subdivision of suburb of Kariong.

4 Visual Inspection

The Project Area was subject to a visual inspection on 23 July 2019 and 16 January 2020 by Tessa Boer-Mah, Principal Heritage Consultant at Heritage Now and Barry Williams, Senior Cultural and Heritage Officer, Darkinjung Local Aboriginal Land Council. The visual inspection was divided into four survey units (Figure 4).

Survey Unit 1 Eastern Portion

The eastern portion of the Project Area has been previously disturbed with some portions also highly modified. The dam is one of the largest modifications in the area, but as such also provided very high ground surface visibility (Plate 1). One Aboriginal site was identified and is described in Section 4.2. Other modifications included landscape associated with the underpass and walkway, which had no ground surface visibility (Plate 2).

Survey Unit 2 Central Portion

The central portion of the Project Area comprised a low lying swampy area (likely caused by water discharged by the dam) but it also forms part of the natural drainage of the Project Area. It is thickly vegetated with low visibility (Plate 3), except for rare patches amongst the bracken fern (Plate 4).

Survey Unit 3 Western Portion Lower

The western portion (lower) of the Project Area is characterised by sand overlying sandstone bedrock (some of which is outcropping). The western portion had good visibility along an unformed vehicle track (Plate 5).

AHIMS#45-3-1289 is a rock engraving site which plots within this survey unit, this location was inspected during the survey, but it was not observed (Plate 6). Additional inspections undertaken suggest that this site is on the southern side of the Central Coast Highway as detailed in Section 4.1.

The majority of the survey area had very low visibility and was thickly vegetated (Plate 7), very occasional ground surface exposures occurred where trees had fallen over (Plate 8). All other portions of survey unit 3 had low ground surface visibility. Despite this, substantial sandstone outcrops were identified, some measuring 20 m, which had sandstone of sufficient texture and flatness that may have been suitable for Aboriginal grinding groove. They were often entirely covered in loose leaf litter or had vegetation growing on top. They are further discussed in Section 4.2.

Survey Unit 4 Western Portion Upper

The western portion (upper) of the Project Area comprised of rocky sand, with some small outcropping boulders of sandstone (Plate 9), however, they were much smaller than those identified in Survey Unit 3. Survey Unit 4 was elevated by a couple of metres and looked out over Survey Unit 3 (Plate 10). It had substantial Eucalyptus trees (Plate 11) and on its northern fringe was grassed with wide tree spacings.

Survey Unit 5 The Avenue and Festival Drive

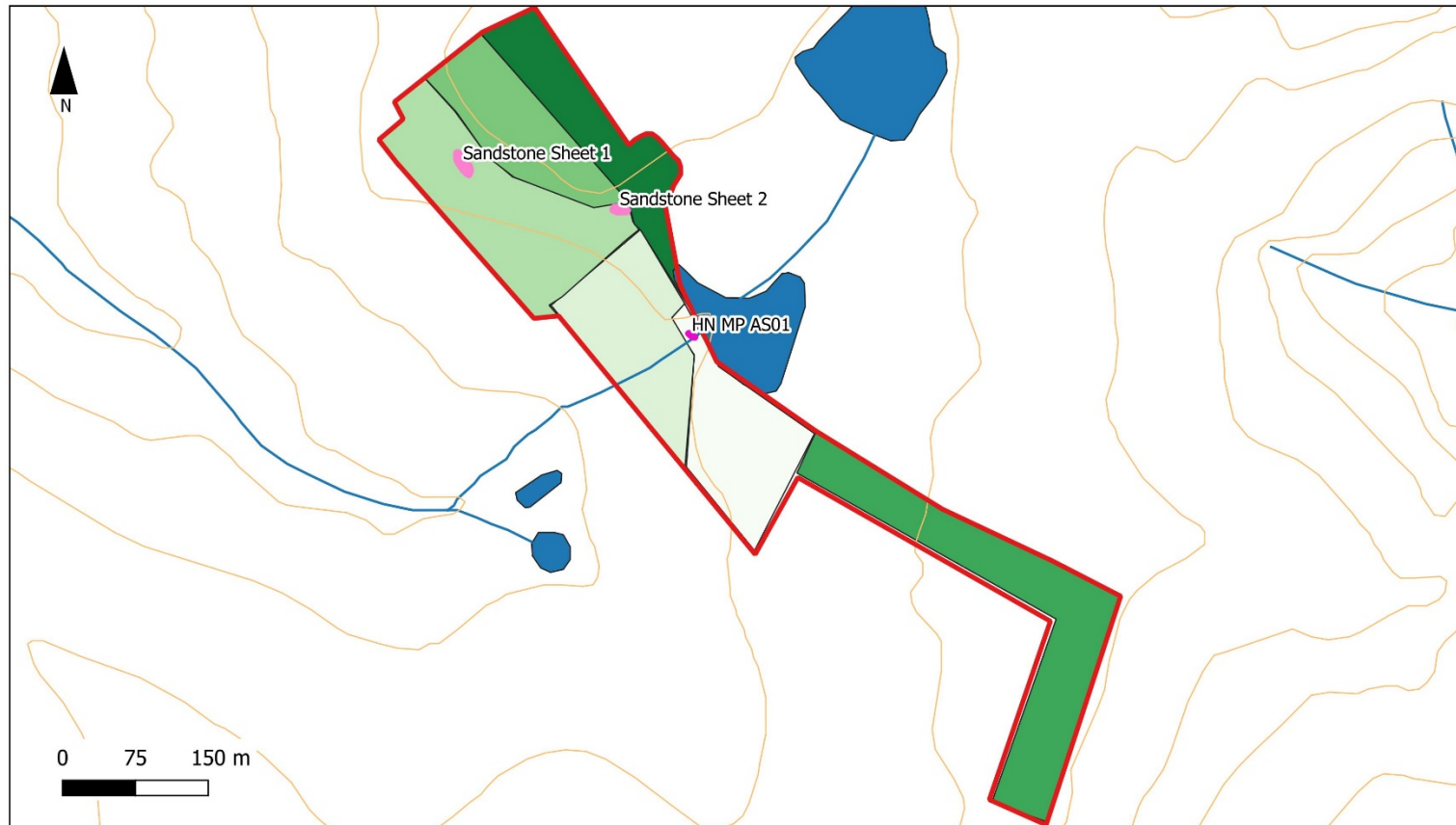
This survey unit comprised of tree-lined roads (Plate 12). The area had low visibility and has been extensively modified for the road. No scarred trees or Aboriginal sites were identified.

Survey Unit 6

The southern end of the survey unit contained grassy fields (Plate 13) and disturbed embankments (Plate 14). Towards the centre of the survey unit is a light cover of open woodland, with trees spaced approximately 10 m apart (Plate 15). The northern extent of the survey unit is in pine forest with very low ground surface visibility (Plate 16). Overall ground surface exposure was 10% and ground surface visibility was approximately 20%.

4.1 AHIMS#45-3-1289

AHIMS#45-3-1289 is a rock engraving site which plots within the Project Area; however, this location does not match the location described in the site card. As such, an attempt was made to visually inspect likely location of the site. Due to the thick vegetation, it was not possible to access the AHIMS#45-3-1289; however, another site in the Northwest Complex recorded by Dallas (1991) was identified: Whale Shelter 1 was located (AHIMS#45-3-1290). The details of Whale Shelter 1 will be updated with AHIMS. On the basis of observations along the southern side of the Central Coast Highway in the vicinity of AHIMS#45-3-1289 it is likely that this site is located at GDA94, Zone 56 E340834 and N6299930 and is not in the Project Area.



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Project Area	Contours Large	Survey Unit 3	Survey Unit 6
HN MP A01	Watercourse	Survey Unit 1	Survey Unit 4
Sandstone Sheets	Waterbody	Survey Unit 2	Survey Unit 5



Figure 4 Survey Units and Aboriginal Sites/Archaeologically Sensitive Locations

4.2 Aboriginal Sites and Archaeological Constraints Identified

One Aboriginal artefact site was identified along with two sandstone sheets which may have been suitable for Aboriginal engravings, but was too obscured by vegetation to be adequately assessed (Figure 5).

HN MP A01 – Mount Penang Artefact 01

One isolated tuff flake was identified in Survey Unit 1 (Plate 17 - Plate 19). It was identified in a disturbed and modified context associated with the southern dam wall. The artefact had been subject to damage, having been broken into two portions to form a complete flake, the portions were approximately 10 m from each other (Table 2). The flake was a grey banded chert (although the surface of the chert had weathered to a cream colour). It had a cortical platform (white river cortex) and a feather termination. Its dimensions were: 59 mm in length, 21 mm in width and 8 mm in thickness.

Table 2 Locations of the flake portions

Portion of Flake	Longitude	Latitude
Proximal	151.293359	-33.429012
Distal	151.293444	-33.42906

Sandstone Sheet 1

This sandstone sheet extended in a north-west to south-east direction. It measured approximately 30 m north-west to south-east and 10 m north-east to south-west and outcropped to approximately 1 m above the ground surface. This sandstone sheet formed a flat platform although it was largely covered in leaf litter and vegetation. The south-east portion of the sandstone sheet was smooth and had fine-grained sandstone suitable for engraving (Plate 20, Plate 21). The north-western end was laminated and thus less suitable for engraving (Plate 22). However, much of the sandstone sheet was obscured and therefore it may have varying qualities of sandstone, indeed other engraving sites in the area had variable quality and weathering of sandstone in the same sheet, as well as having portions covered in vegetation, AHIMS#45-3-0029 for example (Du Cros & Rich, 1986, p. 15).

Sandstone Sheet 2

This sandstone sheet extended east-west. It measured approximately 30 m east-west and 10 m north-south and was extensively covered in leaf litter and vegetation. It had smooth sandstone suitable for engraving.

The sandstone sheets were obscured by dense leaf litter and vegetation therefore could not be investigated thoroughly during the survey, but spot observations suggest that they would have been of suitable quality for Aboriginal grinding grooves. Further investigation of these areas is needed to confirm whether they have engravings or not. Observations from outside the Project Area of the road cuttings show that thick sandstone sheets are present from 40 cm and shallower beneath the topsoil (Plate 24). The installation of the pipeline will be difficult in the archaeologically sensitive sandstone area (Figure 4) given there will be substantial sandstone to cut through along with the need to carefully examine each sheet for Aboriginal engravings.



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-  Project Area
-  Archaeologically Sensitive Sandstone Sheets
-  Aboriginal Artefact Site (HN MP A1)
-  Potential additional artefacts associated with HN MP A1_



Figure 5 Survey Results

5 Impact Assessment

This Aboriginal Due Diligence Assessment addresses the Roadworks portion of the proposal separately to the Water Infrastructure as they have different impacts.

5.1 Roadworks

The roadworks will occur along The Avenue and Festival Drive. The roadworks include: installation of footpaths, decommissioning lighting and the installation of new lighting. The proposed footpath will be 1.5 m wide and its base will be compacted earth to reduce ground disturbance, the concrete portion of the path will be 0.1 m in thickness. Ground lighting will be decommissioned. Overhead lighting will be replaced, but the same conduits will be used so there will be minimal soil disturbance.

No Aboriginal sites have been identified in the roadwork area and thus no mitigation for Aboriginal heritage is required.

5.2 Water Infrastructure

The water and sewer extend from the roundabout at the western end of Festival Drive and proceed in a north-west direction towards the proposed Kangoo Road development. The water and sewer installation will require trenching approximately 1 m wide and up to 4 m in depth, as well as a service road alongside the pipeline.

Aboriginal sites HN MP A1 – Mount Penang Artefact 1, comprising an isolated artefact was identified in the Project Area along with an archaeologically sensitive sandstone area, with at least two sandstone sheets suitable for engraving. AHIMS#45-3-1289 is a rock engraving site which plots within the Project Area, this location was inspected during the survey, but it was not observed. Additional groundtruthing of other sites in the archaeological complex shows that AHIMS#45-3-1289 is not in the Project Area is likely located south of the Central Coast Highway.

The archaeologically sensitive sandstone areas and HN MP A1 – Mount Penang Artefact 1 were identified during the survey (Figure 5). These areas have been avoided by the proposed pipeline works (Figure 6).

The Water Infrastructure installation will involve two stages: 1) vegetation clearance and informal track formation and later 2) installation of water pipes.

The low visibility encountered during the survey substantially hindered the identification of Aboriginal stone artefacts associated in HN MP A1 and there is a larger area which potentially has artefacts associated with HN MP A1 (Figure 6). The clearance of vegetation would allow much higher visibility and may result in more artefacts being identified. As such, this area is to be subject to an Aboriginal Heritage Impact Permit (Figure 7). The AHIP is to allow for the collection of artefacts after vegetation has been cleared. Once Stage 1 has been completed, the AHIP is to allow for the collection of artefacts if identified during the Stage 2 pipe installation. The remainder of the development area is considered to have low sensitivity for Aboriginal objects, works in these areas are to be covered by the provisions in the Due Diligence Code (Figure 7), excluding sandstone sheet 1.



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- | | |
|--|--|
|  Project Area |  HN MP A01 |
|  Set down and construction area |  Potential additional artefacts associated with HN MP A1_ |
|  Pipeline Impact Area |  Sandstone Sheets |



Figure 6 Impact Area and Archaeological Sites/Areas of sensitivity



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- | | |
|---|--|
|  Project Area revised 20191204 |  Area covered by Due Diligence Provisions |
|  HN MP A01 |  AHIP Area |
|  Sandstone Sheets |  Potential additional artefacts associated with HN MP A1_ |

0 100 200 m





Figure 7 AHIP Area and Area Covered by Due Diligence Provisions (excludes sandstone sheet 1)

5.3 Summary

An AHIP will be required for the installation of the Sewer Infrastructure as per Figure 7. The Proposal will avoid the archaeologically sensitive sandstone area and known surface artefacts part of HN-MP-A1. The remainder of the development area is considered to have low sensitivity for Aboriginal objects, works in these areas are to be covered by the provisions in the Due Diligence Code (Figure 7), excluding sandstone sheet 1.

6 Conclusions and Recommendations

An AHIP will be required for the installation of Sewer Infrastructure. The Proposal is to avoid the archaeologically sensitive sandstone area and surface artefacts associated with HN-MP-A1; however, there is potential for unidentified Aboriginal objects to be present in association with HN-MP-A1 and thus an AHIP for the collection of artefacts is to be sought.

The remainder of the development area is considered to have low sensitivity for Aboriginal objects, works in these areas are to be covered by the provisions in the Due Diligence Code, excluding sandstone sheet 1.

All three recommendations below are to be followed.

Recommendation 1

An AHIP covering potential artefacts associated with HN-MP-AS1 (as per Figure 7) is to be applied for, and approved, before the disturbance of the ground surface can commence in the AHIP area. Community collection of artefacts is to be undertaken once vegetation is removed, in consultation with the RAPs.

Recommendation 2

All on-site personnel are to be made aware of their obligations under the National Parks and Wildlife Act 1974, through an onsite induction or other suitable format.

Recommendation 3

High visibility barrier fencing is to be erected around the identified artefacts at HN-MP-A1 and the sandstone sheeting archaeologically sensitive areas. The high visibility barrier fence is to be erected prior to construction and remain in place until the cessation of construction.

Recommendation 4

In the unlikely event, that Aboriginal or suspected Aboriginal objects are identified during works outside the AHIP area, then the heritage consultant and RAPs are to be contacted to identify if it is an Aboriginal object. Suitable management and mitigation measures are to be implemented, and modifications made to the AHIP, as necessary.

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8 Acronyms and Definitions

Acronym	Definition
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
HCCDC	Hunter and Central Coast Development Corporation
HCP	Highway Commercial Precinct
REF	Review of Environmental Factors

9 Plates



Plate 1 Survey Unit 1 Eastern Portion - High exposure south of the dam, view to west



Plate 2 Survey Unit 1 Eastern Portion - Landscaping and modification for pedestrian underpass



Plate 3 Survey Unit 2 Central Portion - Central portion of Project Area thickly vegetated



Plate 4 Survey Unit 2 Central Portion – example of a patch of exposed ground surface



Plate 5 Survey Unit 3 – vehicle track had high ground surface visibility



Plate 6 Survey Unit 3 – vicinity of AHIMS#45-3-1289 does not match description from site card



Plate 7 Survey Unit 3 – the majority of the survey unit was thickly vegetated and had low ground surface visibility



Plate 8 Survey Unit 3 – example of the exposed ground at the base of a fallen tree



Plate 9 Survey Unit 4 – example of exposed sandstone boulder, note surface is very uneven and not suitable for Aboriginal engraving



Plate 10 Survey Unit 4 – elevated area overlooking Survey Unit 3



Plate 11 Survey Unit 4 – example of large Eucalypt



Plate 12 Survey Unit 5



Plate 13 Survey Unit 6 – open fields with occasional trees



Plate 14 Survey unit 6 – example of disturbed embankments



Plate 15 Survey Unit 6 – open woodlands



Plate 16 Survey Unit 6 – Poor ground visibility in the pine forest due to pine needle litter



Plate 17HN MP A1 – Mount Penang Artefact 1 - Ventral Surface



Plate 18HN MP A1 – Mount Penang Artefact 1 - Dorsal Surface



Plate 19HN MP A1 – Mount Penang Artefact 1 – view of a broken distal portion of flake note banding of chert



Plate 20 Sandstone Sheet 1

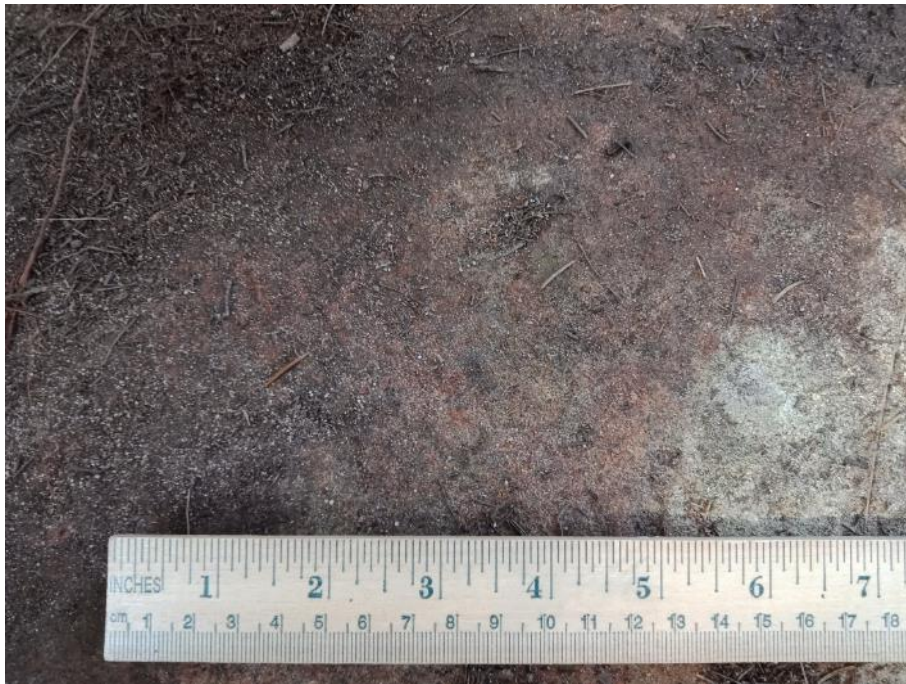


Plate 21 Sandstone Sheet 1 south-eastern portion of the sandstone is smooth and therefore suitable for engraving



Plate 22 Sandstone Sheet 1 sandstone on north-western end is laminated and therefore less suitable for engraving



Plate 23 Sandstone Sheet 2 thoroughly covered in leaf litter and vegetation



Plate 24 Observation from road cutting back toward the Project Area, shows extensive sandstone sheet underlies 30-40 cm of topsoil

Appendix1 AHIMS Search and Site Card

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 19060403 Mt Penang

Client Service ID : 431348

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-3-3155	Fagan's Bay	AGD	56	343610	6299300	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-3162	PT.Clare Cemetery	AGD	56	343000	6299050	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-3163	Fagan's Bay	AGD	56	343620	6299280	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2435	Kangoo Rd.;	AGD	56	342810	6300310	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2436	Debenham Rd.;	AGD	56	343230	6300240	Closed site	Valid	Artefact : -	Shelter with Deposit	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0611	Old Gosford Road;	AGD	56	342845	6300580	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0619	Old Gosford Road;	AGD	56	342474	6300848	Open site	Valid	Art (Pigment or Engraved) : -, Stone Arrangement : -	Rock Engraving, Stone Arrangement	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0620	Old Gosford Road;	AGD	56	342012	6301113	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1316	Mt Penang;	AGD	56	343320	6299675	Closed site	Valid	Shell : -, Artefact : -, Grinding Groove : -	Axe Grinding Groove, Shelter with Midden	98683
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1317	Mt Penang;	AGD	56	342406	6299658	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1318	Mt Penang;	AGD	56	343302	6300589	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	98683
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1319	Mt Penang;	AGD	56	342388	6300572	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1321	Mt Penang;	AGD	56	343302	6300589	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	98683
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							

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Extensive search - Site list report

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45-3-2437	Kangoo Rd;	AGD	56	342800	6300150	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	Brad Welsh							
45-3-0527	Point Clare;	AGD	56	342783	6299025	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	I.M Sim							
45-3-0417	Mooney Mooney Creek;	AGD	56	339385	6299782	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	Webb							
45-3-0425	Mooney Mooney Creek;Old Quarry Site;	AGD	56	339385	6299782	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	Webb							
45-3-0426	Mooney Mooney Creek/Piles Creek Old Quarry Site	AGD	56	339090	6299900	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	3587
	<u>Contact</u>	<u>Recorders</u>	Mr.David Lambert,I Webb							
45-3-0442	Flood Creek;	AGD	56	340094	6300985	Closed site	Valid	Grinding Groove : -, Shell : -, Artefact : -	Axe Grinding Groove,Shelter with Midden	
	<u>Contact</u>	<u>Recorders</u>	R.A Buchan							
45-3-0446	Piles Creek;	AGD	56	340569	6300079	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	<u>Contact</u>	<u>Recorders</u>	Webb							
45-3-1495	Narara Creek;site 243;	AGD	56	342250	6300010	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	J.C Lough							
45-3-1426	Piles Creek;Ca-K-3;	AGD	56	339750	6299700	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	J.C Lough							
45-3-1436	Melinga;Ca-K-20;	AGD	56	340120	6300380	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	<u>Contact</u>	<u>Recorders</u>	J.C Lough							
45-3-1439	Melinga;Ca-K-29;	AGD	56	340000	6300260	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	ASRSYS							
45-3-1441	Piles Creek;Ca-K-31;	AGD	56	340720	6300380	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	

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Extensive search - Site list report

Your Ref/PO Number : 19060403 Mt Penang

Client Service ID : 431348

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-1442	Melinga;Ca-K-33;	AGD	56	340210	6300330	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	287,1159
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-1447	Melinga;Ca-K-41;	AGD	56	339100	6299930	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-1455	Old Gosford Road Gosford Racecourse	AGD	56	343880	6300590	Open site	Valid	Shell : -, Artefact : -	Midden	377,98683
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-0558	Gosford;Narara Ck;	AGD	56	344033	6300603	Open site	Valid	Shell : -, Artefact : -	Midden	98683
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-6-0789	Blackwall;	AGD	56	340577	6299622	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-6-1598	Un-named;	AGD	56	342620	6300260	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-6-1599	Un-named;	AGD	56	342760	6300270	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-6-1600	Un-named;	AGD	56	342830	6300380	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-0058	Piles Creek;	AGD	56	341034	6299631	Closed site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving,Shelter with Art	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-0461	Piles Creek.	AGD	56	340880	6299530	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	1100
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-0018	Floods Falls	AGD	56	339180	6300967	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
45-3-0026	Piles Creek;	AGD	56	339270	6299170	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		

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Extensive search - Site list report

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-3-0027	Piles Creek;	AGD	56	340115	6299888	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0028	Piles Creek	AGD	56	340934	6300086	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	100932,100999
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0029	Piles Creek Mt. Penang	AGD	56	340890	6300150	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	1014
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0030	Piles Creek.	AGD	56	340845	6299993	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	492
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0031	Piles Creek (Gosford)	AGD	56	342397	6300115	Open site	Valid	Art (Pigment or Engraved) : -, Shell : -, Artefact : -	Midden,Rock Engraving	492
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0032	Old Gosford Road;Kendall's Rock;	AGD	56	343128	6300129	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	98683
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0033	Old Gosford Road;Gosford 10;	AGD	56	342980	6300800	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0034	Piles Creek;	AGD	56	342950	6300850	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0035	Piles Creek	AGD	56	342397	6300115	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	492
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2197	Piles Creek;	AGD	56	340980	6299660	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2198	Piles Creek;	AGD	56	340800	6299690	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2199	Piles Creek;	AGD	56	340850	6299540	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-3-1287	Gosford;Squatters Shelter;	AGD	56	340943	6299629	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1290	Kariong (Whale Shelter 1)	AGD	56	340860	6299171	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -	Shelter with Art,Shelter with Deposit	1100
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-1291	Gosford (Whale Shelter 2)	AGD	56	340577	6299622	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1100
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0964	Piles Creek;	AGD	56	339480	6299500	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0304	KG 1(Kariong)	AGD	56	342330	6299110	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	757
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0305	KG 2 (Kariong)	AGD	56	342310	6299500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	757
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0037	Old Gosford Road;Piles Crk/Ca-K-11;	AGD	56	341650	6300121	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0043	Old Gosford Road;Piles Creek;	AGD	56	342112	6300658	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0306	KG 3 (Kariong)	AGD	56	342670	6299960	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	757
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0307	KG 4 (Kariong)	AGD	56	342940	6299920	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	757
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-2113	Koerconing;	AGD	56	340870	6299550	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	1333
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-3219	PN-EN-1	AGD	56	342230	6300100	Closed site	Valid	Art (Pigment or Engraved) : -		
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							

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45-3-0607	Piles Creek;	AGD	56	339060	6300250	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	Contact							Permits		
45-3-3280	West Gosford 1	AGD	56	343359	6300555	Open site	Valid	Shell : -		
	Contact T Russell							Permits		
45-3-3281	West Gosford 3	AGD	56	343280	6300700	Closed site	Valid	Shell : 1		
	Contact T Russell							Permits		
45-3-3279	West Gosford 2	AGD	56	343355	6300575	Closed site	Valid	Shell : -		
	Contact T Russell							Permits		
45-3-3302	KG PAD 1	AGD	56	342350	6299430	Closed site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell							Permits		
45-3-3303	KG PAD 2	AGD	56	342600	6299840	Closed site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell							Permits		
45-3-3311	K - SS - 1	AGD	56	341190	6299550	Open site	Valid	Grinding Groove : 1		
	Contact T Russell							Permits		
45-3-3364	KA 3A	GDA	56	340775	6300001	Open site	Valid	Artefact : -		
	Contact							Permits		
45-3-3365	KA 5A	GDA	56	340896	6299834	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact							Permits		
45-3-3366	KA4	GDA	56	340838	6299696	Open site	Valid	Grinding Groove : -		
	Contact							Permits		
45-3-3367	KA1	GDA	56	340945	6299759	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact							Permits		
45-3-3368	KA2	GDA	56	341000	6299696	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -		
	Contact							Permits		
45-3-0429	Piles Creek;	AGD	56	339843	6299791	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	Contact							Permits		
	Recorders									

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-3-1288	Piles Creek Grooves (Kariiong)	AGD	56	341034	6299631	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	101093
	<u>Contact</u>	<u>Recorders</u>	ASRSYS <u>Permits</u>							
45-3-1289	Kariiong (Head-dress Figure)	AGD	56	341124	6299724	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	1100
	<u>Contact</u>	<u>Recorders</u>	ASRSYS <u>Permits</u>							
45-3-1456	Old Gosford Road (Gosford Racecourse)	AGD	56	344030	6300680	Open site	Valid	Shell : -, Artefact : -	Midden	377
	<u>Contact</u>	<u>Recorders</u>	ASRSYS <u>Permits</u>							
45-3-1445	Melinga Ca-K-38	AGD	56	339190	6299980	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	3587
	<u>Contact</u>	<u>Recorders</u>	Doctor.Jo McDonald,Stephanie Garling <u>Permits</u>							
45-3-3625	SIE MCH1	GDA	56	342163	6300816	Open site	Valid	Art (Pigment or Engraved) : 1, Water Hole : 1		
	<u>Contact</u>	<u>Recorders</u>	Mr.Jeffrey Hill,RPS East Australia Pty Ltd - Echuca Victoria <u>Permits</u>							
45-3-3668	SIE 35	GDA	56	340177	6301079	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Art (Pigment or Engraved) : -		
	<u>Contact</u>	<u>Recorders</u>	Ms.Sharon Hodgetts <u>Permits</u>							
45-3-4044	MPP MT1	GDA	56	341567	6299450	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u>	<u>Recorders</u>	Extent Heritage Pty Ltd - Pyrmont,Mr.Paul Irish,Mrs.Laressa Barry,Coast History & <u>Permits</u>							

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Additional Info : assessment. Number of Aboriginal sites and Aboriginal objects found is 81

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ADDITIONAL INFORMATION

45-3-1289

REGISTER COPY

and

1. Map Name GOSFORD G/N SYDNEY 5. Site No. 45-3-1288
2. Scale 1:25000 1:63360 1:250000 6. Site type Engraving
3. Grid ref 407399591 293691 C.429.869 and Axe Grinding
Grooves
4. Site name(s) Kariong / Gosford / Ca-K-22 7. Classification

8. Air photo ref
9. Cadastral
10. Land Status 11.



45-3-1289

12. Directions for site relocation

84 m S of & of Royal Pacific Highway

13. Owner 14. Tenant/Manager
- Address Address
-
- Attitude Attitude

15. Site Description

Lough's Site No. Ca-K-22.

Report in Catalogue

More than 50 axe grinding grooves in several groups scattered over the rock surface.

Unusual deity - type figure 7m long; snake 3.5m; curved line 300mm; boomerang 1m; circle 0.6m diameter; muredoe.

Extent of site - 21m x 45m

Lough's Reference

Previously M+W-S-22.
Photographs 48, 49, 50, 90, 91,
92, 93, 94.

See Figure 1 on "Contents" page of Lough's report.

16. Reasons for investigation DMR Survey Freeway No 3 9/79. Calga to Kariong.
17. Condition Sites on or near Centre Line.
Not likely to be affected by freeway construction.
18. Interpretation
19. Visitation
20. Recommendations

X

21. Environmental description of site locality

22. Relation to other sites in locality

23. Details of artifact collections

24. Is plan or diagram of site attached? ☒ Yes ☐ No

25. Are annotated photographs attached? ☒ Yes ☐ No

In separate photographic folder in

How many? *H70 only*

7 slides
2 prints.

26. Other additions *H70 report catalogue.*

27. Importance of site to Aborigines

28. Source of this information

29. Oral sources of information

30. Written references

31. Recorded by *J. LOUGH AND ASSOCIATES* Filed by *J. HANRAHAN*
ARCHAEOLOGICAL FIELD SURVEYORS.

S.T.

Address *49 MANNING ROAD,*
DOUBLE BAY, 2028.

Phone - *36. 60 91.*

Date

Date *12/82.*

9/79.

1. Map Name COSFORD..... COSFORD - NORVILLE 5. Site No. 45-3-1289
2. Scale 1:25000..... 1:63,360..... 6. Site type O - Engraving
3. Grid ref 40.77.99.76..... 29.3...691..... -mg. &...A.G.G.....
4. Site name(s) Head-dress figure / Karriong..... 7. Classification
8. Air photo ref
9. Cadastral
10. Land Status 11.

12. Directions for site relocation

Proceed along the Pacific Highway 300m beyond the Wiseman's Ferry Road intersection toward Karriong. Take dirt road south to Mt Penang Boys Home Dam site. Follow the creek bed N. of the dam for 450m. Site is on a platform 100m above from the creek on the Northern side and elevated at 20m.

13. Owner Mt. Penang Boys Home..... 14. Tenant/Manager
- Address Karriong Pacific Highway..... Address
- Karriong.....
Attitude unknown..... Attitude

15. Site Description

Engraving: Figure with Head-dress 5m L x 1m Max Width
on Exposed Rock platform on sandstone. 20m (min distance) from Axe Grinding
grooves - in 2 series 33.5m (max distance)

Figure is engraved between natural water channels which cut across the platform in several places.

Platform 50m L x 40m on diagonal E-W.
20m B

Figure lies in E-W orientation, parallel with a creek ~~run~~ south of the platform, and is approx 20m above it at a distance of

Depth of Grooves vary - Max depth of 15mm. 4 Sections worn flat by water ch erosion caused by channelling and collecting in shallow depressions.

Pecking clearly visible along all grooves.

16. Reasons for investigation ARCH. Survey - Karriong Regional Develop. Scheme.
17. Condition Good in parts - possible exfoliation - since worn smooth by water run off.....
18. Interpretation Research and for Aborigines [note: rough calls this a death figure].....
19. Visitation Probably Rare except for a Squatter who occupies a shelter immediately south of engraving.....
20. Recommendations Not to be disturbed [see accompanying report].....

X

21. Environmental description of site locality

On a Ridge extending from Piles Creek to an unnamed tributary of Piles Creek 800 m. East. Platform is exposed in sections with medium-dense halca cover and eucalypt timber. Drainage across the exposed sections south to another Creek (unnamed tributary of Piles Creek). This southern Creek provides permanent water while rock shallow depressions & water channels provide seasonal water on the platform itself. This Ridge is part of the Kulumra - Gostford grade-travel route [McCarthy: in Oceania 1989]

22. Relation to other sites in locality

30m NE & SE of Axe Grinding Grooves in 3 series

app. 40m E Squatters Shelter - Art + Potential Occupation Deposit

150m NNW Whale Shelter 1 - Art + Tested deposit - occupation site

Other sites around Karing include Engraving sites with which are part of the Dyre Tree Hill series [see Sims: Mankind Vol 7 no. 1 1969]

23. Details of artifact collections

None made.

24. Is plan or diagram of site attached?

Yes/No Drawing from Photo of Tracing.

25. Are annotated photographs attached?

Yes/No How many? 3.

26. Other additions

Sketch of engraving relative to other sites & the exposed platform on which it occurs.

27. Importance of site to Aborigines

28. Source of this information

29. Oral sources of information

see accomp'g Report M. DALLAS: An Archaeological Survey of Karing. NSW, 1980

30. Written references

John Dough EIS 1980 Sydney-Newcastle Freeway
: Section Mt White to Oorumbah.
refers to this site as 'Diedy Figure'

31. Recorded by M. DALLAS

Filed by

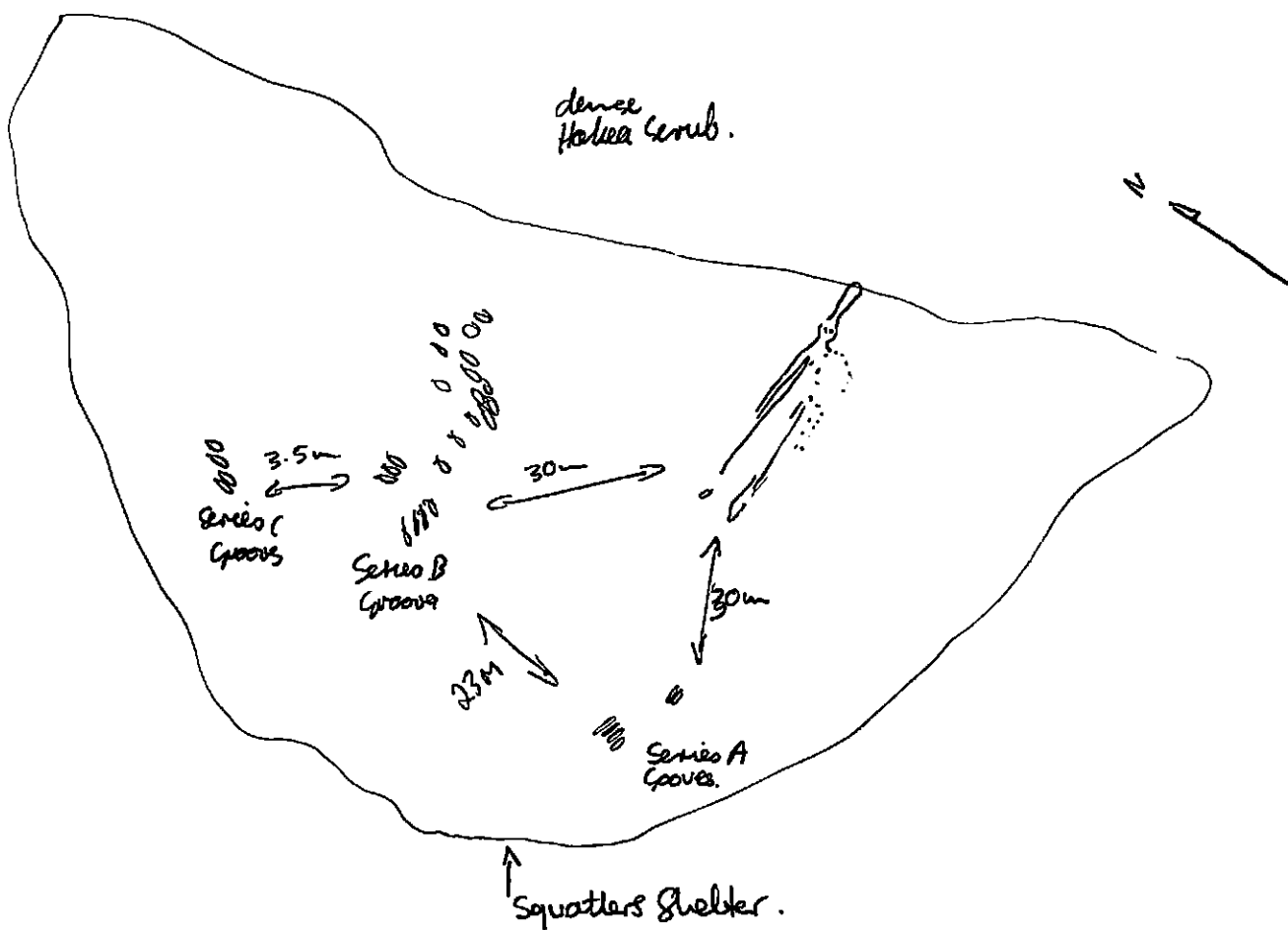
31 WATERVIEW ST
BALMAIN NSW
2183287

Address

Date

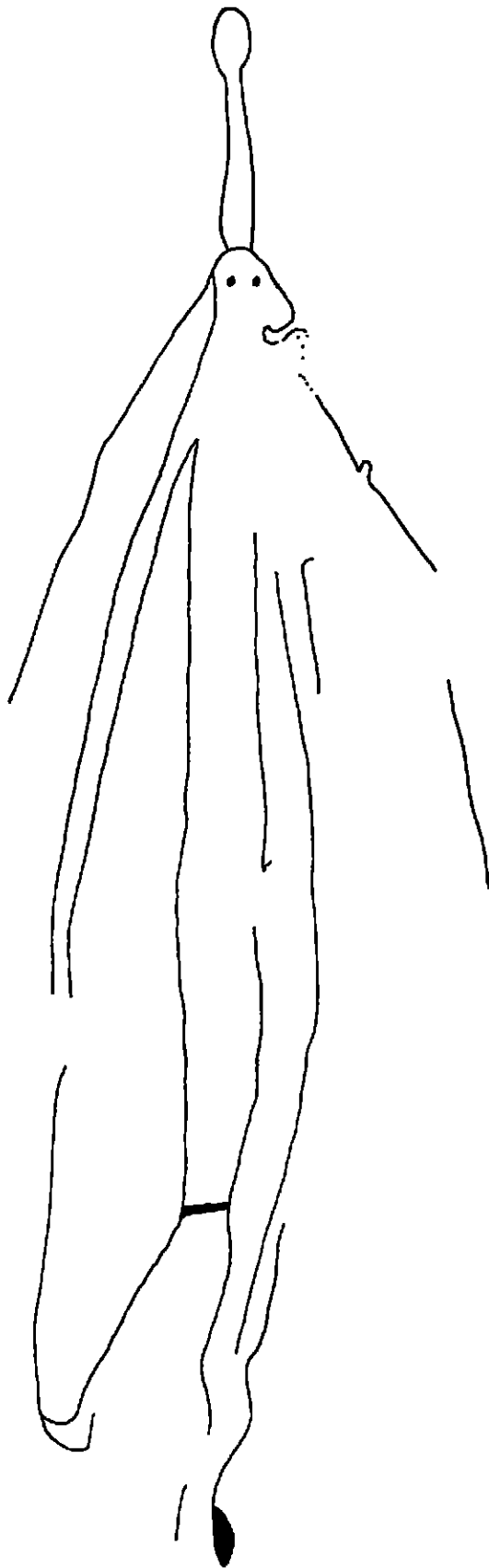
5th November '81

Date



Sketch taken from field note book.

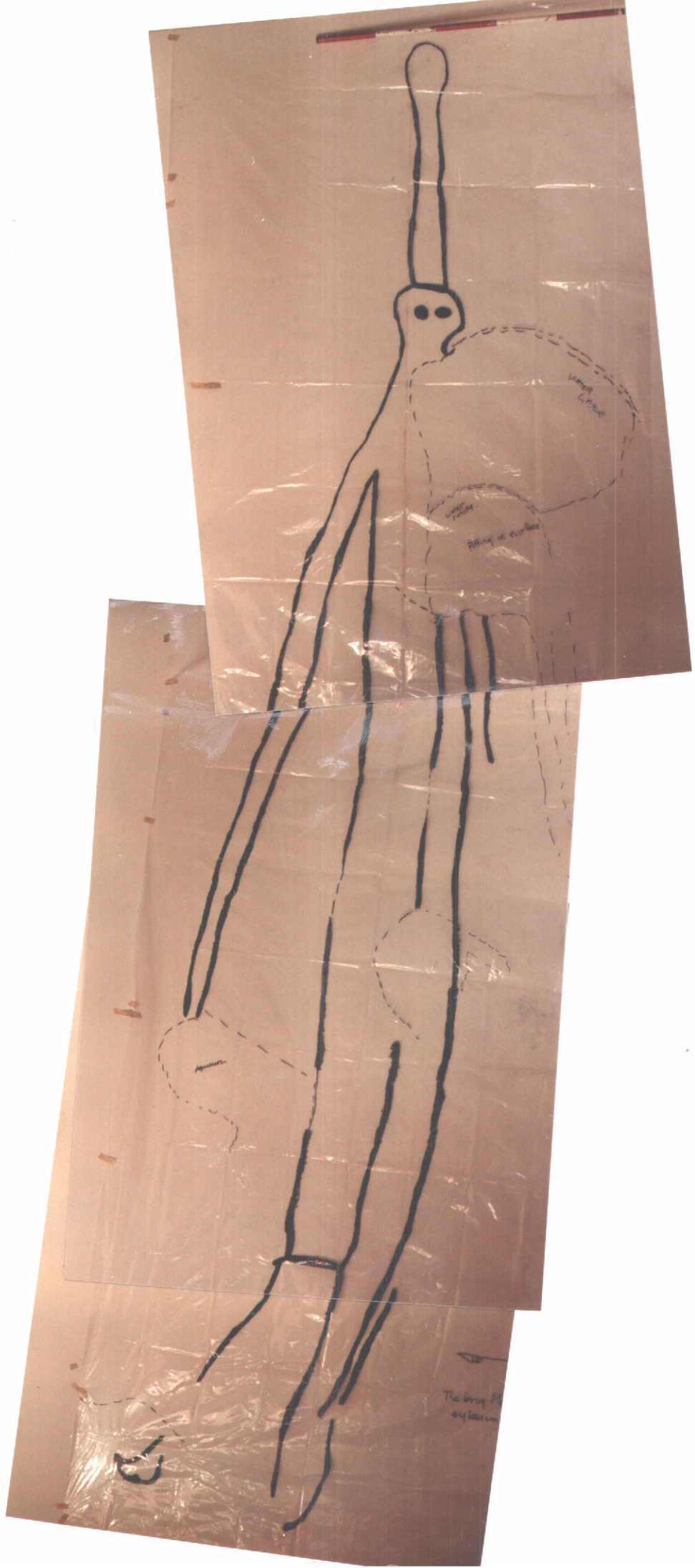
45-3-1289



Site Ca-K-22

Scale 1:25

45-3-1289



Q



