Appendix H

Statement of heritage impact

Bridge over Woronora River, Near Heathcote Historical Heritage Assessment and Statement of Heritage Impact

FINAL REPORT

Prepared for Transport for NSW

27 November 2020

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Report to:	Transport for NSW
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Biosis project no.:	33641
File name:	33641.Heathcote Bridge.SoHI.FIN01.20201026.clean
Citation:	Biosis 2020. Bridge over Woronora River, Near Heathcote Historical Heritage Assessment. Report for Transport for NSW. Bridge, A., Allen, C. and Tetlaw, M. Biosis Pty Ltd. Sydney, NSW. Project no.33641

Document control

Version	Internal reviewer	Date issued
Draft version 01	Fiona Leslie (Mountains Heritage)	27/08/2020 and 01/09/2020
Final draft version 01	Maggie Butcher	23/09/2020
Final version 01	Maggie Butcher	23/10/2020

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- Transport for NSW: Hannah D'eau, Cameron Jordan, Ian Berger and Erin McCarthy.
- KI Studio: Miguel Wustemann

Biosis staff involved in this project were:

- Anne Murray (mapping).
- Charlotte Allen (client liaison and project management).

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Photos

Glossary

Biosis	Biosis Pty Ltd
CBD	Central Business District
CHL	Commonwealth Heritage List
CMP	Conservation Management Plan
DA	Development Application
DCP	Develop Control Plan
DEE	Department of the Environment and Energy
DP	Deposited Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GL	Gigalitres
Heritage Act	*Heritage Act 1977*
LEP	Local Environmental Plan
LGA	Local Government Area
NHL	National Heritage List
NSW	New South Wales
REF	Review of Environmental Factors
RMS	Roads and Maritime Services (know under Transport for NSW)
s170	Section 170
SHI	State Heritage Inventory
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
study area	The area of impact for the proposed works
TfNSW	Transport for New South Wales
VIA	Visual Impact Assessment
WWII	World War 2

Executive Summary

Biosis Pty Ltd (Biosis) was commissioned by Transport for NSW (TfNSW) to undertake a heritage assessment and Statement of Heritage Impact (SoHI) for repair and replacement works on the bridge over Woronora River, Heathcote New South Wales (NSW). The study area is located 3 kilometres north of Heathcote, bordering the suburbs of Heathcote, Engadine and Holsworthy, and is approximately 28 kilometres south-west of the Sydney Central Business District (CBD).

The study area forms part of a key traffic corridor, which connects Sutherland Shire to Liverpool. The proposed development involves widening of the Section 170 (s170) heritage registered item, the Woronora River Bridge (RTA Bridge no. 152), using barrier extensions and steel box girders on either side of the existing bridge and appending headstock extensions to each of the existing concrete trestles, to extend the width of the lanes and increase shoulder corridors. It also involves cutting back the slope face on the northern and southern bridge approaches to improve lane width and bridge repair and maintenance works including, but not limited to, pier protection and anti-carbonation coating. The majority of the proposed works are restricted to the road reserve, bridge and adjacent rock face, with some works occurring to the access track and clearing north-west of the study area, adjacent to Kolara Weir (*Sutherland Shire Local Environmental Plan 2015* (LEP) Item no. A1801).

This assessment covers both the study area as well as any additional areas in the vicinity which are likely to be affected by the proposed works, either directly or indirectly. Identified constraints aim to guide detailed design, with an emphasis on avoiding impacts where feasible.

A Visual Impact Assessment (VIA) has also been undertaken as a separate assessment. The VIA is appended to this report (Appendix 4).

Heritage values

Significant heritage values identified within the study area include:

- Woronora River Bridge, RTA Bridge No.152, RMS s170 heritage and conservation register.
- Cubbitch Barta National Estate Area *Environment Protection and Biodiversity Act 1999* (EPBC Act), Commonwealth Heritage List (CHL) ID No. 105405.

Significant heritage values located within the vicinity of the proposal area include:

- Woronora-Penshurst Pipeline, Sutherland Shire LEP Item No. A4302, Sydney Water s170 Heritage Register No. 4570509.
- Kolara Weir, Sutherland Shire LEP Item No. A1801.

Impacts to heritage values

The proposed works would result in a direct impact to the Cubbitch Barta National Estate Area (CHL ID no. 105405). These impacts include cutting back the rock slope face on the northern bridge approache to improve lane width, which is located within the CHL curtilage for the Place. Cubbitch Barta National Estate Area comprises 18,000 hectares of undeveloped bushland and includes a large portion of the Liverpool region and Holsworthy military training area. Public access is largely restricted due to military use, meaning minimal disturbances have occurred to the natural fabric of the Place since the mid-1900s.

Due to the presence of a Commonwealth heritage item, Cubbitch Barta National Estate Area, the self-assessment process outlined in *Significant Impact Guideline* 1.2 of the EPBC Act, was completed by Biosis to

assess the impact of the proposed works on the historical heritage values for the Cubbitch Barta National Estate Area. As TfNSW has engaged another consultancy to conduct the Aboriginal cultural heritage values assessment for the study area, this self-assessment process only takes into consideration the historical values of the Place. TfNSW is advised that as this assessment does not take into consideration the Indigenous or natural values for the CHL Place, this assessment should only be accepted when looked at in conjunction with the results of the Aboriginal values self-assessment (provided by the third party consultancy).

Based on the assessment, the proposed works are considered to be small scale, low intensity and localised to the area, thus the impact to the historical heritage values of the Place is considered to be minor. As the proposed works are required to ensure the continued safety of drivers using the road way and bridge, the impacts to the CHL Place have been deemed necessary. Although some of these impacts would not be reversible, they are not large enough to be classified as an adverse impact to the entirety of the CHL Place. The TfNSW project team will endeavour to minimise the impact of the proposed works on the Cubbitch Barta National Estate Area during the design stage.

The proposed works would impact Woronora River Bridge's aesthetic and representative significance. The development of detailed concept designs based on previous heritage advice from Biosis has resulted in a proposal which is sympathetic in bulk and form, but will be distinct from the original structure. Elements such as the sandstone block facing of the abutments is also proposed to be salvaged and reused as part of the project where possible. While Woronora River Bridge would no longer be a largely unmodified bridge dating between 1925-1948 remaining in NSW, the proposed works do not diminish the item's heritage significance to the extent that the works are unacceptable from a heritage perspective. Aesthetically and technically, the Woronora River Bridge remains a large and impressive structure featuring clean modern lines, curved beam profiles and octagonal piers, with its construction in rugged terrain, and at a high level above permanent water, constituting a technical achievement at a State level. Similarly, despite the aesthetic change the proposed works would bring, these key features of the item's design and construction remain, and are emphasised in the cantilevered steel box girders and echoed in the octagonal knuckle heads at the piers. The item also remains the only RTA owned concrete bridge in NSW to exceed 80 metres in length, retaining its status as a rare example of high aesthetic and technical achievement at a State level. Similarly, the proposal does not alter the historical significance of the bridge and the role it played during WWII. The Woronora-Penshurst Pipeline would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. The Kolara Weir would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. However, there may be some temporary visual impacts during the period of construction. The proposed works would both directly and indirectly impact Heathcote Road, and its associated infrastructure.

The concept design is considered acceptable from a heritage perspective, with conditions based on the mitigation measures outlined in Section 7.3 and the recommendations below and in Section 8.2.

Recommendations

The following recommendations have been formulated to respond to client requirements and the significance of the site. They are guided by the ICOMOS *Burra Charter* with the aim of doing as much as necessary to care for the place and make it useable and as little as possible to retain its cultural significance.[1]

[1] Australia ICOMOS 2013 Australia ICOMOS 2013

Recommendation 1 Staged heritage review of detailed design.

In order to ensure the protection of heritage values throughout the detailed design process, it is recommended that heritage reviews take place at stages of the design development process. It is recommended that heritage reviews occur at 30%, 80% and 100% design stages.

Recommendation 2 Conservation Management Plan

Preparation of a Conservation Management Plan (CMP) for the Woronora River Bridge is required to outline how the heritage fabric of Woronora River Bridge should be managed on an ongoing basis. As noted above, while the proposal will result in the item no longer being a largely unmodified bridge dating between 1925-1948 remaining in NSW, the item still retains State heritage significance for its technical achievement and also remains the only Roads and Traffic Authority (RTA), now TfNSW, owned concrete bridge in NSW to exceed 80 metres in length. As such, a CMP would be an appropriate management document. This is in line with the NSW *Heritage Manual* and its associated guidelines, including the *Statements of Heritage Impact*.[2] This CMP should also investigate the establishment of an extended heritage precinct for Woronora River Bridge, Kolara Wier and former recreation area, and the extant remains of Heathcote Creek bridge as an area of local and State heritage significance.

Recommendation 3 Reduce impacts to heritage significance of Woronora River Bridge

In order to reduce permanent direct and indirect impacts to Woronora River Bridge, the following should be undertaken or implemented as part of the detailed design and planning stages:

- Retain as much of the original fabric of Woronora River Bridge where possible.
- Use sympathetic colour shades and texture for steel paint finishes of the box girders and headstock extensions.
- Undertake colour and material matching for repair and maintenance works.
- An appropriately qualified structural engineer to undertake an assessment of structural integrity for each element to be removed and/or replaced prior to removal as part of repair and maintenance works. Only replace elements which are at risk of failing.
- Salvage sandstone block facing from abutments and incorporate their use into the project or potential heritage precinct.
- Use discrete fencing with hoarding or fabric for Woronora River Bridge during works.

Recommendation 4 Reduce impacts to other heritage items

In order to reduce temporary indirect impacts during works, the following should be implemented:

- Use discrete fencing with hoarding or fabric for Woronora River Bridge during works.
- Regularly monitor vibration levels during works.
- Undertake an archival recording of heritage items associated with Heathcote Road to be directly impacted by the works prior to impacts occuring.
- Erect an exclusion zone around the survey marker (if relocated) until an archival recording and salvage of the item is conducted. The survey marker to be used as part of interpretative display.

[2] Heritage Office & DUAP 1996a, Heritage Office & DUAP 1996b Heritage Office & DUAP 1996a, Heritage Office & DUAP 1996b

Recommendation 5 Archival recording

An archival recording of the Woronora River Bridge and any associated infrastructure should be undertaken prior to any impacts. To ensure total impacts are catalogued, an archival recording of the Woronora River Bridge is also recommended after the conclusion of works.

Recommendation 6 Construction Heritage Management Sub-Plan

In order to avoid impacts to unidentified or unlocatable heritage items, it is recommended that the following are included in a Construction Heritage Management Sub-Plan:

- Heritage induction for all site workers to provide them with information regarding the heritage significance of various components of the study area and penalties under the *Heritage Act 1977* (Heritage Act).
- Unexpected finds procedure, using the Roads and Maritime Services *Unexpected Heritage Items: Heritage Procedure 02*.[3]

[3] Roads and Maritime Services 2015 Roads and Maritime Services 2015

1 Introduction

1.1 `Project background

Biosis was commissioned by TfNSW to undertake a heritage assessment and SoHI for the proposed Heathcote Road Bridge repair and construction project located at Woronora River Bridge, between Heathcote and Lucas Heights along Heathcote Road, NSW (Figure 1 and Figure 2), referred to as the study area herein. Key features of the proposal include:

- Widening of the existing bridge by widening the headstocks and placing new steel girders on either side of the existing bridge. This will widen the lane widths from 3.05 metres to 3.5 metres plus 1.2 metre shoulders; the current shoulder width is 300 millimetres.
- Minor cutting back of the slope face at pinch points on the northern and southern bridge approaches to improve lane width on both approaches.
- Construct widened road pavement and associated retaining wall structures.
- Abutment modification works on both northern and southern sides.
- Drainage infrastructure, including extension of existing cross culverts.
- Utilities adjustment (optic fibre).

These features seek to address the current safety hazards present on the Woronora River Bridge and its approaches. Current shoulder width measures 300 millimetres. Several collisions and other accidents have showed this width to be inadequate for safety standards.

The following bridge repair and maintenance works are also proposed:

- Pier protection, anti-carbonation coating.
- Repairs of cracking and concrete spalling.
- Replacement of expansion joints and bridge bearings.

These repairs and maintenance works seek to preserve the bridge and ensure it remains usable (Figure 3).

The proposed development would be assessed in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979 NSW* (EP&A Act).

1.2 Location of the study area

The study area is located on the border of Heathcote, Engadine and Holsworthy, Sutherland Shire Local Government Area (LGA) (Figure 1). It surrounds the Woronora River Bridge, located along Heathcote Road. It encompasses 3.6 hectares of public and restricted land and road reserves. The study area is partially located within Holsworthy Military land and Australia's Nuclear Science and Technology Organisation (ANSTO) land. The area also contains two nominated compound sites (Figure 2). These areas are to be used as staging areas for the storage of equipment.

1.3 Scope of assessment

This report was prepared in accordance with current heritage guidelines including *Assessing Heritage Significance*, *Assessing Significance for Historical Archaeological Sites and 'Relics'* and the *Burra Charter.*[4][5] This report provides a heritage assessment to identify if any heritage items or relics exist within or in the vicinity of the study area. The heritage significance of these heritage items has been investigated and assessed in order to determine the most appropriate management strategy.

The following is a summary of the major objectives of the assessment:

- Identify and assess the heritage values associated with the study area. The assessment aims to achieve this objective through providing a brief summary of the principle historical influences that have contributed to creating the present – day built environment of the study area.
- Identifying sites and features within the study area which are already recognised for their heritage value through statutory and non – statutory heritage listings.
- Assess the impact of the proposed works on the cultural heritage significance of the study area.
- Recommend measures to avoid or mitigate any negative impacts on the heritage significance of the study area.

1.4 Limitations

The historical aerial imagery over the study area was of low resolution and was obscured by tree cover. Historical documentation reported that several structures were present within the study area throughout its occupation, however these structures could not be located based on aerial imagery alone. The field investigation was able to relocate some of these structural remnants, refuting this low aerial visibility. Some of the limitations of the historical aerial imagery were overcome during the field investigation.

The two nominated compound areas were not inspected as part of the site visit. These locations have been subjected to a desktop-based archaeological assessment.

This report is based on historical research and field inspections. It is possible that further historical research or the emergence of new historical sources may support different interpretations of the evidence in this report.

Although this report was undertaken to best archaeological practice and its conclusions are based on professional opinion, it does not negate the possibility that additional archaeological material will be located during subsequent work on the site. This is because limitations in historical documentation and archaeological methods make it difficult to accurately predict what is under the ground.

The significance assessment presented in this report is a combination of both facts and interpretation of those facts in accordance with a standard set of assessment criteria. It is possible that another professional may interpret the historical facts and physical evidence in a different way.

[4] Heritage Office 2001 Heritage Office 2001
[5] Australia ICOMOS 2013 Australia ICOMOS 2013

Parts of the study area along Heathcote Road on the approaches to Woronora River Bridge were not accessible due to difficult terrain, including more than 8 metre high vertical rock cuttings and live road traffic. Though they could not be accessed on foot, all efforts were made to observe the areas from vantage points such as from the opposite side of the road corridor behind guard rails, and from the base of cuttings where accessible (i.e. along the access point for the access track).

Figure 1 Location of the study area

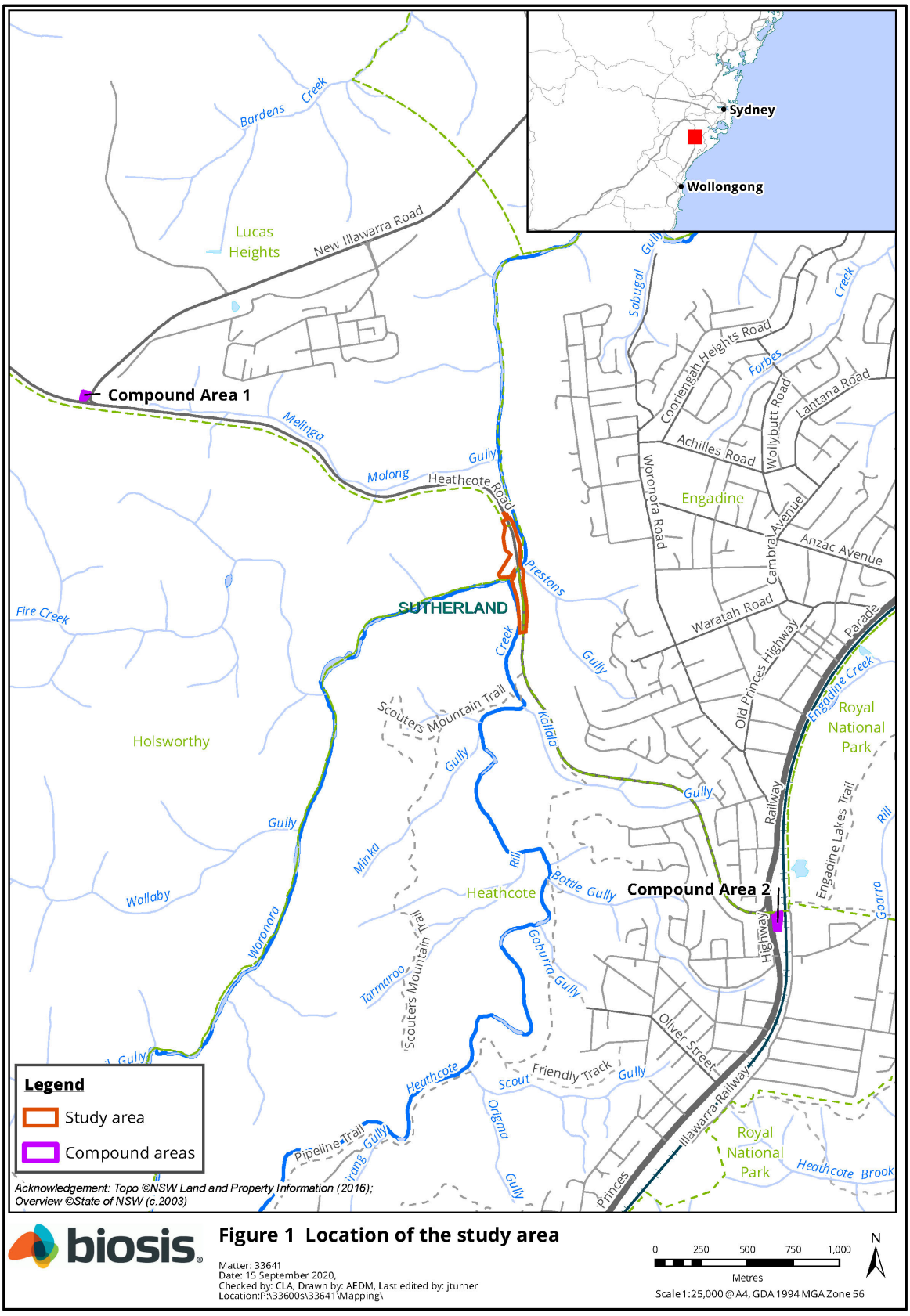

Figure 2 Study area detail

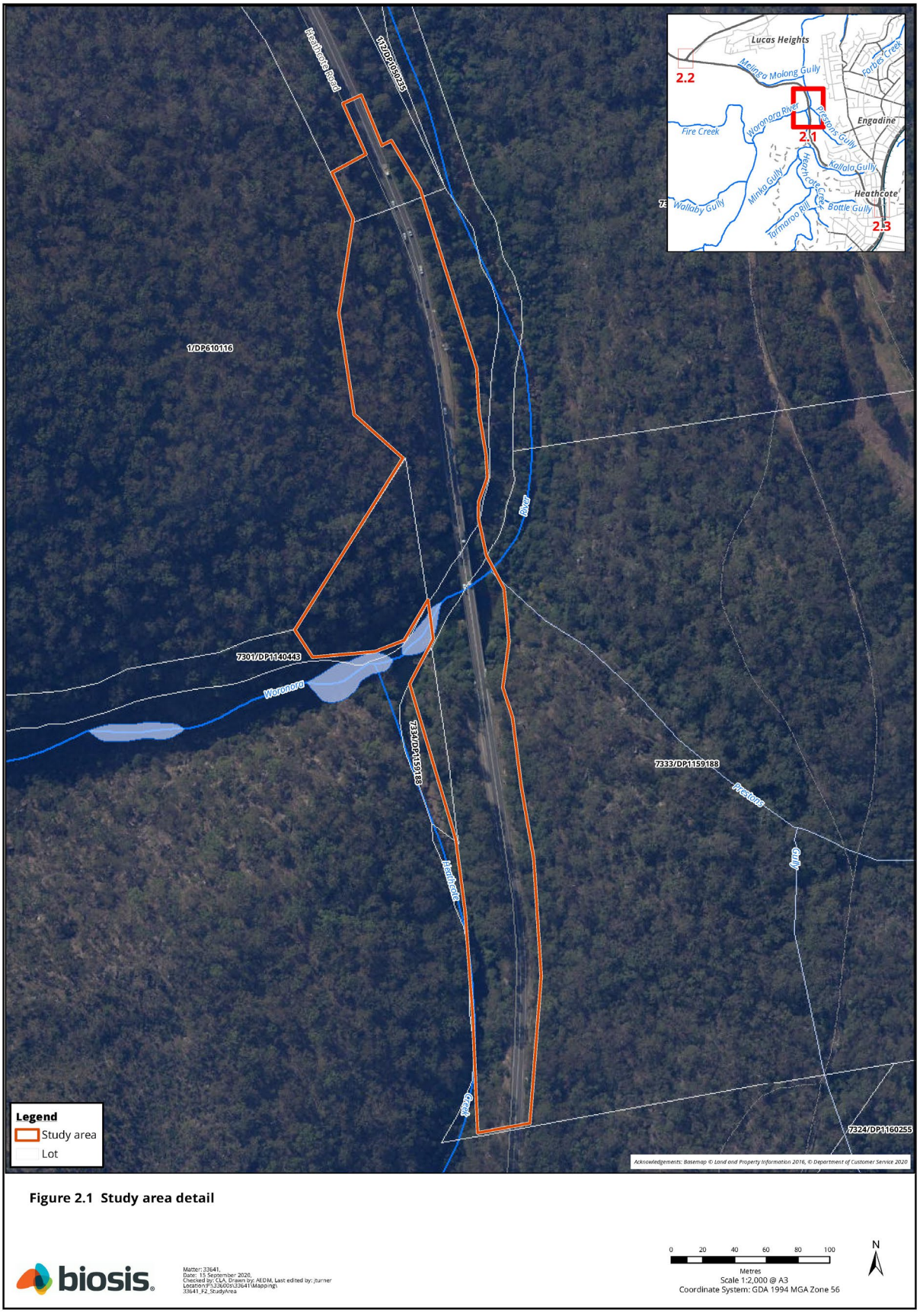

Figure 2.2

Compound Area 1
New Illawarra Road
New Illawarra Road
New Illawarra Road
Heathcote Road
101/DP1009354
1/DP610116
112/DP105023
Lucas Heights
Engadine
Heathcote
Melinga Molong Gully
Forbes Creek
Woronora River
Fire Creek
Prestons Gully
Kallaroo Gully
Minka Gully
Heathcote Creek
Wallaby Gully
Tarmaroo Rill
Bottle Gully
2.1
2.2
2.3
Legend
Study area
Compound areas
Lot
Acknowledgements: Basemap © Land and Property Information 2016, © Department of Customer Service 2020

Figure 2.2 Study area detail

biosis.

Matter: 33641,
Date: 15 September 2020,
Checked by: CLA, Drawn by: AEDM, Last edited by: jturner
Location:P:\33600s\33641\Mapping\
33641_F2_StudyArea

0 10 20 30 40 50
Metres
Scale 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56
N

Figure 2.3


Lucas Heights
Malinga Malong Gully
Forbes Creek
2.2
Woronora River
Fire Creek
Prescots Gully
Engadine
2.1
Kallala Gully
Minko Gully
Wallaby Gully
Tarmaroo Hill
Bottle Gully
Heathcote
2.3
East Heathcote Trail
Heathcote Road
Princes Highway
Illawarra Railway
Wilson Parade
Compound Area 2
Prahran Road
Denmark Place
June Place
5/DP31888
6/DP1142569
13/DP240360
3/DP240360
5/DP240360
4/DP240360
6/DP240360
7/DP240360
8/DP240360
10/DP240360
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23/DP241456
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1/DP549778
4/DP1184025
10/DP1110571
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Legend
Study area
Compound areas
Lot
Acknowledgements: Basemap © Land and Property Information 2016, © Department of Customer Service 2020
Figure 2.3 Study area detail
biosis
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Location:P:\33600s\33641\Mapping\33641_F2_StudyArea
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Metres
Scale 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56
N

Figure 3 Proposed works

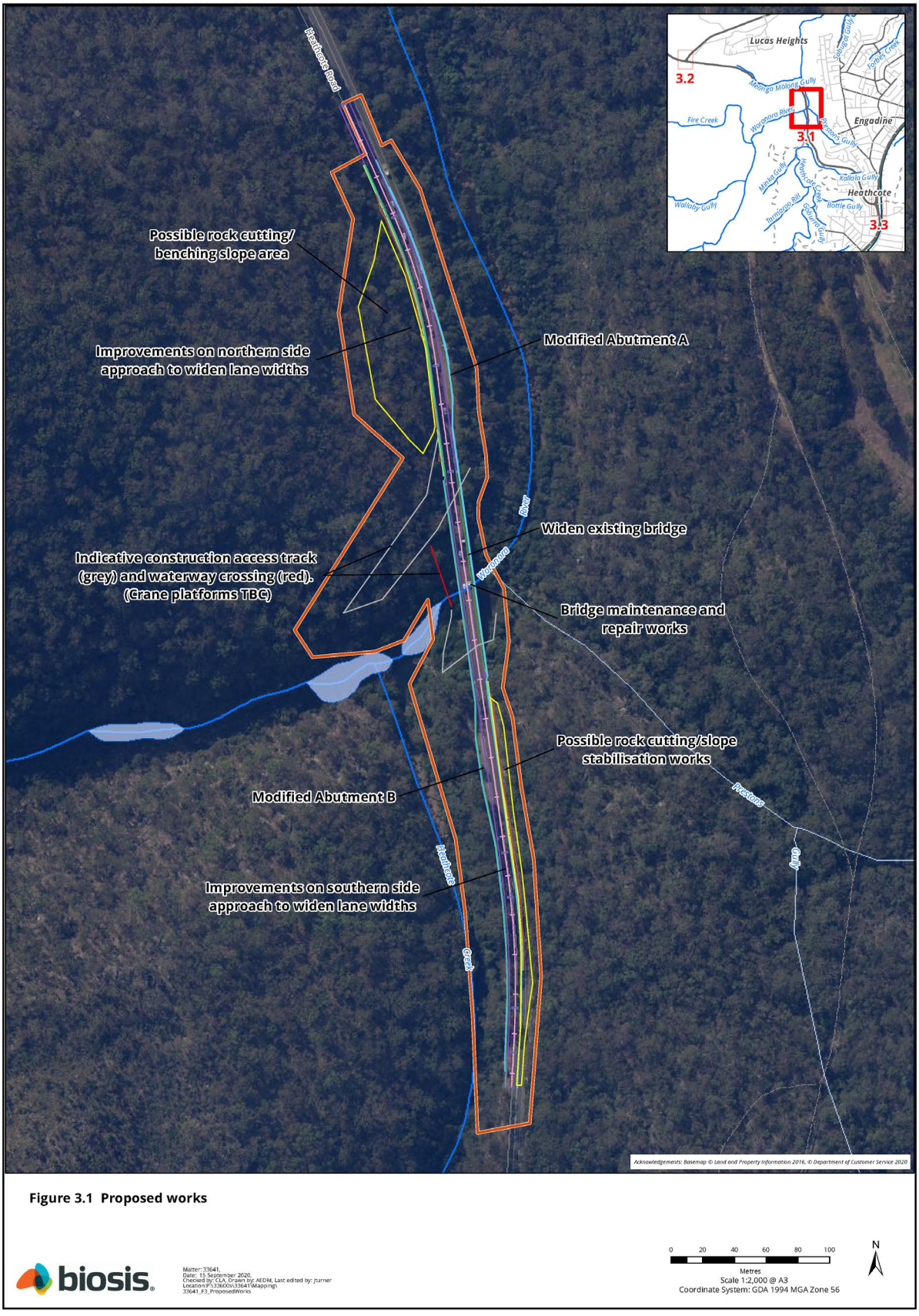

Figure 3.2


Lucas Heights
3.2
Menngo Moiong Gully
Fire Creek
Woronora River
3.1
Engadine
Heathcote
3.3
New Illawarra Road
Compound 1
New Illawarra Road
New Illawarra Road
Heathcote Road
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Figure 3.3

Figure 3.3 Proposed works

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Metres
Scale 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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2 Legislative Requirements

This assessment will support a Review of Environmental Factors (REF) under Part 5 of the EP&A Act. In NSW cultural heritage is managed in a three-tiered system: national, state and local. Certain sites and items may require management under all three systems or only under one or two. The following discussion aims to outline the various levels of protection and approvals required to make changes to cultural heritage in the state.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the National Act protecting the natural and cultural environment. The EPBC Act is administered by the Department of the Environment and Energy (DEE). The EPBC Act establishes two heritage lists for the management of the natural and cultural environment:

- The National Heritage List (NHL) contains items that have been assessed to be of outstanding significance and define 'critical moments in our development as a nation'.[6]
- The Commonwealth Heritage List (CHL) contains natural and cultural heritage places that are on Commonwealth land, in Commonwealth waters or are owned or managed by the Commonwealth. A place or item on the CHL has been assessed as possessing 'significant' heritage value.[7]

A search of the NHL and CHL yielded one item in the vicinity of the study area:

- The NHL lists the Royal National Park and Garawarra State Conservation Area (Item no. 3403-3421, A3422-A3448), which is located approximately 2 kilometres south-east of the study area.

One item is located within the study area:

- The CHL lists the Cubbitch Barta National Estate Area (Item no. 105405), which is located within the north-west of the study area and extends to the west of the study area.

2.2 NSW Heritage Act 1977

Heritage in NSW is principally protected by the Heritage Act (as amended) (which aims to conserve items of environmental heritage in NSW. Environmental heritage is broadly defined under Section 4 of the Heritage Act as consisting of the following items: '*those places, buildings, works, relics, moveable objects, and precincts, of State or Local heritage significance*'. The Act is administered by the Heritage Council, under delegation by the Heritage Division, Heritage NSW. The Heritage Act is designed to protect both known heritage items (such as standing structures) and items that may not be immediately obvious (such as potential archaeological remains or 'relics'). Different parts of the Heritage Act deal with different situations and types of heritage and the Act provides a number of mechanisms by which items and places of heritage significance may be protected.

[6] 'About National Heritage' http://www.environment.gov.au/heritage/about/national/index.html
[7] 'Commonwealth Heritage List Criteria' http://www.environment.gov.au/heritage/about/commonwealth/criteria.html

2.2.1 State Heritage Register

Protection of items of State heritage significance is by nomination and listing on the State Heritage Register (SHR) created under Part 3A of the Heritage Act. The Register came into effect on 2 April 1999. The Register was established under the *Heritage Amendment Act 1998*. It replaces the earlier system of Permanent Conservation Orders as a means of protecting items with State significance.

A permit under Section 60 of the Heritage Act is required for works on a site listed on the SHR, except if that work complies with the conditions for exemptions to the requirement for obtaining a permit. Details of which minor works are exempted from the requirements for a Section 60 Application can be found in the Guideline 'Standard Exemptions for Works requiring Heritage Council Approval'. These exemptions came into force on 5 September 2008 and replace all previous exemptions.

There are no items or conservation areas listed on the SHR within the study area.

2.2.2 Archaeological relics

Section 139 of the Heritage Act protects archaeological *'relics'* from being *'exposed, moved, damaged or destroyed*' by the disturbance or excavation of land. This protection extends to the situation where a person has *'reasonable cause to suspect'* that archaeological remains may be affected by the disturbance or excavation of the land. This section applies to all land in NSW that is not included on the SHR.

Amendments to the Heritage Act made in 2009 changed the definition of an archaeological 'relic' under the Act. A 'relic' is defined by the Heritage Act as:

> *Any deposit, object or material evidence:*
>
> *(a) Which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
>
> *(b) Which is of State or Local significance.*

It should be noted that not all remains that would be considered archaeological are recognised as relics under the NSW Heritage Act. Advice given in the Archaeological Significance Assessment Guidelines is that a 'relic' would be viewed as a chattel and it is stated that,

> *'In practice, an important historical archaeological site will be likely to contain a range of different elements as vestiges and remnants of the past. Such sites will include 'relics' of significance in the form of deposits, artefacts, objects and usually also other material evidence from demolished buildings, works or former structures which provide evidence of prior occupations but may not be "relics".'*[8]

A 'work' could include (but is not excluded to) former road surfaces and kerbs, drainage culverts, retaining walls, cisterns or wells, cesspits, and railway or tram tracks. A 'work' may or may not hold heritage significance.

If a relic, including shipwrecks in NSW waters (that is rivers, harbours, lakes and enclosed bays) is located, the discoverer is required to notify the NSW Heritage Council under Section 146 of the Heritage Act.

Section 139 of the Heritage Act requires any person who knows or has reasonable cause to suspect that their proposed works will expose or disturb a 'relic' to first obtain an Excavation Permit from the Heritage Council of NSW (pursuant to Section 140 of the Act), unless there is an applicable exception (pursuant to Section 139(4)). Excavation permits are issued by the Heritage Council of NSW in accordance with Sections 60 or 140 of the Heritage Act. It is an offence to disturb or excavate land to discover, expose or move a relic without

[8] NSW Heritage Branch, Department of Planning 2009, p.7 NSW Heritage Branch, Department of Planning 2009, p.7)

obtaining a permit. Excavation permits are usually issued subject to a range of conditions. These conditions will relate to matters such as reporting requirements and artefact cataloguing, storage and curation.

Exceptions under Section 139(4) to the standard Section 140 process exist for applications that meet the appropriate criterion. An application is still required to be made. The Section 139(4) permit is an exception from the requirement to obtain a Section 140 permit and reflects the nature of the impact and the significance of the relics or potential relics being impacted upon.

If an exception has been granted and, during the course of the development, substantial intact archaeological relics of state or local significance, not identified in the archaeological assessment or statement required by this exception, are unexpectedly discovered during excavation, work must cease in the affected area and the Heritage Office must be notified in writing in accordance with Section 146 of the Heritage Act. Depending on the nature of the discovery, additional assessment and, possibly, an excavation permit may be required prior to the recommencement of excavation in the affected area.

2.2.3 Section 170 Heritage and Conservation Registers

Section 170 of the Heritage Act requires that culturally significant items or places managed or owned by Government agencies are listed on a departmental Heritage and Conservation Register. Information on these registers has been prepared in accordance with Heritage Council guidelines. Listing of a heritage asset on a heritage and conservation register does not in itself create an obligation to obtain the Heritage Council's approval for works. The Heritage Council's approval is only required for assets listed on the SHR, or subject to an interim heritage order under the Heritage Act. The provisions for archaeological relics under the Heritage Act as described in Section 2.2.2 continue to apply for any archaeological sites or any areas of archaeological potential associated with a heritage item listed on a s170 Heritage and Conservation Register.

S170A(1) requires that, if a government instrumentality intends to undertake any of the following actions regarding items listed on their s170 Heritage and Conservation Register, it must give the Heritage Council a minimum of 14 days' notice of a proposal to:

- Remove an item from the s170 Register;
- Transfer ownership;
- Cease to occupy an item currently on the Register;
- Demolish an item.

Government agencies are also required to annually report on the status of heritage assets under their ownership, control or management in accordance with s170A(4) of the Heritage Act. The reporting must include the following information:

- Any information relating to the Heritage and Conservation Register prepared under s170.
- Compliance with the Guidelines disseminated by the Heritage Council in January 2005.
- A statement on the condition of all of the items and land on the Register.

There is one item within the study area that is entered on a State government s170 Register:

- Woronora River Bridge, RTA Bridge No. 152. (Roads and Maritime Services s170 Heritage and Conservation Register), located over Woronora River along Heathcote Road, Heathcote. This item is situated in the central portion of the study area.

There is also one item located in the vicinity of the study area:

- Woronora-Penshurst Pipeline (Item No. 4570509, Sydney Water s170 Heritage and Conservation Register), from Woronora Dam to Penshurst reservoirs, via former Como railway bridge across Georges River, MGA Zone 56, 316075°E, 6230855°N. This locally listed item runs north-south, approximately 200 metres to the east of the study area.

2.3 Environmental Planning and Assessment Act 1979

2.3.1 Sutherland Shire Local Environmental Plan 2015

The Sutherland Shire LEP contains schedules of heritage items that are managed by the controls in the instrument. Council is responsible for approving controlled work to heritage items listed under the Sutherland Shire LEP via the development application system. However, as the proposal is subject to assessment under Division 5.1 (Part 5) of the EP&A Act, consent from Council is not required. Heritage items within, and in the vicinity of, the proposal area are identified in Figure 4.

There are three heritage items or conservation areas of local heritage significance located within the vicinity of the study area:

- Kolora Weir, (LEP Item No.A1801), West of Heathcote Road and Woronora River Bridge on the Woronora River. This item is situated approximately 100 metres west of the study area.
- Royal National Park (Item No. 3403-3421, A3422-A3448), at the Junction of Audley Road and Sir Bertram Stevens Drive, located approximately 2 kilometres east of the study area.
- Woronora-Penshurst Pipeline, (LEP Item No. A4302). Along Heathcote Road, south-east of the study area.

There are no heritage items or conservation areas of local heritage significance located within the study area.

It should be notedthat the repealed Sutherland Shire LEP 2006 listed Heathcote National Park as an item of State heritage significance (Item No. A098); part of this item is contained in the southern corner of the study area and further south-west. While there remains a State Heritagey Inventory listing for Heathcote National Park, the current Sutherland Shire LEP does not includethis item within Schedule 5 – Environmental Heritage. The Heathcote National Park is not listed under a current statutory instrument.

2.3.2 Sutherland Shire Development Control Plan 2015

The *Sutherland Shire Development Control Plan 2015* (DCP) outlines built form controls to guide development. The Sutherland Shire DCP supplements the provisions of the Sutherland Shire LEP.

There are no conditions relating to heritage contained within the DCP.

2.4 Summary of heritage listings

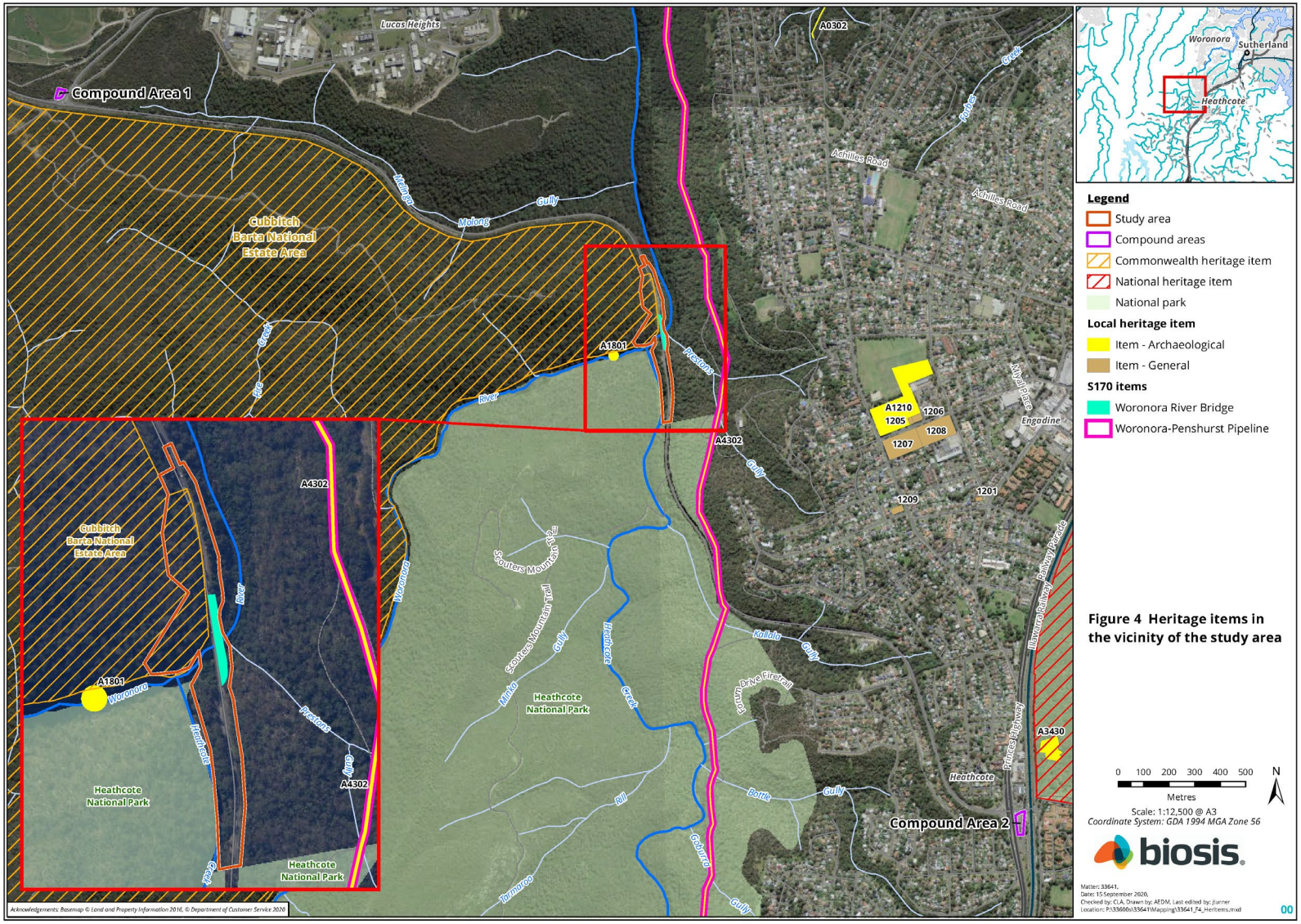
A summary of heritage listings within, and in the vicinity of, the study area is presented in Table 1 and Figure 4.

Table 1 Summary of heritage listings within and adjacent to the study area

Site number	Site name	Address / Property description	Listings		Significance as designated per heritage listing
			Individual item	As a Conservation Area	
-	Woronora River Bridge, RTA Bridge No. 152.	Located over Woronora River along Heathcote Road, Heathcote.	RMS Section 170 Heritage and Conservation Register		Not designated
105405	Cubbitch Barta National Estate Area	Old Illawarra Road and Holsworthy. within and extending north-west of the study area		Commonwealth Heritage List	Commonwealth
A1801	Kolora Weir	West of Heathcote Road and Woronora River Bridge on the Woronora River	Sutherland Shire LEP 2015		Local
A4302/4570509	Woronora-Penshurst Pipeline	Along Heathcote Road. Within the south-east of the study area.	Sutherland Shire LEP 2015		Local
			Sydney Water Section 170 Heritage and Conservation Register		
3403-3421, A3422-A3448	Royal National Park and Garawarra State Conservation Area	On the Audley Road, Sir Bertram Stevens Drive, Bonie Vale and Burraneer Headland, Dark Bay and Carruthers Bay, Princess Highway and Port hacking, Warumbul Road.	Sutherland Shire LEP 2015	National Heritage list	Local, National

Site number	Site name	Address / Property description	Listings		Significance as designated per heritage listing
			Individual item	As a Conservation Area	
3402	Royal National Park - Audley Group	At the Junction of Audley Road and Sir Bertram Stevens Drive, 2 kilometres east of the study area.	Sutherland Shire LEP 2015		State

Figure 4 Heritage items in the vicinity of the study area



3 History

Historical research has been undertaken to identify the land use history of the study area, to isolate key phases in its history and to identify the location of any built heritage or archaeological resources which may be associated with the study area. The historical research places the history of the study area into the broader context of Military, civil engineering and transport throughout NSW.

3.1 Topography and resources

The study area is located on the lower slopes and valleys of the Woronora Plateau along the Woronora River. This topography overlies Hawkesbury sandstone consisting of course-grained quartz sandstone with miner shale and laminate lenses.[9] The study area is also situated in the Hawkesbury soil landscape with features a variable topography of rolling to very steep hills. The local relief is 100-200 metres and the slope gradient is between 20-70%. Valleys like those in the study area are narrow (20-100 metres). The Hawkesbury landscape contains uncleared woodland and open, dry sclerophyll forest. On valleys and slopes, Silvertop Ash *Eucalyptus sieberi*, Sydney Peppermint *E. piperita*, Smooth-barked Apple *Angophora costata* and Black She-oak *Allocasuarina littoralis* predominates. The understorey contains shrub species of the families *Epacridaceae*, *Myrtaceae*, *Fabaceae* and *Proteaceae*.[10] Land use in this landscape has mostly been as National Park, including the Royal National Park which is partly situated within the study area. The area is also used extensively for military exercises and training associated with the military base at Heathcote.[11]

Woronora River intersects the study area. It is the largest tributary of the Georges River, originating at the Waratah rivulet. Its main branches include Forbes creek, Still Creek and Heathcote Creek (adjacent to the study area).[12] Much of the region surrounding Woronora River is considered national park, including the Cubbitch Barta National Estate Area on the north-western side of the study area and Heathcote National Park in the south. This reserve contains considerable evidence of Aboriginal occupation, including art and rock shelter sites. The Woronora River system would have provided exceptional resources to be utilised by Aboriginal people in the past.

3.2 Aboriginal past

It is generally accepted that people have inhabited the Australian landmass for the last 50,000 years.[13] Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. Our knowledge of Aboriginal people and their land-use patterns and lifestyles prior to European contact is mainly reliant on documents written by non-Aboriginal people. These documents are affected by the inherent bias of the class and cultures of their authors, who were also often describing a culture that they did not fully understand - a culture that was in a heightened state of disruption given the arrival of settlers and disease. Early written records can, however, be used in conjunction with archaeological information and surviving oral histories from members of the Aboriginal community in order to gain a picture of Aboriginal life in the region.

[9] Hazelton & Tille 1990, pp. 45 Hazelton & Tille 1990, pp. 45
[10] Hazelton & Tille 1990, pp. 46 Hazelton & Tille 1990, pp. 46
[11] Hazelton & Tille 1990, pp. 47 Hazelton & Tille 1990, pp. 47
[12] AWT 2000 AWT 2000
[13] Allen & O'Connell 2003 Allen & O'Connell 2003

Despite a proliferation of Aboriginal heritage sites there is considerable ongoing debate about the nature, territory and range of pre-contact Aboriginal language groups in the greater Sydney region. These debates have arisen largely because, by the time colonial diarists, missionaries and proto-anthropologists began making detailed records of Aboriginal people in the late 19th century, pre-European Aboriginal groups had been broken up and reconfigured by European settlement activity. The following information relating to Aboriginal people in the Sutherland Shire is based on such early records.

There is some confusion relating to group names, which can be explained by the use of differing terminologies in early historical references. Language groups were not the main political or social units in Aboriginal life. Instead, land custodianship and ownership centred on the smaller named groups that comprised the broader language grouping. Although, there is some variation in the terminology used to categorise these smaller groups, the terms used by Attenbrow will be used here.[14] Attenbrow suggests that a total of four dialects were spoken in the Sydney region:[15]

- Darug coastal dialect/s - the Sydney Peninsula (north of Botany Bay, south of Port Jackson, west to Parramatta), as well as the country to the north of Port Jackson, possibly as far as Broken Bay.
- Darug hinterland dialect - on the Cumberland Plain from Appin in the south to the Hawkesbury River in the north; west of the Georges River, Parramatta, the Lane Cove River and Berowra Creek.
- Dharawal - from south side of Botany Bay, extending south as far as the Shoalhaven River; from the coast to the Georges River and Appin, and possibly as far west as Camden.
- Gundungurra - southern rim of the Cumberland Plain west of the Georges River, as well as the southern Blue Mountains.

Today, the study area is situated in the Gundagara Local Aboriginal Land Council Boundaries.

Following the arrival of European settlers the movement of Aboriginal people became increasingly restricted. Conflict between Europeans and Aboriginal people due to competition over the same resources led to violence. At the same time diseases such as small pox had a devastating effect on the Aboriginal population.[16] Death, starvation and disease were some of the disrupting factors that led to a reorganisation of the social practices of Aboriginal communities after European contact. The formation of new social groups and alliances were made as Aboriginal people sought to retain some semblance of their previous lifestyle.

3.3 Bridge over Woronora River, Heathcote Road – historical development

3.3.1 Exploration of Woronora River, south of Sydney (1789 to 1835)

Early exploration south of Georges River took place shortly after European arrived in NSW. Explorers Bass and Flinders were granted permission to explore south of Botany Bay by Governor Hunter on their ship the *Tom Thumb* in 1796 and announced the discovery of what would be named Port Hacking and the mouth of the Woronora River.[17] From 1811, Governor Hunter allocated land south of Botany Bay and Georges River. The first of these was granted to James Birnie, a mercantile trader who first arrived in Sydney in 1806. Birnie was granted 700 acres (283 hectares) at Kurnell in 1815. By 1821, John Connell a businessman, purchased large land packages within the parishes of Sutherland and Holsworthy. Settlement further south along the Woronora River occurred more slowly, and mentions of the Heathcote area were sparse until the

[14] Attenbrow 2002 Attenbrow 2002
[15] Attenbrow 2002, p.34 Attenbrow 2002, p.34
[16] Attenbrow 2010, p.17 Attenbrow 2010, p.17
[17] Neve n.d., pp. 2 Neve n.d., pp. 2

construction of the Illawarra railway line.[18] In fact, few land grants were granted in the Sutherland Shire and downstream of Woronora River before official Crown land sales in 1856.[19] Prior to 1830, early land grants in the Sutherland Shire were initially granted by promise in order to encourage emancipated convicts and others into farming.

Later, in 1835, the parish of Heathcote, was gazetted. There is little evidence for why the name Heathcote was chosen, although it is suggested that it was the name of several comrades who served with Governor Mitchell during the Peninsular Campaign from 1809-1914.[20] The adjoining parish of Eckersley, which also contains the study area, may have also been named after someone who served with Mitchell. Two small towns are located within the Eckersley Parish near the study area. The area of Lucas Heights was named for John Lucas' flour mill occupied by 1823 but which is no longer considered part of the suburb. Few original land grants existed in the area, as most development took place at Menai and Bangor.[21] The town of Engadine was first settled by Charles McAlister in 1887. Part of the property was in national park lands until 1903.

3.3.2 Early development of towns on the southern end of Woronora River (1835 to 1920)

Surveyors first mapped the area as they journeyed south for the original southern route from Sydney on the Illawarra Road in 1843. This road was eventually replaced by the Princes Highway. The first village in the region was called Bottle Forest, and would later be renamed Heathcote, after the Parish. It is likely this town was small and was laid out in fourteen town allotments in 1842.[22] These allotments were also small, housing large, wealthy manors like Heathcote Hall, built by Issac Harber in the 1880s.[23] Further evidence for these small beginnings comes from a newspaper article written in 1886, which suggests considerations given to the prospect of a railway stop at Bottle Forest was said to be '*extensive…not to be entered upon without due consideration*' .[24] An 1886 plan of a feature survey of the Parish of Heathcote records some detail of the study area. A survey marker tree is recorded near the bend in the Woronora River, and may be located within the study area (Photo 1, Photo 2, Photo 3).[25] In 1879, the Lieutenant-Governor prescribed approximately 7,000 hectares of Crown land as National Park under the Crown Land Alienation Act of 1861.[26] This initial grant led to the later formation of the Royal National Park and the Heathcote National Park to the south-east of the study area. The park was also used early on for timber to supply the surrounding regions.[27] A parish map from 1903 shows the area occupied by the study area was reserved from development (Photo 4, Photo 5, Photo 6). The survey marker tree is recorded on the map; the tree is noted as a gum tree with a broad arrow and a 'D' as the survey mark.

[18] Business Intelligence Team 2018 Business Intelligence Team 2018
[19] Neve n.d., pp. 2 Neve n.d., pp. 2
[20] Business Intelligence Team 2018, pp. 19 Business Intelligence Team 2018, pp. 19
[21] Business Intelligence Team 2018, pp. 29,30 Business Intelligence Team 2018, pp. 29,30
[22] Neve n.d., pp. 9 Neve n.d., pp. 9
[23] 'HISTORIC HEATHCOTE HALL', 5 May1927 'HISTORIC HEATHCOTE HALL', 5 May1927
[24] 'Proposed Railway Line, Bottle Forest to Moss Vale', 1886 'Proposed Railway Line, Bottle Forest to Moss Vale', 1886
[25] NSW Land Registry Services, AO map 3142
[26] 'NATIONAL PARK.' 1879 'NATIONAL PARK.' 1879 'NATIONAL PARK.' 1879 'NATIONAL PARK.' 1879
[27] NSW National Parks and Wildlife Service 2000 NSW National Parks and Wildlife Service 2000

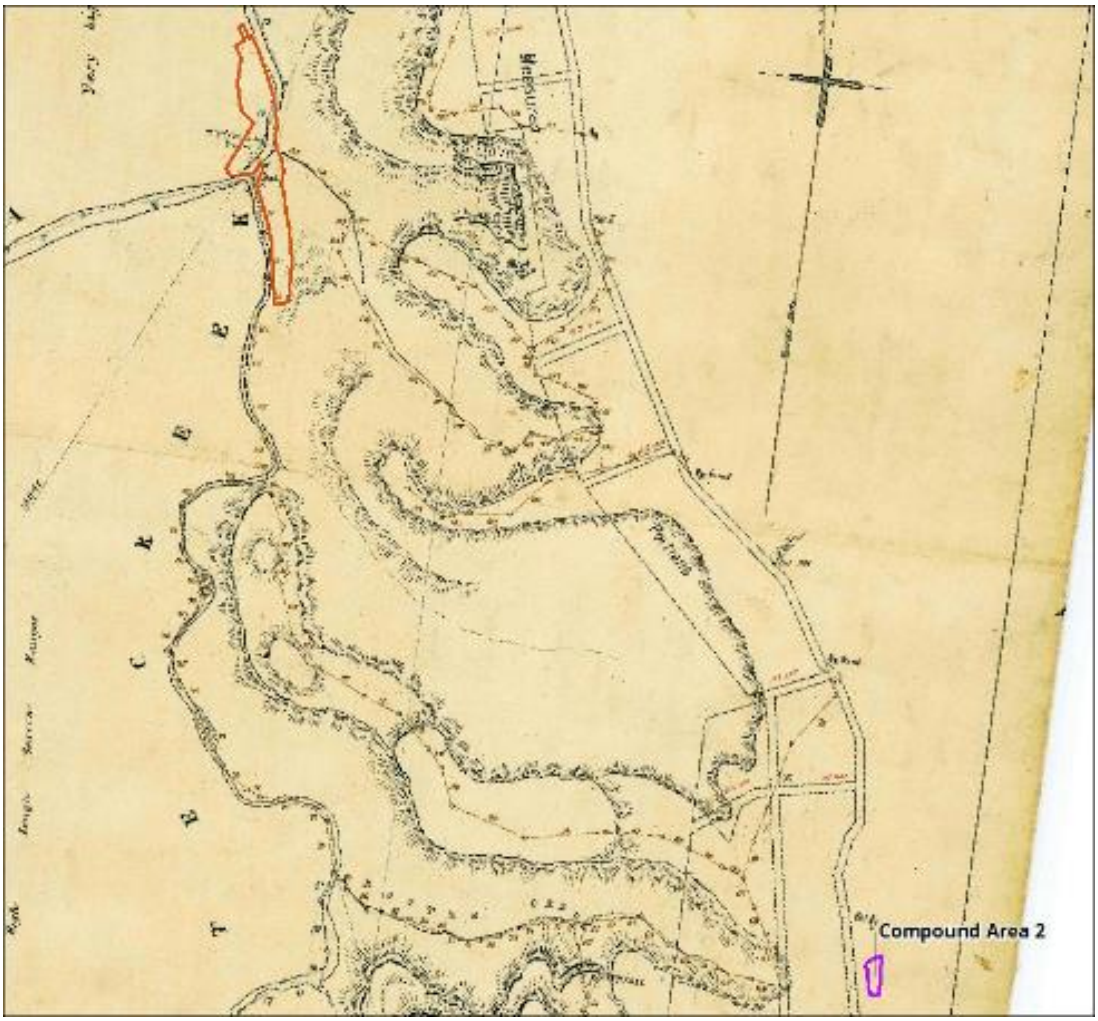


Photo 1 **An 1886 survey plan of Heathcote parish, with the study area and Compound 2 identified (Source: NSW Land Registry Services, AO map 3142)**

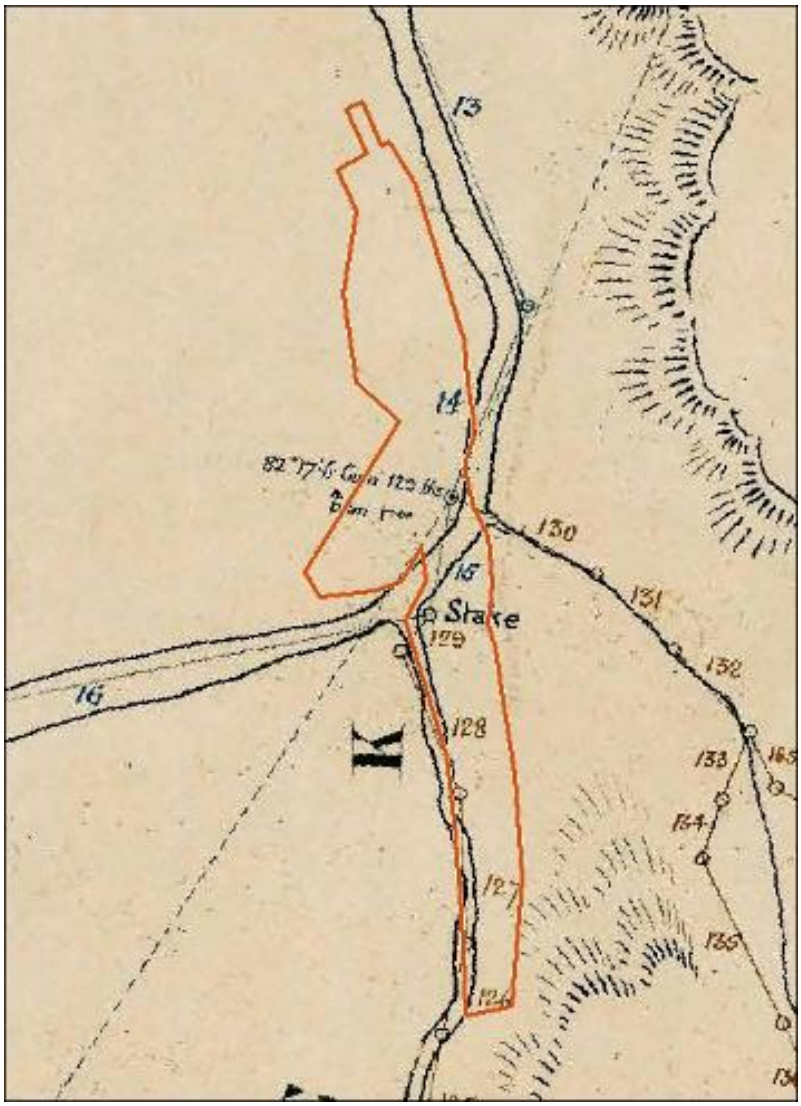


Photo 2 **Detail of an 1886 survey plan of Heathcote parish, with the study area outlined in orange (Source: NSW Land Registry Services, AO map 3142)**

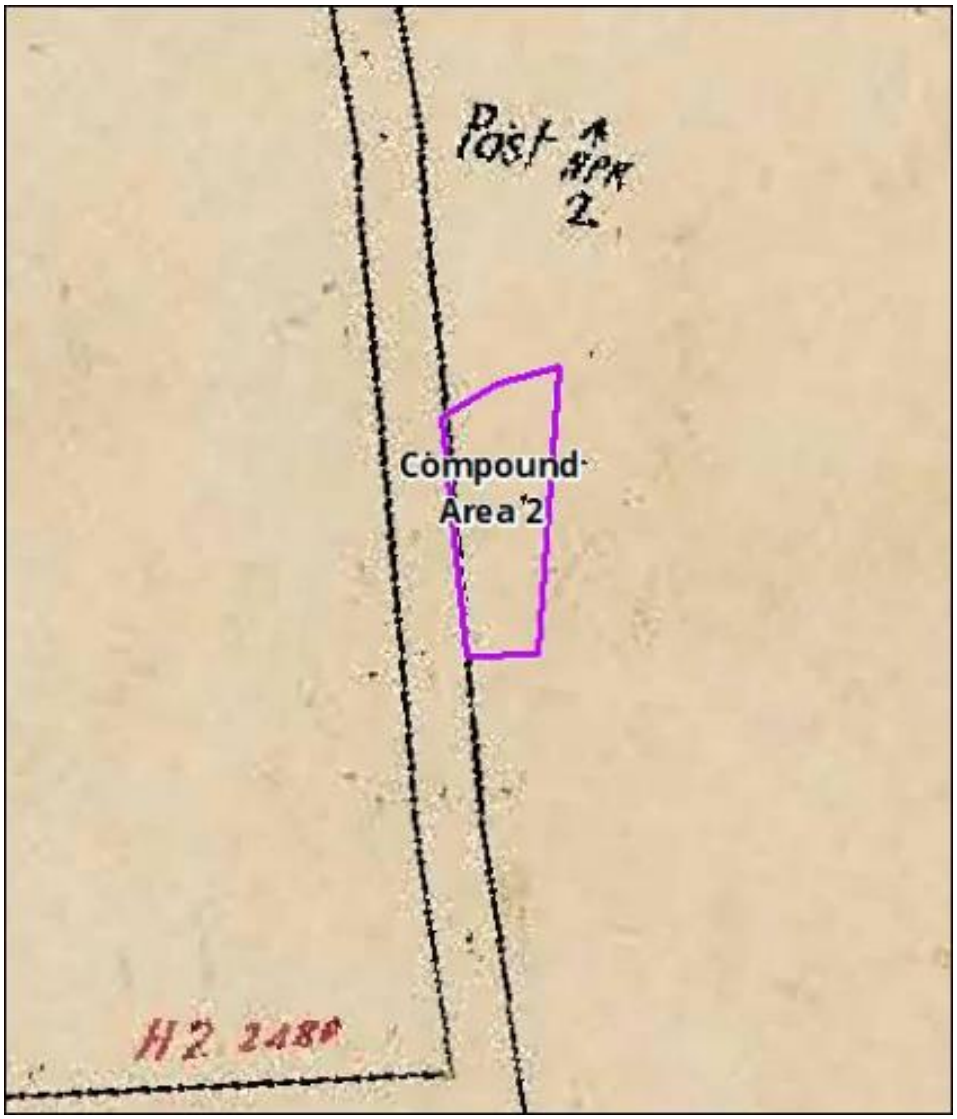


Photo 3 **Detail of an 1886 survey plan of Heathcote parish, with Compound 2 outlined in purple (Source: NSW Land Registry Services, AO map 3142)**

Photo 4 **1903 parish map centered on the study area outlined in orange with Compound 2 outlined in purple (Source: NSW Land Registry Services)**

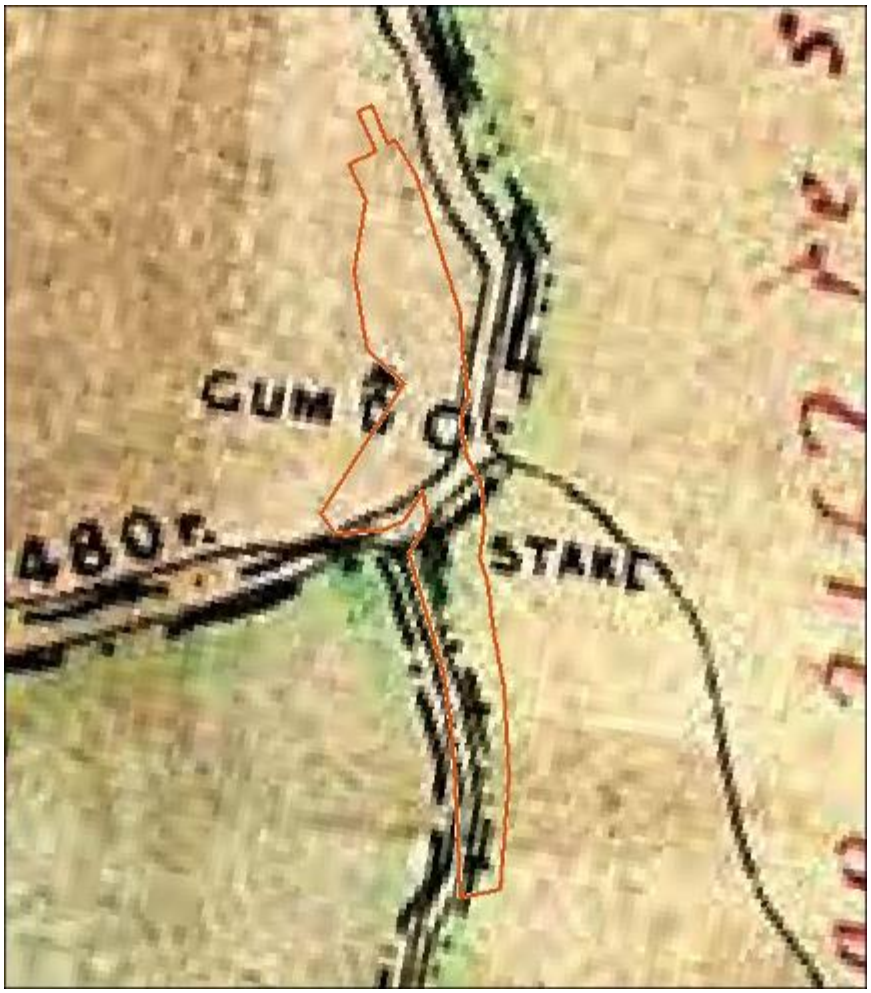


Photo 5 **Detail of 1903 parish map with the study area outlined in orange (Source: NSW Land Registry Services)**

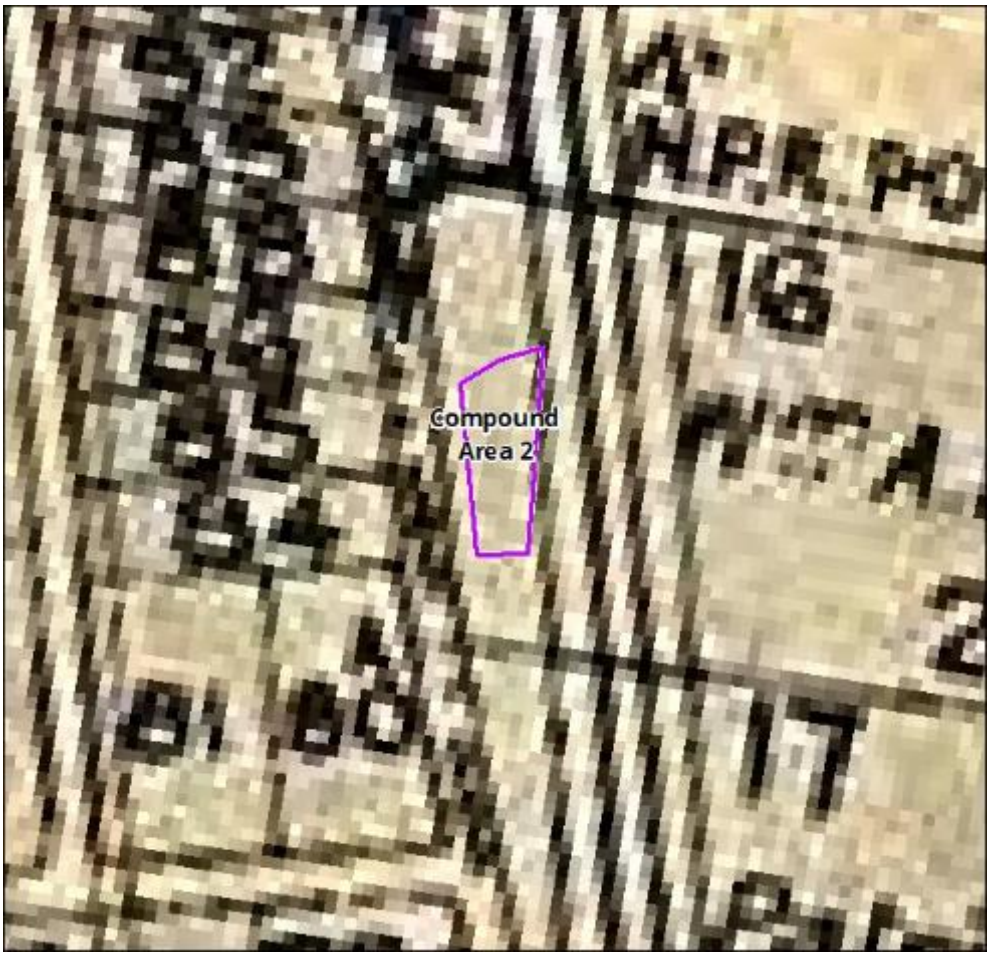


Photo 6 Detail of 1903 parish map with Compound area 2 outlined in purple (Source: NSW Land Registry Services)

Like other undeveloped towns in NSW, urban development generally increased alongside railway construction. Heathcote was further subdivided in 1886 in conjunction with construction of the railway in the same year. A newspaper article from 1886 recognises a large portion of the parish has been saved from public ownership, but it was recognised that the construction of the railway line and the land along its corridors would open it up to areas where extensive coal beds existed, therefore increasing the prosperity and growth of the town. It was thought that this commercial activity would pay for the line.[28] Another newspaper article written in 1886 reports that interest in crown land sales was so great that two special train services needed to be ordered to account for it.[29] The village of Heathcote was formalised in 1933.[30] The areas outside the three towns surrounding Heathcote and what would be Engadine and Lucas Heights was allocated to mining permits and mineral leases until 1945 when the area was reserved and was therefore undeveloped.

The town of Lucas Heights north of the study area, developed quite late compared with Heathcote. By 1910, Lord Kitchener, while advising on military matters, declared Holsworthy and much of the surrounding area including the study area to be a permanent army encampment. This was formalised in the Government Gazette in 1913.[31] In total, 16,868 acres (6826 hectares) was acquired for the Holsworthy training area outside

[28] 'Trial Survey from Bottle Forest to Moss Vale', 1886 'Trial Survey from Bottle Forest to Moss Vale', 1886
[29] 'CROWN LAND SALE AT HEATHCOTE', 1886 'CROWN LAND SALE AT HEATHCOTE', 1886
[30] Business Intelligence Team 2018, pp. 20 Business Intelligence Team 2018, pp. 20
[31] Business Intelligence Team 2018, pp. 29,30 Business Intelligence Team 2018, pp. 29,30

the study area. The Holsworthy base was connected to the north by the Old Illawarra Road, which was then the only route south to Wollongong.[32] Access was not improved until the construction of Heathcote Road.

Slightly north, the small town of Engadine also developed slowly, named after a small parcel of land owned by Charles McAlister who purchased the land in 1887 at a Heathcote crown land auction. A school was built at Engadine in 1910, while the railway line reached Engadine later in 1920. The town was formalised in the Government Gazette in 1933.[33]

3.3.3 Early infrastructure projects along the Woronora River (1920 to 1941)

Major infrastructure projects were not implemented in the lower Sutherland Shire and the study area until the early 1920s. The first of these was the Kolara Weir (known also as Kolora Weir, or Engadine Weir), positioned at the intersection of the Woronora River and Heathcote Creek, adjacent to the study area. Increased population growth within the Sutherland Shire and Sydney generally required new reserves to support a growing demand for water. One solution to this was the Upper Nepean Scheme constructed in the Illawarra Catchment. Closer to the study area, plans for Woronora Dam were brought to the attention of the government in 1927. At the same time, the areas adjacent to the study area in the south-east were reserved for public recreation in 1923, according to parish maps. At this time a flow check tower is reported to have been installed at the site, prior to the construction of the weir.[34] Likewise the land across the Woronora River to the north-west was reserved for coal mining leases in 1926.[35]

Appreciable water capacity had been reached for the Upper Nepean Scheme by the 1920s and newer catchment areas were needed to supply the regions of Sutherland-Cronulla. The centre piece was Woronora Dam upstream, designed in 1920 as a 60 feet high dam[36]. In the interim period, water would then flow 6.5 miles (approximately 10 kilometres) downstream into a series of weirs. Two of these weirs were located at the intersection of Woronora River and Heathcote creek, approximately 200 metres west of the study area. Together they created Kolara Lake, and were named Kolara Weir [1] [2] built in the early 1930s (Photo 7). This small weir supported a 1.8 million gallon pool and was used by the population of Engadine before the Woronora Dam was complete[37]. Kolara Weir included ancillary facilities including a pump house and amenities block located nearby. A newspaper article from 1931 records a sandstone wall 'in a gully'[38] near Heathcote Creek. The entire Woronora Scheme, including Woronora Dam, was completed by 1941.[39]

[32] Cosmos Archaeology Pty Ltd 2013, pp. 7 Cosmos Archaeology Pty Ltd 2013, pp. 7
[33] Business Intelligence Team 2018, pp. 15 Business Intelligence Team 2018, pp. 15
[34] "Kolara" Weir - Woronora The Real Story', 2004, pp. 12–13 "Kolara" Weir - Woronora The Real Story', 2004, pp. 12–13
[35] Crown plan 16659.3000, 1958
[36] W.V. Aird 1961, pp. 91,92 W.V. Aird 1961, pp. 91,92
[37] W.V. Aird 1961, pp. 91,92 W.V. Aird 1961, pp. 91,92
[38] 'A 24-HOUR DAY', 1931 'A 24-HOUR DAY', 1931
[39] "Kolara" Weir - Woronora The Real Story', 2004 "Kolara" Weir - Woronora The Real Story', 2004

Photo 7 Kolara Weir being constructed in 1931 (Source: 'SITE OF WEIR ON WORONORA RIVER' Construction and Real Estate Journal (1930-1938) 11 March 1931, pp. 4)

3.3.4 World War Two, the defence of NSW and the construction of Heathcote Road and the Woronora Bridge (1941 to present)

Concerns during the Second World War (WWII) in the early 1940s refocused the priorities of major infrastructure design. From the onset of WWII, the roads department were given £1,650,000 by state and federal governments for various infrastructure projects across Australia. Two fifths (£660,000) were spent on road construction and maintenance. Wartime planning made quickly apparent that Sydney's position, surrounded by water, was a major detriment for defensive and military organisation in NSW. If major bridges were destroyed and roads blocked, access to important military and industrial zones would have been cut off. This prompted the expansion of military road networks across the state.[40]

Importantly, these roads and bridges were constructed to support the movement of troops and supplies if traditional routes were compromised. Heathcote Road [4] within and adjacent to the study area was constructed by the military in 1941, in part to provide a better cross country connection to the Holsworthy military area.[41] Its 20 kilometre route meanders through the hills and valleys of the Woronora Plateau and eventually connects to Liverpool through Holsworthy. In the opposite direction Heathcote Road provides an alternative route to the Princes Highway and from there, further south. Prior to this, the only singular route was through Menai, to the north, closer to Georges River on the Illawarra Road. Construction required large corridors of tree removal and use of heavy machinery, as evidenced in Photo 8. The road was completed in 1941. Woronora River Bridge (Also known as the 'bridge near Engadine') [5], the subject of this proposal, was

[40] Department of Main Roads, New South Wales 2000, pp. 172–173 Department of Main Roads, New South Wales 2000, pp. 172–173

[41] Department of Main Roads, New South Wales 2000, pp. 172–173 Department of Main Roads, New South Wales 2000, pp. 172–173

completed at the same time. It provides an important route over the Woronora River to Princes Highway. It is a five span, two lane reinforced concrete bridge, approximately 130 metres long. The abutments are also made of concrete but with are faced with sandstone.[42]

Photo 8 Heathcote Road being constructed in 1941 (Source: Department of Main Roads, New South Wales 2000, pp. 173)

Shortly after the construction of Heathcote Road the Woronora Dam was also completed in 1942. The dam itself holds 71.79 gigalitres (GL) of water, sufficient to supply the communities of Sutherland-Cronulla.[43] Transport of this water, unconnected to the Upper Nepean Scheme, meant that additional pipelines needed to be constructed. The Woronora-Penshurst Pipeline was constructed in 1942 and is still in use today. The 27.1 kilometre long pipeline transports water from Woronora Dam to Penshurst reservoir and then to towns within the Sutherland Shire. A shortage of steel after the onset of war meant that unique construction methods were required on the pipeline. Mild steel spirally welded pipes were constructed as only small sheets of metal were available. The pipe had to be of a large diameter hence the unique construction method.[44]

The completion of the Woronora Dam also made Kolara Weir redundant. Ownership of the weir transferred from the water board of NSW to the local government and the weir preserved as a public waterhole.[45] Additional construction projects at the weir site included the installation of lighting to improve the site for patrons as well as address safety concerns[46]. Large development plans were considered for the weir, a kiosk

[42] Department of Main Roads, New South Wales 2000, pp. 172–173 Department of Main Roads, New South Wales 2000, pp. 172–173
[43] HeritageNSW n.d. HeritageNSW n.d.
[44] HeritageNSW n.d. HeritageNSW n.d.
[45] "Kolara" Weir - Woronora The Real Story', 2004 "Kolara" Weir - Woronora The Real Story', 2004
[46] "Kolara" Weir - Woronora The Real Story', 2004 "Kolara" Weir - Woronora The Real Story', 2004

was planned but appears to not have been constructed. An amenities block [8] was constructed in 1970.[47] The waterhole was reportedly quite popular and concerns were also raised about parking space beside Heathcote road. Tragedies at the weir culminated with its demolition in 1985 by the 17th Construction Squadron (Photo 9).[48] While unreported, it is likely the associated structures at the site were also demolished. It may be likely that foundations or disturbed material may exist here, either on the surface or as subsurface archaeological deposits. A photograph taken at the time of demolition also includes another unmentioned structure. The building is square and made of brick and is likely the amenities block [8].

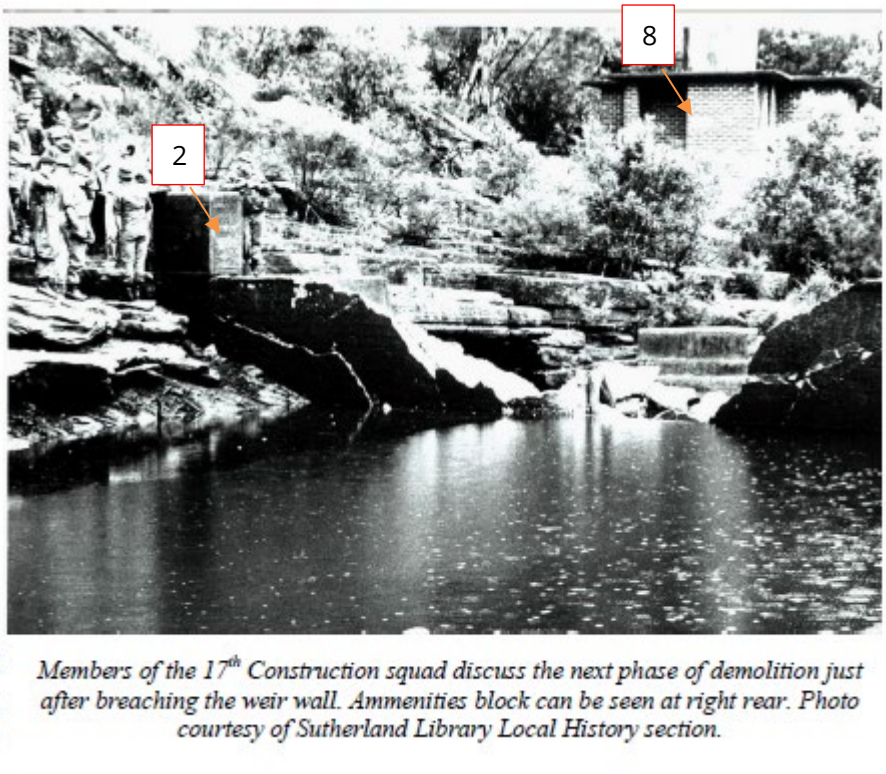


Photo 9 Kolara Weir after partial demolition in 1984. Associated structures [8] can be seen in the background (Source: "Kolara" Weir - Woronora The Real Story', 2004, pp. 14)

An early survey map from 1886 shows little development within the study area, however it does illustrate that the area was surveyed, with plans for the expansion and development of Heathcote visible on the map. A later parish map, undated but suspected to date between 1920 and 1930, shows a proposed route for Heathcote Road, leading to Liverpool. Also present is the mention of a dam at the same location as the Kolara weir. This has been interpreted as a plan rather than a description of visible structures. Future notes made on the parish map show that amendments were made up until 1986 (Photo 10, Photo 11 and Photo 12).

[47] "Kolara" Weir - Woronora The Real Story', 2004, pp. 12-13 "Kolara" Weir - Woronora The Real Story', 2004, pp. 12-13
[48] "Kolara" Weir - Woronora The Real Story', 2004 "Kolara" Weir - Woronora The Real Story', 2004

Photo 10 Parish map likely dating from 1920-1930 with the study area outlined in orange and compound area 2 outlined in purple (Source: NSW Land Registry Services)

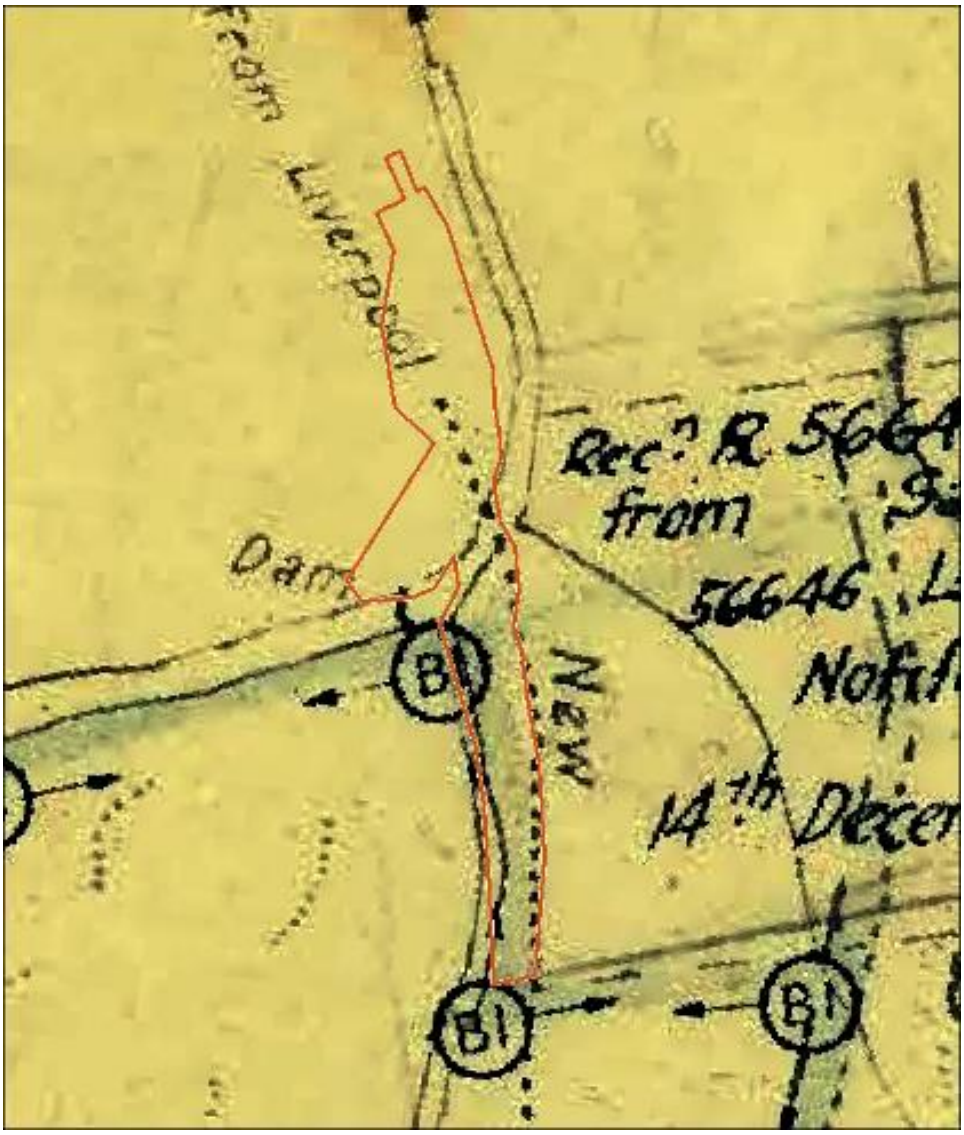


Photo 11 Detail of Parish map likely dating from 1920-1930, with the study area outlined in orange (Source: NSW Land Registry Services)

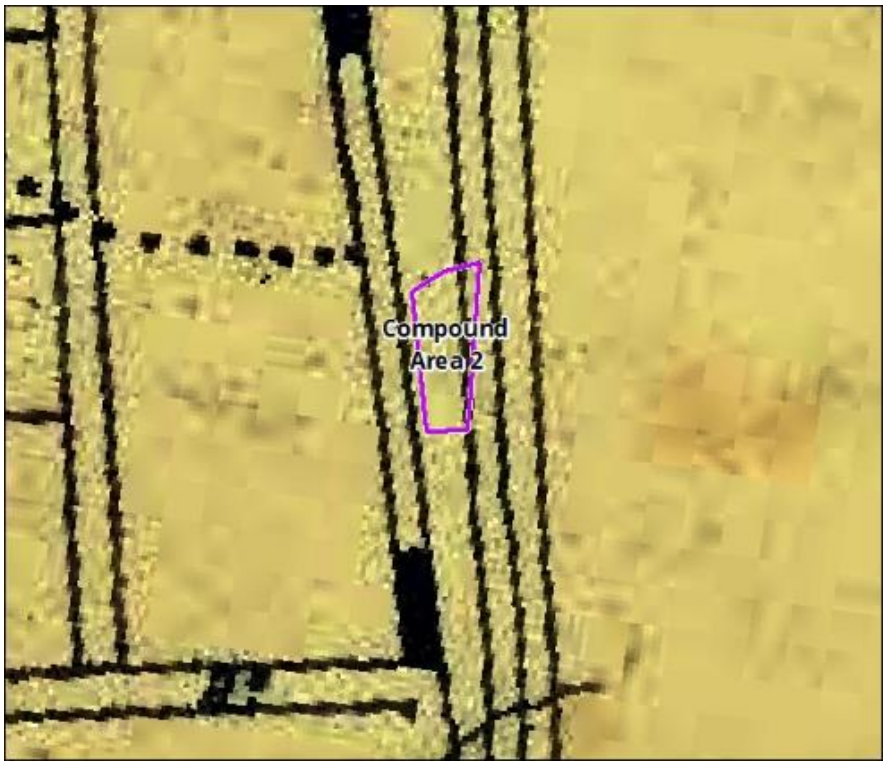


Photo 12 Detail of Parish map likely dating from 1920-1930, with Compound area 2 outlined in purple (Source: NSW Land Registry Services)

Another parish map which dates shortly after clearly shows that the construction of these structures was approved.

An early aerial from 1943 (Photo 14, Photo 16) partially covers the study area. Clearly visible at this time are the Road [4], bridge [5] and dirt track [6]. Also visible is what appears to be a bridge over Heathcote Creek [7], linking the dirt track to Heathcote Road. This bridge is not visible on the 1956 aerial but may have existed at that time. The track and bridge may have existed earlier, being constructed alongside Heathcote Road. The pump house [3] is not visible either. It was either not covered by this photograph or has been demolished when the Woronora Dam was built in 1942. The weir was no longer used at this time and the pump house [3] may have become redundant. There is mention of the pumping house in a newspaper article from 1935.[49]

[49] 'WHERE TO HIKE THIS WEEK-END', 1935 'WHERE TO HIKE THIS WEEK-END', 1935

Photo 13 1943 aerial taken over the study area, outlined in orange (Source: Six Maps)

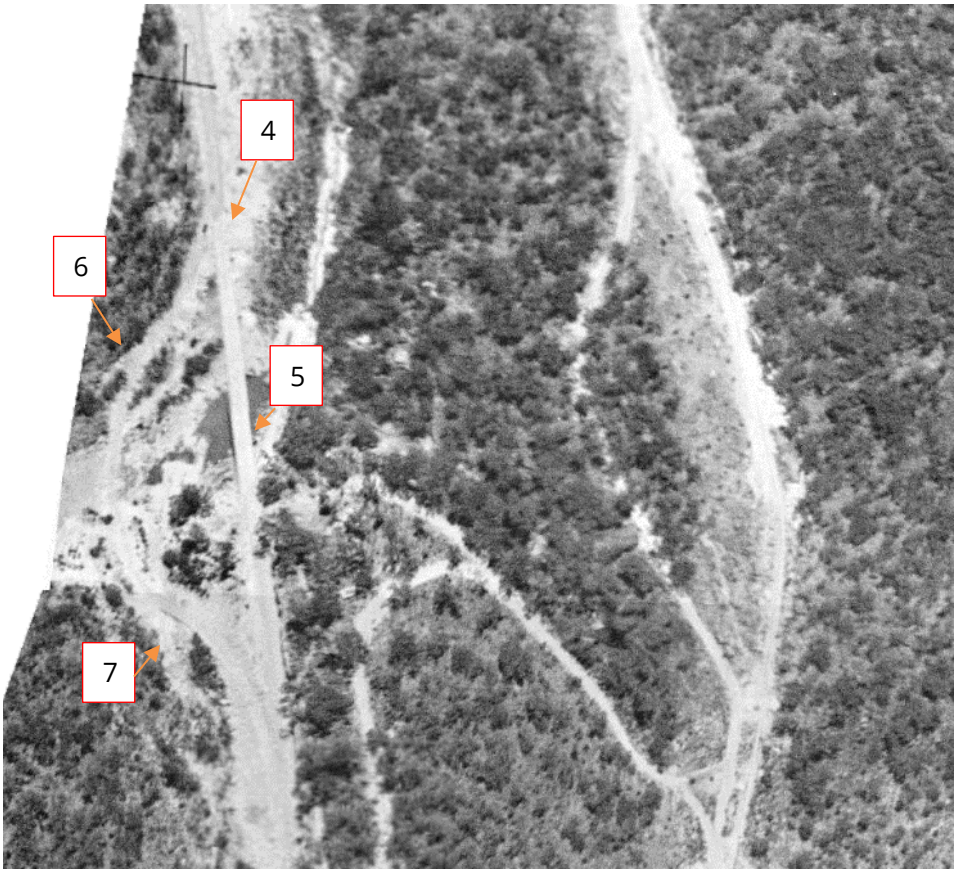


Photo 14 1943 aerial taken over the study area (Six Maps)

An aerial taken in 1956 shows the track over Heathcote Creek [6], with the Weir also visible [2]. The pumping station [3] appears to be absent. Despite the development during the early 1920s and 1940s little other development had taken place along this section of the Woronora River. No ground structures, including the 'pump house' [3], lighting or amenities block [8] are visible. A large amount of tree cover generally reduces the visibility of the study area, obscuring any retaining walls or culverts which may be present beside Heathcote Road [4].

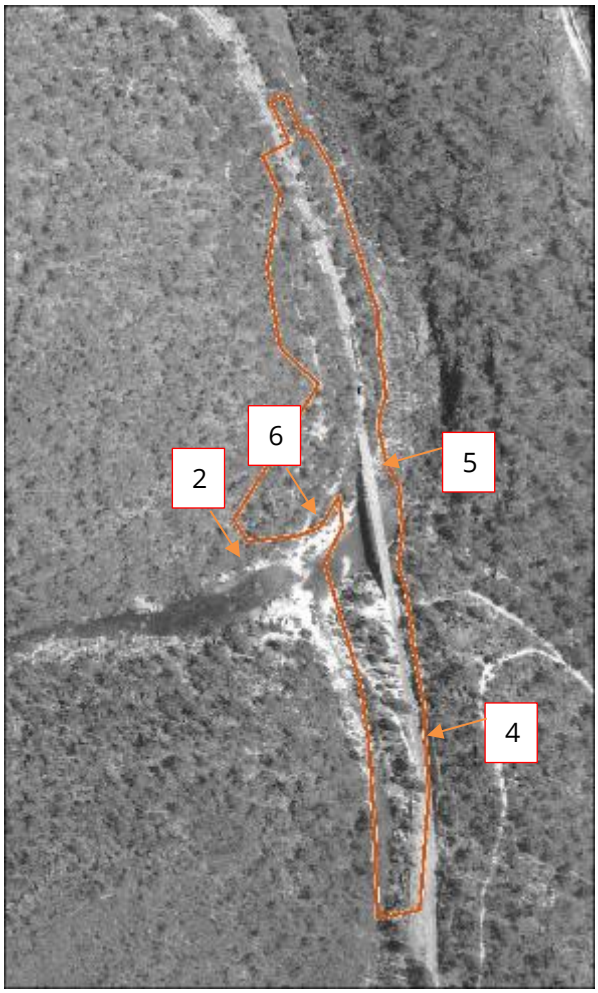


Photo 15 1956 aerial photograph of the study area, outlined in orange (Source: NSW aerial imagery)

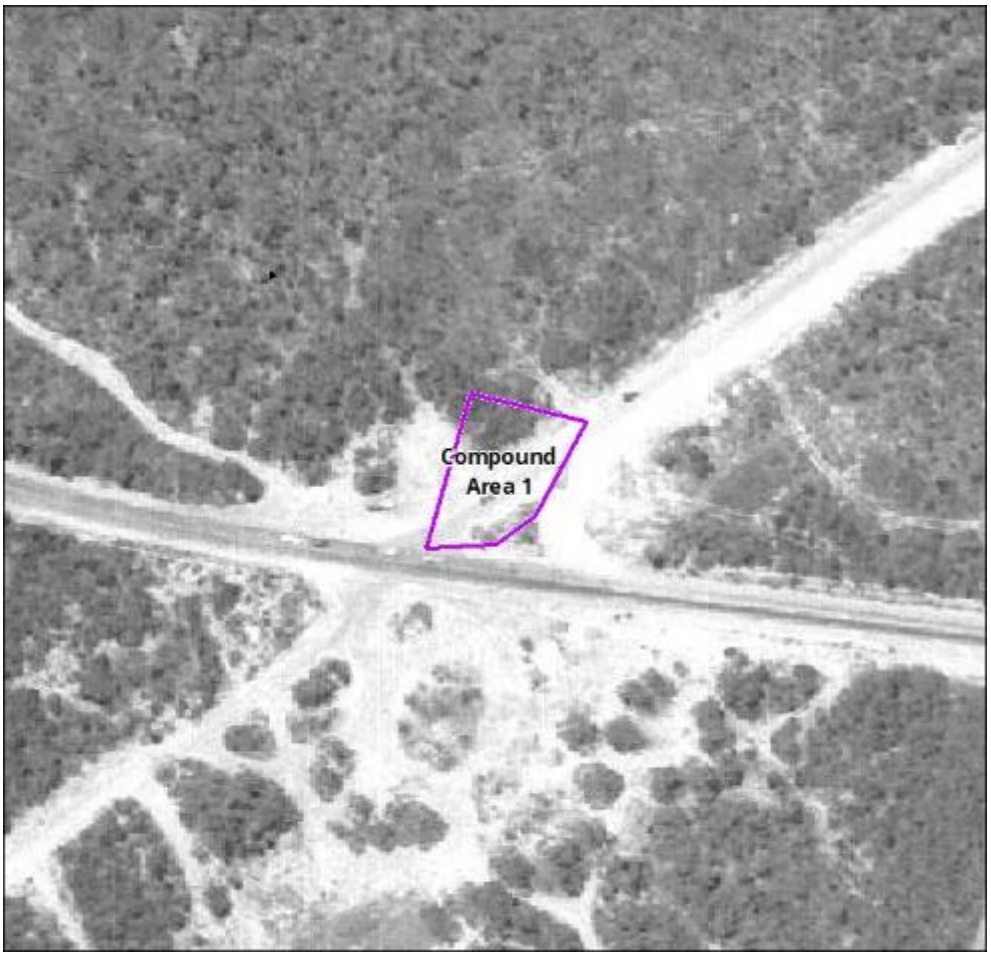


Photo 16 1956 aerial photograph of Compound area 1 outlined in purple (Source: NSW aerial imagery)

A parish map from 1958 (Photo 17) shows the level of development around Kolara Weir and on the western side of Heathcote Road and bridge [4, 5]. Two weirs [1] [2] create the boundary for Kolara Lake. A pump house [3] is located on the southern side of the second weir, in proximity to Heathcote Road. A rough vehicular track [6], dips in front of the weir across a reportedly shallow Woronora River and Heathcote Creek. No further information can be seen about the crossing over Heathcote Creek, but it is more likely a vehicular track than a bridge. This bridge and track were probably constructed at the same time as the road, allowing access to its underside and the weir and associated structures.

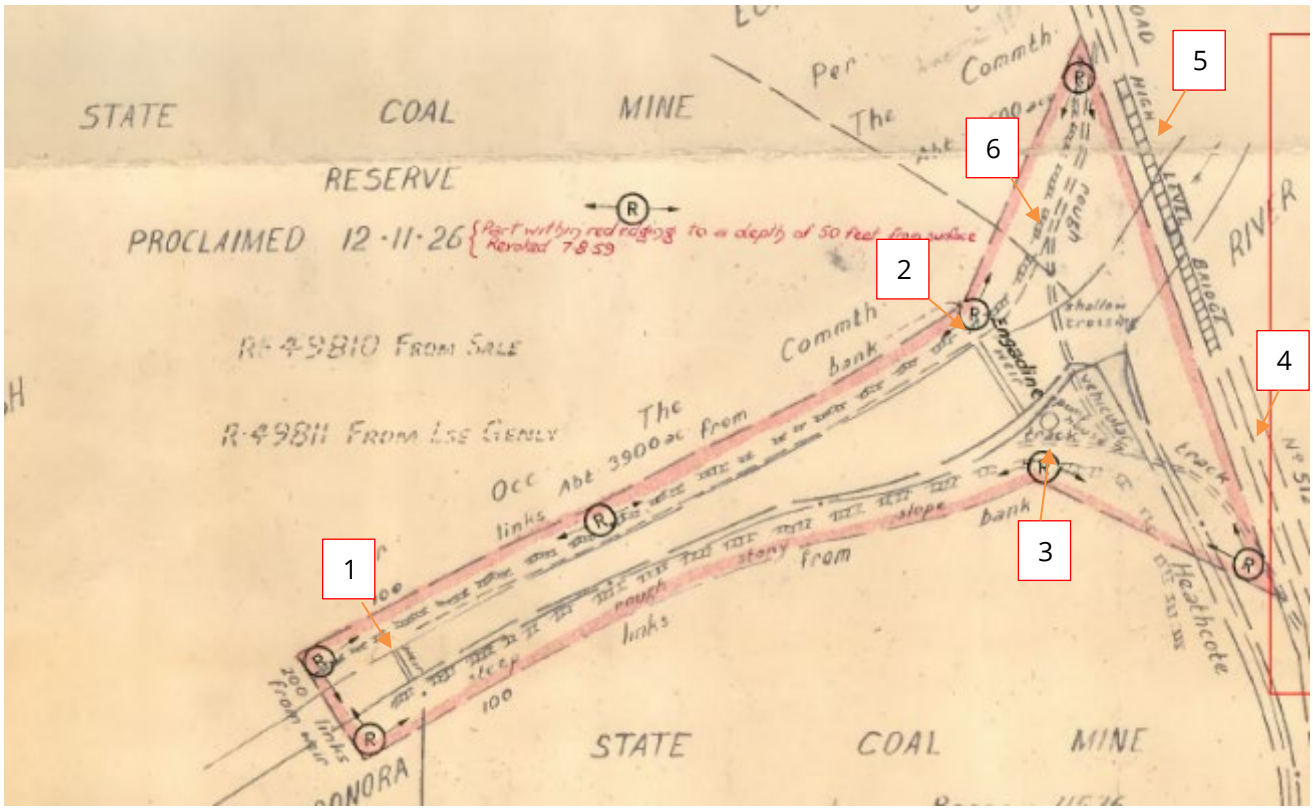


Photo 17 Crown Plan No. 16659.3000 showing structures within the study area, 1958 (Source: NSW Land Registry Services)

A later aerial taken in 1978 (Photo 18, Photo 19) also shows little development besides the original structures. It appears as though portions of the vehicular track [6] on the river bed of Woronora River appears slightly damaged. It is unlikely this track was used often, even after the construction of associated infrastructure. It likely remained a dirt track until the present.

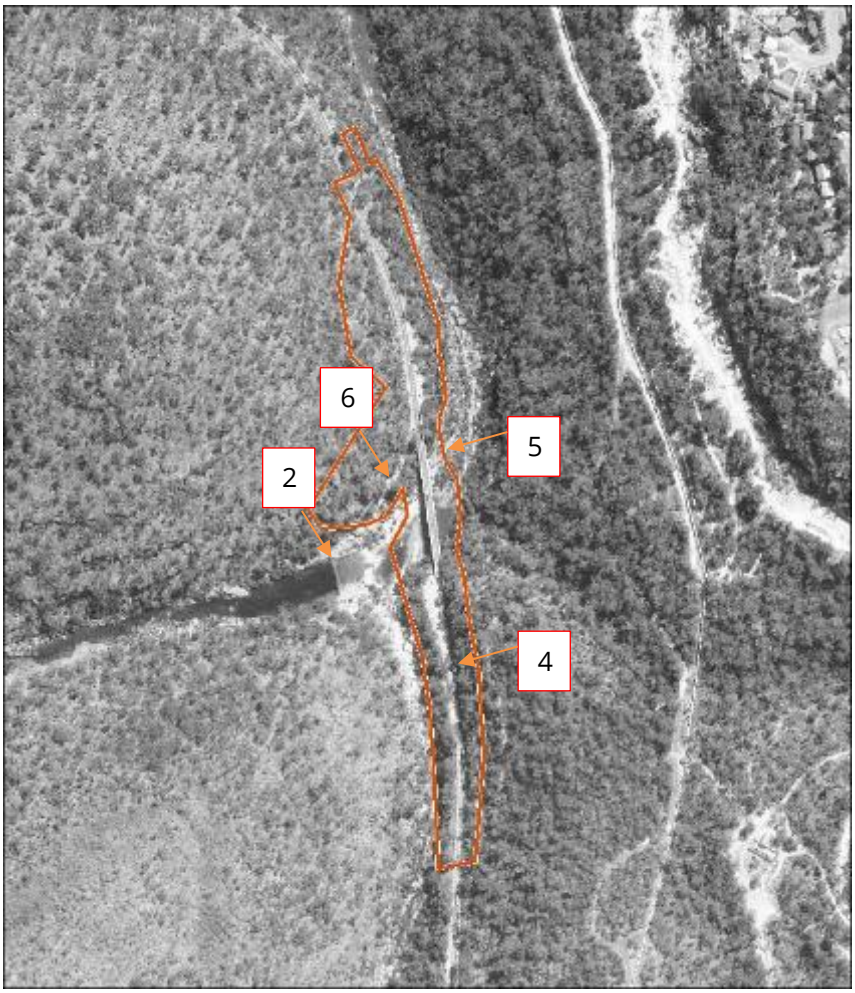


Photo 18 1978 aerial photograph of the study area, outlined in orange (Source: NSW aerial imagery)

Photo 19 1978 aerial photograph of Compound area 2, outlined in purple (Source: NSW aerial imagery)

Some modifications were made to Woronora River Bridge in 1990. These comprised new jersey kerb and rectangular steel rails, which superseded the original bridge railing system, and armco guardrailing which protected the approaches. (Photo 20, Photo 21, Photo 22).[50] By 1998 the Weir and associated buildings have been demolished (Photo 23, Photo 24). This may have raised the water level, eroded part of the vehicle track [6] which crossed Woronora River and perhaps Heathcote Creek as well. Although it is more likely the reduced visibility of this feature is a result of tree cover and disuse. Heathcote Road and its associated bridge remain intact however, and are still in use today.

[50] Roads and Traffic Authority of NSW 1990, *Bridge over Woronora River on Heathcote Road, Engadine – Parapet Additions, Schedule of Drawings*, 1990, provided by TfNSW on 10 September 2020.

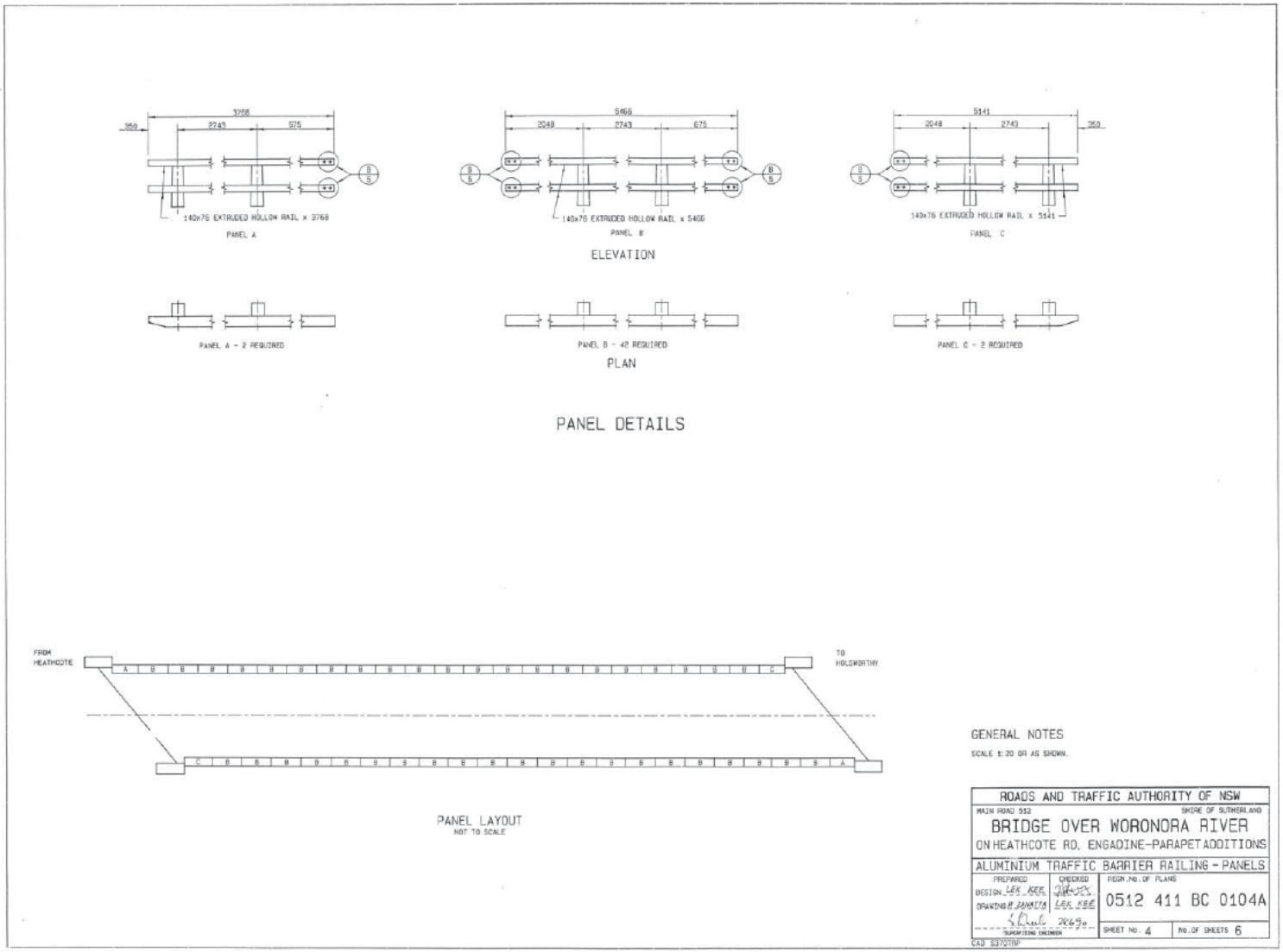


Photo 20 Design drawings of aluminium traffic barrier railing panels for 1990 bridge additions (Source: TfNSW, provided 10 September 2020)

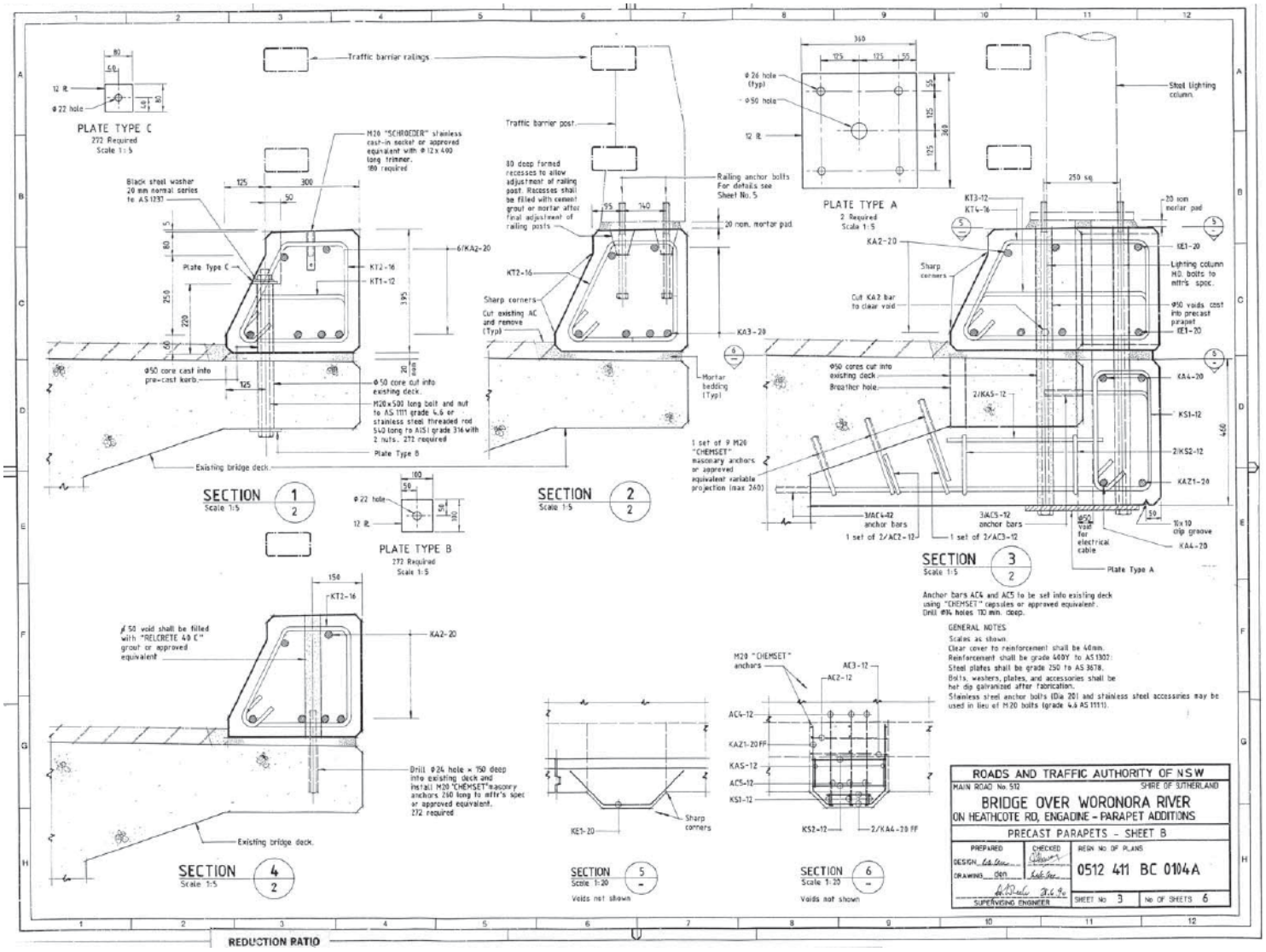


Photo 21 Design drawings of pre-cast parapets for 1990 bridge additions (Source: TfNSW, provided 10 September 2020)

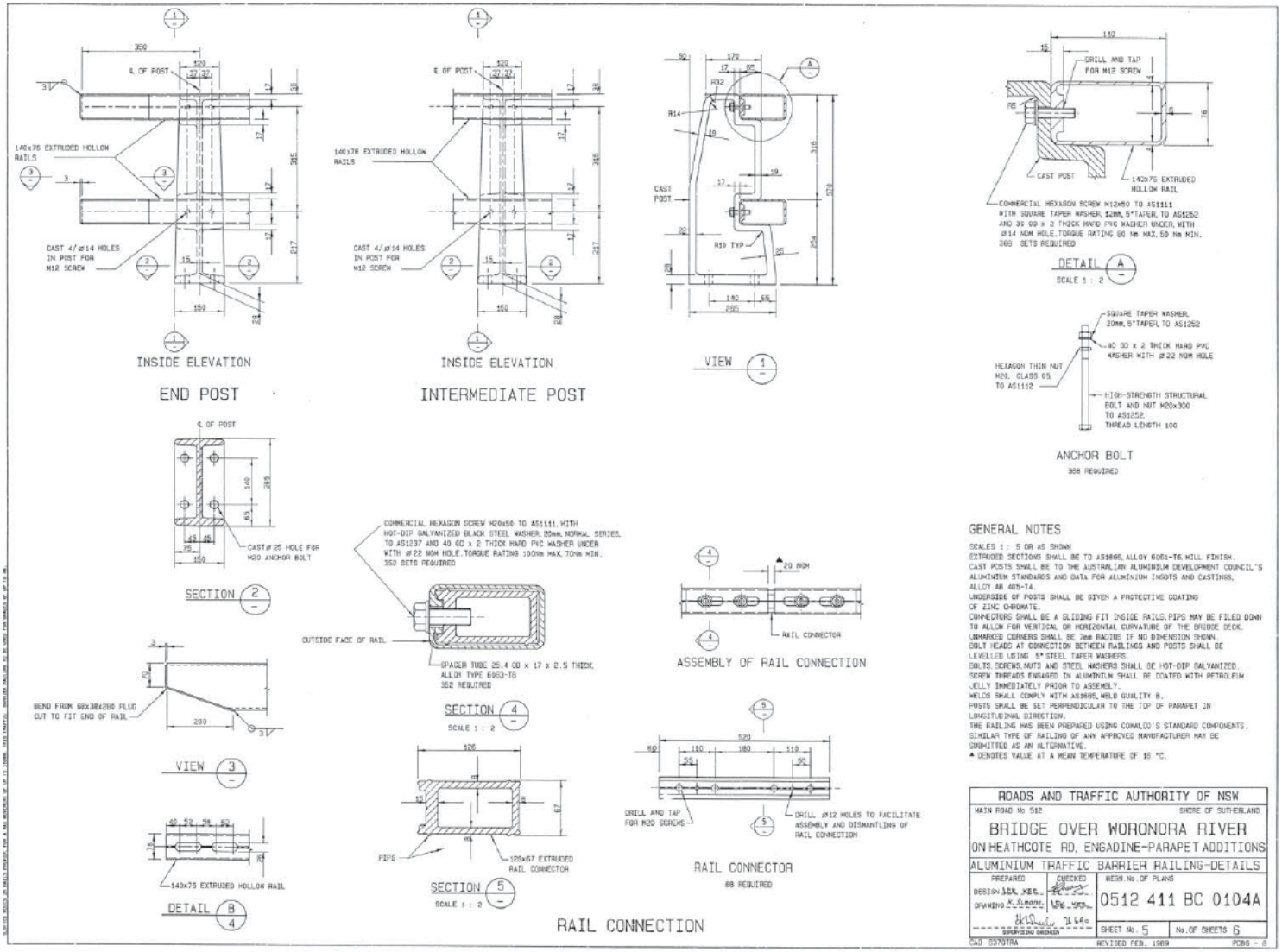


Photo 22 Designs for aluminium traffic barrier railings for 1990 bridge additions (Source: TfNSW, provided 10 September 2020)

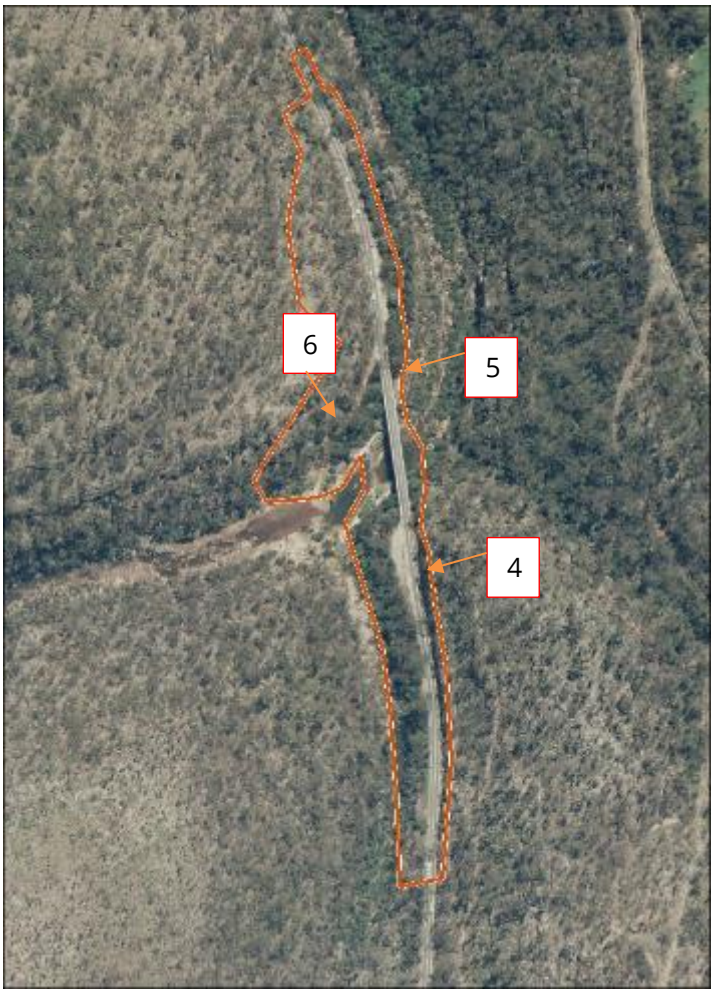


Photo 23 1998 aerial photograph of the study area, outlined in orange (Source: NSW aerial imagery)

Photo 24 1998 aerial photograph of Compound area 1, outlined in purple (Source: NSW aerial imagery)

3.3.5 Cubbitch Barta Estate (2004 to present)

A late addition to the study area was the Cubbitch Barta Estate, formally gazetted in 2004. Although the Cubbitch Barta National Estate was long inhabited by Aboriginal people before European settlement, the large reserved national estate was not formally gazetted until 2004. It comprises 18,000 hectares of undeveloped area of bushland comprising a large portion of the Liverpool region and Holsworthy military training area. Some of the estate, including the small portion in the north-west of the study area were reserved for coal leases in 1926. Public access is largely restricted due to military use. The boundary of the Commonwealth listed area runs approximately along the western edge of the northern bridge approach (Figure 4). It has been used as a training facility for Australian military during the 19th century.[51]

3.4 Chronology of the study area

Based upon the historical research presented it is possible to summarise the chronology of the study area. This chronology is included as Table 2.

[51] Cubbitch Barta National Estate Area, Old Illawarra Road, Holsworthy, NSW, Australia 2004 Cubbitch Barta National Estate Area, Old Illawarra Road, Holsworthy, NSW, Australia 2004

Table 2 Chronological development of the study area

No.	Building	Date
-	Survey marker tree	Pre-1880
1	Kolara Weir 1	Early 1930s
2	Kolara Weir 2	Early 1930s
3	'Pump House'	Early 1930s
4	Heathcote Road	1941
5	Bridge over Woronora River	1941
6	Vehicular track	By 1943
7	Bridge over Heathcote Creek	By 1943
8	Amenities block	1970, removed 1980s

3.5 Research themes

Contextual analysis is undertaken to place the history of a particular site within relevant historical contexts in order to gauge how typical or unique the history of a particular site actually is. This is usually ascertained by gaining an understanding of the history of a site in relation to the broad historical themes characterising Australia at the time. Such themes have been established by the Australian Heritage Commission (AHC) and the Heritage Office and are outlined in synoptic form in Historical Themes[52].

There are 38 State historical themes, which have been developed for NSW, as well as nine National historical themes. These broader themes are usually referred to when developing sub-themes for a local area to ensure they complement the overall thematic framework for the broader region.

A review of the contextual history has identified three historical themes which relates to the occupational history of the study area. This is summarised in Table 3.

Table 3 Identified historical themes for the study area

Australian theme	NSW theme	Local theme
Developing local, regional and national economies	Transport	Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements.
Building settlements, towns and cities	Utilities	Activities associated with the provision of services, especially on a communal basis.
Governing	Defence	Activities associated with defending places from hostile takeover and occupation.
Developing Australia's cultural life	Leisure	Activities associated with recreation and relaxation.

[52] NSW Heritage Council 2001 NSW Heritage Council 2001

4 Site visit/current condition

A physical inspection of the study area was undertaken on 11 August 2020 by Biosis staff Charlotte Allen (Project Archaeologist) and Ashley Bridge (Archaeologist). The principal aims of the survey were to identify any heritage items and their associated values within the study area. Heritage items can be buildings, structures, places, relics or other works of historical, aesthetic, social, technical/research or natural heritage significance. 'Places' include conservation areas, sites, precincts, gardens, landscapes and areas of archaeological potential.

4.1 Site setting

The study area is located within a rural landscape, and consists largely of:

- The existing road corridor of Heathcote Road.
- Heathcote River Bridge (Woronora River Bridge/RTA Bridge no. 152).
- Cubbitch Barta National Estate Area.
- Lot 7333 DP 1159188, Lot 7334 DP 1159188, Lot 7301 DP 1140443 and Lot 2 DP 1216308.

The study area is bounded by the Cubbitch Barta National Estate Area to the north-west of the study area, natural landscape to the south and north and the Woronora River to the east along the northern approach.

The majority of the study area is comprised of roadways and associated infrastructure, in addition to the Woronora River Bridge and natural landscape. Throughout the southern approach of the study area, a number of culverts, retaining walls, an access track and concrete piers crossing Heathcote Creek on the southern side of Woronora River are present (see Section 4.2 for more information). The northern approach contains the remnants of an access track, in addition to structural foundations associated with the Kolara Weir and culverts. The study area traverses a steep slope on either side of the road corridor, which follows the alignment of Heathcote Creek until it crosses the Woronora River, where the landscape evens out to a more moderate slope.

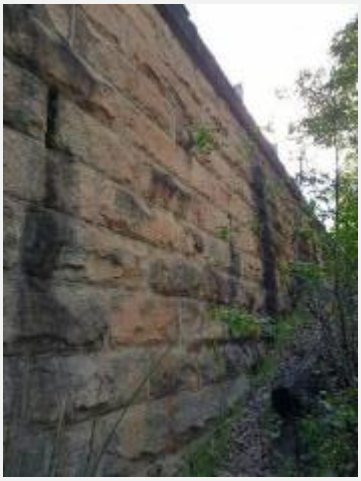
4.1.1 Inspection of heritage items

As part of this assessment, an inspection of heritage items located within, or adjacent to, the study area was undertaken. Within the study area, there is one CHL heritage item and one s170 register item in the north-western portion and central portion, respectively. In addition to these items, one LEP listed heritage item is located adjacent to the western boundary of the study area. Details of the data collected during the physical inspection is summarised in Table 4. No new items of heritage significance were identified during the physical inspection.

Table 4 Data gathered during inspection of heritage items within, adjacent to and in the vicinity of the proposal area

Field	Data
Cubbitch Barta National Estate Area (CHL no. 105405)	
Physical description	The Cubbitch Barta National Estate Area is an 18,000 hectare large tract of bushland within the Woronora Plateau, covering plateaux, ridges and rocky creek valleys immediately adjacent to the dense urban development of Sydney's south-west. The bushland is largely untouched due to its use as a Commonwealth military training area from 1913. The bushland contains a multitude of Aboriginal sites, which reflect a substantial history of Aboriginal occupation.
Location	Approximately 30 kilometres south-west of inner Sydney. The area is bounded by the easterly alignment of Kota Bahru Road in the north, Illawarra Road in the west and the Holsworthy Range boundary in the south and east. Lot 1 DP817692 and Lot 6a DP752034 are excluded from this listing.
Setting	Large, untouched rural landscape.
Fabric	Bushland.
Current use	-
Associated features	Holsworthy Military Training Area.
	
Woronora River Bridge (RTA Bridge no. 152) (RMS s170 heritage register)	
Physical description	Five span, two lane heavily skewed (35 degree) reinforced concrete bridge. Main spans are 27.43 metres and the two approach spans 21.94 metres. The deck is a continuous reinforced concrete structure with two longitudinal beams which curve down at the piers for increased strength. There are cross beams connecting the longitudinal beams, both in the centre and at the piers. The abutments are made of sandstone, with concrete end posts atop either side of the wall approaches.
Location	Heathcote Road, Heathcote NSW.
Setting	Located across Woronora River, in a rural landscape setting surrounded by bushland.
Fabric	Reinforced concrete, road base and sandstone.

Field	Data
Current use	Road bridge for transportation. Used as a link between Liverpool and the Sutherland Shire.
Associated features	Heathcote Road, culverts, retaining walls, Kolara Weir, Woronora River and Heathcote Creek.



Kolara Weir (Sutherland LEP 2015 no. A1801)	
Physical description	N/A
Location	On Woronora River, south of Heathcote Road Bridge, Holsworthy, NSW.
Setting	Located in a rural landscape setting surrounded by bushland.
Fabric	N/A
Current use	Demolished.
Associated features	Pump house (demolished), concrete abutments, access track, wall and concrete foundation remnants.

4.2 Built fabric assessment

The study area is located on the border of Engadine, Heathcote and Holsworthy, NSW. Built fabric contained within the study area largely comprises of the following items:

- Road surfaces, rock cuttings and guardrails throughout the central portion of the study area (Photo 25).
- Culvert headwalls and inlets along the north-eastern and south-western portions of the study area, within the Heathcote Road road corridor (Photo 26).
- Retaining walls along the extent of the south-western portion of the study area (Photo 27 and Photo 28).
- Access tracks leading to Kolara Weir from the northern and southern approaches, traversing down to the Woronora River and Heathcote Creek (Photo 29 and Photo 30).
- Within the northern approach of the study area (Lot 7301 DP 1140443), structural remains of concrete foundations are present, most likely associated with the Kolara Weir (Photo 31).
- Concrete piers across the extent of Heathcote Creek, associated with the access track (Photo 32).
- Large concrete material possibly associated with the weir in the north-western portion of the study area (Photo 33).
- Sandstone abutment possibly associated with the former crossing over Heathcote Creek and the Kolara Weir (Photo 34).
- Small sandstone wall located adjacent to Woronora River, most likely associated with the weir (Photo 35).
- Woronora River Bridge (RTA Bridge no. 152) located through the centre of the study area, extending across Woronora River and forming part of Heathcote Road, including 1990 additions comprising jersey kerb and rectangular steel rails (Photo 36, Photo 37).

The survey marker tree recorded on the 1880 survey plan and 1903 Parish map was not identified during the survey.

Photo 25 Example of the road surfaces and guardrails along Heathcote Road [4] visible throughout the study area, facing north

Photo 26 **Example of sandstone culvert headwall with reinforced concrete pipe (culvert no. 475320) along south-western road alignment, facing north**

Photo 27 **Sandstone retaining wall section within the south-western portion of the study area, adjacent to the road corridor, facing east**

Photo 28 **Well-constructed sandstone retaining wall section within the south-western portion of the study area, underneath haphazard retaining wall, facing north-east**

Photo 29 **Access track from southern approach [6], with dense leaf litter and vegetation throughout, facing south**

Photo 30 **Access track from northern approach [6], considerably less leaf litter and vegetation throughout the northern approach, facing north**

Photo 31 **Concrete foundations located in the north-western portion of the study area, most likely associated with the Kolara Weir and the amenities block [8], facing north-west**

Photo 32 **Concrete piers across the extent of Heathcote Creek, associated with the access track [6] and former bridge [7], facing west**

Photo 33 **Large concrete material associated with the Weir in the north-western portion of the study area, facing west**

Photo 34 **Sandstone abutment possibly associated with the former crossing over Heathcote Creek and the Kolara Weir**

Photo 35 **Small sandstone wall located adjacent to Heathcote Creek, most likely associated with the weir, facing north**

Photo 36 **Woronora River Bridge [5] located across Woronora River, facing north**

Photo 37 **View of 1990 additions to Woronoran River Bridge [5] comprising jersey kerb and rectangular steel rails on the southern approach, facing north**

4.3 Archaeological assessment

The potential archaeological resource relates to the predicted level of preservation of archaeological resources within the study area. Archaeological potential is influenced by the geographical and topographical location, the level of development, subsequent impacts, levels of onsite fill and the factors influencing preservation such as soil type. An assessment of archaeological potential has been derived from the historical analysis presented in Section 3 of this report.

4.3.1 Archaeological resource

This section discusses the archaeological resource within the study area. The purpose of the analysis is to outline what archaeological deposits or structures are likely to be present within the study area and how these relate to the history of land use associated with the study area.

The historical context presented in this report indicates that majority of the study area has been used for transportation purposes as a roadway and bridge from 1941 and in conjunction with the Kolara Weir [1] [2] between 1920 and 1985. It is located within the Cubbitch Barta National Estate Area and Holsworthy military training area (north-western portion of the study area), with Heathcote Road [4] and Woronora River Bridge [5] located throughout the central portion of the study area. Associations with the military training area has resulted in the construction of numerous roadways, bridges, retaining walls and culverts, in addition to public recreation areas from 1960, until the Kolara Weir [1] [2] was decommissioned in 1985. While there may have

been other possible archaeological remains within the study area relating to military objects, historical road surfaces and the Kolara Weir [2] or pump house [3], it is likely the demolition of the Weir and construction of Heathcote Road [4] and Woronora River Bridge [5] would have disturbed or removed any archaeological remains which may have been present. As the study area is located within land previously utilised by the military during WWII, military objects could be present or located in the vicinity of the proposal area. These may include (but are not excluded to) road mines/blocks constructed as part of defensive retreat measures to cut off major roads in the event of an attack or access facilities such as stairs leading to Heathcote Road (one of which is located on the western side of the road north of the proposal area).

Woronora River Bridge [5] is an original, intact example of military driven concrete bridge construction during WWII in NSW. Original schematic designs of the bridge dating to 1941 illustrate that while no major modifications have been made to the bridge since its construction, minor modifications and additions to the guardrails were made in 1990. These works do not appear to have affected the heritage items overall significance. Structural remains identified throughout the field investigation within the western portion of the study area are associated with the Kolara Weir [2] [8], and the access tracks and vehicular bridge over Heathcote Creek [6] are visible from as early as 1958. It should be noted that since Heathcote Road's construction and the Weir's demolition, minimal disturbances have been recorded throughout the area.

4.3.2 Integrity of sub-surface deposits

Although minimal disturbances have occurred throughout the study area since the construction of Heathcote Road in 1941 and the demolition of Kolara Weir in 1985, it is likely that the demolition works would have disturbed or removed much of the remaining intact sub-surface deposits present, in particular any historical structures [2] [6] [8]. Historical documentation illustrates that it is likely the remaining, intact portions of the study area contain low potential for archaeological sub-surface deposits to exist, with no indication of structures or camp sites located along the roadway during its construction. While there may be both disturbed and undisturbed archaeological material associated both the Weir and the roadway within the study area, it is unlikely that any remains recovered would provide further information than can be ascertained from historical documentation.

4.3.3 Research potential

Archaeological research potential refers to the ability of archaeological evidence to provide information about a site that could not be derived from any other source and which contributes to the archaeological significance of that site. Archaeological research potential differs from archaeological potential in that the presence of an archaeological resource (i.e. archaeological potential) does not mean that it can provide any additional information that increases our understanding of a site or the past (i.e. archaeological research potential).

The research potential of a site is also affected by the integrity of the archaeological resource within a study area. If a site is disturbed, then vital contextual information that links material evidence to a stratigraphic sequence may be missing and it may be impossible to relate material evidence to activities on a site. This is generally held to reduce the ability of an archaeological site to answer research questions.

Assessment of the research potential of a site also relates to the level of existing documentation of a site and of the nature of the research done so far (the research framework), to produce a 'knowledge' pool to which research into archaeological remains can add.

Table 5 Research themes relating to the study area

Australian theme	NSW theme	Discussion
3. Developing local, regional and national economies	**Transport**	A significant portion of the study area has functioned as a roadway from the 1940s onwards to provide a better cross country connection to the Holsworthy military area. To provide the best route, the Woronora River Bridge was also constructed. While there may be both disturbed and undisturbed archaeological material associated with this function within the study area, it is unlikely that any remains would provide further information regarding transport that cannot be ascertained from historical documentation.
4. Building settlements, towns and cities	**Utilities**	The study area is associated with the development of the Sutherland Shire, with the construction of Kolara Weir directly associated with the creation of the Woronora Dam public recreation and memorial spaces which hold local heritage significance. However, while there may be both disturbed and undisturbed archaeological material present within the proposal area, it is unlikely that any remains would provide further information regarding towns, villages and suburbs that cannot be ascertained from historical documentation.
7. Governing	**Defence**	A portion of the study area is contained within the Holsworthy military training area, established in the early 1910s, with the construction of Heathcote Road and its associated bridges built in response to urgent defence work. During WWII Heathcote Road was used heavily by army traffic between Liverpool, Holsworthy and the military base at Loftus. The Sutherland area was considered a potential target for Japanese attack, therefore precautionary measures, including fortification activities ensued. It is likely Heathcote Road acted as one of the main conduits for these activities to successfully proceed. Evidence of these public works are still intact within the study area, however, it is unlikely that the remains would provide further information regarding defence that cannot be ascertained from historical documentation.
8. Developing Australia's cultural life	**Leisure**	The conversion of the Kolara Weir into a swimming hole and public recreation area in the 1960s directly relates to structural remains identified throughout the north-western portion of the study area [2] [8]. Historical accounts state that during the 1960s and 1970s Heathcote Road was lined with cars, parked to use the old Weir on weekends for swimming and activities. This was utilised until the Sutherland Council demolished the Weir in 1985. While most of the Weir and its associated features have been disturbed or removed due to this demolition, undisturbed archaeological material may still be present within the study area and sub-surface deposits. However, it is unlikely that any remains recovered would provide further information regarding leisure that cannot be ascertained from historical documentation.

4.3.4 Summary of archaeological potential

Through an analysis of the above factors a number of assumptions have been made relating to the archaeological potential of the study area, these are presented in Table 6 and Figure 5.

The assessment of archaeological potential has been divided into three categories:

- **High archaeological potential** – based upon the historical context and documentary evidence presented within this report there is a high degree of certainty that archaeologically significant remains relating to this period, theme or event will occur within the study area.
- **Moderate archaeological potential** – based upon the historical context and documentary evidence presented within this assessment it is probable that archaeological significant remains relating to this period, theme or event could be present within the study area.
- **Low archaeological potential** – based upon the historical context and documentary evidence presented within this assessment it is unlikely that archaeological significant remains relating to this period, theme or event will occur within the study area.

Please note that the pump house associated with Kolara Weir is located outside of the proposal area and as such as not been included in this assessment.

Table 6 Assessment of archaeological potential

Designation	Description	Probable feature(s)	Possible construction date	Archaeological potential
[4]	Heathcote Road	Compacted layers of stone, gravels and soils, postholes	1941	Low
[5]	Bridge over Woronora River	Footings and/or foundations	1941	Low
[6]	Vehicular track and bridge over Heathcote Creek	Levelling deposits, road base, footing and foundations	Pre-1943	Low
[7]	Bridge over Heathcote Creek	Footings and foundations	Pre-1943	Low
[8]	Amenities block	Footings and foundations, floor surfaces, underfloor deposits, postholes, levelling deposits	1970	Low
-	Infrastructure associated with Heathcote Road and Woronora River Bridge	Culverts, retaining walls, cut and fill, sandstone materials	1941	Low
-	Infrastructure associated with Kolara Weir	Weir abutments, cut and fill, footings, construction materials	Post-1920	Low

Designation	Description	Probable feature(s)	Possible construction date	Archaeological potential
-	Landscape features associated with the public recreation centre	Postholes, fencing, walls, footings, access tracks, recreational material	1960-1985	Low

4.4 Inaccessible or unsurveyed areas

Parts of the study area along Heathcote Road on the approaches to Woronora River Bridge were not accessible due to difficult terrain, including high vertical rock cuttings over 8 metres in height and live road traffic. Though they could not be accessed on foot, all efforts were made to observe the areas from vantage points such as from the opposite side of the road corridor behind guard rails, and from the base of cuttings where accessible (i.e. along the access point for the access track). A survey marker tree was also recorded on 1903 survey maps, the near the bend in the Woronora River, however it was not relocated during the field investigation. Futhermore, the two nominated compound areas were not inspected as part of the site visit. As such, these areas have been assessed based on available desktop information presented in Section 3.3 and observations made during the site visit (Table 7).

Table 7 Desktop assessment of inaccessible or unsurveyed areas

Area description	Discussion	Desktop assessment	
		Built fabric assessment	Archaeological potential
Inaccessible area – north-west	• No features recorded in this area on 1880 survey plan or 1903 Parish map. • No known structures associated with military construction of Heathcote Road during WWII. • No structures recorded in 1958 Crown plan (16659.3000). • Informal track visible west of rock cutting in 1956 and 1978 aerial photographs. • No observable structures observed from Heathcote Road during site visit.	N/A	Low
Inaccessible area – north-east	• No features recorded in this area on 1880 survey plan or 1903 Parish map. • No known structures associated with military construction of Heathcote Road during WWII. • No structures recorded in 1958 Crown plan (16659.3000). • No observable structures observed from Heathcote Road during site visit. However, it is possible that the retaining wall extends into this area, and further culverts may be present.	Potential presence retaining wall and culverts	Low

Area description	Discussion	Desktop assessment	
		Built fabric assessment	Archaeological potential
Compound area 1	• Cleared and unsealed roadside area within Compound area 1 in 1956 and 1990 aerial photograph.	N/A	Low
Compound area 2	• No features recorded in this area on 1880 survey plan or 1903 Parish map. • No features recorded on c.1920-1930 Parish map. • Cleared and unsealed roadside area within Compound area 2 in 1978 aerial photograph, containing storage structures.	N/A	Low

Figure 5 Assessment of archaeological potential

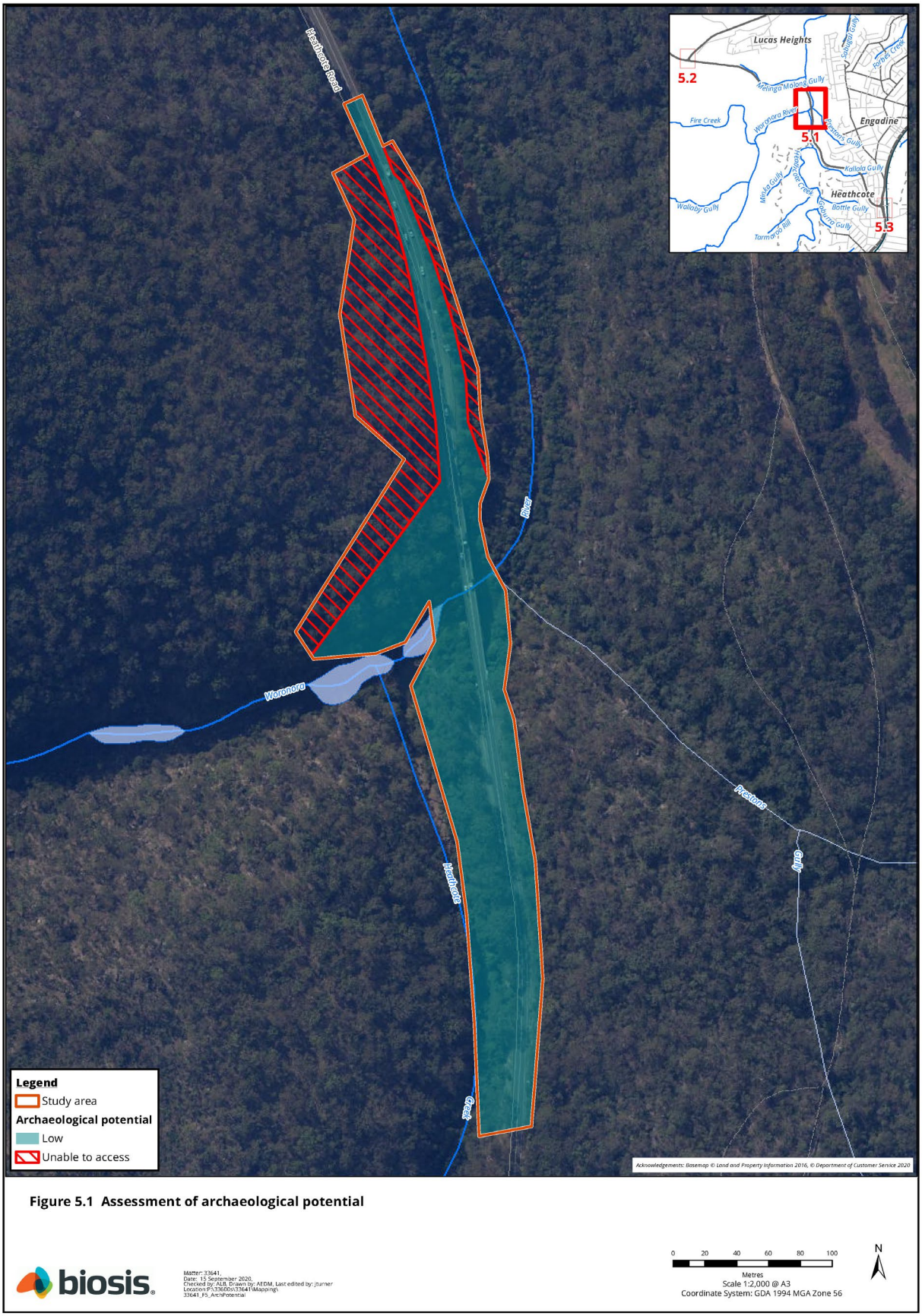


Figure 5.2


Lucas Heights
5.2
Melinga Molong Gully
Fire Creek
Woronora River
Engadine
5.1
Preston's Gully
Kallala Gully
Heathcote
Bottle Gully
Wallaby Gully
Tarmaroo Rill
5.3
Compound Area 1
New Illawarra Road
New Illawarra Road
New Illawarra Road
Heathcote Road
Legend
Compound areas
Archaeological potential
Low
Acknowledgements: Basemap © Land and Property Information 2016, © Department of Customer Service 2020

Figure 5.2 Assessment of archaeological potential

Matter: 33641,
Date: 15 September 2020,
Checked by: ALB, Drawn by: AEDM, Last edited by: jturner
Location:P:\33600s\33641\Mapping\
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Metres
Scale 1:1,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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Figure 5.3


Lucas Heights
5.2
Melinga Molong Gully
Fire Creek
Woronora River
5.1
Engadine
Forbes Creek
Walaby Gully
Heathcote
Bottle Gully
5.3
East Heathcote Trail
Prahran Road
Renmark Place
Heathcote Road
Heathcote Road
Heathcote Road
Heathcote Road
Princes Highway
Compound Area 2
Illawarra Railway
Wilson Parade
Jane Place
Legend
Compound areas
Archaeological potential
Low
Acknowledgements: Basemap © Land and Property Information 2016, © Department of Customer Service 2020

Figure 5.3 Assessment of archaeological potential

biosis.

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Date: 15 September 2020,
Checked by: ALB, Drawn by: AEDM, Last edited by: jturner
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5 Heritage assessment (significance)

An assessment of heritage significance encompasses a range of heritage criteria and values. The heritage values of a site or place are broadly defined as the '*aesthetic, historic, scientific or social values for past, present or future generations*'[53]. This means a place can have different levels of heritage value and significance to different groups of people.

The archaeological significance of a site is commonly assessed in terms of historical and scientific values, particularly by what a site can tell us about past lifestyles and people. There is an accepted procedure for determining the level of significance of an archaeological site.

A detailed set of criteria for assessing the State's and Commonwealth's cultural heritage was published by the (then) NSW Heritage Office. These criteria are divided into two categories: nature of significance, and comparative significance.

5.1 NSW heritage assessment criteria

5.1.1 Heritage criteria

Heritage assessment criteria in NSW fall broadly within the four significance values outlined in the Burra Charter. The Burra Charter has been adopted by state and Commonwealth heritage agencies as the recognised document for guiding best practice for heritage practitioners in Australia. The four significance values are:

- Historical significance (evolution and association).
- Aesthetic significance (scenic/architectural qualities and creative accomplishment).
- Scientific significance (archaeological, industrial, educational, research potential and scientific significance values).
- Social significance (contemporary community esteem).

The NSW Heritage Office issued a more detailed set of assessment criteria to provide consistency with heritage agencies in other States and to avoid ambiguity and misinterpretation. These criteria are based on the Burra Charter. The following SHR criteria were gazetted following amendments to the *Heritage Act 1977* (Heritage Act) that came into effect in April 1999:

- Criterion (a) - an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (b) - an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (c) - an item is important in demonstrating the aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).
- Criterion (d) - an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.

[53] Heritage Office 2001 Heritage Office 2001

- Criterion (e) - an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (f) - an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).
- Criterion (g) - an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places; or cultural or natural environments; or a class of the local area's cultural or natural places; or cultural or natural environments.

5.1.2 Levels of heritage significance

Items, places, buildings, works, relics, movable objects or precincts can be of either local or state heritage significance, or both. Places can have different values to different people or groups.

Local heritage items

Local heritage items are those of significance to the local government area and its community. In other words, they contribute to the individuality and streetscape, townscape, landscape or natural character of an area and are irreplaceable parts of its environmental heritage. They may have greater value to members of the local community, who regularly engage with these places and/or consider them to be an important part of their day-to-day life and their identity. Collectively, such items reflect the socio-economic and natural history of a local area. Items of local heritage significance form an integral part of the State's environmental heritage.

State heritage items

State heritage items, places, buildings, works, relics, movable objects or precincts of State heritage significance include those items of special interest in the State context. They form an irreplaceable part of the environmental heritage of NSW and must have some connection or association with the State in its widest sense.

5.2 Commonwealth heritage assessment criteria

The CHL is a list of the historic, cultural and natural heritage places on Commonwealth land or in Commonwealth waters, or owned or managed by the Commonwealth Government.[54] Similarly to the SHR heritage criteria, there are a number of criteria required to list a heritage item on the Commonwealth register. The Australian Heritage Council is required to advise the Minister for the Environment and Energy on whether a Commonwealth Place has significant heritage values, by assessing the Place to see if it meets one or more of the nine CHL criteria. These are as listed below:

1. The place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history.
2. The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.
3. The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.

[54] Commonwealth of Australia 2019 Commonwealth of Australia 2019

4. The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:
    a. a class of Australia's natural or cultural places; or.
    b. a class of Australia's natural or cultural environments.
5. The place has significant heritage values because of the place's importance in exhibiting particular aesthetic characteristics values by a community or cultural group.
6. The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.
7. The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.
8. The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.
9. The place has significant heritage value because of the place's importance as part of Indigenous tradition.

5.3 Heritage items within the study area

The study area contains two previously listed heritage items and a number of newly identified structures as outlined below. As such, an assessment of significance for the Woronora River Bridge listing has been included as it appears on the State Heritage Inventory (SHI) in Table 8. Significance assessment for the Cubbitch Barta National Estate Area can be found in Table 15.

Assessments of significance using the NSW Heritage Office assessment criteria (Section 5.1.1) for each new structure has also been undertaken in Table 9, Table 10, Table 11, Table 12, Table 13 and Table 14.

Table 8 NSW Heritage office significance criteria assessment for Woronora River Bridge (RTA Bridge no.152)

Woronora River Bridge [5]	
Significance assessment	
Criteria A - Historical	The Woronora River Bridge is strongly associated with the State theme of Defence, the bridge being constructed as an essential component of the Heathcote Road built during WWII to facilitate the movement of troops and supplies associated with the Army installations in the southern Sydney area and the Illawarra and also to provide part of a strategic cross country connection between the Great Western and Princes Highways. Since WWII, the Woronora River Bridge, as part of Heathcote Road, has provided the third way of reaching the Sutherland Shire, and the only direct connection between Sutherland and Western Sydney. The bridge also formed a landmark in the post-war landscape of leisure for swimmers and picnickers from adjacent areas to the northwest and south east, and as part of a landscape no longer used for leisure, can help to demonstrate the way leisure activities have evolved to the present.
Criteria B - Historic Association	-
Criteria C - Aesthetic	Woronora River Bridge is a large and impressive structure for its type, having five spans and a total length of over 125 metres. The clean modern lines of its design, featuring curved beam profiles and octagonal piers, are attractive and sit well within the rugged sandstone woodland landscape. The bridge forms a landmark on the Heathcote Road, which winds down through impressive sandstone cuttings to reach the bridge. As a large structure it is reasonably sophisticated technically, featuring a heavy skew and rocker bearings to allow thermal movements. Its construction in rugged terrain and at a high level above permanent water constitutes a technical achievement.
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	The Woronora River Bridge is the longest continuous concrete beam bridge in the study group of RTA controlled beam bridges constructed prior to 1948, at 125 metres in length being the only structure to exceed eighty metres in length, apart from the redecked bridge crossing the Hawkesbury River at Windsor, which is a series of simply supported spans. The Woronora River Bridge is capable of demonstrating the key characteristics of the class of larger concrete beam bridges of the period 1925-1948.

Woronora River Bridge [5]
Statement of significance
Woronora River Bridge has historic, aesthetic and technical significance, and is an outstanding representative example of its class in NSW. Chiefly, the bridge has historic significance due to its strong association with strategic defence planning in World War Two in the south-eastern quarter of the wider Sydney area. The bridge also has significance because of its association with the history of transport to the Sutherland area, and with post war leisure activities in southern Sydney. The bridge is a large and impressive structure in a spectacular sandstone woodland landscape, and forms a landmark on Heathcote Road. The bridge has a high level of representative significance due to its size, as the only reinforced concrete beam bridge currently controlled by the Roads and Traffic Authority [now TfNSW] and constructed in the period 1925-1948 to exceed eighty metres in length.

Table 9 NSW Heritage criteria for Heathcote Road [4]

Heathcote Road [4]	
NSW Heritage criteria	
Criteria A - Historical	x
Criteria B - Historic Association	-
Criteria C - Aesthetic	-
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
Heathcote Road was constructed in direct response to urgent defence work as part of WWII efforts in the Holsworthy area. Due to its strong associations to WWII this item is important in the course, or pattern, of NSW's cultural or natural history, and meets criteria (a). This item contains historical significance at a local level.	

Table 10 NSW Heritage criteria for vehicular track [6]

Vehicular track [6]	
NSW Heritage criteria	
Criteria A - Historical	-
Criteria B - Historic Association	-
Criteria C - Aesthetic	-
Criterion D - Social	-
Criterion E - Research	-

Vehicular track [6]	
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
The vehicular track over Heathcote Creek [6] is not considered important in the course or pattern of the history of the Weir [2] or Heathcote Road [4], nor does it hold research potential which may contribute to our historical knowledgeof the study area. The vehicular track does not have a strong or special association with the life or works of a person, or group of people of importance in the history of the Weir or Heathcote Road, nor does it have a special association with a community or cultural group for social, cultural or spiritual reasons. The vehicular track is not important in demonstrating characteristics or a high degree of technical or creative achievement, nor does it possess uncommon, rare or endangered aspects of Weir or Heathcote Road. The vehicular track is not important in demonstrating the principal characteristics of a class of cultural or natural places or environments in the Heathcote, Holsworthy or Engadine regions. The vehicular track does not hold heritage significance.	

Table 11 NSW Heritage criteria for bridge over Heathcote Creek [7]

Bridge over Heathcote Creek [7]	
NSW Heritage criteria	
Criteria A - Historical	-
Criteria B - Historic Association	-
Criteria C - Aesthetic	-
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
The former bridge over Heathcote Creek [7] is not considered important in the course or pattern of the history, nor hold research potential which may contribute to our historical knowledge, of Kolara Weir [2] or Heathcote Road [4]. The bridge does not have a strong or special association with the life or works of a person, or group of people of importance in the history of the Weir or Heathcote Road, nor does it have a special association with a community or cultural group for social, cultural or spiritual reasons. The bridge is not important in demonstrating characteristics or a high degree of technical or creative achievement, nor does it possess uncommon, rare or endangered aspects of the Weir or Heathcote Road. The bridge is not important in demonstrating the principal characteristics of a class of cultural or natural places or environments in the Heathcote, Holsworthy or Engadine regions. The bridge does not hold heritage significance.	

Table 12 NSW Heritage criteria for infrastructure associated with Heathcote Road and Woronora River Bridge

Infrastructure associated with Heathcote Road and Woronora River Bridge	
NSW Heritage criteria	
Criteria A - Historical	x
Criteria B - Historic Association	-
Criteria C - Aesthetic	x
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
Individually, the associated infrastructure for Heathcote Road and Woronora River Bridge (inclusive of any culverts and sandstone retaining walls) does not possess any of the NSW heritage criteria, however when taken in direct association with the construction of the road and bridge, these items meet criterion (a) and (c).	

Table 13 NSW Heritage criteria for infrastructure associated with Kolara Weir

infrastructure associated with Kolara Weir	
NSW Heritage criteria	
Criteria A - Historical	-
Criteria B - Historic Association	-
Criteria C - Aesthetic	x
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
Individually, the infrastructure associated with Kolara Weir (inclusive of any structures, abutments or water crossings) does not possess any of the NSW heritage criteria, however when taken in direct association with the construction of the Weir, these items meet criterion (c).	

Table 14 NSW Heritage criteria for landscape features associated with the public recreation centre and amenity block [8]

Landscape features associated with the public recreation centre and amenity block [8]	
NSW Heritage criteria	
Criteria A - Historical	-
Criteria B - Historic Association	-
Criteria C - Aesthetic	-
Criterion D - Social	-
Criterion E - Research	-
Criterion F - Rarity	-
Criterion G - Representativeness	-
Significance assessment	
The landscape features associated with the public recreation centre and amenity block [8] are not considered important in the course or pattern of the history, nor hold research potential which may contribute to our historical knowledge of the Weir [2] or Heathcote Road [4]. The landscape features associated with the public recreation centre and amenity block [8] do not have a strong or special association with the life or works of a person, or group of people of importance in the history of the Weir or Heathcote Road, nor do they have a special association with a community or cultural group for social, cultural or spiritual reasons. The landscape features associated with the public recreation centre and amenity block [8] are not important in demonstrating characteristics or a high degree of technical or creative achievement, nor do they possess uncommon, rare or endangered aspects of the Weir or Heathcote Road. The landscape features associated with the public recreation centre and amenity block [8] are not important in demonstrating the principal characteristics of a class of cultural or natural places or environments in the Heathcote, Holsworthy or Engadine regions. The landscape features associated with the public recreation centre and amenity block [8] do not hold heritage significance.	

5.4 Statement of significance

The study area contains one CHL heritage Place and one s170 register listed item, and is located adjacent to and in the vicinity of one local and one s170 register heritage item. Existing statements of significance from the SHI for these items are provided in Table 15. The study area is considered to be significant at a local, State and Commonwealth level.

Table 15 Statements of significance for listed heritage items within, adjacent to and in the vicinity of the study area

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
Item no. A4302	Woronora-Penshurst Pipeline	From Woronora Dam to Penshurst reservoirs, via former Como railway bridge across Georges River, MGA Zone 56, 316075°E, 6230855°N	Sutherland Shire LEP 2015	Local	The Woronora - Penshurst Pipeline is significant because of its relationship with the Woronora Dam, the fifth of the water supply dams built as part of Sydney's water supply. Woronora Dam was completed in 1942 and is the only one of Sydney's water supply dams which is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. The dam and pipeline were built with the objective of supplementing Sydney's water supply whilst the much larger Warragamba Dam was being constructed. The Woronora - Penshurst Pipeline is culturally significant as it supplies water from Woronora Dam to the areas of Sutherland, Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park and the areas just north of Georges River. The pipeline is 27.1 km long and consists of 42 inch (1.07m) mild steel spirally welded pipes. The pipeline has technical significance because of its corkscrew construction method. At the time of construction only small width steel sheets were available and in order to obtain a large diameter pipeline these were welded together in a spiral technique. The pipeline crosses the Como Railway Bridge which was converted to a cycleway bridge by Sydney Water. The bridge is of State significance and listed by the National Trust of Australia (NSW) and is on the Register of the National Estate. The bridge was constructed by John Whitton and a significant technical accomplishment. It was placed into service in 1885 and is the tenth in a series of twelve related bridges. It was the first of the series with six spans (earlier bridges having 1 to 4 spans). When completed it was the fourth longest metal truss bridge in Australia. It carried single track railway lines which were the first in Sydney to be electrified in 1926. The operational and physical curtilage of the pipeline extends to the original pipelines and all the supporting/associated structures. The visual curtilage extends further as the pipeline is a major feature of the landscape between Woronora Dam and Penshurst.

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
Item no. 4570509	Woronora-Penshurst Pipeline	From Woronora Dam to Penshurst reservoirs, via former Como railway bridge across Georges River.	Sydney Water s170 heritage register	Local	Same as above.
CHL no. 105405	Cubbitch Barta National Estate Area	Old Illawarra Rd, Holsworthy, NSW, Australia.	Commonwealth Heritage List	Commonwealth	Cubbitch Barta National Estate Area is a large area with outstanding cultural and natural values. It is very significant as a cultural and natural landscape which demonstrates relationships between the environment and human occupation through time. Its significance is emphasised by its proximity to Sydney, the Nation's largest metropolitan centre. Cubbitch Barta National Estate Area is an integral component of the Woronora Ramp area, stretching south-west from Sydney, together with Royal National Park, Heathcote National Park, the Woronora catchment and O'Hare's Creek Catchment. Major parts of the Woronora Ramp region are included in the Register of the National Estate. This region, together with the other tracts of undeveloped areas to the west and north of the metropolitan area, are essential in defining the character of the broader Sydney region. In the network of gullies which criss-cross the area, many of the natural values remain undisturbed and the Indigenous heritage is impressively retained. Over 500 Aboriginal sites provide a glimpse of the relationship between people and the land prior to 1788. The sites and the area's long term and more recent connections with Aboriginal people, combine to form a landscape of great significance for its Indigenous heritage. The landscape also provides important illustrations of European settlement, agriculture and Australia's military history. It is unusual to find landscapes in this region so intact. This provides a rare opportunity to understand both the natural and cultural history of the region. It is remarkable that this landscape has survived on the margins of the Nation's earliest and largest urban centre. **Indigenous values**: The Cubbitch Barta National Estate Area is highly

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					valued by members of the Tharawal Local Aboriginal Land Council and the Dharawal people for its symbolic, cultural, educational and social associations (Criterion G.1). The Aboriginal cultural landscape of the area reflects the past lifestyle of Aboriginal people in this region and its preservation enables Aboriginal people to maintain cultural links to the area. These connections with the past are particularly important, because Aboriginal people in this part of Australia were among the earliest impacted by European settlement of this continent and their culture has since been disrupted by war, disease and urban development. Throughout the environments of the area the Dharawal see evidence of the relationship between their people and the land. The Tharawal Local Aboriginal Land Council is also concerned about maintaining the area's natural environment. The area contains a large and diverse collection of Aboriginal sites, which represent a complex Aboriginal cultural landscape (Criterion A.3). Over 530 sites are known from the area and a further 509 potential archaeological sites have been documented. It is highly likely that the area contains many hundreds more sites. Sites include rock paintings and drawings, engravings, open scatters of artefacts, grinding grooves and scarred trees. The survival of a significant number of scarred trees within the area is important as this is a rare type of site within the Sydney Basin (Criterion B.2). While rock art sites are well represented in the Sydney Basin, other types of sites are less so. The preservation within the area of scarred trees, open artefact scatters and archaeological sites in particular, offer considerable potential for further developing a picture of day to day activities of Aboriginal people in the Sydney Basin prior to 1788 (Criterion C.2). This large number of sites and the stories they may tell form a landscape in which Aboriginal life prior to 1788 is recorded without the large scale impact of European settlement. There is also a high density of sites in the area. This is particularly important because sites are found in groups or clusters with their relationship to one another largely intact. By

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					examining where they are located in the landscape and their relationship to other types of sites, a more complete picture of the lifestyle of Aboriginal people could be established (Criterion C.2). The Georges River, which bounds the National Estate area on the west and is close to the north, has been identified as an important north-south Aboriginal cultural boundary within the Sydney Basin. The cultural landscape of the National Estate area is representative of the southern social unit of the Sydney Basin (Criterion D.2). This unit has been characterised by the presence of a number of distinctive traits within the art and by complex analyses which show that the art sites of this region are significantly different from those north of the Georges River. The large number of sites, the relatively high site density, the condition of sites and the preservation of the landscape as a whole makes the area important in terms of the further definition of this southern unit. The area also offers considerable research potential in terms of the analysis and interpretation of small scale groups (Criterion C.2). There is evidence to suggest that this area formed the cultural landscape of a single residence group whose territory extended over the Georges River and Williams/Mill Creek drainage basins. In this region, it is uncommon to have such a landscape preserved in this way and particularly important, as knowledge of local groups from Ethnohistory is often incomplete and problematic. The rich collection of more than 300 rock art sites within the area is regionally significant as a group in the Sydney Basin and representative of rock art south of the Georges River (Criterion D.2). The rock art sites are diverse in terms of technique (paintings, drawings and engravings) and motifs depicted (Criterion A.3). The art in the area contains a number of motifs which are rare within the Sydney region, such as the engraving of a pregnant woman. The site where this occurs is considered important, as female motifs and gender specific evidence of this kind are relatively rare (Criterion B.2). The long history of recording the rock art sites by voluntary groups and individuals indicates that they are aesthetically important to

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					groups within the broader community (Criteria E.1). The aesthetic value of these sites is enhanced by their excellent condition and lack of graffiti. The Cubbitch Barta National Estate Area is important as an illustration of a landscape in which changes in the relationship between Aboriginal people and early settlers took place (Criterion A.4). This is a phase in the cultural history of Australia for which traditional documentation is often poor. The area is associated with Governor Macquarie's war against the Aboriginal people of the Liverpool, Campbelltown and Appin areas from April to November 1816. Despite efforts to move Indigenous people away from this country, documentation indicates Aboriginal people were still visiting sites within the area in the 1830s. Within the area, it is the evidence of the strong Aboriginal presence combined with the nineteenth century history and land use without much twentieth century development, which makes this area unusual for the way it can illustrate this period of history. Potential exists for further research to shed light on this era through research relating to exploration, settlements within the area and information about the adjacent Aboriginal reserve (Criterion C.2). **Natural values**: This area contains a diversity of natural landscapes and vegetation types in a relatively unmodified condition, in an area otherwise greatly altered by urban development. Vegetation communities include plateau forest (covering forest and woodland on both tertiary alluvium soils and on shale), gully forest, woodland/heath complex, riparian forest, sedgeland, heath/swamp complex and melaleuca thickets. The laterite ridgetops are almost entirely intact and are significant reference sites which demonstrate the formation of laterite caps and the occupying vegetation communities (Criterion A.2). Diversity of plant species is high, with more than 400 species recorded in the area. At least seven different plant communities have been distinguished in the area, indicating high community diversity (Criterion A.3). At least eight plant species considered rare nationally occur here: DARWINIA DIMINUTA, D GRANDIFLORA,

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					EUCALYPTUS LUEHMANNIANA, GREVILLEA LONGIFOLIA, HIBBERTIA NITIDA, LOMANDRA FLUVIATILIS, MELALEUCA DEANEI and TETRATHECA NEGLECTA. A rare and undescribed species of greenhood orchid (PTEROSTYLIS sp E) has also been recorded here. The area contains a substantial remnant of Cumberland Plain woodlands, a vegetation type growing mainly on Wianamatta shale. Only 6% of the original area of Cumberland Plain woodlands remains. This community has been listed as an endangered ecological community under the NSW Threatened Species Conservation Act 1995. LEUCOPOGON EXOLASIUS, found here, is listed as vulnerable under the Commonwealth Endangered Species Protection Act 1992. Regionally significant plants include E SQUAMOSA, GREVILLEA DIFFUSA and ZORNIA DYCTIOCARPA (Criterion B.1). The broad headed snake (HOPLOCEPHALUS BUNGAROIDES), found in this area, is listed under the Commonwealth Endangered Species Protection Act 1992. The koala (PHASCOLARCTOS CINEREUS) population found locally is considered one of the few remaining viable populations in southern NSW. The area also contains a significant population of the spotted tailed quoll (DASYURUS MACULATUS). Both the koala and quoll are listed as vulnerable under the NSW Threatened Species Conservation Act, together with the giant burrowing frog (HELEIOPORUS AUSTRALIACUS), red crowned toadlet (PSEUDOPHRYNE AUSTRALIS), powerful owl (NINOX STRENUA) and greater broad nosed bat (SCOTEANAX RUEPPELLII), all of which are recorded in the area. The New Holland mouse (PSEUDOMYS NOVAEHOLLANDIAE), considered to be regionally rare, is also found here together with a number of other fauna species of regional or State conservation significance (Criterion B.1). The area has areas of significant aesthetic values, particularly the forested creek gorges (Criterion E.1). **Historic values**: The settlement sites and transport routes in the area are associated with the history of nineteenth century European settlement and the development of agriculture in the Liverpool region, including the wine

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					industry and subsistence farming in a bushland setting. The Grodno Settlement site is associated with the activities of migrants in the Liverpool region. The Cubbitch Barta National Estate Area also provides evidence of transport routes for settlers in the Liverpool, Holsworthy and Campbelltown areas. These demonstrate the transport linkages that connected the nineteenth century settlements, industry and farms to more established regions of Sydney. Holsworthy is also significant for its military associations. It was a training site for Australian troops and horses engaged in World War One battles, including Gallipoli. The Holsworthy Military Training Area is also significant for the training activities of the Australian Army after World War Two (Criterion A.4). The Old Army Internment Camp Group was used to inter Germans and other Europeans, from 1914-19. The internment of migrants in Australia followed Britain's foreign nationals policy during World War One and this site reflects Australia's strong defence links with Britain. It also demonstrates Australia's fear of European immigrants during World War One and reflects concerns that Australia's war effort and National security were threatened by spies and invasion. The Old Army Internment Camp Group also indicates the impact of World War One on Australia's home front when men were interned and their families left to fend for themselves (Criterion A.4). The Old Army Internment Camp Group is associated with the history of Federation. The acquisition of its remaining buildings in 1913 was part of the Commonwealth Government's major program of defence construction for Australia (Criterion A.4). The Old Army Internment Camp Group survives as evidence of the largest internment camp in Australia during World War One. The guard buildings and structures are rare in demonstrating the guards' section of a World War One internment camp in Australia and are also significant because they were constructed by German and other European internees (Criterion B.2). This Group has important associations for those who trained there during World War Two and who more recently undertook National Service

Item no.	Item name	Address / property description	Listing(s)	Significance	Statement of significance
					Training or permanent Army service there during its use as a military camp. It has similar associations for members of the World War One Light Horse Regiments and their families and descendants. It has strong associations for former internees. It also has important associations for Australians as a reminder of a period of conflict and troubled National identity, involving a deep suspicion of non-British immigrants at that time (Criterion G.1).
Item no. A1801	Kolara Weir	West of Heathcote Road and Woronora River Bridge on the Woronora River	Sutherland Shire LEP 2015	Local	N/A
-	Woronora River Bridge (RTA Bridge no. 152)	Heathcote Road, Heathcote, NSW 2233; Lat: -34.06333333333333 Long: 150.99638888888887	RMS s170 heritage register	State	Woronora River Bridge has historic, aesthetic and technical significance, and is an outstanding representative example of its class in NSW. Chiefly, the bridge has historic significance due to its strong association with strategic defence planning in World War Two in the south-eastern quarter of the wider Sydney area. The bridge also has significance because of its association with the history of transport to the Sutherland area, and with post war leisure activities in southern Sydney. The bridge is a large and impressive structure in a spectacular sandstone woodland landscape, and forms a landmark on Heathcote Road. The bridge has a high level of representative significance due to its size, as the only reinforced concrete beam bridge currently controlled by the Roads and Traffic Authority and constructed in the period 1925-1948 to exceed eighty metres in length. Full significance assessment, including criteria assessment, can be found in Table 8.

6 Proposal

6.1 Proposal need

The Woronora River Bridge forms part of a key traffic corridor, which connects Sutherland Shire to Liverpool, with 23,000 vehicles crossing the bridge each day. A number of traffic incidents resulting in serious injuries and a fatality in 2015 has prompted the need for the bridge widening proposal for Woronora River Bridge. The narrow width of the bridge was identified as a key factor in the 2015 fatality and other crashes.

Woronora River Bridge has narrow travel lanes, measuring 3.05 metres wide, and shoulders measuring 300 millimetres wide. These widths do not align with the Ausroads specified minimum lane and shoulder widths. As a result, they represent a significant safety issue for Heathcote Road, which has a 70 kilometre speed zone. There is very little 'room for error' when vehicles are negotiating the bridge due to the narrow width. Any minor distraction has the possibility to result in a catastrophic outcome. Vehicles often slow to cross the bridge due to the narrow width issue, which results in poor driver comfort and also has secondary network reliability and travel time impacts. A standard truck body is 2.5 metres wide (excluding mirrors). If mirrors extend further than approximately 250 millimetres from truck body then two trucks travelling in opposing directions cannot simultaneously cross the bridge without the risk of some level of collision.

It is proposed to widen the Woronora River Bridge to 3.5 metre lanes and 1.2 metre shoulders; this will reduce the likelihood of head-on collisions. The lane and shoulder widths of the bridge approaches were also assessed and multiple deficiencies were identified. The same safety issue on the Woronora River Bridge exists at the northern and southern bridge approaches. As such, the proposal aims to remedy these issues by providing minimum 3.5 metre travel lanes and 1.2 metre shoulders through the full extent of the works (i.e. the Woronora River Bridge and bridge approaches). If the Woronora River Bridge were to be duplicated and left in its current configuration of 3.05 metre lanes and 300 millimetre shoulders, this would still remain unacceptable from a road design and road safety perspective due to the narrow width of the bridge.

6.2 Development of proposal options

At the strategic development stage of the project, the following options were considered by TfNSW:

1. Do nothing.
2. Do minimal - median barrier on bridge.
3. Bridge widening.
4. Bridge duplication, with a single lane bridge each way.

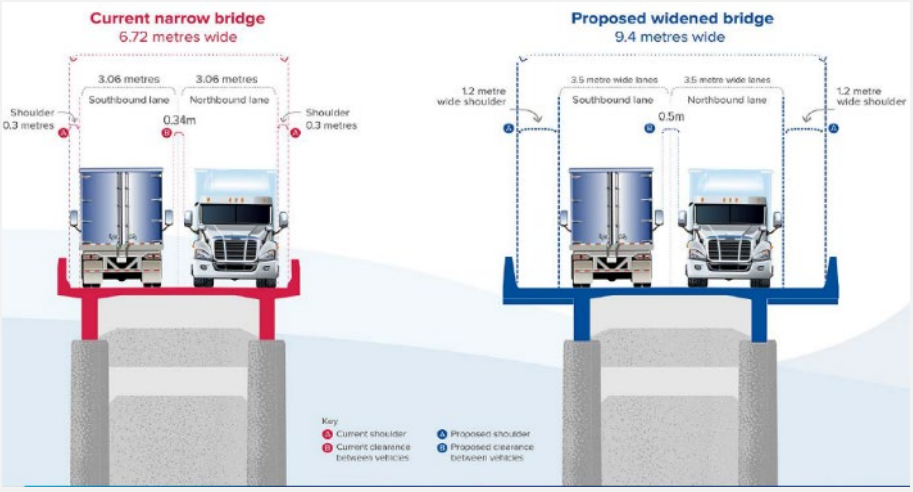
These options were evaluated by TfNSW with the following constraints in mind:

- The bridge has a long span at height over the Woronora River. Flooding of the Woronora River at this location to can reach within approximately 5 metres of the bridge girder soffit.
- Reversed high cut/high embankment on approaches mean that widening both sides is preferable to avoid high retaining walls and modification of existing high sandstone cuttings
- It is prefered not to risk the integrity of the existing structure of Woronora River Bridge.
- The works must be able to be implemented quickly. Some of the options above may result in significant delays associated with property acquisition.

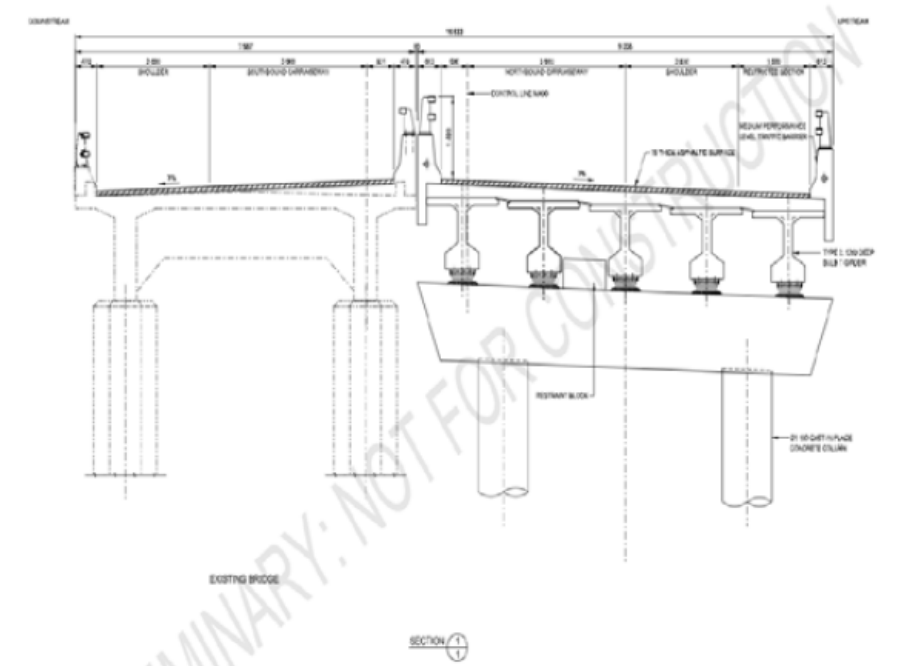
- It is prefered not to require long term closure of Heathcote Road due to a detrimental effect on traffic on the Princes Highway and Bangor Bypass, with 23000 vehicles per day being redirected from Heathcote Road due to the closure of the bridge.
- There are biodiversity constraints associated with the surrounding National Park areas.
- There are sites of Aboriginal cultural significance in close proximity to the bridge.

A summary of the evaluations undertaken by TfNSW for the proposal options are presented in Table 16**Error! Reference source not found.**.

Table 16 Summary of evaluation for proposal options 1-4

Proposal option	Evaluation summary
Option 1 – Do nothing	• Does not resolve the risks and issues currently affecting the safety of road users in the 23,000 vehicles using Heathcote Road and Woronora River Bridge each day.
Option 2 - Installation of a central median barrier on the existing Woronora River Bridge	• Narrow width (existing: 3 m lanes, 300 mm shoulders) would further complicate the passage of heavy vehicles as it is already the minimum width of these vehicles. • Incident response vehicles would not be able to reach the site of incident with central median barrier. • Would require eventual rework to achieve compliant lane and width shoulder for alignment with long term solution.
Option 3 - Widening of the Woronora River Bridge	• Enables for widening of lane widths from 3.05 metres to 3.5 metres plus 1.2 metre shoulders, from the current shoulder width of 300 millimetres. • Minor cutting back of the slope face at pinch points on the northern and southern bridge approaches. • Works can be delivered in the short term. • Impact to Commonwealth heritage item Cubbitch Barta National Estate as a result of rock cutting. • Impacts to S170 heritage item Woronora River Bridge. • Comparatively fewer environmental impacts than Option 4. • Less complex property issues and acquisitions. • Fewer constructability impacts than Option 4. 

Proposal option	Evaluation summary
Option 4 - Duplication of the Woronora River Bridge, comprising a new bridge located adjacent to the existing bridge with a single lane running in each direction with shoulders	• Significant environmental impact due to the high (15-20 m) rock cutting with benching (4 m wide) every 7 m required on the northern bridge approach. • Higher impacts to Commonwealth heritage item Cubbitch Barta National Estate as a result of rock cutting compared to Option 3. • Serious challenges in machinery accessing the top of the cut. No access through military land, with large cliffs up the slope of the area needed for access, preventing machinery access. Access would require a temporary ramp and retaining wall system from the road for large excavators, drilling equipment and dump trucks. • Serious safety management issues would arise in the aforementioned cutting activity. This relates to large machinery on top of the cut, close to the edge of a 15-20 m high rock cutting. • Significant impacts to traffic. The rock cutting would require a long term road closure to deliver these works. It would not be appropriate from a road safety perspective to attempt to conduct these works adjacent to live traffic due to rock fall risk. The temporary ramp access would also block a minimum one lane of traffic. • There are significant issues relating to how the required bulb T reinforced concrete bridge girders would be installed. This would require a significantly larger crane pad (and therefore environmental impact) than Option 3. • The existing bridge would remain at it's current width – from a long term road safety perspective this is a poor outcome. • On the southern approach, large ~10 m high retaining walls would be required above Heathcote Creek resulting in a significant environmental impact. • Urban design advice is that widening both sides of the passage would be the preferred outcome (Option 3). • The cost of this option is prohibitive given the strict upper limit project budget. • Widening to one side of bridge only – new narrow bridge adjacent to existing bridge

Proposal option	Evaluation summary
	 • New structure would accommodate 3.5 m lanes and .2 m shoulders. • Not feasible from a bridge engineering perspective because vehicles would straddle the joint between old and new structures.

As a result of the evaluation of Options 1-4, the preferred option was identified as Option 3 - Widening of the Woronora River Bridge.

6.3 Exploration of bridge widening options

Initially, two design sub-options were developed for the bridge widening option:

- Option A - Widen to one side supported by additional piers (Photo 38).
- Option B - Widen on both sides using a steel cantilever bracket post tensioning system (Photo 39.

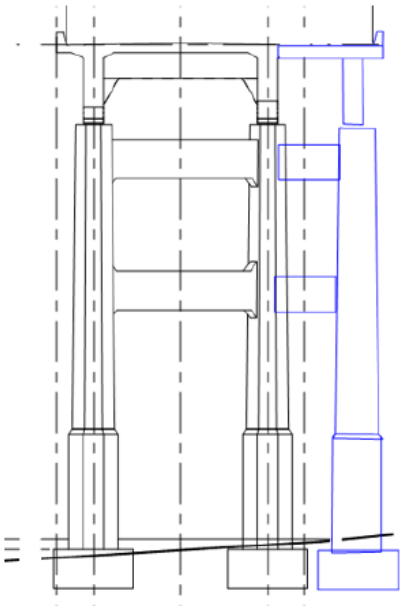


Photo 38 Option A – Widen on one side support by additional piers

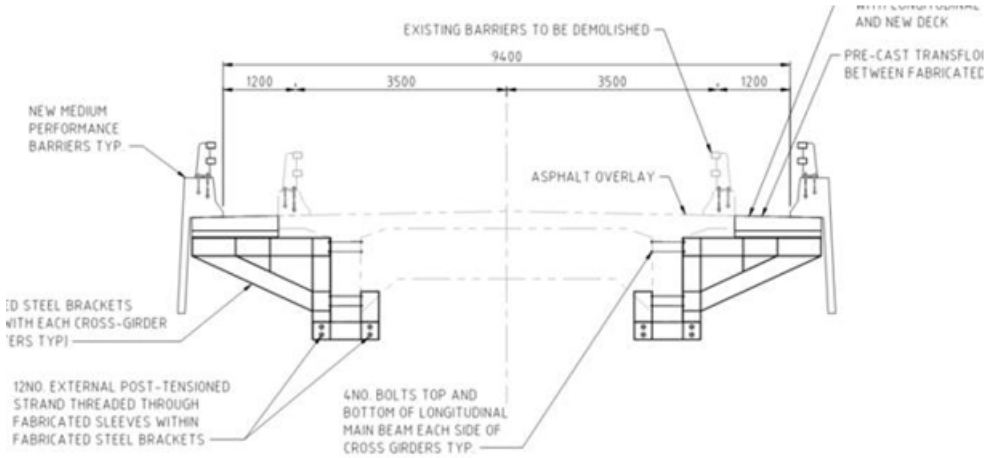


Photo 39 Option B – Widen on both sides using a steel cantilever bracket post tensioning system

Option A was evaluated for its viability. It was considered there would be a higher potential environmental impact associated with pier construction works in the waterway and larger footprint of works required on northern and southern approaches. There would also be more substantial deviation from the existing structure, less sympathetic heritage outcomes, potential impacts to the National Park and Aboriginal heritage, and direct impacts to Cubbitch Barta National Estate area. Urban design assessment noted that this would not be the most favourable option, and would be asymmetrical. Bridge engineering assessment strongly recommended against this option because of differential movement between old and new structural elements; the vehicle travel lane would also straddle along the joint. As the widening would be locked to one side, this would require more substantial works on both approaches to modify the alignment, resulting in more substantial rock cutting works on one approach, and more substantial earthworks and major retaining wall structures on the alternate approach. This is also made difficult by the existing road curve and the skewed alignments of Woronora River and Heathcote Creek. Option A would also have complex maintenance issues for the longitudinal bridge joint, and constructability challenges and potentially longer duration of full road closures. It was found that there would be substantially greater

acquisition costs and some potentially complex issues around Commonwealth and National Park lands which may impact proposal viability, as well as higher construction costs with more substantial bridge works, rock cutting works, pavement widening works (possibly even a viaduct), and utility relocation adjustments and cost.

In light of the above disadvantages of Option A, Option B was shortlisted as the preferred option as it had more favourable urban design, heritage and environmental outcomes, and was further explored by TfNSW for its viability. A detailed structural investigation and engineering assessment found that this option was not feasible due to the requirement to drill eight holes per bracket in the existing bridge girders but not impact existing steel reinforcement. The entire bridge would have required steel reinforcement mapping, with locations spray painted on the bridge. Furthermore, experience on other similar projects using this solution found there was a risk of encountering steel not detected in the steel reinforcement scan, which could damage the structural integrity of the bridge.

As a result, the widening of the bridge headstocks (Option C) was investigated by TfNSW as an alternative to support the widening of the bridge on both sides. Headstocks transfer the load from multiple girders to the pier column.[55] The headstock extensions would include headstock connector rods across the existing headstock and pier clamps with knuckle heads. These would support new box girders which would in turn support the widened deck above. This method has had successful application on similar concrete bridge structures (Photo 40). Option C would reduce direct physical impacts to the original fabric of the bridge.

Photo 40 Example of headstock extension used for Market Street Viaduct, Darling Harbour

Option C was evaluated as the preferred design option for the widening of Woronora River Bridge on both sides. TfNSW proceeded with developing concept designs of Option C.

[55] Transport for NSW 2019, p.56

6.4 Development of concept design for Option C bridge widening

Followong the identification of Option C as the preferred bridge widening design option, concept designs were developed for the proposal. The aesthetics of the Woronora River Bridge design were a significant driver in the form and detail of the concept designs in order to reduce the impacts that the proposal would have on the heritage significance of the bridge. The concept design has developed over time in consultation with heritage advice provided by Biosis.

The first round of concept designs for Option C were provided by TfNSW to Biosis on 28 August 2020 (Appendix 2). These designs consisted of the wider road design and engineering aspects of the proposed works such as demolition, rock cuttings, services and infrastructure, drainage, pavements and retaining walls, and three-dimensional modelling of the proposed bridge widening design. One cross section drawing was provided in the road design and engineering drawings which did not include the proposed headstock extensions, only the extended width of the road and new barriers (Photo 41). Additional three-dimensional modelling of the bridge provided detail on the early design of the steel headstock extensions and box girders (Photo 42).

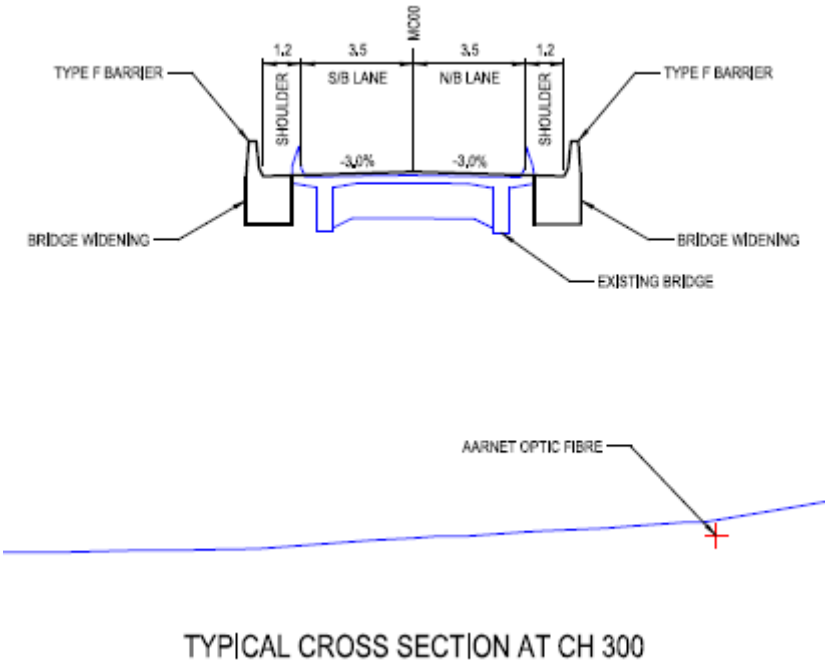


Photo 41 Cross section of bridge widening from concept design drawings (Source: TfNSW, provided 28 August 2020)

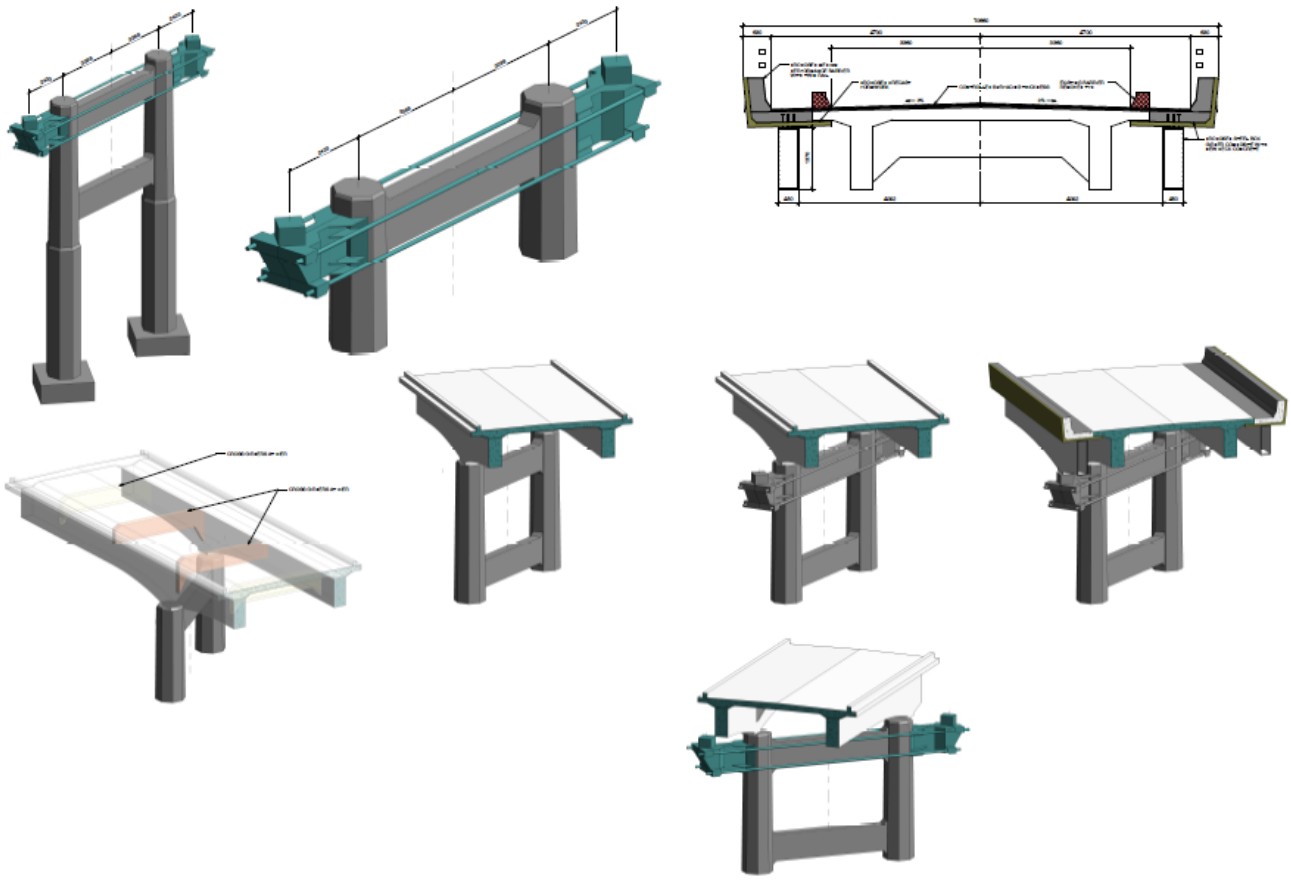


Photo 42 Early three-dimensional designs of the headstock extension and box girders for widening of Woronora River Bridge (Source: TfNSW, provided 28 August 2020)

These designs were assessed for their impact on the heritage significance of the Woronora River Bridge and surrounding heritage items. Whilst the impact to the Cubbitch Barta National Estate Area's historical heritage values would be minimal, it was recommended by Biosis that, based on these drawings, further exploration of design options should be undertaken which would have fewer direct and indirect impacts to the study area and associated heritage items and places. The proposed designs posed an unacceptable impact to the State heritage significance and the technical, aesthetic and representative values of the Woronora River Bridge. The design of the proposed headstock extensions was not considered to be sympathetic to the item's architectural form. It was also unclear whether the overall appearance of the proposed new steel box girders would respect the aesthetic and form of the original architecture. In addition to direct impacts to original fabric, the proposed designs would have a visual impact, affecting views of the item, but also altering the aesthetic of the bridge.

Biosis highlighted bridge widening techniques used for similar heritage listed bridges in NSW, Broughton Creek Bridge (RTA Bridge No. 704, Roads and Maritime Services Section 170 Heritage and Conservation Register) and Stapletons Bridge over Frazer Creek (RTA Bridge No. 881, Roads and Maritime Services Section 170 Heirtage and Conservation Register). The resulting works for these two bridges provided sympathetic additions to the original bridge designs, but could be clearly differentiated as new work. These two examples are presented in Table 17.

Table 17 Examples of sympathetic widening projects for similar heritage-listed bridges in NSW

Item	Details
Broughton Creek Bridge (RTA Bridge No. 704, Roads and Maritime Services Section 170 Heritage and Conservation Register)	
Statement of significance	As a recently widened bridge, the Broughton Creek Bridge has technical and aesthetic signicance and the potential to contribute to an understanding of contemporary strategies for the continued use of older road infrastructure under changing demands. The original fabric embodies the design principles and construction techniques applied to modest concrete bridges during the period 1925-1948, being a sturdy structure of a standard concrete beam design, poured on site and neatly finished. The widened bridge represents an excellent, and possibly unique adaptation to achieve a wider deck without the need for additional piers, and has retained the spacious and clean lines of the original structure, with most of the original fabric unaltered and the views to and from the structure, which allow its interpretation have been maintained. Thus, although the bridge has been widened, it retains the capacity to demonstrate the key characteristics of bridges of its type and era (date significance updated: 8 September 2004).
Discussion of bridge widening	The original bridge comprises concrete wall abutments and three longitudinal beams which are supported at the central pier and curve down to frame compositely with the abutment walls, and each span has a cross girder at the pier. The central pier has two columns which frame into a cross girder which has a wider upper section to accommodate the two supported decks. The bridge widening, undertaken in 1994, was achieved by installing small composite cantilever beams which taper upward from the main beam. Three rows of steel structs per span brace the main beams to assist in distributing the twisting effect of loads outside the main beams coming through the cantilevers. The additional bridge deck as part of this widening supports a kerb and Thriebeam style guardrailing. The wall abutments were extended to accommodate the new deck width. Gabion box walls have been used to stabilise the abutment fill. The new concrete additions are simple in design, and while similar in colour and style, these are largely unobtrusive and can be differentiated from the original elements of the bridge.
	

Item	Details
	
Stapletons Bridge over Frazer Creek (RTA Bridge No. 881, Roads and Maritime Services Section 170 Heirtage and Conservation Register)	
Statement of significance	Stapletons Bridge is of local historical, associative and aesthetic and technical significance. Its associations with James Stapleton, local landowner; and the Fraser family, for whom the creek was named contribute to an understanding of the history of the locality. The bridge is a component of Tongarra Road, a historically important route in the area, particularly as a timber route in the mid-nineteenth century, then as a coal transport route from later that century. While the crossing has been bridged since at least the 1850s, the present bridge, constructed in 1929 demonstrates the process of road infrastructure improvement undertaken by the Main Roads Board cum Department of Main Roads from the late 1920s to bring such infrastructure up to the standards required to cope with the changing nature and volume of traffic. Subsequent modifications are related to the industrial, commercial and residential expansion of the Greater Wollongong area in the late twentieth century. The bridge's design employs a reinforced concrete beam cantilever approach span system, which gives the bridge a distinctive appearance (date significance updated: 18 August 2005).
Discussion of bridge widening	The original bridge has one main span and comprises three rows of continuous piers and beams, which haunch down to the piers and then up to the terminal cross girders. The bridge is presumed to be founded on spread footings, with the fill stabilised by loose rock. The bridge widening was undertaken in 1991 to accommodate a widened roadway and a footway. One additional row of piers and beams was added to the southern side and two have been added to the northern side of the bridge. The new columns are slightly wider than the originals columns, but otherwise the widening is very sympathestic. The wideneded bridge deck has New Jersey kerbs with aluminium rails, and an aluminium railing for the footway.

Item	Details
	  

Following this advice, subsequent detailed concept designs were developed for the proposal (Appendix 3). Changes to the design detail include the following:

- The steel knuckle head for the headstock extensions will be octagonal in shape, reflecting the form of the existing concrete piers (Photo 43, Photo 44, Photo 45).
- The new steel box girders will have a cantilevered form, which reflects the original cantilevered shape of the concrete girders (Photo 43, Photo 44, Photo 45).
- The steel prestressing bars would connect the two knuckle heads through post tensioning in place at the piers. There is an option for two thicker prestressing bars or three thinner prestressing bars (Photo 46, Photo 47).
- The steel additions are proposed to be painted. The use of weathering steel was also considered as part of the detailed concept design, but this was discussed by Biosis, TfNSW and KI Studio at a design meeting and considered a less sympathetic option than painted steel.
- Investigations into the original design drawings of the bridge have confirmed that the sandstone block facing on the current abutment wing wall is not structural and is cladding. It has been proposed to salvage the sandstone and reuse the material if possible, as the new abutment wing wall will obsure the sandstone facing.

Image:

Photo 43 Photomontage of detailed concept design of Option C bridge widening (Source: TfNSW, provided 20 October 2020)

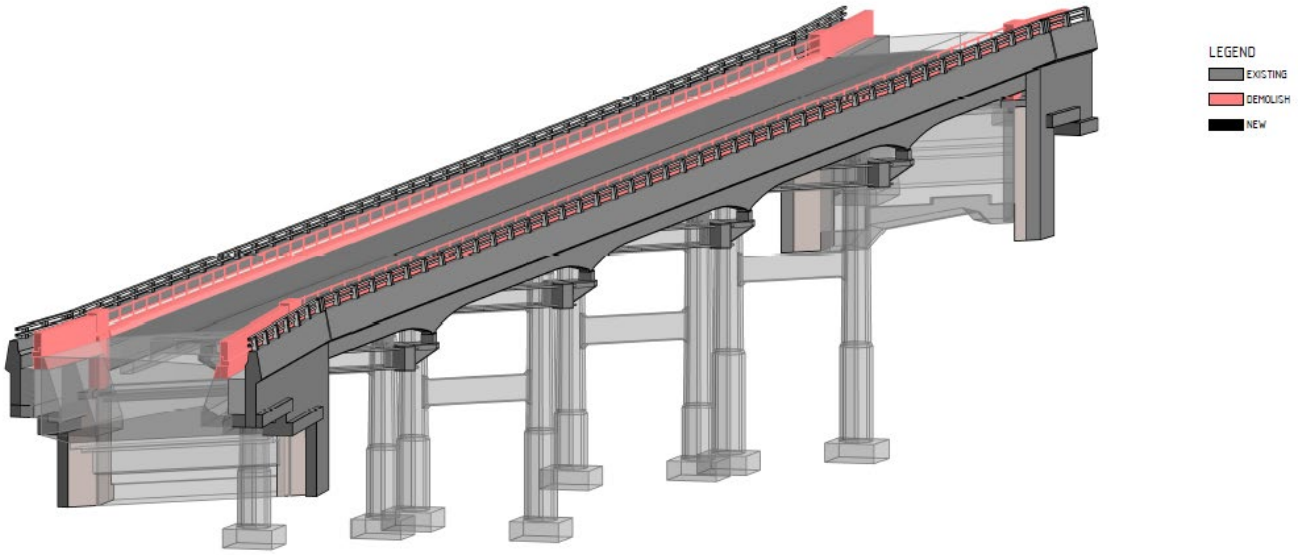


Photo 44 Detailed three-dimensional concept design for Option C bridge widening (Source: TfNSW, provided 15 October 2020)

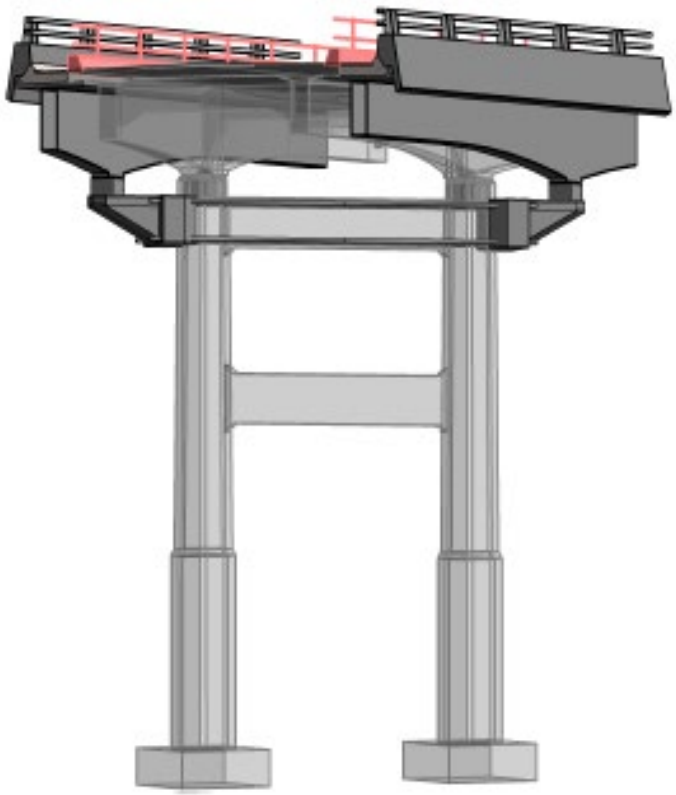


Photo 45 Detailed three-dimensional concept design for Option C bridge widening, detail of headstock extensions, new steel box girders and widened deck with barriers (Source: TfNSW, provided 15 October 2020)

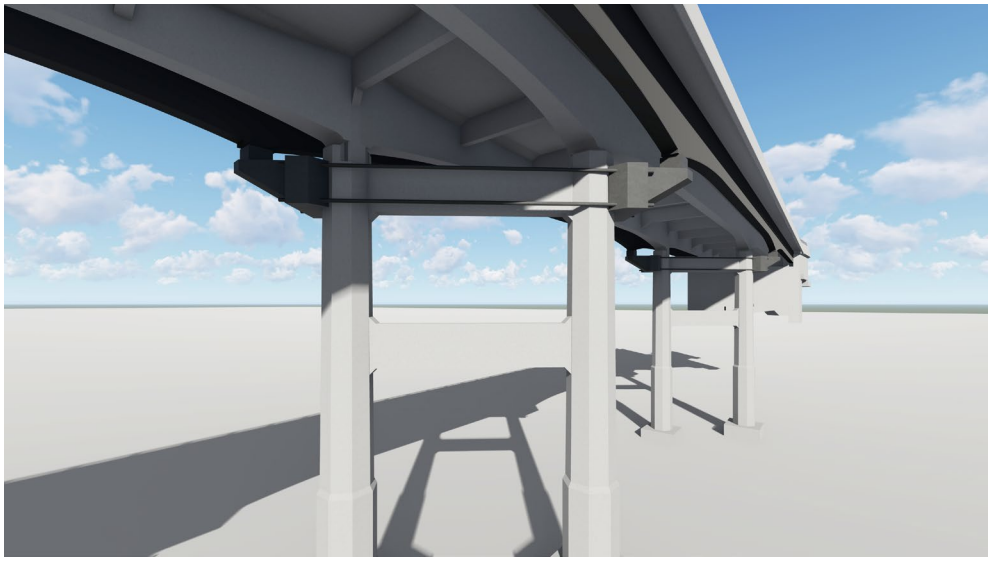


Photo 46 Example view of option for two thicker prestressing bars connecting knuckle heads at piers (Source: TfNSW, provided 20 October 2020)

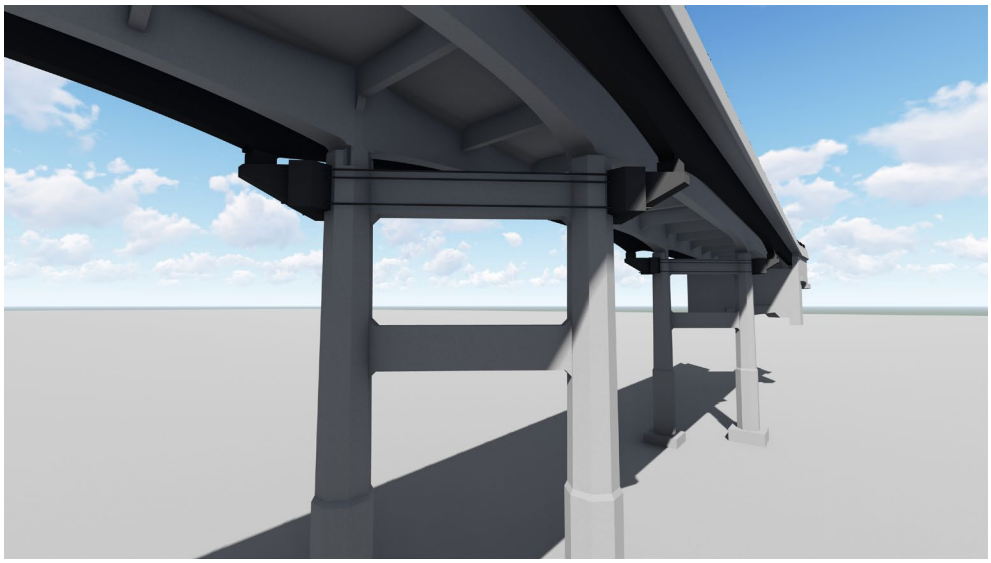


Photo 47 Example view of option for three thinner prestressing bars connecting knuckle heads at piers (Source: TfNSW, provided 20 October 2020)

These concept designs are the subject of the impact assessment presented in Section 7.

6.5 Proposal details

TfNSW proposes to undertake road safety improvements along Heathcote Road. The proposed works are shown in Figure 3 and full detailed concept designs are provided in Appendix 3. Key features of the proposal are outlined in Sections 6.5.1 and 6.5.2.

6.5.1 Bridge widening works

- Widening of the existing bridge by widening the headstocks and placing new steel girders on either side of the existing bridge. This will widen the lane widths from 3.05 metres to 3.5 metres plus 1.2 metre shoulders; the current shoulder width is 300 millimetres (Photo 48, Photo 49).
    - Prepatory works will take place on bridge piers to install headstock extensions; this will include (but is not excluded to) preparation of the surface of piers, cut shear key, drill locating/guide bolts.
    - Headstock extensions will be installed by lifting the items into place and temporarily supported. Headstock extensions will then post tensioned in place at the pier and any temporary supports removed (Photo 50, Photo 51).
    - Girders will be installed by lifting them into place on top of the bearings positioned on top of the headstock extensions (Photo 52).
    - The existing 1990 barrier would be demolished, as well as the current guardrails and abutment walls on the northern and southern bridge approaches (Photo 48, Photo 49).
    - The edge of existing bridge deck slab will be prepared for construction of the widened area of bridge deck. Hydro-demolition may potentially be used to expose steel reinforcement or preparation of starter bars.
    - Formwork for slab extension will be installed, followed by installation of new steel reinforcement and pouring of concrete for the deck slab extension.

- The new barrier will be constructed, with formwork installed, followed by steel reinforcement and pouring of concrete.
- The steel traffic rail will be installed on the bridge barrier (Photo 48, Photo 49).
- Asphalt wearing course will be milled and re-sheeted on trafficable areas of the bridge deck.
- Finishing works will be undertaken, such as pavement markings.

- Minor cutting back of the slope face at pinch points on the northern and southern bridge approaches to improve lane width on both approaches (Photo 53, Photo 54, Photo 55,Photo 56).
- Construct widened road pavement and associated retaining wall structures (Photo 57, Photo 58, Photo 59, Photo 60, Photo 61, Photo 62).
- Abutment modification works on both northern and southern sides (Photo 48, Photo 49, Photo 63, Photo 64, Photo 65).
    - The existing abutment wall will be demolished (Photo 63).
    - Excavations will occur to bedrock for the new abutment foundations. If required, piles will be installed into the underlying rock for additional strength.
    - Starter bars will be drilled into the existing bridge abutments.
    - Investigations into the original design drawings of the bridge have confirmed that the sandstone block facing on the current abutment wing wall is not structural and is decorative cladding. The sandstone will be removed and reused if possible.
    - Formworkwill be erected, new steel reinforcement will be installed and concrete poured for widened abutments.
    - New bearing pads will be installed on the new widened section of abutments.
- Drainage infrastructure, including extension of existing cross culverts (Photo 57, Photo 58, Photo 59, Photo 60, Photo 61, Photo 62, Photo 70, Photo 71).
- Utilities adjustment (optic fibre) (Photo 57, Photo 58, Photo 59, Photo 60, Photo 61, Photo 62, Photo 70, Photo 71).

These features seek to address the current safety hazards present on the Woronora River Bridge and its approaches. The current shoulder width measures 300 millimetres, and several collisions and other accidents have showed this width to be inadequate for safety standards. The proposal meets the key safety objective within the confines and constraints of the environment within which Woronora River Bridge is contained.

Please note that it is not possible to preclude whether or not any future possible upgrade to the Heathcote Road corridor may still require widening of the Woronora River Bridge to meet current road design standards.

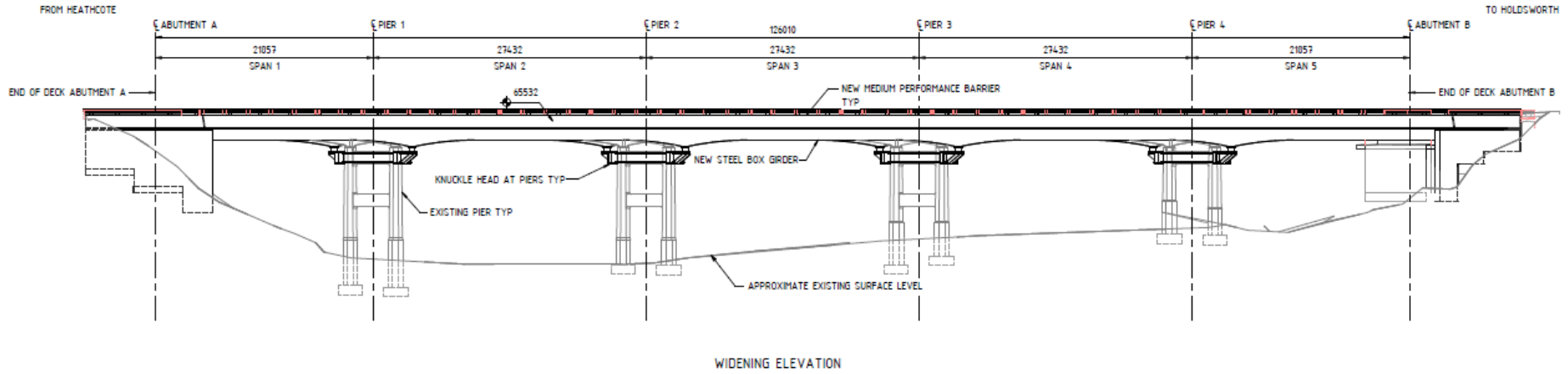


Photo 48 Elevation of bridge widening concept design (Source: TfNSW, provided 15 October 2020)

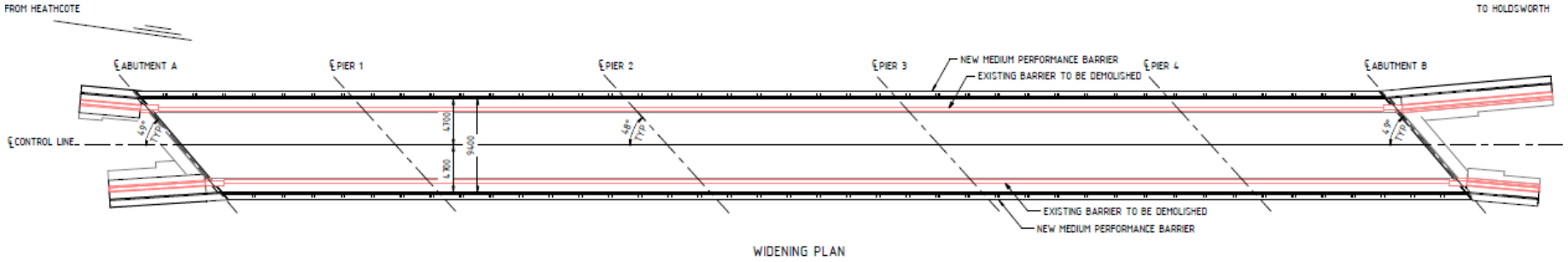


Photo 49 Plan of bridge widening concept design (Source: TfNSW, provided 15 October 2020)

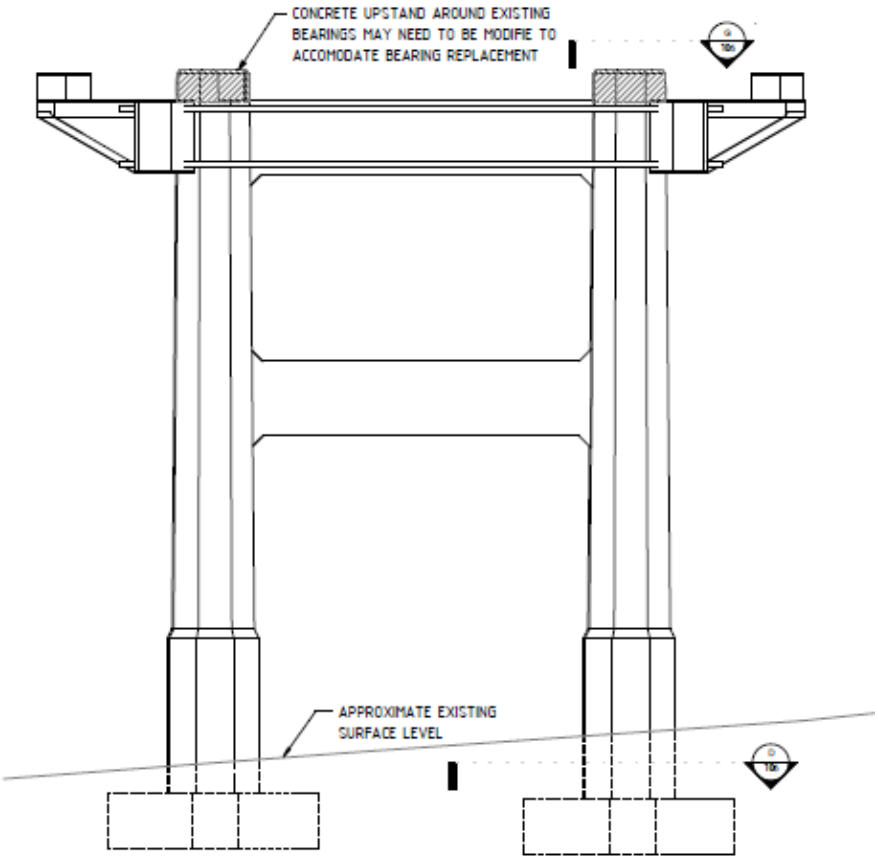


Photo 50 Detailed concept design of headstock extensions using knuckle heads at piers and prestressing bars (Source: TfNSW, provided 15 October 2020)

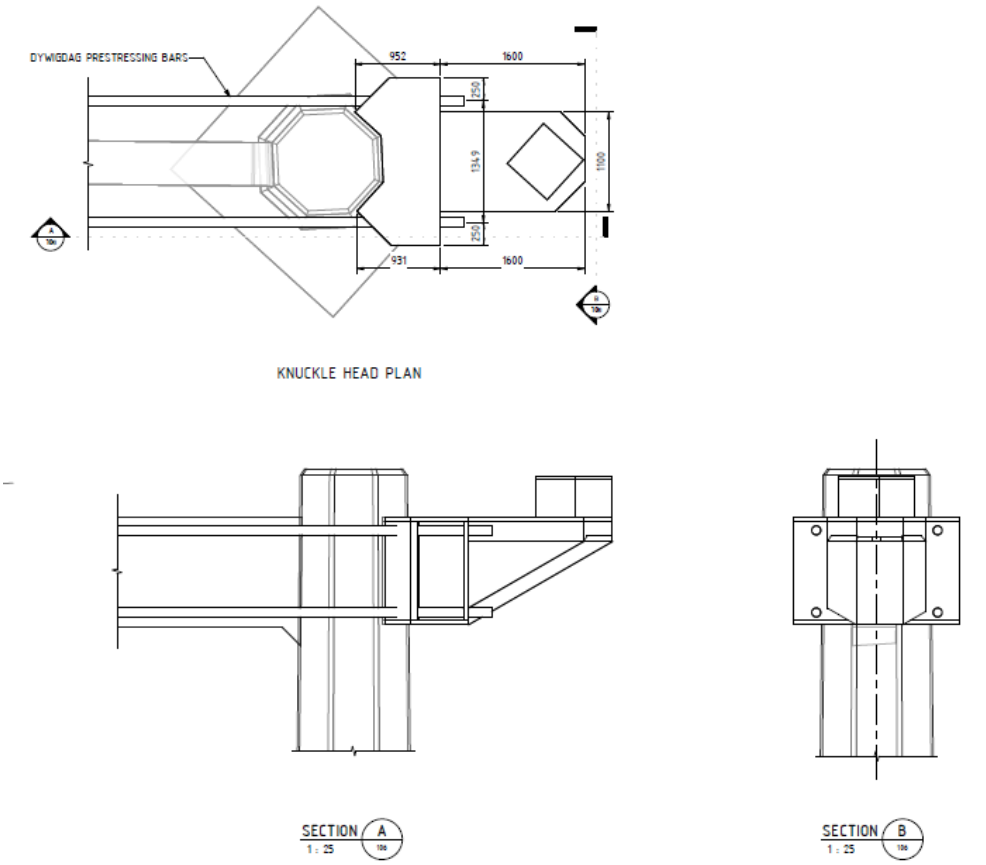


Photo 51 Detail of concept design for knuckle heads at piers, prestressing bars and bearings (Source: TfNSW, provided 15 October 2020)

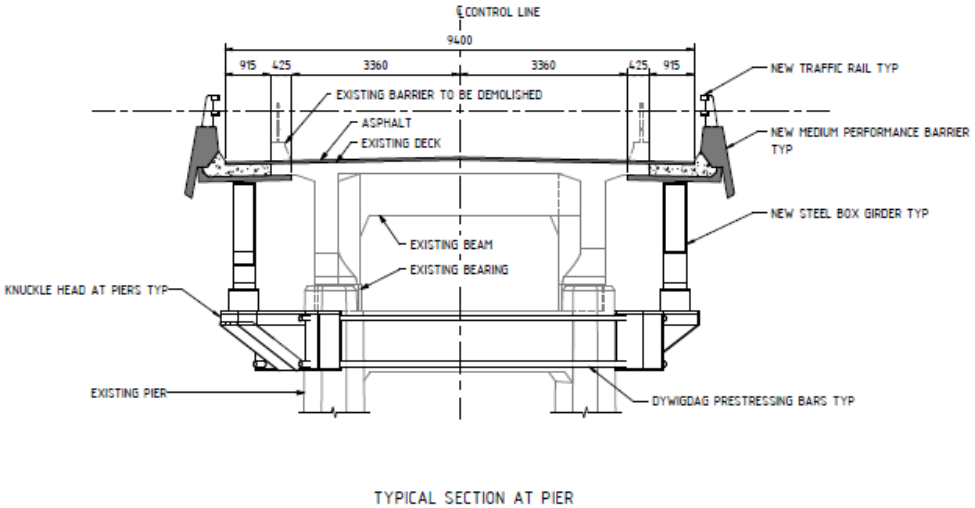


Photo 52 Detail of concept design for headstock extension and new steel box girders (Source: TfNSW, provided 15 October 2020)

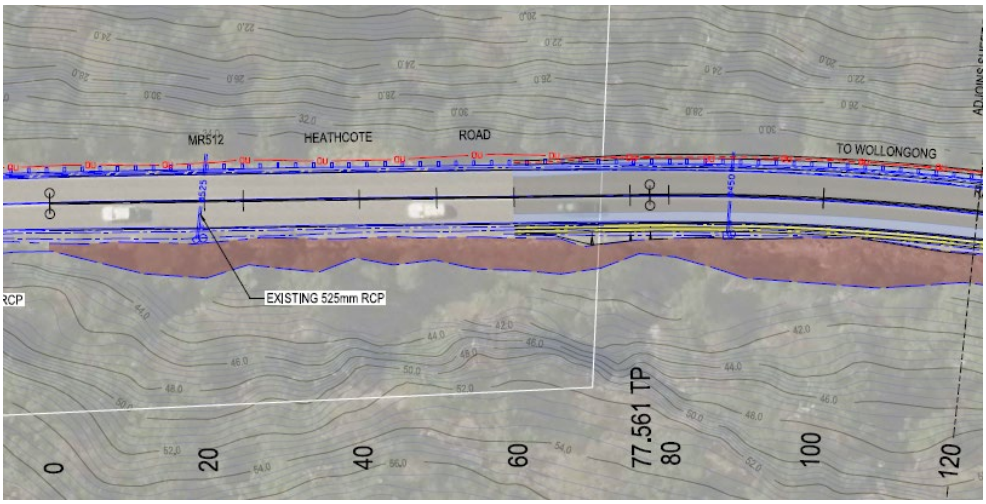


Photo 53 Proposed rock cutting on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

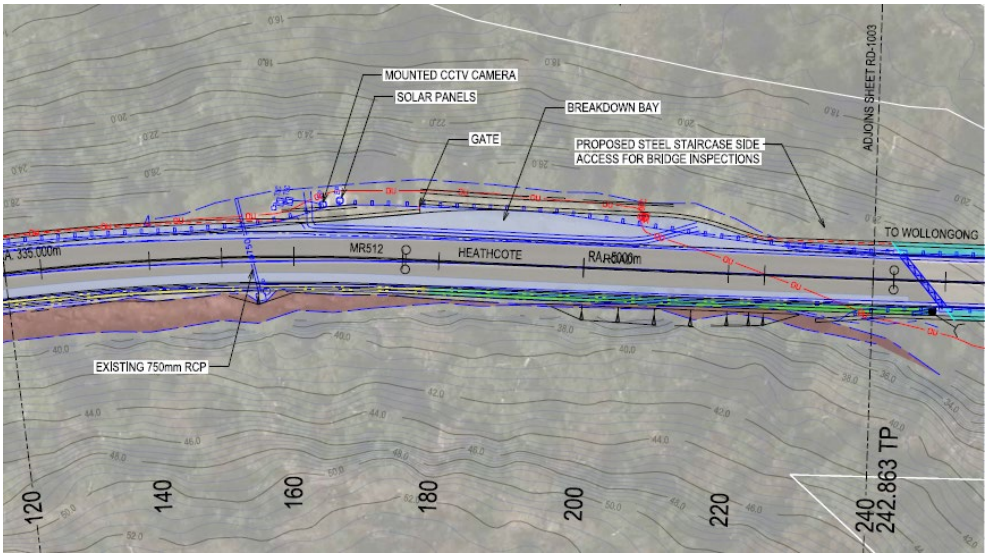


Photo 54 Proposed rock cutting on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

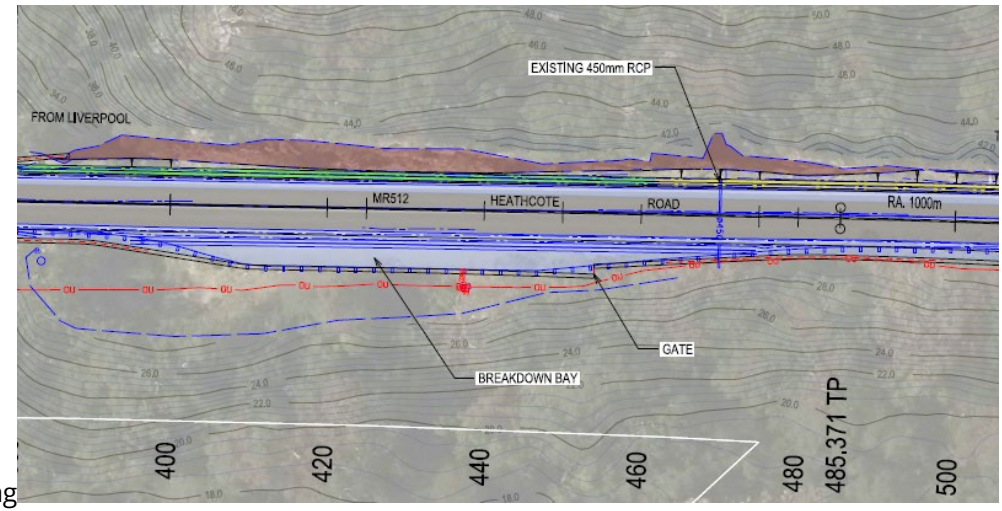
imag 

Photo 55 Proposed rock cutting on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

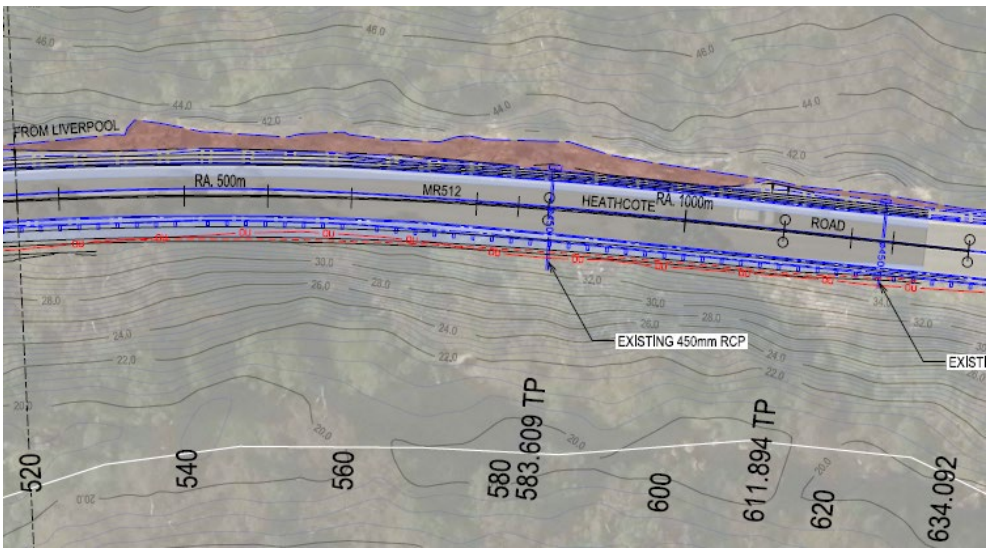
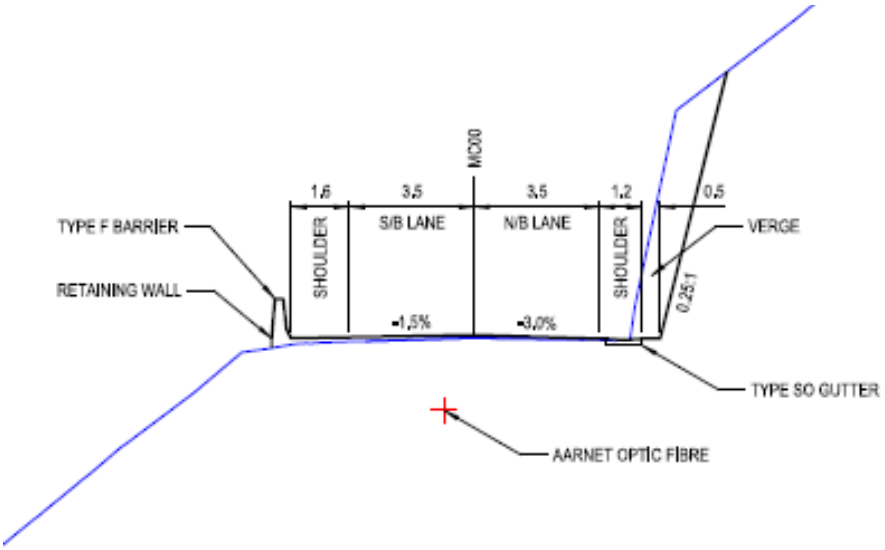
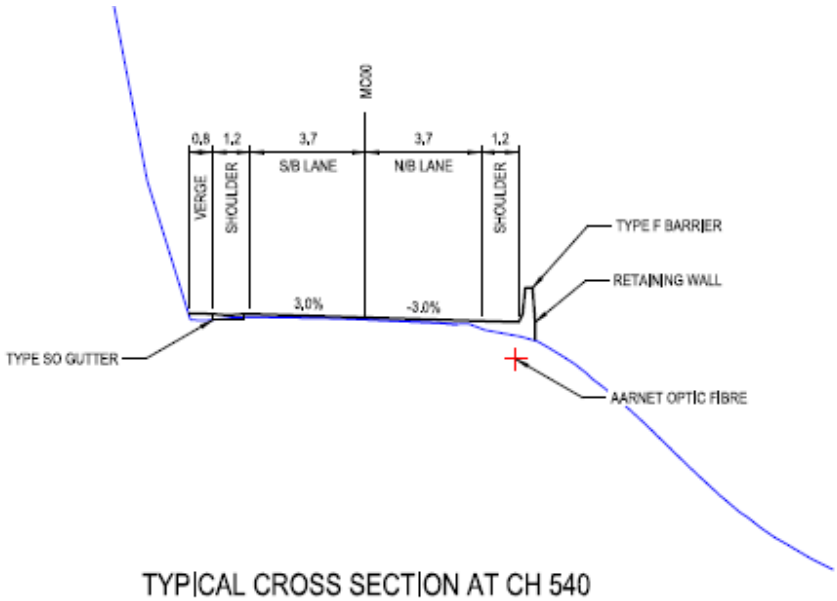


Photo 56 Proposed rock cutting on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)



TYPICAL CROSS SECTION AT CH 223

Photo 57 **Example section of proposed widened road pavements, cutting and retaining wall on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)**



TYPICAL CROSS SECTION AT CH 540

Photo 58 **Example section of proposed widened road pavements and retaining wall on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)**

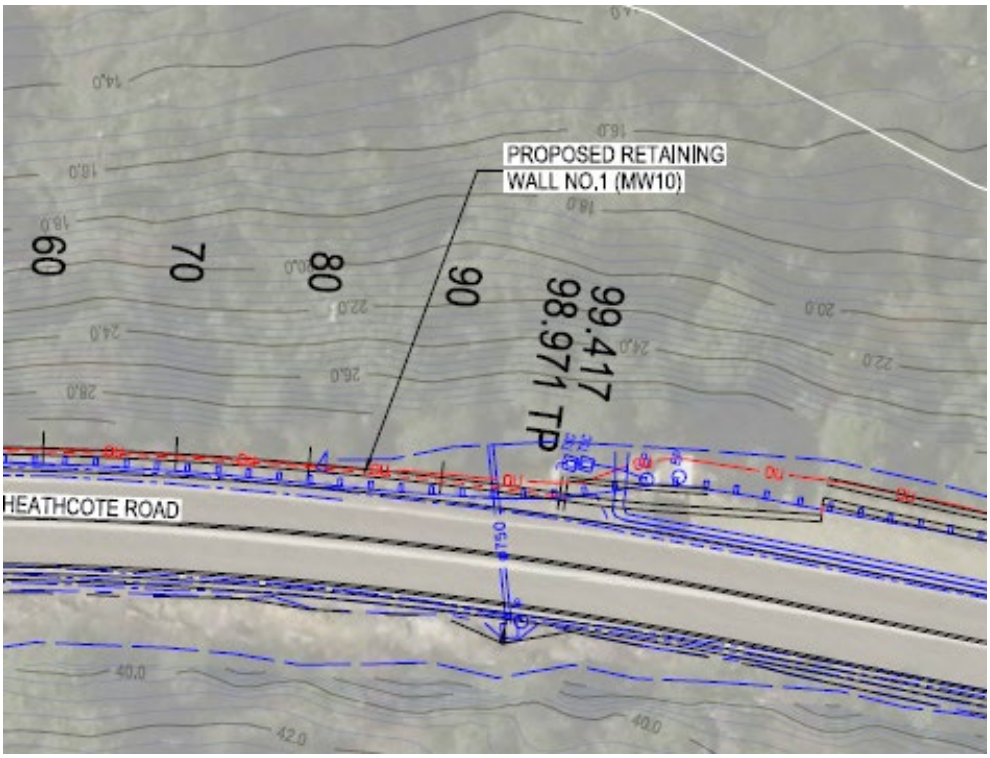


Photo 59 Plan of of proposed retaining wall on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

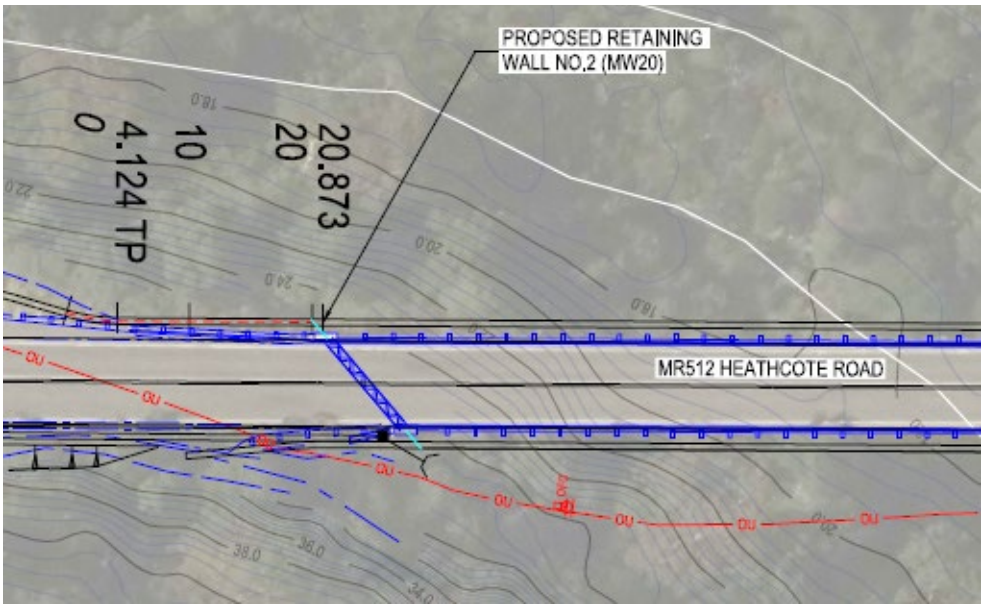


Photo 60 Plan of proposed retaining wall on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

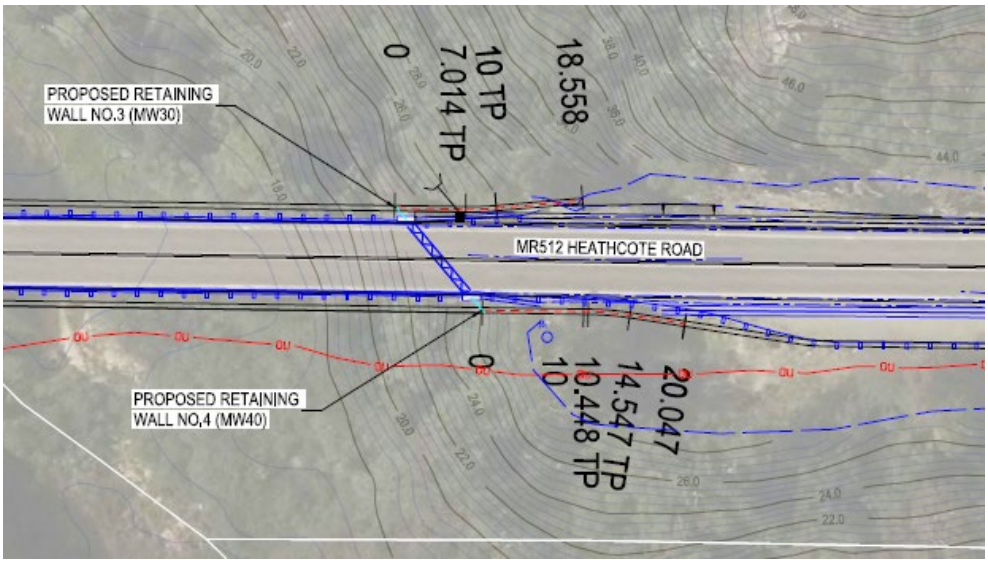


Photo 61 **Plan of proposed retaining wall on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)**

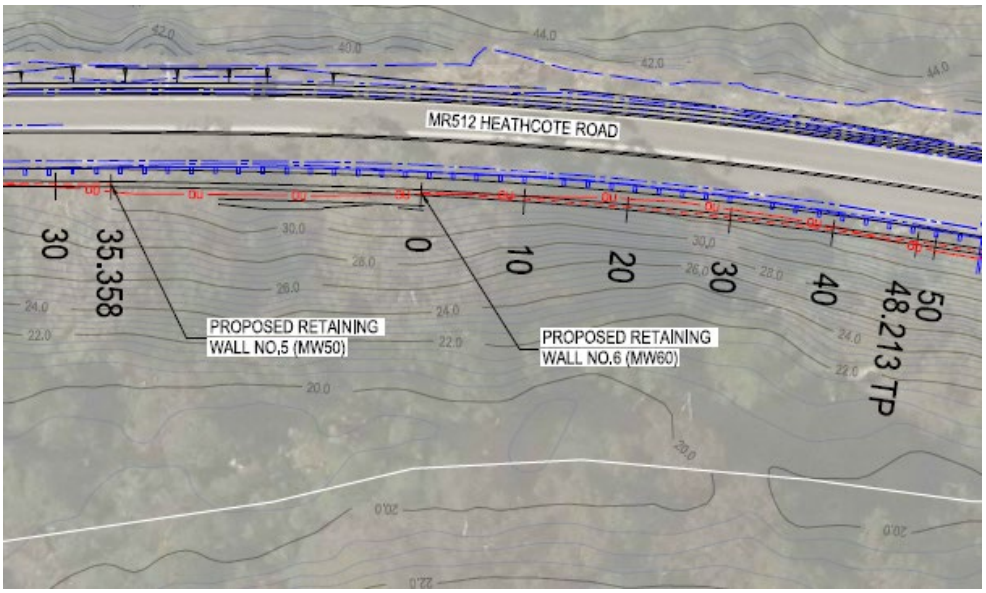


Photo 62 **Plan of proposed retaining wall on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)**

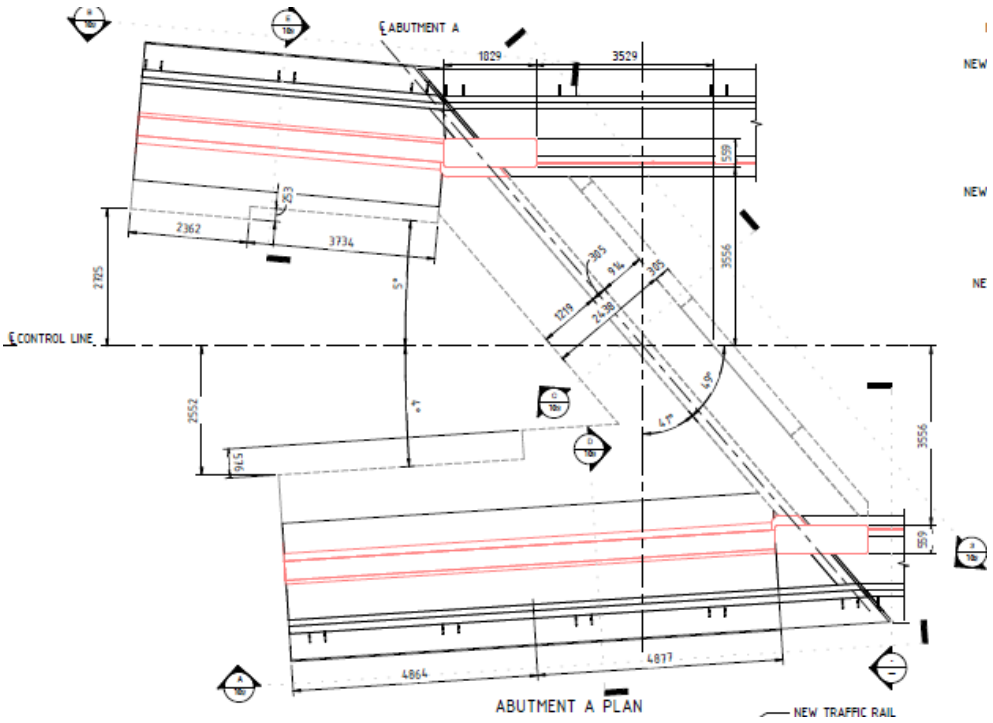


Photo 63 Detailed concept design of abutment demolition and proposed works (Source: TfNSW, provided 15 October 2020)

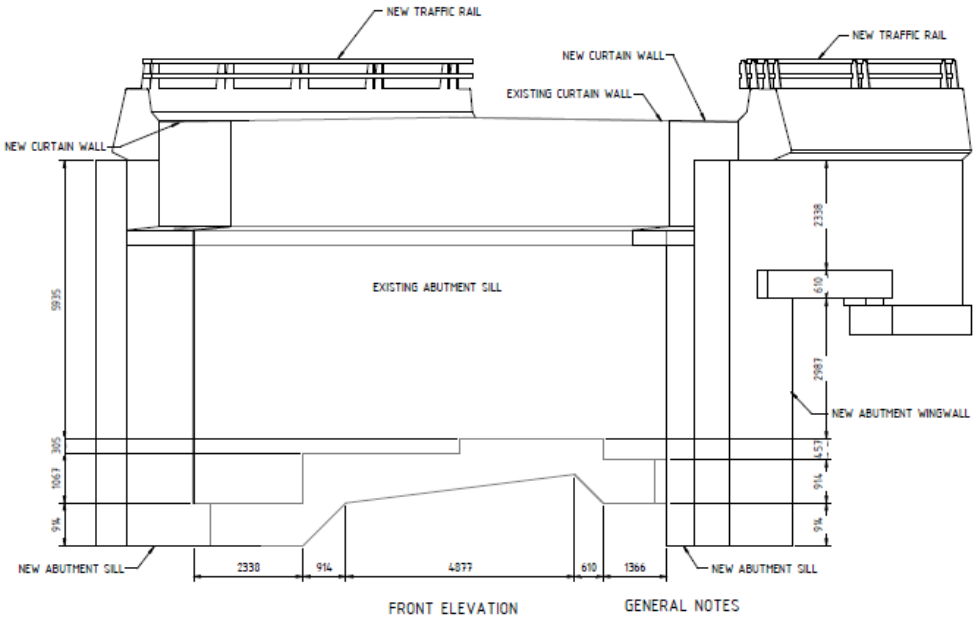


Photo 64 Detailed concept design of proposed new abutment wingwall, curtain wall and traffic rail (Source: TfNSW, provided 15 October 2020)

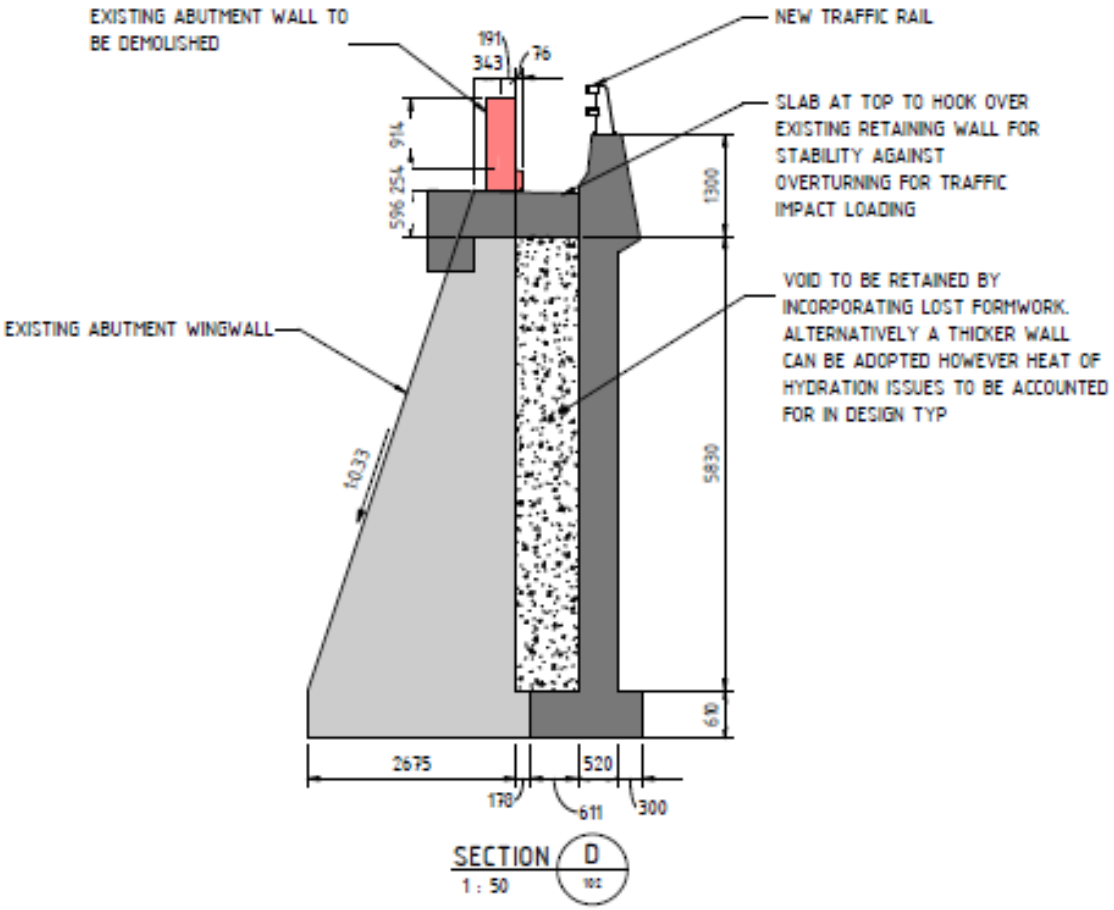


Photo 65 Detailed concept design of abutment works (Source: TfNSW, provided 15 October 2020)

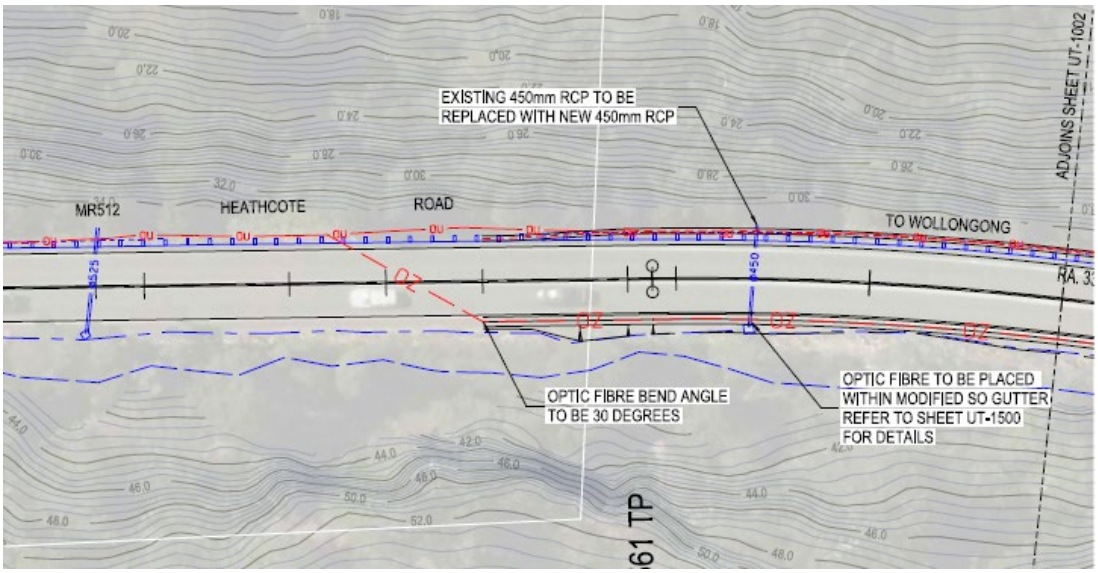


Photo 66 Plan of proposed relocation of services on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

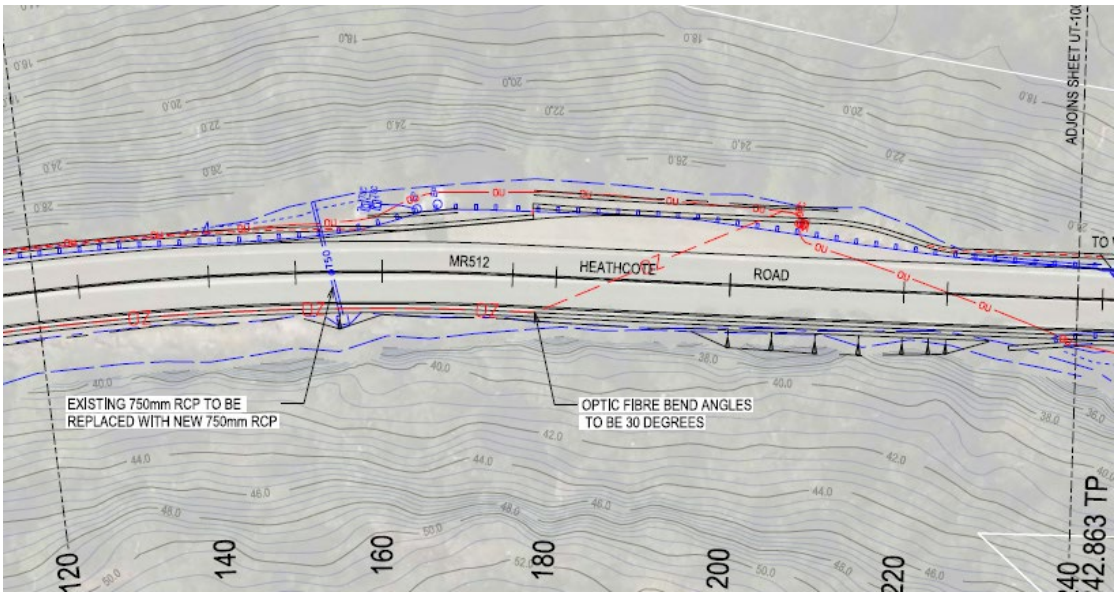


Photo 67 Plan of proposed relocation of services on the northern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

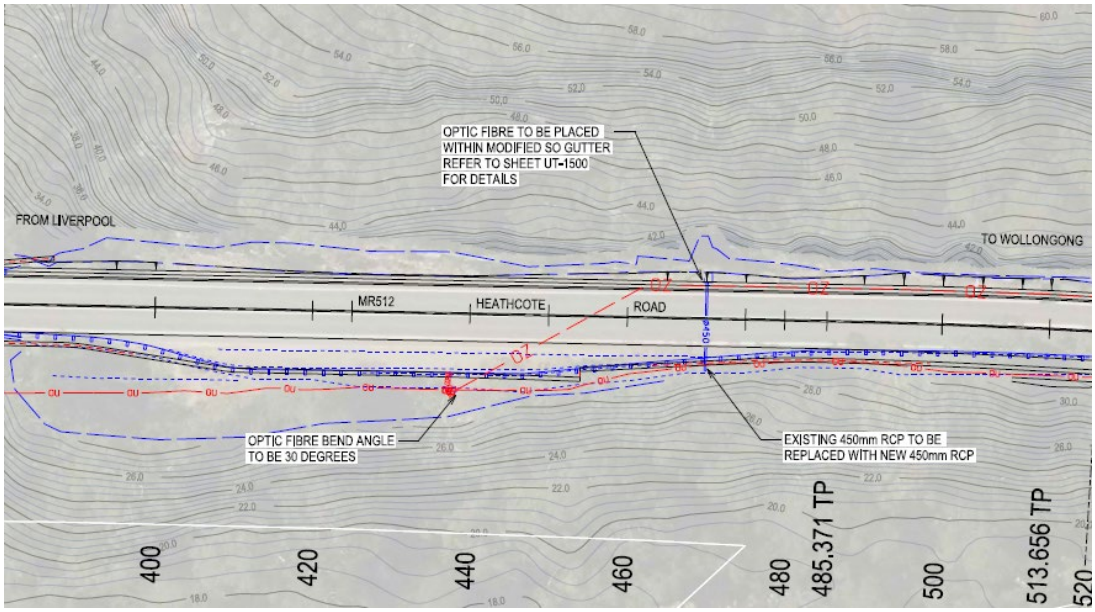


Photo 68 Plan of proposed relocation of services on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

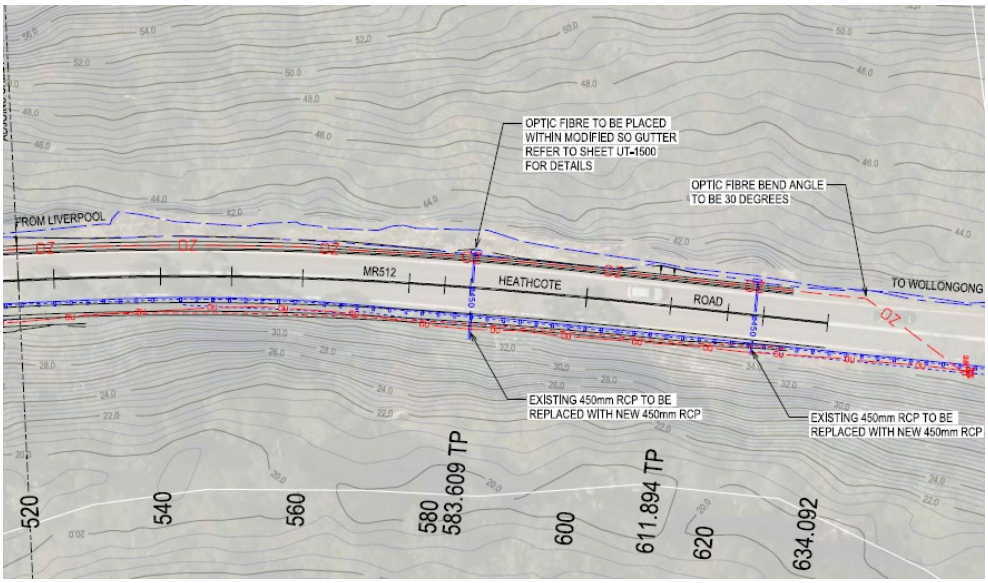


Photo 69 Plan of proposed relocation of services on the southern approach to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

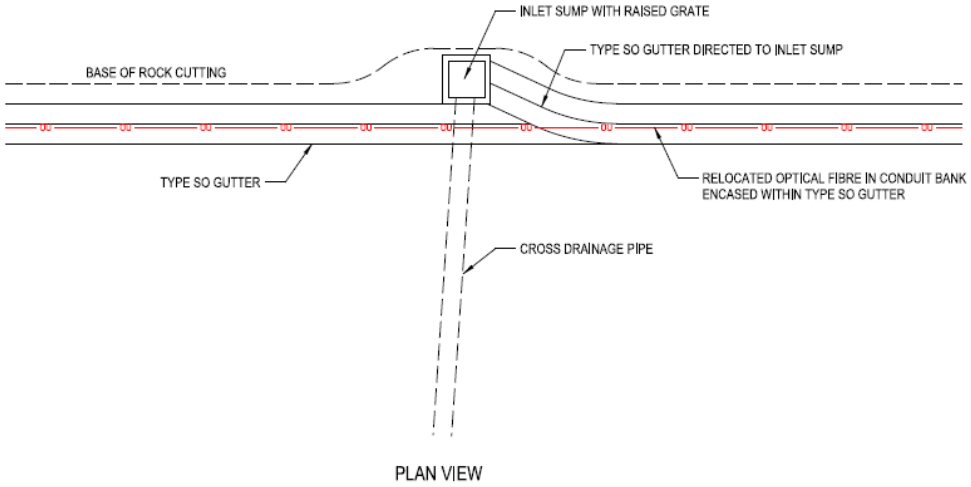


Photo 70 Example detail plan of proposed relocation of services on approaches to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

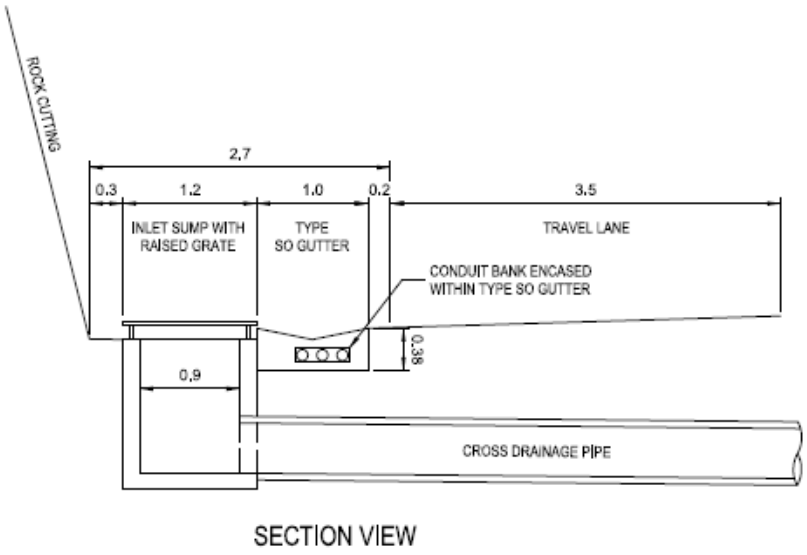


Photo 71 Example detail section of proposed relocation of services on the approaches to Woronora River Bridge (Source: TfNSW, drawings dated 24 August 2020)

6.5.2 Bridge repair works

The following bridge repair and maintenance works are also proposed:

- Pier protection through anti-carbonation coating.
- Repairs to cracking and concrete spalling on the existing bridge structure.
- Replacement or upgrading of expansion joints and bridge bearings.

These repairs and maintenance works seek to preserve the bridge and ensure it remains operational (Figure 3). In addition to these key works, two compound areas have been nominated for construction. Both site locations are owned by TfNSW and have previously been used as construction compound locations. The following information has been provided by TfNSW for each site compound:

- Compound site 1 (Location 1):
  - Approximately 2.6 kilometres east of the study area, on the corner of Princes Highway and Wilson Parade intersection, Heathcote.
  - The land is owned by TfNSW, and currently not in use.
  - Approximate area of 2100 metres squared, all of which is hardstand area.
  - No vegetation removal would be required.
  - The closest residential receivers are located on the far side of Princes Highway (about 60 metres west) and on the other side of the adjacent railway corridor (about 80 metres east).
- Compound site 2 (Location 2):
  - Approximately 5 kilometres west of the study area and is a fenced compound site on the north-west corner of Heathcote Road and New Illawarra Road intersection, Lucas Heights.
  - It is approximately 700 metres squared.
  - No vegetation removal is required.
  - The return trip for construction traffic to and from the main work site would be approximately 10 kilometres.
  - There are no nearby residential receivers.

The compound areas were not surveyed as part of the site visit. A desktop assessment of these areas has been undertaken based on information collected in Section 3.3, and is presented in Table 7.

Furthermore, it is also proposed to utilise hardstand areas within the existing road corridor during the full road closure for the following items:

- An amenities block and optional site office.
- Temporary stockpiling.
- Temporary laydown areas for delivery and possible fabrication of bridge components.

The bridge repair and maintenance works to the Woronora River Bridge and Heathcote Road are discussed in more detail below, in Table 18:

Table 18 Breakdown of Heathcote Road bridge repair and maintenance works (taken from TfNSW *Heathcote Road bridge over Woronora River – safety improvement works: Statement of Heritage Impacts Brief*)

Category	Proposed works
Site establishment and pre-construction works	
Site establishment and pre-construction works	• Implement full road closure traffic arrangements. • Potential small on-site office and amenities block within existing road corridor. • Establish nominated temporary laydown and storage areas within the closed road corridor. • Install personnel protection screens on bridge. • Demarcate approved limits of work. • Possible property boundary works (i.e. fencing). • Establish erosion and sediment controls. • Establish access track for vehicles and plant beneath the bridge. This would be accessed via the northern abutment. This would require vegetation removal along the identified access track and also to establish area/s for crane platforms. • Construct a temporary waterway crossing across Woronora River for vehicle access to the southern side. • Establish crane platform area/s. • Possible geotechnical and survey investigation work. • Construct scaffolding. This may require both ground and suspended scaffolding. • Install bridge walkways on both sides (either by crane or scaffolding). • Establish a small storage area on the northern access track for storage of plant and equipment above the flood level when not in use. • Utilities adjustment (optical fibre).
Construction	
Bridge strengthening and repair	• Repair and maintenance work to existing bridge includes: – Repairs to cracking and concrete spalling. – Replacement of expansion joints and bearings. – Anti-carbonation coating. • Pier protection, earthworks and installation of rip-rap material. • Install working platforms at abutments and modifications to bridge abutments and associated earthworks, possible retaining wall,

Category	Proposed works
	installation of bridge aprons. • Bridge widening including: – Installation of permanent formwork (performed from scaffold walkways). – Extension of headstocks. – Construction of steel girders either side of the existing bridge. – Installation of a steel staircase adjacent to the eastern side of the northern abutment to allow access for inspection of the bearings (awaiting confirmation from TfNSW whether this is a permanent structure, and dimensions of the structure). • Deck pouring. • Parapet installation using mobile cranes. • Installation of drainage. • Remove existing rail on bridge. • Install new bridge deck including pavement and temporary line markings.
Upgrade to northern and southern approaches	• Slope stabilisation works to the rock cutting on both northern and southern approaches. This includes removal of vegetation on the face of the cutting and crest of the slope up to maximum five metres behind the crest, scaling of the rock face, shotcreting, rock bolting, installation of rock netting, crest drain repairs, and reconstruction of the drainage gutter along the base of the slope. • Construction of new retaining walls along the length of the approaches. These are proposed to be piled retaining walls to minimise the construction footprint. • New and modified drainage infrastructure including upgrade and extend existing cross culverts and install scour protection at the outlets. • Construction of widened pavement and line-marking. • Installation of road furniture features including barriers and signage.
Demobilisation	
Demobilisation	• Remove scaffolding, site office and crane/s. • Long term stabilisation of disturbed areas prior to removal of erosion and sediment controls. • Reinstate barrier on bridge. • Undertake permanent line-marking.

Category	Proposed works
Plant and equipment	
Plant and equipment	Equipment likely to be used includes; • Hand tools. • Generator. • Ladders. • Excavators. • Road line marking trucks. • Light vehicles. • Rollers. • Flat-bed delivery trucks. • Asphalt and concrete pavers. • Graders. • Concrete trucks and outriggers. • All terrain cranes and self-erecting cranes. • Loaders. • Material transfer vehicles. • Scaffolding and scaffolding platforms. • Pneumatic scabbler. • Lighting towers. • Elevated work platform.

7 Statement of heritage impact

This SoHI has been prepared to address impacts resulting from the proposed redevelopment and road widening of the study area. The SoHI identifies the level of impact arising from the proposed development and discusses mitigation measures which must be taken to avoid or reduce those impacts. This section of the report has been prepared in accordance with the Heritage Manual guideline *Statements of Heritage Impact*.[56]

A VIA has also been undertaken as a separate assessment for the proposal, and is provided in Appendix 4.

7.1 NSW heritage impacts

7.1.1 Quantifying heritage impact(s)

Impacts to heritage items can be quantified under four main categories: direct impacts, indirect impacts, cumulative impacts and no impact. These kinds of impacts are dependent on the proposed impacts, nature of the heritage item and its associated curtilage.

Direct impacts

Direct impacts are where the completion of the proposed development will result in a physical loss or alteration to a heritage item which will impact the heritage value or significance of the place. Direct impacts can be divided into whole or partial impacts. Whole impacts essentially will result in the removal of a heritage item as a result of the development where as partial impacts normally constitute impacts to a curtilage or partial removal of heritage values. For the purposes of this assessment direct impacts to heritage items have been placed into the following categories:

- Physical impact - whole: where the development will have a whole impact on a heritage item resulting in the complete physical loss of significance attributed to the item.
- Physical impact - partial: where the project will have a partial impact on an item which could result in the loss or reduction in heritage significance. The degree of impact through partial impacts is dependent on the nature and setting of a heritage item. This typically these impacts are minor impacts to a small proportion of a curtilage of an item or works occurring within the curtilage of a heritage item which may impact on its setting (i.e. gardens and plantings).

Indirect impacts

Indirect impacts to a heritage item relate to alterations to the environment or setting of a heritage item which will result in a loss of heritage value. This may include permanent or temporary visual, noise or vibration impacts caused during construction and after the completion of the development. Indirect impacts diminish the significance of an item through altering its relationship to its surroundings; this in turn impacts its ability to be appreciated for its historical, functional or aesthetic values.

Cumulative impacts

Cumulative impacts relate to minimal or gradual impacts from a single or multiple developments upon heritage values. A cumulative impact would constitute a minimal impact being caused by the proposed development which over time may result in the partial or total loss of heritage value to the study area or

[56] Heritage Office & DUAP 1996 Heritage Office & DUAP 1996

associated heritage item. Cumulative impacts may need to be managed carefully over the prolonged period of time.

No impact

This is where the project does not constitute a measurable direct or indirect impact to the heritage item.

7.1.2 Discussion of heritage impact(s)

The discussion of impacts to heritage can be centred upon a series of questions which must be answered as part of a SoHI to frame the nature of impact to a heritage item. The Heritage Manual guideline *Statements of Heritage Impact* includes a series of questions in relation to indicate the criterion which must be answered.[57] Questions relating to the proposed development of Woronora River Bridge and the associated responses are presented in Table 19 below.

Table 19 Discussion of heritage impacts from the Heritage Manual guideline *Statements of Heritage Impact*

Question to be considered	Response
Minor partial demolition	
Are particular features of the item affected by the demolition?	The proposed works to the Woronora River Bridge would require the removal and replacement of the expansion joints and bearings visible throughout the extent of the bridge, while also repairing areas of cracking and concrete spalling. The Woronora River Bridge is one of only a handful of original, intact concrete bridges remaining in NSW, and is the only road bridge remaining built for strategically significant military purposes during WWII. The bridge demonstrates a high level of technical and representative value, as there are very few unmodified bridges dating between 1925-1948 present in NSW;the expansion joints and bearings have been identified as being contributory elements to the overall significance of the bridge. This means that any alteration to the original fabric of the bridge would be considered a direct physical impact to the item. However, the replacement of the expansion joints and bearings, reparing cracks and concrete spalling are part of bridge repair and maintenance works to strengthen the structural integrity of the bridge, allowing it to continue to function under its original purpose. Extension works to existing culvert outlets would also require the removal of the stone headwall component of these structures. The construction of a retaining wall on both approaches may also risk damage to the original sandstone retaining walls on the southern side. The proposed works would result in direct impacts to each item, with indirect impacts also anticipated for the sandstone retaining walls, as the proposed works will likely result in vibration works and vegetation removal.

[57] Heritage Office & DUAP 1996 Heritage Office & DUAP 1996

Question to be considered	Response
Is the detailing of the partial demolition sympathetic to the heritage significance of the item?	Yes. Mitigation measures require that any new expansion joints or bearings, as well as any repairs to cracking, concrete spalling and/or any other works deemed partial demolition, to be sympathetic to the original fabric that would be replaced as part of the proposed works. The TfNSW Bridge Aesthetic Guidelines[58] state that it is *'essential that the principle of distinguishing new from old is not abused by making the new work visually obtrusive and at odds with the character of the old".* To ensure this is achieved, it is recommended that, where possible, any direct impacts that involve replacement or removal of original fabric be avoided. This would allow for the retention of the bridge's aesthetic/technical and representative values and avoid unsympathetic designs. As any alterations to the heritage item may reduce the overall heritage significance of the bridge, any partial demolition required to ensure the continued health and safety of the road and bridge will need to adhere to the mitigation measres set forward in this report and the TfNSW Bridge Aesthetic Guidelines.
If the partial demolition is a result of the condition of the fabric, is it certain that the fabric cannot be repaired?	In order to keep the Woronora River Bridge at an acceptable safety standard, the expansion joints and bearings are required to be replaced as part of the proposed works. All other proposed work to the bridge include repairs to the existing fabric to ensure as much of the original fabric can be retained as possible. Mitigation measures recommend that each expansion joint and bearing is assessed prior to removal, with only the elements at risk of failing removed.
Minor additions	
How is the impact of the addition on the heritage significance of the item to be minimised?	Minor additions that are required as part of proposed works include deck pouring, installation of drainage, installation of a steel staircase adjacent to the eastern side of the northern abutment to allow access for inspection of the bearings, repairs to cracking and concrete spalling, implementation of anti-carbonation coating, installation of riprap material to prevent scour, bridge aprons and possible repair and construction of retaining walls. Mitigation measures would ensure that similar materials and colour schemes are used, where possible, to ensure the bridge [5] remains visually similar to its original appearance, while still maintaining a distinction from its original design, as per the TfNSW Bridge Aesthetic Guidelines.[59] Measures also attempt to avoid any direct impacts or removal of original materials/fabric of the heritage item to ensure as much of the heritage significance is retained as possible. While the current schematic designs for the proposed bridge works have been designed to adhere to current health and safety requirements, the direct impacts still have the potential to affect the significance of the overall item. The high level of technical and representative significance of Woronora River Bridge means that any major alteration or addition to the original fabric of the bridge would result in a significant impact to the overall heritage value of the item.

[58] Transport for NSW 2019, p.104
[59] Transport for NSW 2019, p.104

Question to be considered	Response
	The remaining impacts would be confined to the proposal area boundary. The proposed works would result in altering the vegetation outside of the curtilage boundaries, to allow vehicle access for equipment.
Will the additions visually dominate the heritage item?	No, the minor additions to the bridge will replace the existing fabric with similar materials (in both shape and size), therefore as to not visually dominate the heritage item. The proposed works will also involve maintenance repairs which will not visually dominate the item. Mitigation measure advise that colour and form matching is also undertaken to ensure the additions do not distract from the original heritage item. This is in line with the TfNSW Bridge Aesthetic Guidelines.[60]
Are the additions sympathetic to the heritage item? In what way (e.g. form, proportions, design)?	Yes. Mitigation measures would ensure that similar materials and colour schemes are used, where possible, to ensure the bridge remains visually similar to its original fabric. Measures also attempt to avoid any unnecessary direct impacts or removal of original materials to ensure as much of the heritage significance is retained as possible. The style of the additions, while more modern, would adhere to the visual aesthetic encapsulated in the original designs, ensuring the additions are discernible from the original fabric. This would allow the additions to conform the structures original proportions, form and design. It is recommend that each repair or minor addition is assessed prior to any modification, with only the elements at risk of failing repaired.
Major additions	
How is the impact of the addition on the heritage significance of the item to be minimised?	Major additions that are required as part of proposed works include the installation of decking, pavements and line marking, the construction and installation of barriers either side of the bridge, construction of headstock extensions, construction of steel box girders to either side of the existing concrete trestles, and the installation of precast formwork between the barriers and girders. Mitigation measures would ensure that similar materials and colour schemes are used, where possible, to ensure the bridge remains visually similar to its original fabric, in conjunction with TfNSW Bridge Aesthetic Guidelines. [61] Measures have also been recommended by Biosis that where possible, TfNSW attempts to avoid any unnecessary removal of original materials or fabric from the heritage item, to ensure as much of the heritage significance is retained as possible. However, the proposed works will still result in direct and indirect impacts to the bridge due to the nature of the proposal. In order to reduce the severity of impacts which may affect the heritage significance of Woronora River Bridge, further development of the concept design for the bridge widening has taken place. The shape and form of the knuckle heads which form part of the headstock extension have been designed so as to mirror the octagonal shape of the piers, while the steel box girders will have a cantilievered form which replicates that of the original concrete girders. The use of steel for the

[60] Transport for NSW 2019, p.104
[61] Transport for NSW 2019, p.104

Question to be considered	Response
	headstock extensions and girders will ensure that the new additions can be differentiated from the original concrete material of the bridge. The use of a painted finish rather than weathering steel is preferred as this is more sympathetic to the item, and a colour shade can be selected which will complement but not imitate the original fabric. The use of prestressing bars (either two thicker bars or three thinner bars) in the design also allows for the original concrete tressles to remain visible and also reduces the direct impacts to heritage fabric that could occur with extensive drilling into the structure. It is also proposed to salvage and reuse the sandstone block facing from the abutments as part of the project, as these will be obscured by the new abutment wing walls. Despite this, the works will still affect the current significance of the overall item, specifically its aesthetic and representative significance, as the Woronora River Bridge is one of only a handful of original, intact concrete bridges remaining in NSW (albeit with some very minor additions in the form of the 1990 safety rails), and is the only road bridge remaining built for strategically significant military purposes during WWII. However, the detailed concept design has attempted to reduce the impacts of the works by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. The new works also enable the bridge to continue to function as per its original purpose.The remaining impacts would be confined to the road reserve boundaries. The proposed works would result in altering the vegetation outside of the curtilage boundaries, to allow vehicle access for equipment.

Question to be considered	Response
Will the additions tend to visually dominate the heritage item?	Yes, the proposed works would involve the construction of a number of large additions which would visually dominate the heritage item. Works would include the construction and extension of the bridge decking and barriers on either side of the bridge extent to allow for road widening and shoulder extensions. To achieve this, the installation of precast formwork would be placed on the outside of the barrier extension and cantilievered steel box girders would be placed as support directly underneath. These girders would be supported by the construction of headstock extensions consisting of bearers, octagonal-shaped knuckleheads and prestressed bars appending each of the existing concrete trestles. This would visually dominate the side profile of the bridge and the sandstone abutments visible to either side of the bridge approach. The bridge is located within restricted portions of both Holsworthy Military land and ANSTO land, with the bridge built in a remote natural landscape comprising of a number of vertical escarpments and dense vegetation. This means that the degree of visibility of the bridge is reduced, with public views to and from the bridge inhibited due to the topography of the landscape. Despite this, the statement of significance for the bridge (Table 8) illustrates that the heritage item exhibits aesthetic values, which does not require public views to or from the bridge to be significant. Although the degree of visibility is reduced, the aesthetic values of the bridge are not diminished as a result. While the proposed additions allow the bridge to continue to function as intended, continue to serve its original key transport purpose and remain in its existing landscape, they will still diminish majority of the aesthetic and representative values identified in the s170 register listing, which will reduce the overall significance assessment at a State level and potentially the ability to list the item on the SHR in the future. However, the detailed concept design has attempted to reduce the visual dominance of the works and thereby the impact to the item's heritage significance by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders. The steel can also be painted in a shade and texture that will complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project.
Are the additions sympathetic to the heritage item? In what way (e.g. form, proportions, design)?	Yes, efforts have been made to create a sympathetic design for the additions. The steel box girders will largely obscure the underside and sides of the original fabric. However, the steel box girders will have a cantilever shape, mirroring the original concrete girders of the bridge similar to the bridge widening additions to Stapletons Bridge over Frazer Creek (RTA Bridge No. 881, Roads and Maritime Services Section 170 Heirtage and Conservation Register). While the examples of bridge widening outlined in Table 17 utilised modern concrete as the material for structural additions, the proposed use

Question to be considered	Response
	of steel painted in an appropriate shade and texture will complement the original fabric, and also attempts to mitigate the visual affects of the works. Regarding the new concrete deck extensions and road barriers, these should also be pigmented so as to be able to differentiate from the original concrete fabric, but remain a sympathetic shade.
Repainting	
Have previous (including original) colour schemes been investigated? Are previous schemes being reinstated?	Yes. Conversations with TfNSW have resulted in the identification of the original colour scheme of the Woronora River Bridge [5], with confirmation that where possible colour matching of maintenance and repair works would be implemented to ensure there are minimal visual impacts to the heritage item. New additions to the bridge would be painted or pigmented in a shade that would be sympathetic to but not imitate the shade of the original concrete fabric. This will ensure that new works can be differentiated from original materials, but do not overwhelm the aesthetic of the item.
Will the repainting effect the conservation of the fabric of the heritage item?	The proposed works state that an anti-carbonation coating would be applied to the bridges exterior. The purpose of this coating is to assist the preservation of the bridge fabric, with the coating painted on clear, therefore not changing the original colour scheme of the bridge. It is Biosis' understanding that this would not affect the conservation of the fabric of the heritage item.
New development adjacent to a heritage item	
How is the impact of the new development on the heritage significance of the item or area to be minimised?	Mitigation measures for repair and maintenance works to Woronora River Bridge would ensure that similar materials and colour matching are used, where possible, to ensure the bridge remains visually similar and retains its original fabric. Measures also attempt to avoid any direct impacts or removal of original materials/fabric of the heritage item to ensure as much of the heritage significance is retained as possible. The remaining impacts would be confined to the proposal area boundary. The proposed works would result in altering the vegetation outside of the curtilage boundaries, to allow vehicle access for equipment.

Question to be considered	Response
Why is the new development required to be adjacent to a heritage item?	The proposed works are required to ensure the continued safety of drivers using the road way and bridge. Currently, the roadway does not conform to current road design guidelines, with crash history statistics for the bridge[62] including a record of both fatalities and serious injuries. Road safety concerns are a key issue for motorists and the local community. Predicted population and traffic growth for the area is also anticipated to place increased pressure on the road corridor, potentially increasing the risk of the number and severity of incidents. Increased incidents would potentially lead to an increase in unplanned road closures, and a reduction in travel time reliability. The proposed works will not adversely impact the adjacent heritage items [1] [2], however the works would result in a direct impact to the Woronora River Bridge, therefore reducing its heritage significance. However, the detailed concept design has attempted to reduce the visual dominance of the works and thereby the impact to the item's heritage significance by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders. The steel can also be painted in a shade and texture that will complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project.
How does the curtilage allowed around the heritage item contribute to the retention of its heritage significance?	The proposed works required for the Woronora River Bridge are located within the curtilage of the s170 heritage item. These works have been assessed as vital for the continued health and safety of the members of the public who use Heathcote Road [4]. However the works include a number of direct and indirect impacts that negatively affect the significance of the heritage item. As this bridge is one of the only remaining examples of intact, original concrete built bridges for military purposes during WWII in NSW, retaining as much of its original fabric and its visual aesthetic is important. The detailed concept design has attempted to reduce the impact to the item's heritage significance by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. Curtilages for the Kolara Weir [1] [2] and the Woronora-Penshurst Pipeline would not be impacted as part of the proposed works, with visual impacts to both heritage items temporary. The proposed works have a negligible impact on the overall retention of both items heritage significance. The proposed works will also contain direct impacts to the Cubbitch Barta National Estate Area; full details regarding these impacts can be found in Section 7.2. However, following discussions with TfNSW, it has been suggested that an extended precinct heritage curtilage could be established. This precinct would include Woronora River Bridge, the former Kolara Wieir recreation

[62] TfNSW Strategic design gateway report, 2011 to 2016

Question to be considered	Response
	area, Kolara Wier and the extant piers of the former Heathcote Creek bridge. The creation of this precinct will be beneficial in capturing the historical and social context of the study area and surrounds as a identified in this assessment, and to establish this area as a place which holds various elements which together are of historical, aesthetic, technical and social significance to the local area.
How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?	The proposed works would involve the construction of a number of major additions which would visually dominate the heritage item [5]. This would obscure views from the side profile of the bridge, which is visible to the public on approach to the bridge. Minor modifications to the guardrails and edge barriers in the 1990s may have some minor affects to the setting and views to the bridge, however these modifications where not extensive enough to reduce the overall significance or disrupt line of sight to the bridge from the approaches. A number of mitigation measures have been developed by TfNSW to minimise negative effects on the bridge. These include: appending all permanent frameworks to the sides of the bridge, below road height, so not to overtly impact views to or from the heritage item; where possible, use similar materials and colour schemes to ensure the bridge remains visually similar to the public; and implement temporary scaffolding and reversible hardstand areas where possible to ensure minimal indirect visual impacts are achieved long term. Similarly, the detailed concept design has attempted to reduce the visual dominance of the bridge widening works and thereby the impact to the item's heritage significance by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders. The steel can also be painted in a shade and texture that will complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project. The proposed works would have minimal effect on the current views to and from the remaining heritage items adjacent to the study area. Views to and from the Woronora-Penshurst Pipeline would not have any long term effects, with most visual impacts to the heritage item being temporary structures. Views to Kolara Weir [1] [2] are currently restricted by vegetation/tree coverage throughout the ravine and along the embankment of the Woronora River, with vegetation clearance required to provide access for the plant and/or equipment required for the repairs. Currently the public is not able to view the Weir from Heathcote Road [4], therefore impacts to views to or from the item would be minimal.
Will the public, and users of the item, still be able to view and appreciate its significance?	The proposed works would not deter or reduce members of the public from accessing or viewing the heritage items within or adjacent to the study area, with the public still being able to view the Woronora River Bridge as they drive over Heathcote Road [4]. At present, few members of the public are

Question to be considered	Response
	able to view the bridge from the valley below as access is restricted, therefore any direct or indirect impacts to the base of the bridge would most likely not be seen. However, as the bridge remains largely intact and has not undergone any major modifications since its construction in 1941, the proposed works would affect the aesthetic significance of the item and reduce the representative significance of the item. This would reduce the ability for the public to appreciate its rarity, technical and aesthetic values. However, the detailed concept design has attempted to reduce the visual dominance of the bridge widening works, and thereby the impact to the item's heritage significance, by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders. The steel can also be painted in a shade and texture that will complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project. The proposed works would not visually impact the views to or from the Woronora-Penshurst Pipeline, enabling ongoing appreciation of this item. Currently, the Kolara Weir remnants [1] [2] are not visible from Heathcote Road, and it is anticipated that this will not change once the proposed works are completed.

7.2 Commonwealth heritage impacts

7.2.1 Self-assessment process

The north-western portion of the study area is contained within a CHL Place, therefore this SoHI has been guided by the self-assessment process outlined in *Significant Impact Guideline 1.2* of the EPBC Act, to assess the impact of the proposed action on the heritage values for the Cubbitch Barta National Estate Area. This assessment process is different to section 7.1, as it is assessed under different legislative drivers. The self-assessment process examines the environmental context of the Place, the proposed impact and avoidance or mitigation strategies to determine if a significant impact will occur.

This self-assessment process only takes into consideration the historical values of the CHL Place as TfNSW has engaged another consultancy to prepare the Indigenous and natural values assessment for the study area. This assessment should only be accepted when viewed in conjunction with the results of the Aboriginal values self-assessment (provided by the third party consultancy) for the CHL Place. The historical assessment can be found in Table 20.

Table 20 Significant Impact Guideline 1.2 responses for historical heritage values only (EPBC Act 1999)

Question	Response
Step 1 – Environmental context	
What are the components or features of the environment in the area where the action will take place?	The proposed actions are to take place within the CHL Place Cubbitch Barta National Estate Area (CHL no. 105405). This area comprises of approximately 18,000 hectares of the Woronora Plateau, approximately 30 kilometres south-west of inner Sydney. It adjoins Heathcote National Park to the south-east and Dharawal State Recreation Area to the south, forming part of an extensive tract of bushland stretching southwards from the Sydney metropolitan area. It encompasses important Indigenous, natural and historical values for the region and was used as a military training ground during WWII. Specifically the proposed works would affect a small portion of the far western boundary of the CHL Place. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Which components of features of the environment are likely to be impacted?	The proposed works would not impact on any previously identified built fabric as part of the CHL Place. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Is the environment which is likely to be impacted, or are elements of it, sensitive or vulnerable to impacts?	Historical values relating to the CHL Place present within the northern portion of the study area are vulnerable to impacts, due to the type of proposed works specified in Section 6.1. However, mitigation and management recommendations would greatly reduce the risk of inappropriate impacts to the majority of these elements. Based on the proposed works, it is likely that the rock cutting would be unable to be avoided, therefore causing irreversible impacts to a small portion of the Estate. Historical remnants of the Kolara Weir were identified during the field investigation, located within the boundary of the CHL Place. It is anticipated that the historical elements found throughout the north-western section of the study area, would not be adversely affected once mitigation measures have been implemented. Indigenous heritage values and natural heritage values were not assessed as part of this report.
What is the history, current use and condition of the environment which is likely to be impacted?	The land present within the current study area, which is a part of the CHL Place, was originally used for the Kolara Weir and public recreation purposes until the Weir was decommissioned in 1985. Biosis conducted a physical inspection of the area earlier this year, with the portion of the CHL Place remaining largely untouched since the Weir was decommissioned and in good condition. Indigenous heritage values and natural heritage values were not assessed as part of this report.

Question	Response
Step 2 – Proposed impacts	
What are the components of the Action?	The proposed works involve using the old access track from Heathcote Road to the Kolara Weir for vehicle and machinery access, possible rock cutting for the bridge and road widening, and the potential installation of a water crossing and crane platforms in the north-eastern portion of the study area. Indigenous heritage values and natural heritage values were not assessed as part of this report.
What are the predicted adverse impacts associated with the action including indirect consequences?	These elements are required to ensure the continued safety of drivers using the road way and bridge. Currently, the roadway does not conform to current road design guidelines, with crash history statistics for the bridge[63] including a record of both fatalities and serious injuries. Road safety concerns are a key issue for motorists and the local community. Predicted population and traffic growth for the area is also anticipated to place increased pressure on the road corridor, potentially increasing the risk of the number and severity of incidents. Increased incidents would potentially lead to an increase in unplanned road closures, and a reduction in travel time reliability. Overall, the majority of works are minor and would result in a negligible loss of heritage values. Heritage controls would be required to ensure that as much of the significance of the heritage fabric is maintained. Indigenous heritage values and natural heritage values were not assessed as part of this report.
How severe are the potential impacts?	The proposed actions to the western boundary of the CHL Place have been assessed against the Significant Impact Guidelines 1.2 of the EPBC Act and are considered to be small scale, low intensity and localised to the area, thus the overall impact to the Place is considered to be minor[64]. Although some of these impacts will not be reversible, they are not large enough to be classified as an adverse impact to the entirety of the CHL Place. Indigenous heritage values and natural heritage values were not assessed as part of this report.
What is the extent of uncertainty about potential impacts?	Comprehensive investigations have been undertaken for historical heritage values for the Cubbitch Barta National Estate Area. As such, these heritage values and their relationship with the study area are well understood. The potential impacts associated with the proposed works are well understood and have been modified to minimise potential impacts to heritage fabric. Heritage controls within this document would also minimise impacts. Indigenous heritage values and natural heritage values were not assessed as part of this report.

[63] TfNSW Strategic design gateway report, 2011 to 2016

[64] Department of Sustainability, Environment, Water, Population and Communities 2013 Department of Sustainability, Environment, Water, Population and Communities 2013

Question	Response
Step 3 – Impact avoidance and mitigation	
Will any measures to avoid or mitigate impacts ensure, with a high degree of certainty that impacts are not significant?	The proposed actions to the western boundary of the CHL Place have been assessed as having a small scale, low intensity and localised impact on the wider CHL Place. In order to successfully widen Heathcote Road, impacts to the rock face is required, with the removal of vegetation on the face of the cutting and crest of the slope, scaling of the rock face, shotcreting, possible rock bolting, maintenance access points, and reconstruction of the drainage gutter at the base of the slope proposed on the northern and southern road approaches (see Table 18 for further details). As the proposed works are required to ensure the continued health and safety of road users travelling along Heathcote Road and across the Woronora River Bridge, TfNSW have tried to ensure as much of the impacts (direct and indirect) are able to be reversible to the natural heritage values within the study area, however this is not possible with the rock face. The remainder of the impacts appear to be reversible and/or temporary, therefore mitigating any loss of natural or historic values in this area of the CHL Place. Based on overall impacts and mitigation measures in place, these necessary impacts would not detract or contain any adverse effects on the CHL Place as a whole. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Step 4 – Are the impacts significant?	
Is there a real chance or possibility that the action will:	
Permanently destroy, remove or alter the fabric of a heritage place?	Yes, the works would result in impacts to heritage fabric within the study area. Whilst these impacts are required for Heathcote Road and Woronora River Bridge to continue to function safely, there would be a nominal loss of significance to the overall CHL Place. These impacts would not adversely affect the fabric of the heritage place or diminish the overall heritage significance. The proposed works would not impact on the heritage significance of the National Estate Area as a whole. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place?	No. Whilst the proposed works would result in either an impact or temporary alteration to some heritage fabric within the study area, the works are required to assist in priority safety improvement works to Heathcote Road and Woronora River Bridge. As a result, existing access tracks and clearings have been used where possible to minimise the overall disturbances that would occur as a result of the proposed works, and the impacts to the rock face on the northern approach would only be completed where necessary to ensure they are not inconsistent with the heritage values of the area. TfNSW have also attempted to reduce the visual impacts of slope treatments by matching the shotcreting colour, to ensure the impacts are visually sympathetic. Indigenous heritage values and natural heritage values were not assessed as part of this report.

Question	Response
Involve the erection of buildings or other structures adjacent to, or within important site lines of a heritage place which are inconsistent with the heritage values of the place?	Yes, the proposed actions would require the erection of crane platforms throughout the clearing at the base of the access track, located in the north-western portion of the study area. It would also involve the temporary construction of a waterway crossing for vehicles. However, these platforms and waterways would be removed at the completion of the proposed works, therefore no long term structures will remain within the CHL Place. There are no other structures or buildings that would impact on significant heritage views, proposed to be erected within the CHL Place bounds. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Substantially diminish the heritage value of a heritage place for a community or group for which it is significant?	No, the works would not substantially diminish the heritage values of places in the study area. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place?	No, the works would not substantially alter the settings of heritage values of places in the study area. Indigenous heritage values and natural heritage values were not assessed as part of this report.
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site?	No, the works would not restrict or inhibit access. Indigenous heritage values and natural heritage values were not assessed as part of this report.

The proposed actions on the historical heritage values of the place are **not** considered to be significant as defined by the *Significant Impact Guidelines* 1.2.[65]

[65] Department of Sustainability, Environment, Water, Population and Communities 2013 Department of Sustainability, Environment, Water, Population and Communities 2013

7.3 Assessment of impacts

A discussion, assessment and mitigation of impacts to heritage items located within or adjacent to the study area is presented in Table 21.

Table 21 Assessment of impacts to NSW Heritage local and State heritage items adjacent or within the vicinity to the study area

Heritage item	Significance as designated per heritage listing	Discussion	Assessment	Mitigation measures
Woronora River Bridge (RTA Bridge no. 152)	Not designated	The proposed works involves a number of major direct physical and indirect visual impacts to the Woronora River Bridge [5]. These include the construction and installation of extended decking and safety barriers either side of the current bridge edge, installation of headstock extensions comprising of knuckle heads attached to the existing piers through prestressed bars, demolition of existing road abutment walls and the 1990 safety barriers, construction of steel box girders either side of the existing concrete trestles, and construction of new abutment wing walls obscuring the current sandstone block facing. The proposed works would also involve a number of minor additions and replacements, including but not limited to, repairs to cracking and concrete spalling, implementation of anti-carbonation coating and replacement of expansion joints and bearings. These direct physical and indirect visual impacts to the item would drastically reduce its representative and aesthetic values. Views to and from the heritage item would be obscured by the new additions, and the aesthetic of the original structure would also be altered as a result of the works. The Woronora River Bridge [5] is one of only a handful of original, intact concrete bridges remaining in NSW, and is the only remaining road bridge built for strategically significant military purposes during WWII. It	• Direct – physical impact (whole) • Direct – physical impact (partial) • Indirect impact – visual	• Staged heritage review of detailed design. • Development of a CMP for Woronora River Bridge prior to any works, including the investigation of extended heritage precinct for Woronora River Bridge, Kolara Wier and former recreation area, extant remains of Heathcote Creek bridge. • Sympathetic colour shades and texture for steel paint finishes. • Colour and material matching for repair and maintenance works.

Heritage item	Significance as designated per heritage listing	Discussion	Assessment	Mitigation measures
		is also the only RTA owned concrete bridge in NSW to exceed 80 m in length. This demonstrates a high level of technical and representative significance, as there are minimal unmodified bridges dating between 1925-1948 remaining in NSW. Any alteration to the original fabric of the bridge would therefore be significant, as it would affect the overall heritage value of the item. However, the detailed concept design has attempted to reduce the direct physical impacts and indirect visual impacts to the item's heritage significance, by reflecting the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders and prestressed bars to attach the knuckle heads to existing piers. The steel can also be painted in a shade and texture that will complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project.		• Archival recording of Woronora River Bridge before and after impacts are made. • Structural integrity assessment of each element to be removed and/or replaced by a suitably qualified structural engineer prior to removal as part of repair and maintenance works. Only replace elements which are at risk of failing. • Retention of original fabric of the bridge where possible. • Salvage sandstone block facing from abutments for use in the project or potential heritage precinct. • All contractors to undertake heritage

Heritage item	Significance as designated per heritage listing	Discussion	Assessment	Mitigation measures
				inductions and training on unexpected finds procedure as part of site inductions.
		Views to and from the heritage item's curtilage would be impacted for the duration of the construction period through the presence of equipment, cranes and other structures. There is also the risk of vibration damage during works which may affect the structural integrity of the item.	• Indirect impact – temporary visual • Indirect impact – temporary vibration	• Use of discrete fencing with hoarding or fabric during works. • Regular monitoring of vibration levels during works.
Woronora-Penshurst Pipeline (Item No. A4302, and No. 4570509)	Local	The item would not be directly impacted by the proposed works, and views to and from the item would not be restricted more than they current are as a result of the development. However, there may be some temporary visual impacts during the period of construction.	• Indirect impact – temporary visual	• All contractors to undertake heritage inductions as part of site inductions.
Kolara Weir (Item no. A1801)	Local	The item would not be directly impacted by the proposed works, however views to and from the item may be more restricted as a result of the proposed works. However, these visual restrictions are temporary, with views returning to normal at the completion of construction.	• Indirect impact – temporary visual	• Use of discrete fencing for Woronora River Bridge during works. • All contractors to undertake heritage inductions as part of site inductions.
Heathcote Road [4] and associated infrastructure	Not designated	Heathcote Road was constructed in direct response to urgent defence work as part of WWII efforts in the Holsworthy area. Due to its strong associations to WWII this item is important in	• Direct impact - physical impact (partial)	• Archival recording of heritage items prior to works.

Heritage item	Significance as designated per heritage listing	Discussion	Assessment	Mitigation measures
		the course, or pattern, of NSW's cultural or natural history. As a result, infrastructure associated with Heathcote Road may also contain historical and aesthetic significance. These items may include, but are not limited to, culverts, sandstone retaining walls, military objects, survey markers and historical road surfaces. If any items are located during construction and will require impacts, it is recommended that an archival recording is completed prior to works continuing. In regards to the survey markers, if any are located during construction, they should be avoided and an exclusion zone should be erected until an archival recording and salvage is conducted so the marker can be used as part of interpretative display.		• Exclusion zone erected around survey marker (if relocated) until an archival recording and salvage of item is conducted. Survey marker to be used as part of interpretative display.

7.4 Statement of heritage impact

The study area forms part of a key traffic corridor, which connects Sutherland Shire to Liverpool. The proposed development involves widening of Woronora River Bridge [5] using steel box girders and headstock extensions on either side of the bridge to support a widened deck, which would extend the width of both lanes and increase shoulder corridors. It also involves cutting back the slope face on the northern and southern bridge approaches to improve lane width and bridge repair and maintenance works including pier protection and anti-carbonation coating. The proposed works are in direct response for the continued safety of drivers using the road way and bridge. Currently, the roadway does not conform to current road design guidelines, with crash history statistics for the bridge including a record of both fatalities and serious injuries.[66] Road safety concerns are a key issue for motorists and the local community. Predicted population and traffic growth for the area is also anticipated to place increased pressure on the road corridor, potentially increasing the risk of the number and severity of incidents. Increased incidents would potentially lead to an increase in unplanned road closures, and a reduction in travel time reliability.

The study area is within, and adjacent to, a number of local, State and Commonwealth heritage listed items or Places. These include: Woronora River Bridge (RTA Bridge no. 152) [5]; Woronora-Penshurst Pipeline (Item No. A4302, and No. 4570509); Kolara Weir (Item no. A1801) [1] [2]; and the Cubbitch Barta National Estate Area (CHL I.D. no. 105405).

The historical context presented in this report indicates that majority of the study area has been used for transportation purposes as a roadway and bridge from 1941 and in conjunction with the Kolara Weir [1] [2] between 1920 and 1985. It is located within the Cubbitch Barta National Estate Area and Holsworthy military training area (north-western portion of the study area), with Heathcote Road [4] and Woronora River Bridge [5] located throughout the central portion of the study area. Associations with the military training area has resulted in the construction of numerous roadways, bridges, retaining walls and culverts, in addition to public recreation areas from 1960, until the Kolara Weir [1] [2] was decommissioned in 1985. As the study area is located within land previously utilised by the military during WWII, military objects could be present or located in the vicinity of the proposal area. These may include (but are not excluded to) road mines/blocks constructed as part of defensive retreat measures to cut off major roads in the event of an attack or access facilities such as stairs leading to Heathcote Road (one of which is located on the western side of the road north of the proposal area). While there may have been other possible archaeological remains within the study area relating to military objects, historical road surfaces and the Kolara Weir [2] or pump house [3], it is likely the demolition of the Weir and construction of Heathcote Road [4] and Woronora River Bridge [5] would have disturbed or removed any archaeological remains which may have been present.

7.4.1 Woronora River Bridge

The Woronora River Bridge [5] is an original, intact example of military-driven, concrete bridge constructed during WWII in NSW and is the only remaining Road Bridge built for strategically significant military purposes during WWII. As the Woronora River Bridge is one of only a handful of original, intact concrete bridges, it demonstrates high historical and representative significance at a State level. It is also the only RTA owned concrete bridge in NSW to exceed 80 metres in length, providing a rare example of high aesthetic and technical achievement at a State level.

Original schematic designs for the bridge, dating to 1941, illustrate that while no major modifications have been made to the bridge since its construction, minor modifications were made to the guardrails and edge barriers (parapet) in 1990 as part of safety improvement works. Although these works to the parapet and

[66] TfNSW Strategic design gateway report, 2011 to 2016

guardrails were a modification to the bridge, they were minor and did not diminish the overall heritage significance of the bridge, as they did not reduce the overall aesthetic, technical or historical values of the bridge.

The Woronora River Bridge has been assessed as having "historic, aesthetic and technical significance, and is an outstanding representative example of its class in NSW", and is one the few remaining largely unmodified concrete bridges built throughout the period of WWII.[67] Aesthetically and technically, the Woronora River Bridge is a large and impressive structure for its type featuring clean modern lines, curved beam profiles and octagonal piers, with its construction in rugged terrain, and at a high level above permanent water, constituting a technical achievement at a State level.[68]

Historically, the Woronora River Bridge is strongly associated with the State theme of Defence, with the bridge being constructed as an essential component of the Heathcote Road built during WWII to facilitate the movement of troops and supplies associated with the Army installations in the southern Sydney area. The bridge also formed a landmark in the post-war landscape of leisure for swimmers and picnickers, therefore can help to demonstrate the way leisure activities have evolved to the present.[69] The bridge also demonstrates key characteristics of the class of concrete beam bridges of the period between 1925 and 1948, and is the only remaining Road Bridge from this period, therefore containing high representative values at a State level.

The proposal would result in both direct and indirect impacts to the Woronora River Bridge, in the form of bridge widening works as well as repairs and maintenance. These works would include, but are not limited to, permanent frameworks and working platforms to support the bridge widening, replacement of decking, installation of drainage and maintenance work to the concrete spalling, expansion joints and bearings and the construction of headstock extensions and steel box girders to either side of the bridge and the existing concrete trestles. As there are so few, largely unmodified bridges dating between 1925-1948 remaining in NSW, the the proposed impacts to the bridge would have an impact on its technical, aesthetic and representative values. However, as the bridge will not be demolished as part of the works, the proposed works should not significantly reduce the historical values of the item.

Key features of the bridge would be obstructed and views to and from the bridge would be impacted, resulting in the diminishment of the aesthetic and representative values of the heritage item. Although public views of the bridge are currently limited, the aesthetic values of the bridge are not diminished as a result of these views and the bridge still provides a representative example of this type of bridge in NSW. While the proposed additions allow the bridge to continue to function, serve its original key transport purpose and remain in its existing landscape, they will still affect the aesthetic and representative values identified in the s170 register listing, and potentially reduce its State heritage significance and the ability to list the item on the SHR in the future.

However, through ongoing consultation with Biosis regarding heritage implications of the proposal throughout the design process, the detailed concept design has attempted to reduce the direct physical impacts and indirect visual impacts to the item's heritage significance. The current detailed concept design reflects the aesthetics of the Woronora River Bridge in the new additions, while still remaining visually distinct from the original elements. This has been achieved through the use of a cantiliever shape for the steel box girders which mirror the existing concrete girders, and the minimal nature of the headstock extension works including octagonal knuckle heads to support the bearings for the new box girders and prestressed bars to attach the knuckle heads to existing piers. The steel can also be painted in a shade and texture that will

[67] Heritage NSW 2009
[68] Heritage NSW 2009
[69] Heritage NSW 2009

complement but not mimick the original concrete material, and it is proposed to salvage and reuse the sandstone block facing from the abutments as part of the project.

While there would still be impacts to the aesthetic and representativeness values, the detailed concept design has made great effort to mitigate these as much as possible through sympathetic designs based on heritage advice previously provided by Biosis. While Woronora River Bridge would no longer be a largely unmodified bridge dating between 1925-1948 remaining in NSW, the proposed works do not diminish the item's heritage significance to the extent that the works are unacceptable from a heritage perspective. Aesthetically and technically, the Woronora River Bridge remains a large and impressive structure featuring clean modern lines, curved beam profiles and octagonal piers, with its construction in rugged terrain, and at a high level above permanent water, constituting a technical achievement at a State level. Similarly, despite the aesthetic change the proposed works would bring, these key features of the item's design and construction remain, and are emphasised in the cantilevered steel box girders and echoed in the octagonal knuckle heads at the piers. The item also remains the only RTA owned concrete bridge in NSW to exceed 80 metres in length, retaining its status as a rare example of high aesthetic and technical achievement at a State level. Similarly, the proposal does not alter the historical significance of the bridge and the role it played during WWII.

7.4.2 Cubbitch Barta National Estate Area

The proposed works would also result in direct impacts to the Cubbitch Barta National Estate Area (CHL ID no. 105405). These impacts include cutting back the rock slope face on the northern bridge approach to improve lane width, which is located within the curtilage for the CHL Place. Cubbitch Barta National Estate Area comprises of 18,000 hectares of undeveloped bushland, comprising of a large portion of the Liverpool region and Holsworthy military training area. Some of the estate, including the small portion in the north-west of the study area, was reserved for coal leases in 1926. Public access is largely restricted due to military use, meaning minimal disturbances have occurred to the natural fabric of the listing since the mid-1900s.

The self-assessment process outlined in *Significant Impact Guideline* 1.2 of the EPBC Act, was completed by Biosis to assess the impact of the proposed works on the historical heritage values for the Cubbitch Barta National Estate Area. TfNSW have engaged another consultancy to undertake the self-assessment for the Indigenous and natural values and as such the final assessment for the CHL Place should take into consideration the evaluation of Indigenous and natural heritage values.

Based on the assessment of the place's historical values, the proposed works are considered to be small scale, low intensity and localised to the area, thus the overall impact to the Place is considered to be minor. As the proposed works are required to ensure the continued safety of drivers using the road way and bridge, the impacts to the CHL Place have been deemed necessary. Although some of these impacts would not be reversible, they are not large enough to be classified as an adverse impact to the entirety of the CHL Place. The assessment included in this report should only be accepted when looked at in conjunction with the results of the Aboriginal values self-assessment (provided by the third party consultancy) for the CHL Place. Based on the CHL class listing, the Place is required to be assessed in a holistic manner, not on an individual basis.

7.4.3 Woronora-Penshurst Pipeline

The Woronora-Penshurst Pipeline would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. It is recommended that all contractors are required to complete a heritage induction prior to works commencing and that and indirect visual impacts are made reversible.

7.4.4 Kolara Weir

The Kolara Weir [2] would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. However, there may be some temporary visual impacts during the period of construction. Where feasible, discrete fencing should be established around the area of works to mitigate the temporary disruption of views and all contractors should be required to complete a heritage induction prior to works commencing.

7.4.5 Heathcote Road and associated infrastructure

Heathcote Road, along with the Woronora River Bridge, was constructed in direct response to urgent defence work as part of WWII efforts in the Holsworthy area. The proposed works would both directly and indirectly impact the item, and its associated infrastructure, as a result. Examples of associated infrastructure may include, but are not limited to, culverts, sandstone retaining walls, military objects, survey markers and historical road surfaces. If any items are located during construction and will require impacts in order to proceed with the proposed works, it is recommended that an archival recording is completed prior to works continuing. In regards to the survey markers, if any are located during construction, they should be avoided and an exclusion zone should be erected until an archival recording and salvage is conducted so the marker can be used as part of interpretative display.

8 Conclusions and recommendations

8.1 Conclusions

This SoHI has concluded that there would be direct and indirect impacts to heritage items within and adjacent to the study area

The proposed works would impact Woronora River Bridge's aesthetic and representative significance. The development of detailed concept designs based on previous heritage advice from Biosis has resulted in a proposal which is sympathetic in bulk and form, but will be distinct from the original structure. Elements such as the sandstone block facing of the abutments is also proposed to be salvaged and reused as part of the project where possible. While Woronora River Bridge would no longer be a largely unmodified bridge dating between 1925-1948 remaining in NSW, the proposed works do not diminish the item's heritage significance to the extent that the works are unacceptable from a heritage perspective. Aesthetically and technically, the Woronora River Bridge remains a large and impressive structure featuring clean modern lines, curved beam profiles and octagonal piers, with its construction in rugged terrain, and at a high level above permanent water, constituting a technical achievement at a State level. Similarly, despite the aesthetic change the proposed works would bring, these key features of the item's design and construction remain, and are emphasised in the cantilevered steel box girders and echoed in the octagonal knuckle heads at the piers. The item also remains the only RTA owned concrete bridge in NSW to exceed 80 metres in length, retaining its status as a rare example of high aesthetic and technical achievement at a State level. Similarly, the proposal does not alter the historical significance of the bridge and the role it played during WWII.

Based on the assessment of the historical values of the Cubbitch Barta National Estate, the proposed works are considered to be small scale, low intensity and localised to the area adjacent to Woronora River Bridge, thus the overall impact to the Place is considered to be minor. The Woronora-Penshurst Pipeline would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. The Kolara Weir would not be directly impacted as a result of the proposed works, with views to and from the item not anticipated to be restricted more than they currently are as a result of the development. However, there may be some temporary visual impacts during the period of construction. The proposed works would both directly and indirectly impact Heathcote Road, and its associated infrastructure.

In conclusion, the concept design is considered acceptable from a heritage perspective, with conditions based on the mitigation measures outlined in Section 7.3 and the recommendations below in Section 8.2.

8.2 Recommendations

These recommendations have been formulated to respond to client requirements and the significance of the site. They are guided by the ICOMOS *Burra Charter* with the aim of doing as much as necessary to care for the place and make it useable and as little as possible to retain its cultural significance.[70]

[70] Australia ICOMOS 2013 Australia ICOMOS 2013

Recommendation 1 Staged heritage review of detailed design.

In order to ensure the protection of heritage values throughout the detailed design process, it is recommended that heritage reviews take place at stages of the design development process. It is recommended that heritage reviews occur at 30%, 80% and 100% design stages.

Recommendation 2 Conservation Management Plan

Preparation of a Conservation Management Plan (CMP) for the Woronora River Bridge is required to outline how the heritage fabric of Woronora River Bridge should be managed on an ongoing basis. As noted above, while the proposal will result in the item no longer being a largely unmodified bridge dating between 1925-1948 remaining in NSW, the item still retains State heritage significance for its technical achievement and also remains the only Roads and Traffic Authority (RTA), now TfNSW, owned concrete bridge in NSW to exceed 80 metres in length. As such, a CMP would be an appropriate management document. This is in line with the NSW *Heritage Manual* and its associated guidelines, including the *Statements of Heritage Impact*.[71] This CMP should also investigate the establishment of an extended heritage precinct for Woronora River Bridge, Kolara Wier and former recreation area, and the extant remains of Heathcote Creek bridge as an area of local and State heritage significance.

Recommendation 3 Reduce impacts to heritage significance of Woronora River Bridge

In order to reduce permanent direct and indirect impacts to Woronora River Bridge, the following should be undertaken or implemented as part of the detailed design and planning stages:

- Retain as much of the original fabric of Woronora River Bridge where possible.
- Use sympathetic colour shades and texture for steel paint finishes of the box girders and headstock extensions.
- Undertake colour and material matching for repair and maintenance works.
- An appropriately qualified structural engineer to undertake an assessment of structural integrity for each element to be removed and/or replaced prior to removal as part of repair and maintenance works. Only replace elements which are at risk of failing.
- Salvage sandstone block facing from abutments and incorporate their use into the project or potential heritage precinct.
- Use discrete fencing with hoarding or fabric for Woronora River Bridge during works.

Recommendation 4 Reduce impacts to other heritage items

In order to reduce temporary indirect impacts during works, the following should be implemented:

- Use discrete fencing with hoarding or fabric for Woronora River Bridge during works.
- Regularly monitor vibration levels during works.
- Undertake an archival recording of heritage items associated with Heathcote Road to be directly impacted by the works prior to impacts occuring.
- Erect an exclusion zone around the survey marker (if relocated) until an archival recording and salvage of the item is conducted. The survey marker to be used as part of interpretative display.

[71] Heritage Office & DUAP 1996a, Heritage Office & DUAP 1996b Heritage Office & DUAP 1996a, Heritage Office & DUAP 1996b

Recommendation 5 Archival recording

An archival recording of the Woronora River Bridge and any associated infrastructure should be undertaken prior to any impacts. To ensure total impacts are catalogued, an archival recording of the Woronora River Bridge is also recommended after the conclusion of works.

Recommendation 6 Construction Heritage Management Sub-Plan

In order to avoid impacts to unidentified or unlocatable heritage items, it is recommended that the following are included in a Construction Heritage Management Sub-Plan:

- Heritage induction for all site workers to provide them with information regarding the heritage significance of various components of the study area and penalties under the *Heritage Act 1977* (Heritage Act).
- Unexpected finds procedure, using the Roads and Maritime Services *Unexpected Heritage Items: Heritage Procedure 02*.[72]

[72] Roads and Maritime Services 2015 Roads and Maritime Services 2015

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Appendices

NOTE: Information from this point on include sketches and database search printouts and do not meet WCAG requirements. If you're having trouble accessing the information please contact us at HeathcoteRoadBridge@transport.nsw.gov.au or 1800 572 004

Appendix 1 Heritage inventory sheets

Item details

Name of item:
Woronora River Bridge
Other name/s:
RTA Bridge No. 152
Type of item:
Built
Group/Collection:
Transport - Land
Category:
Road Bridge
Location:
Lat: -34.06333333333333 Long: 150.99638888888887
Primary address:
Heathcote Road, Heathcote, NSW 2233
Local govt. area:
Sutherland
All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Heathcote Road	Heathcote	Sutherland			Primary Address

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
Roads and Maritime Services	State Government	

Statement of significance:

Woronora River Bridge has historic, aesthetic and technical significance, and is an outstanding representative example of its class in NSW. Chiefly, the bridge has historic significance due to its strong association with strategic defence planning in World War Two in the south-eastern quarter of the wider Sydney area. The bridge also has significance because of its association with the history of transport to the Sutherland area, and with post war leisure activities in southern Sydney. The bridge is a large and impressive structure in a spectacular sandstone woodland landscape, and forms a landmark on Heathcote Road. The bridge has a high level of representative significance due to its size, as the only reinforced concrete beam bridge currently controlled by the Roads and Traffic Authority and constructed in the period 1925-1948 to exceed eighty metres in length.
Date significance updated: 21 Oct 04
Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the Department of Premier and Cabinet copyright and disclaimer.

Description

Designer/Maker:

DMR - individuals unknown

Physical description:

This five span two lane heavily skewed (35 degree) reinforced concrete bridge crosses a significant sandstone gorge in steep coastal forested country. Main spans are 27.43m and the two approach spans 21.94m. The deck is a continuous reinforced concrete structure with two longitudinal beams which curve down at the piers for increased strength. There are cross beams connecting the longitudinal beams, both intermediate and at the piers. Being square to the longitudinal beams, at each pier there are two cross beams, one at each pierhead. The deck is supported on steel rocker bearings at the abutments and approach piers. The piers have two octagonal columns each, connected by a rectangular headstock. The taller piers step out to larger size over their lower sections. At the centre span, the skew of the bridge aligns with the river orientation.

Abutments are wall type with square return walls in faced sandstone. Topping the abutment corners are concrete endposts. These provide an interface between guardrailing of the approaches and a retrofitted New Jersey kerb and steel rail system on the bridge. The monumental style endposts, which have strong vertical post art deco design details, have suffered from a variety of impacts, including damage to the outstands holding the bridge plaques.

Each end of the bridge has an expansion joint system, with an elaborate array of hold-downs retrofitted beneath to secure them.

From above the northwestern abutment, an old track allows pedestrian access to the river. This may have been used for access to construct the piers, and possibly for site camp and storage.

Physical condition and/or
Archaeological potential:

Original condition assessment: 'The bridge is in good condition apart from miscellaneous impact damage to endposts.' (Last updated: 13/10/2004.)

2007-08 condition update: 'Fair.' (Last updated: 17/4/09.)

Date condition updated:17 Apr 09

Modifications and dates:

New jersey kerb and rectangular steel rails have superseded the original bridge railing system, and armco guardrailing protects the approaches

Current use:

Road bridge

Former use:

Road bridge

History

Historical notes:

The bridge over the Woronora River was built in conjunction with the construction of Heathcote Road between 1940 and 1943, which links Liverpool and the Sutherland Shire. Liverpool was selected as a site for a town by Governor Macquarie in 1810, in response to demands for land in that area, already well known as a farming district. Settlement to the

south and east of the Georges River, however, was scant until the latter part of the nineteenth century. The Old Illawarra Road (now Forest and Wollongong Roads) was surveyed by Thomas Mitchell and constructed with convict labour between 1842 and 1845. This road led from Sydney to Wollongong, through Newtown, Arncliffe and Hurstville to Lugarno where a hand punt was established across the Georges River. The road then wound south through Menai, along the western side the present Lucas Heights and forded the Woronora River near today's North Engadine and continued to Wollongong. Parish maps from the 1890s show settlement along this road and the Menai Road.

In 1884 the settlement of Eckersley was established in the present Holsworthy area, and a small group of farmers inhabited the Menai area to the east, then known as Bangor, by the first decades of the twentieth century. Prior to World War One, livestock were driven from Liverpool through Menai to the slaughter yards at Sutherland, crossing the Woronora River on a sandbar at low tide, adjacent to the present Menai Road Bridge. The first bridge over the Woronora River, a timber bridge on the Menai Road downstream and to the north of the subject bridge, opened in 1912, partly in response to energetic petitioning by residents of Sutherland and Bangor, now Menai, across the previous decade. (Larcombe, 1979, p. 58-9, 77; Kennedy, 1982, p. 113-4, Keating, 1996, pp. 7-8.)

Liverpool had hosted military activities from the late nineteenth century. From about 1910 the Australian forces were readied for a war with Germany, and the encampments at Liverpool became more active. Lord Kitchener visited to inspect the forces in 1910 and, as a result of his report, an area of 883 acres was acquired at Holsworthy for a Remount Depot. Holsworthy hosted various military divisions once war was declared, including the 3rd and 6th Light Horse regiments. The war also brought motor vehicles to Liverpool in significant numbers for the first time, and the heavy flows of military traffic resulted in wear on the roads, including the road known as Illawarra Road, connecting Liverpool and Holsworthy. (Keating, 1996, pp.146, 147.)

World War Two upturned the road infrastructure priorities in place in the interwar period to serve civic Sydney. During 1940 and 1941, roads were built for the ease of movement of troops and defence supplies, to provide access to and within military camps and other defence establishments, and to munitions factories. Strategists were also concerned to provide multiple access routes to important items of infrastructure and around major obstacles such as rivers and escarpments. The section of Heathcote Road between Holsworthy and Heathcote was substantially constructed during 1940-41 to provide an improved cross-country connection with Holsworthy. The new road was 13 miles long and incorporated four new concrete bridges, over Harris, Williams and Deadmans Creeks, and the Woronora River. The Liverpool-Wallgrove Road was also upgraded at this time, and, with Heathcote Road provided a strategic connection between the Great Western Highway and the Princes Highway, bypassing city traffic. (DMR, 1976, p. 172)

The bridge over the Woronora River was completed in 1941. During the period 1925-1940 the Department of Main Roads (DMR) adapted existing standards of bridge design to meet the requirements of improved motor vehicle performance - they were generally wider than previously with an improved load capacity. The principal types of bridges constructed during the period were: reinforced concrete beam; concrete slab; steel truss on concrete piers; and timber beam bridges. Concrete was favoured in many instances because it was perceived to

be a low maintenance material (The Roadmakers, DMR, 1976, pp.169, 170). Based on RTA bridge database records, reinforced concrete beam or girder bridges were the most common form of concrete bridge construction to 1948, with more than 160 extant. They have been very popular in NSW, and elsewhere, providing an efficient and often aesthetically pleasing solution to a wide range of crossing types.

The construction of Heathcote Road required extensive clearing, cutting and filling, in particular in the steep gully of Deadmans Creek, and on the ascent and descent from the Woronora River crossing. [See Figures 8-18] Tractors, trucks, motorised rollers and air compress technology were utilised. Robert Fretus, the contractor for the Williams and Deadman's Creek bridges, also on Heathcote Road, was encouraged by the DMR to work quickly, as Heathcote Road and its bridges were being built as an urgent defence work. It is probable that the contractors for the Woronora River Bridge worked under similar circumstances. (RTA File 259.1932.) During the war Heathcote Road was heavily used by Army traffic travelling between Liverpool, Holsworthy and the military base at Loftus, and the industrial areas of Wollongong. The Sutherland area was considered a possible target for Japanese attack as the war progressed, and fortification and precautionary activities ensued; Heathcote Road would have acted as one of the main transport conduits facilitating these endeavours. The road was known as Military Road at this time. (Kirkby, 1970, pp. 91-7, RTA Bridge File 411.1133)

In the 1960s a weir beneath the Woronora River Bridge, created a popular swimming hole for those from the north and south. Rom Dortins, living in Bankstown at the time, remembers that on weekends Heathcote Road was lined with parked cars on both sides of the bridge for several hundred metres, with the picnickers squeezing their cars into the narrow shoulders and against the rock cuttings until the weir was destroyed by Sutherland Council. (Pers. Comm. Rom Dortins, 2nd September 2004) It is now difficult to stop near the bridge, the previous parking area having been fenced off. Parking is discouraged by the high speed and volume of traffic.

The Sutherland Shire is characterised by its isolation from Sydney, being on the southern side of Botany Bay and the Georges River and bound to the east, west and south by the ocean, Woronora River and Royal National Park. While the Princes Highway, crossing the George's River at Tom Ugly’s Bridge, and Rocky Point and Taren Point Roads, with Captain Cook Bridge, form the main links with the city, Heathcote Road has provided an important link to the Liverpool area, also a significant centre of employment, for sixty years. The journey from Liverpool to Sutherland via Heathcote Road, through the spectacular sandstone country of the Holsworthy Military Reserve and Heathcote National Park, and emerging on the Princes Highway at Heathcote, captures this sense of splendid isolation.

In the 1990s, concern about the narrowness of Woronora River Bridge and the narrow and winding character of sections of the Heathcote Road surfaced within the community, with a number of individuals contacting the Roads and Traffic Authority to lobby for a new road between Liverpool and Sutherland. (RTA bridge File 411.1133)

Historic themes

Australian theme (abbrev)	New South Wales theme	Local

		theme
3. Economy-Developing local, regional and national economies	Technology-Activities and processes associated with the knowledge or use of mechanical arts and applied sciences	(none)-
3. Economy-Developing local, regional and national economies	Transport-Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	(none)-
7. Governing-Governing	Defence-Activities associated with defending places from hostile takeover and occupation	(none)-
8. Culture-Developing cultural institutions and ways of life	Leisure-Activities associated with recreation and relaxation	(none)-

Assessment of significance

SHR Criteria a)

[Historical significance]

The Woronora River Bridge is strongly associated with the State theme of Defence, the bridge being constructed as an essential component of the Heathcote Road built during WWII to facilitate the movement of troops and supplies associated with the Army installations in the southern Sydney area and the Illawarra and also to provide part of a strategic cross country connection between the Great Western and Princes Highways. Since WWII, the Woronora River Bridge, as part of Heathcote Road, has provided the third way of reaching the Sutherland Shire, and the only direct connection between Sutherland and western Sydney. The bridge also formed a landmark in the post-war landscape of leisure for swimmers and picnickers from adjacent areas to the northwest and south east, and as part of a landscape no longer used for leisure, can help to demonstrate the way leisure activities have evolved to the present.

SHR Criteria c)

[Aesthetic significance]

Woronora River Bridge is a large and impressive structure for its type, having five spans and a total length of over 125 metres. The clean modern lines of its design, featuring curved beam profiles and octagonal piers, are attractive and sit well within the rugged sandstone woodland landscape. The bridge forms a landmark on the Heathcote Road, which winds down through impressive sandstone cuttings to reach the bridge. As a large structure it is reasonably sophisticated technically, featuring a heavy skew and rocker bearings to allow thermal movements. Its construction in rugged terrain and at a high level above permanent water constitutes a technical achievement.

SHR Criteria g)

[Representativeness]

The Woronora River Bridge is the longest continuous concrete beam bridge in the study group of RTA controlled beam bridges constructed prior to 1948, at 125 metres in length being the only structure to exceed eighty metres in length, apart from the redecked bridge crossing the Hawkesbury River at Windsor, which is a series of simply supported spans. The Woronora River Bridge is capable of demonstrating the key characteristics of the class of larger concrete beam bridges of the period 1925-1948.

Integrity/Intactness:

Good

Assessment criteria:

Items are assessed against the State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Listings

Heritage Listing	Listing	Listing	Gazette	Gazette	Gazette

	Title	Number	Date	Number	Page
Heritage Act - s.170 NSW State agency heritage register					

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Heritage Study of Pre-1948 Concrete Beam Bridges (Sthn, Sth West, Sydney)	2005		Burns and Roe Worley and Heritage Assessment And History (HAAH)		Yes

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	Department of Main Roads, (DMR)	1976	The Roadmakers: A History of Main Roads in New South Wales	
Written	Keathing, Christopher	1996	On the Frontier: A Social History of Liverpool	
Written	Kennedy, Brian and Barbara	1982	Sydney and Suburbs, a History and Description	
Written	Kirkby, David, R	1970	From Sails to Atoms. First Fifty Years of Sutherland Shire 1906-1956	
Written	Larcombe, F. A.	1979	Change and Challenge. A History of the Municipality of Canterbury, NSW	
Written	Roads and Traffic Authority		RTA Bridge File 411.1133	

Note: internet links may be to web pages, documents or images.

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Every effort has been made to ensure that information contained in the State Heritage Inventory is correct. If you find any errors or omissions please send your comments to the Database Manager.

Place Details

Send Feedback

Cubbitch Barta National Estate Area, Old Illawarra Rd, Holsworthy, NSW, Australia

Photographs

List	Commonwealth Heritage List
Class	Indigenous
Legal Status	Listed place (22/06/2004)
Place ID	105405
Place File No	1/15/023/0016

Summary Statement of Significance

Cubbitch Barta National Estate Area is a large area with outstanding cultural and natural values. It is very significant as a cultural and natural landscape which demonstrates relationships between the environment and human occupation through time. Its significance is emphasised by its proximity to Sydney, the Nation's largest metropolitan centre. Cubbitch Barta National Estate Area is an integral component of the Woronora Ramp area, stretching south-west from Sydney, together with Royal National Park, Heathcote National Park, the Woronora catchment and O'Hare's Creek Catchment. Major parts of the Woronora Ramp region are included in the Register of the National Estate. This region, together with the other tracts of undeveloped areas to the west and north of the metropolitan area, are essential in defining the character of the broader Sydney region. In the network of gullies which criss-cross the area, many of the natural values remain undisturbed and the Indigenous heritage is impressively retained. Over 500 Aboriginal sites provide a glimpse of the relationship between people and the land prior to 1788. The sites and the area's long term and more recent connections with Aboriginal people, combine to form a landscape of great significance for its Indigenous heritage. The landscape also provides important illustrations of European settlement, agriculture and Australia's military history. It is unusual to find landscapes in this region so intact. This provides a rare opportunity to understand both the natural and cultural history of the region. It is remarkable that this landscape has survived on the margins of the Nation's earliest and largest urban centre.
Indigenous values:
The Cubbitch Barta National Estate Area is highly valued by members of the Tharawal Local Aboriginal Land Council and the Dharawal people for its symbolic, cultural, educational and social associations (Criterion G.1). The Aboriginal cultural landscape of the area reflects the past lifestyle of Aboriginal people in this region and its preservation enables Aboriginal people to maintain cultural links to the area. These connections with the past are particularly important, because Aboriginal people in this part of Australia were among the earliest impacted by European settlement of this continent and their culture has since been disrupted by war, disease and urban development. Throughout the environments of the area the Dharawal see evidence of the relationship between their people and the land. The Tharawal Local Aboriginal Land Council is also concerned about maintaining the area's natural environment. The area contains a large and diverse collection of Aboriginal sites, which represent a complex Aboriginal cultural landscape (Criterion A.3). Over 530 sites are known from the area and a further 509 potential archaeological sites have been documented. It is highly likely that the area contains many hundreds more sites. Sites include rock paintings and

drawings, engravings, open scatters of artefacts, grinding grooves and scarred trees. The survival of a significant number of scarred trees within the area is important as this is a rare type of site within the Sydney Basin (Criterion B.2). While rock art sites are well represented in the Sydney Basin, other types of sites are less so. The preservation within the area of scarred trees, open artefact scatters and archaeological sites in particular, offer considerable potential for further developing a picture of day to day activities of Aboriginal people in the Sydney Basin prior to 1788 (Criterion C.2). This large number of sites and the stories they may tell form a landscape in which Aboriginal life prior to 1788 is recorded without the large scale impact of European settlement. There is also a high density of sites in the area. This is particularly important because sites are found in groups or clusters with their relationship to one another largely intact. By examining where they are located in the landscape and their relationship to other types of sites, a more complete picture of the lifestyle of Aboriginal people could be established (Criterion C.2). The Georges River, which bounds the National Estate area on the west and is close to the north, has been identified as an important north-south Aboriginal cultural boundary within the Sydney Basin. The cultural landscape of the National Estate area is representative of the southern social unit of the Sydney Basin (Criterion D.2). This unit has been characterised by the presence of a number of distinctive traits within the art and by complex analyses which show that the art sites of this region are significantly different from those north of the Georges River. The large number of sites, the relatively high site density, the condition of sites and the preservation of the landscape as a whole makes the area important in terms of the further definition of this southern unit. The area also offers considerable research potential in terms of the analysis and interpretation of small scale groups (Criterion C.2). There is evidence to suggest that this area formed the cultural landscape of a single residence group whose territory extended over the Georges River and Williams/Mill Creek drainage basins. In this region, it is uncommon to have such a landscape preserved in this way and particularly important, as knowledge of local groups from enthnohistory is often incomplete and problematic. The rich collection of more than 300 rock art sites within the area is regionally significant as a group in the Sydney Basin and representative of rock art south of the Georges River (Criterion D.2). The rock art sites are diverse in terms of technique (paintings, drawings and engravings) and motifs depicted (Criterion A.3). The art in the area contains a number of motifs which are rare within the Sydney region, such as the engraving of a pregnant woman. The site where this occurs is considered important, as female motifs and gender specific evidence of this kind are relatively rare (Criterion B.2). The long history of recording the rock art sites by voluntary groups and individuals indicates that they are aesthetically important to groups within the broader community (Criteria E.1). The aesthetic value of these sites is enhanced by their excellent condition and lack of graffiti. The Cubbitch Barta National Estate Area is important as an illustration of a landscape in which changes in the relationship between Aboriginal people and early settlers took place (Criterion A.4). This is a phase in the cultural history of Australia for which traditional documentation is often poor. The area is associated with Governor Macquarie's war against the Aboriginal people of the Liverpool, Campbelltown and Appin areas from April to November 1816. Despite efforts to move Indigenous people away from this country, documentation indicates Aboriginal people were still visiting sites within the area in the 1830s. Within the area, it is the evidence of the strong Aboriginal presence combined with the nineteenth century history and land use without much twentieth century development, which makes this area unusual for the way it can illustrate this period of history. Potential exists for further research to shed light on this era through research relating to exploration, settlements within the area and information about the adjacent Aboriginal reserve (Criterion C.2).

Natural values:

This area contains a diversity of natural landscapes and vegetation types in a relatively unmodified condition, in an area otherwise greatly altered by urban development. Vegetation communities include plateau forest (covering forest and woodland on both tertiary alluvium soils and on shale), gully forest, woodland/heath complex, riparian forest, sedgeland, heath/swamp complex and melaleuca thickets. The laterite ridgetops are almost entirely intact and are significant reference sites which demonstrate the formation of laterite caps and the occupying vegetation communities (Criterion A.2). Diversity of plant species is high, with more than 400 species recorded in the area. At least seven different plant communities have been distinguished in the area, indicating high community diversity (Criterion A.3). At least eight plant species considered rare nationally occur here: DARWINIA DIMINUTA, D GRANDIFLORA, EUCALYPTUS LUEHMANNIANA, GREVILLEA LONGIFOLIA, HIBBERTIA NITIDA, LOMANDRA FLUVIATILIS, MELALEUCA DEANEI and TETRATHECA NEGLECTA. A rare and undescribed species of greenhood orchid (PTEROSTYLIS sp E) has also been recorded here. The area contains a substantial remnant of Cumberland Plain woodlands, a vegetation type growing mainly on Wianamatta shale. Only 6% of the original area of Cumberland Plain woodlands remains. This community has been listed as an endangered ecological community under the NSW Threatened Species Conservation Act 1995. LEUCOPOGON EXOLASIUS, found here, is listed as vulnerable under the Commonwealth Endangered Species Protection Act 1992. Regionally significant plants include E SQUAMOSA, GREVILLEA DIFFUSA and ZORNIA DYCTIOCARPA (Criterion B.1). The broad headed snake (HOPLOCEPHALUS BUNGAROIDES), found in this area, is listed under the Commonwealth Endangered Species Protection Act 1992. The koala (PHASCOLARCTOS CINEREUS) population found locally is considered one of the few remaining viable populations in southern NSW. The area also contains a significant population of the spotted tailed quoll (DASYURUS MACULATUS). Both the koala and quoll are listed as vulnerable under the NSW Threatened Species Conservation Act, together with the giant burrowing frog (HELEIOPORUS AUSTRALIACUS), red crowned toadlet (PSEUDOPHRYNE AUSTRALIS), powerful owl (NINOX STRENUA) and greater broad nosed bat (SCOTEANAX RUEPPELLII), all of which are recorded in the area. The New Holland mouse (PSEUDOMYS NOVAEHOLLANDIAE), considered to be regionally rare, is also found here together with a number of other fauna species of regional or State conservation significance (Criterion B.1). The area has areas of significant aesthetic values, particularly the forested creek gorges (Criterion E.1).

Historic values:
The settlement sites and transport routes in the area are associated with the history of nineteenth century European settlement and the development of agriculture in the Liverpool region, including the wine industry and subsistence farming in a bushland setting. The Grodno Settlement site is associated with the activities of migrants in the Liverpool region. The Cubbitch Barta National Estate Area also provides evidence of transport routes for settlers in the Liverpool, Holsworthy and Campbelltown areas. These demonstrate the transport linkages that connected the nineteenth century settlements, industry and farms to more established regions of Sydney. Holsworthy is also significant for its military associations. It was a training site for Australian troops and horses engaged in World War One battles, including Gallipoli. The Holsworthy Military Training Area is also significant for the training activities of the Australian Army after World War Two (Criterion A.4). The Old Army Internment Camp Group was used to inter Germans and other Europeans, from 1914-19. The internment of migrants in Australia followed Britain's foreign nationals policy during World War One and this site reflects Australia's strong defence links with Britain. It also demonstrates Australia's fear of European immigrants during World War One and reflects concerns that Australia's war effort and National security were threatened by spies and invasion. The Old Army Internment Camp Group also indicates the impact of World War One on Australia's home front when men were interned and their families left to fend for themselves (Criterion A.4). The Old Army Internment Camp Group is associated with the history of Federation. The acquisition of its remaining buildings in 1913 was part of the Commonwealth Government's major program of defence construction for Australia (Criterion A.4). The Old Army Internment Camp Group survives as evidence of the largest internment camp in Australia during World War One. The guard buildings and structures are rare in demonstrating the guards' section of a World War One internment camp in Australia and are also significant because they were constructed by German and other European internees (Criterion B.2). This Group has important associations for those who trained there during World War Two and who more recently undertook National Service Training or permanent Army service there during its use as a military camp. It has similar associations for members of the World War One Light Horse Regiments and their families and descendants. It has strong associations for former internees. It also has important associations for Australians as a reminder of a period of conflict and troubled National identity, involving a deep suspicion of non-British immigrants at that time (Criterion G.1).

Official Values

Criterion A Processes

The Holsworthy National Estate Area contains a diversity of natural landscapes and vegetation types in a relatively unmodified condition, in an area otherwise greatly altered by urban development. As such it forms an important remnant of the original land system of the Sydney region, where geological and biological processes can continue within a reasonably large and relatively natural area. In particular, the laterite ridgetops within the place demonstrate the formation of laterite caps and the evolution of biological communities adapted to them.

The koala *Phascolarctos cinereus* population, located within the place, is the largest in the Sydney metropolitan area and one of the few remaining viable natural populations in southern NSW (L. Gibson pers. comm. 1996). The place is a component of major importance in an identified network of koala habitat in the region (Phillips & Callaghan 1996).

The New Holland mouse *Pseudomys novaehollandiae* , considered to regionally rare, occurs in the heath/swamp complex. Its population here, together with wallaroo *Macropus robustus* and grey kangaroo *Macropus giganteus* populations found in plateau forest within the place, are significant as few populations of these animals survive in the region (AXIS Environmental/AMBS Consulting 1995).
Because it represents a relatively large remnant of Sydney's original land system and reflects its biophysical diversity, the place contains a correspondingly diverse range of vegetation communities. These include plateau forest, gully forest, woodlands/heath complex, riparian forest, sedgeland, heath/swamp complex and *Melaleuca* thicket. These communities support a high diversity of plant species with over 400 plant species recorded in the area (Benson & Howell 1990, AXIS Environmental/ AMBS Consulting 1995).

Criterion B Rarity

The turquoise parrot *Neophema pulchella* was recorded here in the 1960s (AXIS Environmental/AMBS Consulting 1995).
Regionally significant plants include *Eucalyptus squamosa, Grevillea diffusa* and *Zornia dyctiocarpa* (AXIS Environmental/AMBS Consulting 1995).

Criterion B Rarity

Leucopogon exolasius (2VC-) found within the place is listed as vulnerable on the Commonwealth Endangered Species Protection Act 1992. A further eight plant species are considered nationally rare including *Darwinia diminuta* (3RCi), *Darwinia grandiflora* (2RCi), *Eucalyptus leumanniana* (2RCa), *Grevillia longifolia* (2RC-), *Hibbertia nitida* (2RC-), *Lomandra fluviatilis* (3RCa), *Melaleuca deanei* (3RC-) and *Tetratheca neglecta* (3RC-) (AXIS Environmental/AMBS Consulting 1995).

The rare and undescribed orchid, *Pterostylis* sp. 'E' is recorded from Holsworthy (M. Petersen pers. comm. 1997).

The plateau forest and woodland communities on tertiary alluvium/shale have largely been cleared from the surrounding lands and many of the last remnants of the shale flora are being destroyed with the expansion of Campbelltown (Benson & Howell 1990). The place includes a significant proportion of the remainder. Plateau forest communities are estimated to cover 9.5% of the Holsworthy Training Area (Axis Environmental/ AMBS Consulting 1995). Virtually none of the plateau forest on shale, referred to by Benson & Howell (1990) as 'Cumberland Plain woodlands', is protected in conservation reserves (Benson & Howell 1990, Benson 1992).

The melaleuca thicket community is confined to the place (R. Lembit pers. comm. 1996).

The broad-headed snake *Hoplocephalus bungaroides* listed as endangered on the Commonwealth Endangered Species Protection Act 1992, occurs here.

Other fauna found within the place listed as vulnerable on the NSW Threatened Species Conservation Act include the giant burrowing frog *Heleioporus australiacus*, red-crowned toadlet *Pseudophryne australis*, powerful owl *Ninox strenua*, greater broad-nosed bat *Scoteanax rueppellii*, koala *Phascolarctos cinereus* and spotted-tailed quoll *Dasyurus maculatus*. (AXIS Environmental/AMBS Consulting 1995).

Criterion C Research

The laterite ridgetops within the place are almost entirely intact and are significant reference sites demonstrating the formation of laterite caps and the vegetation communities occupying them (pers. comm. Adam 1996). These laterite caps were once extensive in the Sydney region, but as most have been utilised for suburban development or disturbed by quarrying, the remnants here are particularly important in contributing to understanding the regional land system and the processes leading to it being as it was when European settlement began.

Criterion E Aesthetic characteristics

The Holsworthy area has significance aesthetic values for the present community. These relate particularly to the dramatic views of bushland, the Sydney Basin and the Sydney city skyline which can be obtained from the ridgetops. There are also excellent views of rugged creek gorges, rockpools and fringing forest from locations such as Engineers' Bridge.

Description

The Cubbitch Barta National Estate Area is commonly known as the Holsworthy Military Training Area. Cubbitch Barta means 'people of the river' in the Aboriginal Gurgur language and was chosen as the name for this National Estate place by the nominator. Holsworthy has been a military training area since the late nineteenth century. It has since become known as the Holsworthy Military Training Area, the Holsworthy Field Firing Range, the Holsworthy Range, or simply The Range. The Cubbitch Barta National Estate Area is a large tract of bushland covering plateaux, ridges and rocky creek valleys immediately adjacent to the dense urban development of Sydney's south-west. The bushland has been largely protected from development and public use, due to the area being set aside as a Commonwealth military training area in 1913. The bushland contains hundreds and possibly well over a thousand Aboriginal sites, which reflect a substantial history of Aboriginal occupation. This represents an extensive landscape where Aboriginal life in this region prior to 1788 is recorded without large scale impact of European settlement. A number of European nineteenth century sites in the area are associated with the history of European settlement and the development of agriculture in the Liverpool region. The Holsworthy area was used as a training area for Australian Defence personnel in the late nineteenth century and throughout the twentieth century. The Range comprises the southern area of the National Estate area and is an extensive tract of open countryside, in parts very undulating and not fully accessible to the public, dominated by a thickly wooded incised plateau. Due to the area being used as a firing range by the army, Defence personnel were settled in the area known as the Old Army Internment Camp, on the northern part of the Range. During World War One, there was an internment camp for migrants and prisoners of war here. The Old Army Internment Camp Group is entered in the Interim list for the Register of the National Estate as a place of individual significance (refer to file RR 014223).
The landscape:
The Cubbitch Barta National Estate Area occupies 18, 000ha of the Woronora Plateau, approximately 30km south-west of inner Sydney. It adjoins Heathcote National Park to the south-east and Dharawal State Recreation Area to the south, forming part of an extensive tract of bushland stretching southwards from the Sydney metropolitan area. It also contains part of the Woronora and O'Hare's Creek catchments. The area has soils derived from the interbedded shale and fine to medium grained quartz sandstone of the Mittagong Formation. The landscape is one of crests, ridges, valleys and plateau remnants. The original plateau surface has been eroded by creeks including Harris, Williams and

Deadman's Creeks, flowing northwards to join the Georges River, which discharges into Botany Bay. In the southern part, two further creeks, Punchbowl and O'Hares, join the Georges River. The creeks have formed deeply dissected valleys where the underlying Hawkesbury sandstone is revealed and where there are scenic waterfalls and waterholes surrounded by she oaks and tall eucalypts. In other valleys, clear water seeps from wet heaths and collects in the pools on flat sandstone platforms. On these flat rocks are occasionally found Aboriginal engravings. On the sides of many valleys are sandstone overhangs and rock shelters which provide cool, sheltered sites for banks of ferns, mosses and lichens. Aboriginal art such as hand stencils, charcoal sketches and ochre paintings are located in these overhangs. Remnant ridges capped with laterite occur in the area, important as most other laterite caps in the region have been extensively disturbed by mining or suburban development. These elevated areas provide views across the Sydney basin and toward the distant Sydney city skyline. The area contains a wide range of vegetation, varying from dry woodland/heath complex, to plateau forest and woodland, gully forest, riparian forest, sedgeland, heath/swamp complex and melaleuca thickets. The major vegetation types are dry woodland (approximately 50% of the vegetation cover) and gully forest. The southern ridge tops support a dry open woodland similar to that found in nearby Royal National Park, Heathcote National Park and the O'Hares Creek catchment area, with the most common tree species being red bloodwood (E GUMMIFERA), yertchuk (E CONSIDENIANA) and narrow leaved stringybark (E OBLONGA). The ridge tops towards the north of the area consist of sandstone or laterite over sandstone and support woodland dominated by Sydney red gum (ANGOPHORA COSTATA), scribbly gum (E HAEMASTOMA/E RACEMOSA) and red blood wood (E GUMMIFERA). Plateau forest and woodland fall into two main subgroups: tertiary alluvium dominated by ironbarks (E CREBRA and E FIBROSA); and shale dominated by Sydney red gum (ANGOPHORA COSTATA, E PUNCTATA, E SPARSIFOLIA and E GUMMIFERA). Both subgroups have a grassy understorey with THEMEDA AUSTRALIS, ENTOLASIA STRICTA and LOMANDRA sp among the common plant species encountered. A substantial remnant (approximately 1,650ha) of Cumberland Plain woodland, consisting mainly of grey box (E MOLUCCANA) and forest red gum (E TERETICORNIS), is located between the Georges River and Harris Creek in the north-west. Only 6% of the original area of this woodland is thought to survive in the Sydney Basin and it is listed as an endangered community under NSW Threatened Species Conservation Act. Gully forest covers about 40% of the area, with dominant trees including Sydney red gum (ANGOPHORA COSTATA), Sydney peppermint (E PIPERITA), red blood wood (E GUMMIFERA) and blackbutt (E PILULARIS). The shrub layer includes saw tooth banksia (BANKSIA SERRATA) and Christmas bush (CERATOPETALUM GUMMIFERUM). The spectacular gymea lily (DORANTHES EXCELSA) nears its southern limit here. Small sections of river fringing forest in the area are dominated by coach wood (CERATOPETALUM APETALUM) and river gum (TRISTANIOPSIS LAURINA). Patches of sedgeland and wet heaths are restricted mainly to the southern part around perched swamps on the Woronora Plateau. The sedgelands differ from the heath/swamp complex in lacking a shrub layer. Common species are LEPTOCARPUS TENAX, SCHOENUS BREVIFOLIUS and SPRENGELIA INCARNATA. In the heath/swamp complex, dominant shrubs are fern leaved banksia (BANKSIA OBLONGIFOLIA), heath leaved banksia (B ERICIFOLIA) and dagger bush (HAKEA TERETIFOLIA). Ground cover plants include PTILOTHRIX DEUSTA, LEPYRODIA SCARIOSA, LEPTOCARPUS TENAX and CYATHOCHAETA DIANDRA. Very small areas of melaleuca thickets occur in the north and are dominated by snow in summer (MELALEUCA LINARIFOLIA), together with bangalay (E BOTRYOIDES) and Sydney blue gum (E SALIGNA). Many of the vegetation types within the area contain rare plant species. Cubbitch Barta National Estate Area contains a population of spotted tailed quolls (DASYURUS MACULATUS), a cat sized carnivorous marsupial considered uncommon to rare on mainland Australia and which has declined dramatically this century. It has significant populations of koalas (PHASCOLARCTOS CINEREUS) and is considered prime koala habitat. Evidence suggests that the area provides a connecting corridor between the Campbelltown area and Heathcote and Royal National Parks, along which koalas may have been moving for thousands of years. More than ninety bird species have been recorded here, including some usually found much further west. Species recorded include the turquoise parrot NEOPHEMA PULCHELLA and the powerful owl NINOX STRENUA. Common reptiles include the bearded dragon (POGONA BARBATA), blind snake (RAMPHOTYPHLOPS NIGRESCENS), Lesueur's velvet gecko (OEDURA LESUEURII) and yellow faced whip snake (DEMANSIA PSAMMOPHIS). Thirty-six reptiles and amphibians are known to occur here. Freycinet's frog (LITORIA FREYCINETI), the giant burrowing frog (HELEIOPORUS AUSTRALIACUS) and Haswell's frog (PARACRINIA HASWELLI), are some of the amphibians noted from the area.
The Aboriginal landscape:
The Cubbitch Barta National Estate Area contains more than 530 Aboriginal sites spread throughout the plateaux and Rocky Creek valley terrain. These include rock shelters with painted and drawn art, engravings on open rock platforms, camping places, grinding grooves and scarred trees on the older trees of the forests and woodlands. The area contains an important collection of sites which are relatively undisturbed in their landscape setting. While many Aboriginal sites have been recorded within the area, only a portion of the area has been systematically surveyed and there are likely to be many hundreds more sites to be recognised and documented. According to most sources, the area falls mostly or wholly within the boundaries of the Dharawal people. The Dharawal's boundary with their northern neighbours is generally considered to be the Georges River and in the north-west they shared a boundary with the Dharug which may have taken in a small part of the western side of the National Estate area. In the nineteenth century, Aboriginal sites were first noted within the boundaries of this area by R Etheridge. Etheridge's informant stated that his father visited rock art sites around Harris Creek with Aboriginal people around 1838. Many of the sites within the area were recorded during the 1970s, through the activity of the Sydney Prehistory Group. Additional sites were recorded by Corporal Robert Thompson in the 1980s. These recordings were reassessed in 1995 within the Holsworthy Training Area Environmental Audit. Up to this point, 295 sites had been recorded in the area, with recordings heavily biased toward sites containing rock art (235) and grinding grooves (sixty-nine). In late 1996, a systematic archaeological survey of

parts of the area was conducted as part of an Environmental Impact Statement (EIS) for two options proposed for the Second Sydney Airport. This survey recorded a further 240 sites and revealed a broader range of sites than previously known. These included: 128 rockshelters with drawn or painted rock art, sixteen sites with engraved art, sixty-four sites with grinding grooves, forty-seven scarred trees, thirty-seven isolated finds and eighteen open scatters of artefacts. Currently more than 530 sites are recorded within the area. This includes over 300 rock art sites. The EIS study also documented 509 potential archaeological deposits. These are places (usually rockshelters) where it is highly likely that archaeological material will be found under the surface. No archaeological excavations have taken place within the area and the length of association of Aboriginal people and the Cubbitch Barta National Estate area is unknown. The recent survey work indicates considerable potential for future archaeological investigations. The rock art found within the area represents a significant collection of Aboriginal imagery, created using a diverse range of techniques (engravings, pigment applied wet, pigment applied dry) and reflecting a wide variety of subject matter. This collection of art is distinct in its combination of features from other bodies of rock art in the Sydney basin. Dominant motifs in the painted and drawn area include macropods, hand stencils, fish and eels, with emus, wombats, echidnas and koalas. The colour most frequently used is black (charcoal) with red and white also common. A combination of colours was used in a small proportion of sites. Many sites contain ten figures or less and the largest site has more than sixty figures. Fewer engraving sites exist within the area compared with other areas in the Sydney Basin and the number of figures per site is generally small (not more than six). They do however contain different motifs and appear to form compositions. Engraved motifs include large footprints, emu tracks, eels, fish, macropods, koalas, human like figures and one engraving apparently of a pregnant female. This last motif appears to be unique in this area. Small engraved channels have also been found on flat rocks within creeks and in association with engraving sites. These grooves may have been used to channel water from the surrounding spongy heath into deeper rock pools. Archaeological work in the Sydney basin has confirmed north-south differences in the art of the basin, with the Georges River most often identified as the boundary between the two regions. Differences between these regions have been established by complex analyses of the art (both pigment and engraving sites). Fewer engraving sites exist south of the Georges River and there are also a number of differences in the way motifs are depicted. This large body of sites has been generally protected from the impact of the surrounding urban development and remains in excellent condition. It represents a large and important sample of Aboriginal sites in the southern Sydney basin. In many comparable areas, sites have been flooded behind dams, such as the adjacent Woronora dam and the Cataract, Cordeaux and Avon catchments further to the south. Similarly, as coal mining has not occurred under the area, the rockshelters here have not been affected by subsidence which has been documented affecting sites in catchments to the south. The area has also not been commercially logged since the turn of the century, an important factor in the survival of a significant number of scarred trees. The nineteenth century European settlement sites in the area illustrate the story of settlement in the Liverpool region and the way it affected Aboriginal people. Early colonial farms were established to the north and west of the area from 1800-20 and some of the conflicts that occurred within the first half of the nineteenth century, most notably Governor Macquarie's proclaimed war on Aborigines in 1816, were played out in and around the area. The Aboriginal landscape of this historic period is well represented by the landscapes of the area, containing isolated homesteads, roads, farms and a small town settlement. Etheridge's account indicates that Aboriginal people were still visiting sites within the area in the 1830s. One of the earliest Aboriginal reserves in the Sydney area is thought to have been located immediately adjacent to the area in the north east, around Sandy Point on the Georges River. This reserve was occupied at a time in the late nineteenth century when the settlement of Eckersley was established within the area, along with a number of farms and vineyards. While the relationship between Aboriginal people on the reserve and the area is not currently known, they may have visited the area to obtain bush foods or to maintain other social or spiritual connections. Since the establishment of the military facility in 1913, Aboriginal people have had only limited access to the area. Connections have been maintained, to some extent, through Aboriginal people in the Army. More recently, the Tharawal Local Aboriginal Land Council has assumed a custodial role for the Training Area and in 1993, negotiated with the Army to look after the area's cultural heritage sites. In late 1996, Tharawal representatives visited many of the sites in the area as part of their role in the cultural heritage surveys associated with the Sydney second airport environmental impact statement. The Australian Army has been cooperating with the Tharawal Local Aboriginal Land Council to protect Aboriginal sites in the area by providing access for Aboriginal people, assisting in documenting places and taking steps to avoid sites during military activities.

European settlement and agriculture:

From 1798 to 1805 the NSW Colonial Government issued land grants to early settlers in the Liverpool region including Thomas Moore, Captain Thomas Rowley and Thomas Laycock. The first land grants for European settlement were made in the Holsworthy area from 1805-13. In 1835, the rugged sandstone gorges of the area were surveyed and proclaimed as the Parish of Eckersley. The Old Coach Road, Old Illawarra Road and New Illawarra Road provided transport routes for settlers in the Liverpool, Holsworthy and Campbelltown regions. Evidence suggests that the Old Illawarra Road and the Old Coach Road were constructed earlier than attributed and this warrants further investigation. During the 1880s the land south of the Georges River in Eckersley was opened to farmers. Many European vignerons grew olives, almonds and grapes and experimented with wine production in the sandy soils. The first settlers to take up an official selection with the parish were Frank and Harry Etchells in 1889. They built a stone cottage, grew fruit and vegetables, raised poultry and bees and distilled rum inside the rock ledges at waterfalls along the river. They transported their rum by pack horse to Bulli and sold it to miners. Other settlers included Nathanial George Bull, a one time Mayor of Liverpool, who also built a dwelling. The Freres brothers established a vineyard in the area in association with Charles Kelso. By 1891, the Eckersley area supported over thirty small farms and a post office was built providing a mail service to Liverpool twice a week. Isaac Himmelhoch established the substantial Grodno

vineyard with the intention of producing high quality wines. By 1901 the 640 acre selection grew Hermitage and Malbec grapes. By 1911 Eckersley had declined after settlers encountered difficulties growing vines in the sandy soil. Most of the vines were affected by phylloxera. The selections were abandoned to make way for the proposed military reserve and the Grodno vineyard was destroyed following the Army's arrival.

Military history:

In the late 1880s the NSW Volunteer Soldiers conducted training exercises and manoeuvres between the Royal National Park and the Georges River at Liverpool. The Army held manoeuvres in the Holsworthy Range in 1906, 1907 and 1910. As part of the new Commonwealth Government's major program of defence construction, it acquired 833 acres to establish a remount depot and veterinary hospital in 1912 and in 1913 a further 16,868 acres at the site now known as Old Army Camp. Eighty thousand acres of land were finally acquired for a military barracks, a training area and an artillery range. At the time of acquisition, the land contained both large and small holdings, many of which were still undeveloped. The site chosen for the barracks was a large orchard surrounded by thick bush and scrub. The remount depot located here was used to prepare 47,000 horses for overseas service in World War One and various Light Horse Divisions trained here before embarking for Gallipoli and other theatres of war. During World War One, Holsworthy Barracks was used as an Internment Camp. Those interned included German, Austrian, Hungarian, Croatian, Czech, Bulgarian and Turkish people from Australia, as well as internees from the South Pacific and Asia. The main compound housed German and Australian civilians. However, there were some prisoners of war including survivors of the German cruiser Emden which was beached at Cocos on 9 November, 1914. A further three compounds held other prisoners. This was the largest internment camp in Australia during World War One, holding over 6 000 internees. At its peak there were more than 210 buildings on site. The German section was closed in mid-1919 with the last man leaving on 5 May, 1920. It appears that almost all of the buildings associated with the World War One internees were razed when hostilities ceased. The only evidence of the camp exists in the three stone buildings (sergeants' mess/corporals' club, burnt-out recreation hall and jail/powder magazine) in the former guards' camp, north of Artillery Road, in the railway siding and its associated permanent way and in some of the road and kerbing surrounding the former parade ground, a flat grassed area. All other existing fabric on the site dates from the period after 1930. After World War One, the former internment camp was used for militia camps and a new ordnance depot was built. The stone buildings erected by the internees were used for permanent army units. (For more information about the internment camp area, see related file: Old Army Internment Camp Group, Holsworthy, RR 014223). In 1938 a further 33,860 acres were added to the Holsworthy Range. From 1939 a prisoner of war camp was established and 6,780 Australians, mostly of Italian origin, were interned. It is unknown if any structures remain from this phase. In 1942 an armoured fighting vehicle school replaced the remount depot. In 1950 the remount site was taken over for National Service personnel. In 1958 the Holsworthy Range became the home of the 1st Infantry Brigade Group. The Range has been used extensively for training soldiers in the use of small firearms, tanks and artillery. Although the Range has been used for military training, the natural features of the landscape remain relatively undisturbed. With the exception of the Holsworthy Barracks, the airfield and small weapons ranges, there have been a limited number of other developments over the area, mainly the small network of roads, demolition areas and vehicle staging areas. After World War Two, the consolidation of military bases increased the demand for housing to accommodate its personnel. Holsworthy Village, established in 1952, exemplifies this process. The village featured rows of modest fibro-cement cottages of similar architectural form set in wide, tree lined streets. The houses have recently been comprehensively refurbished with modern cladding and aluminium windows, effectively destroying their significance as a post war housing group.

The Cubbitch Barta National Estate Area comprises the following historic elements which are significant in the Liverpool region and are important elements in the cultural landscape : old Illawarra Road, c 1850s. This gravel road linked Liverpool to Darkes Forest; old Coach Road, c 1880s. This gravel road links with the old Illawarra Road near Darkes Forest and features stone culverts; new Illawarra Road, c 1870s. This is a gravel road linking the Liverpool/old Illawarra Road at Eckersley; Grodno settlement site, c 1890s. This includes cleared former vineyard grounds, cellar remains, wells, irrigation channels, stone culverts and a long dry stone wall of stones; Eckersley Post Office site, c 1890s. This site includes the remains of structures covered by overgrowth; Eckersley House site, c 1890s. This includes the remains of a stone and mud dwelling, with cellar; other homestead remains, c 1890s. The site features several other unidentified homestead remains, some with wells and some with chimneys, which are likely to relate to the Grodno and Eckersley settlements.

The recent past and area today:

The area continues to be used as a Military Training Area for small arms training, navigation, unit manoeuvres and demolition training. Training has taken place here for both National Service and regular units which have seen active service in Korea, Malaya and Vietnam. Units which continue to have a strong presence at Holsworthy include military engineers and Battalions of the Royal Australian Regiment.

There is increasingly widespread community recognition of the existence of a diverse range of heritage values within the area, encompassing natural, indigenous and historic values. In March 1997, the Liverpool Regional Museum put together an exhibition of the Aboriginal, European, military and environmental heritage of Holsworthy area. In 1997 the community has shown considerable interest in the heritage of the area, largely as a response to suggestions the area could be used as a location for the second Sydney Airport.

History Not Available

Condition and Integrity

The Cubbitch Barta National Estate Area is a large undeveloped area of bushland, surrounded on the north and west by major growth areas of south-west Sydney. Since the turn of the century, public access to the area has been restricted through its use for Commonwealth military activities, mostly training exercises. It is largely because of its military status and the Australian Army's management regime, that the National Estate area has remained in a relatively natural condition and that National Estate values have been maintained. Much of the bushland, valleys and waterways remained undisturbed, despite military activity. Impacts from military activities have included localised infrastructure construction (airfields, roads, bridges and small buildings), localised ground disturbance and impact damage from ordinance, concentrated impacts within army demolition and target areas, increased bushfire rates caused by exploding ordinance and impacts from vehicle and troop movements. Most of this military activity has been restricted to ridge tops and to a large extent, the topography of the area has played a role in protecting sensitive areas and Aboriginal sites. Target and demolition areas, where the highest impacts occur, are relatively small, defined areas on ridge tops which are repeatedly used. A large number of Aboriginal sites, in particular rock art sites and rock shelters, occur within valleys where they are relatively sheltered from direct impacts. Most Aboriginal sites appear to have escaped significant damage. Specific impacts of military operations on Aboriginal sites have been discussed in the Army's environmental audit. Identified impacts include: 1) damage to art sites from artillery fire (either from ricochet or direct hit); 2) the impact of exploding mortars on sandstone expanses on which engravings are found (although no engravings have been damaged to date); 3) the impact of heavy vehicles whose tracks have been found on sandstone expanses which contain engravings (although again no engravings appear to have been directly affected to date); 4) the potential threat to at least one archaeological deposit from the presence of a live mortar bomb located within the floor area. Obviously other shelters may be similarly at risk; 5) graffiti on art sites, although this was not frequently observed; 6) the encroachment of sediments on the largest set of axe grinding grooves which may be partly caused by increased siltation due to firing. The environmental audit considered the body of sites within the Military Training Area to have considerable integrity and that their protection should be a high priority.
Some Aboriginal sites have been affected by public visitation, particularly those located near the boundary of the area along the Georges River; however most sites in the restricted access areas are in excellent condition. The presence of unexploded ordinance including bullets, hand grenades, mortars and rockets continues to restrict public movement in the area. The majority of the landscape and vegetation communities in the area are in remarkably good condition. There are few weeds in much of the bushland, although clumps of pampas grass occur along the roads and patches of prickly pear are found near the Grodno settlement site. The area has not been farmed or logged since the 1900s and the creeks and rivers have high water quality. Introduced animals recorded from the area including the fox (VULPES VULPES), dog (CANIS FAMILIARIS), cat (FELIS CATUS), hare (LEPUS CAPENSIS), rabbit (ORYCTOLAGUS CUNICULUS), house mouse (MUS DOMESTICUS) and black rat (RATTUS RATTUS). The high frequency of fire in the area, induced by the military's live firing activity, may lead to a loss of native species diversity in the plateau forest areas. In 1997, the known condition of historic elements within the Cubbitch Barta National Estate area is as follows: the gravel roads; old Illawarra Road; the Old Coach Road; and New Illawarra Road. are in good condition. The Grodno settlement site, Eckersley Post Office Site, Eckersley House Site and other homestead sites have low level remains above the ground and building fragments. The sites are reported as having been cleared by the Department of Defence in 1913. The archaeological potential of these sites has not been assessed. The condition of the Old Army Internment Camp Group's elements is as follows: the former powder magazine/gaol is generally in good condition and is still being used. The mess (former corporals' club) is externally in good condition having recently been renovated by the Army, but the interior is somewhat dilapidated. The recreation hall comprises burnt out remains of wall footings but with a small portion of the lower storey of the main wing substantially intact. Much of the pedestrian bridge's original fabric has been removed, but concrete piers and iron fixings remain. The former parade ground and some tree plantings survive from the internment period. While the area currently receives protection from its military status (and associated public safety concerns), the area is under increasing pressure from new urban developments occurring around its margins. The area is surrounded by natural buffer zones of protected areas in the south and east and by its western boundary along the Georges River. The Australian Army is still, however, concerned about unauthorised public access into the area, as evidenced by warnings advertised in the press. (July 1997)

Location

About 18,000ha, at Holsworthy, comprising the following areas: 1) the Holsworthy Range area as shown on the Holsworthy Range Special map published in the Holsworthy Training Area Environmental Audit Main Report for the Department of Defence (AXIS Environmental/AMBS Consulting, 1995); and 2) an area bounded by the easterly alignment of Kota Bahru Road in the north, Illawarra Road in the west and the Holsworthy Range boundary in the south and east. Excluded are Lot 1 DP817692 and Lot 6a DP752034.

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Report Produced Mon Aug 10 10:08:59 2020

Item details

Name of item:
Kolora Weir
Type of item:
Archaeological-Terrestrial
Group/Collection:
Utilities - Water
Category:
Weir
Primary address:
On Woronora River, south of Heathcote Road Bridge, Holsworthy, NSW 2173
Local govt. area:
Sutherland
All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
On Woronora River, south of Heathcote Road Bridge	Holsworthy	Sutherland			Primary Address

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan	Sutherland Shire Local Environmental Plan 2015	A1801	23 Jun 15		

References, internet links & images

None

Note: internet links may be to web pages, documents or images.

Data source

The information for this entry comes from the following source:
Name:
Local Government
Database number:
2440843

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Item details

Name of item:
Heathcote National Park
Other name/s:
L143
Type of item:
Landscape
Group/Collection:
Parks, Gardens and Trees
Category:
Reserve
Primary address:
, Heathcote, NSW 2233
Local govt. area:
Sutherland
All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
	Heathcote	Sutherland			Primary Address

Statement of significance:

National Park conserving rugged Hawkesbury sandstone topography, and a wide veriety of habitats along freshwater creeks, for mammals, reptiles and birdlife. Forms part of the large natural landscape separating the Sydney and Illawarra urban areas. State significance.
Date significance updated: 26 Feb 10
Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the Department of Premier and Cabinet copyright and disclaimer.

Description

Physical description:
The park is situated in rugged sandstone country, between the Woronora River in the west and the Illawarra Railway to the east. The Hawkesbury sandstone geology exhibits many interesting cliff and rock formations. These have evolved from deposition some 200 million years ago, with subsequent uplifting and stream erosion beginning about 94 million years ago. The park conserves a wide variety of habitats. Ridge top open forests with Angophoras, Grey Gum, Red Bloodwood and Gnarled Banksia. Sheltered valley side scrubland with Sydney Peppermint and Blackbutt in the bottom of the valley. Open Heathlands as well. Wide variety of characteristic wildflowers including gymea Lilies, Grass trees, Banksias, Hakeas and Grevilleas. Small native mammals may occasionally be seen, though most are nocturnal. Reptiles and many species of birds.

History

Historical notes:

Traditional land of the Dharawal Aboriginal tribe. The area eventually became a National Park in 1974. Previously a State Park. 712 hectares declared a primitive area in 1943, following creation of a 34 hectare sanctuary in 1937 (Miara Sanctuary). Recognition due to the efforts of Myles Dunphy and the Mountain Trails Club. The park has for a long time been popular for bushwalking and camping, especially for Scouts, Cubs and Girl Guides. Attractions include creeks with their many fine swimming holes (Kingfisher Pool and Lake Eckersly).

Assessment of significance

SHR Criteria c)

[Aesthetic significance]

Representative

SHR Criteria e)

[Research potential]

Representative

Assessment criteria:

Items are assessed against the State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Local Environmental Plan	Sutherland Shire Local Environmental Plan 2006	A098	29 Nov 06		
Local Environmental Plan - Lapsed			15 Dec 00	162	13351

References, internet links & images

Type	Author	Year	Title	Internet Links
Written	Neve		A Brief History of the Sutherland Shire	
Written	Pauline Curby	1998	Sutherland Shire Foreshore Study Thematic History	
Written	Pauline Curby		Sutherland Shire Foreshore Study History	

Note: internet links may be to web pages, documents or images.

Data source

The information for this entry comes from the following source:

Name:

Local Government

Database number:

2440289

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Item details

Name of item:
Woronora - Penshurst Pipeline
Other name/s:
Woronora Dam
Type of item:
Built
Group/Collection:
Utilities - Water
Category:
Water Pipe
Location:
Lat: 34 06 37 S Long: 150 56 15 E
Primary address:
Woronora Dam, Woronora, NSW 2232
Local govt. area:
Sutherland

Boundary:

The physical boundary and curtilage of the Woronora-Penshurst Pipeline extends to the boundary of SCA/Sydney Water land along the route of the pipeline. The curtilage includes the original pipeline and all infrastructure associated with the pipeline such as bridges, tunnels, valvehouses, flow metres, cross-connections and pumping stations. The SCA owns the first 200m of pipe immediately downstream of the dam. The remainder is owned by Sydney Water.

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Woronora Dam	Woronora	Sutherland			Primary Address

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
Water NSW	State Government	

Statement of significance:

The Woronora-Penshurst Pipeline is significant because of it's relationship with the Woronora Dam, the fifth of the water supply dams built as part of Sydney's water supply. Woronora Dam was completed in 1942 and is the only one of Sydney's water supply dams which is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. The dam and pipeline were built with the objective of supplementing Sydney's water supply whilst the much larger Warragamba Dam was being constructed.

The Woronora - Penshurst pipeline is culturally significant as it supplies water from Woronora Dam to the areas of Sutherland, Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park and the areas just north of Georges River.

The pipeline is 27.1 km long and consists of 42 inch (1.07m) mild steel spirally welded pipes.

The pipeline has technical significance because of it's corkscrew construction method. At the time of construction only small width steel sheets were available and in order to obtain a large diameter pipeline these were welded together in a spiral technique.

Date significance updated: 15 Feb 07

Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the Department of Premier and Cabinet copyright and disclaimer.

Description

Designer/Maker:
MWS&D Board / PWD

Builder/Maker:
Water Board

Construction years:
1936-1942

Physical description:
Woronora Dam is the only one of Sydney's major water supply storage dams which is not primarily part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. It has the smallest catchment area, 85 sq km, of any of the water supply dams. The Dam is located on the Woronora River, just downstream of it's confluence with the Waratah Rivulet, about 6 km northwest of the township of Waterfall.

Water is discharged from the lake via two 3 feet (0.9m) diameter pipes in the base of the dam, these lead to a valvehouse located at the bottum of the downstream face of the wall. The water then flows along a 16.1 mile (27 km) pipeline, consisting of 42 inch (1.07m) mild steel spirally welded pipes lined internally with 1 3/8 inch (34mm) cement mortar. The pipeline crosses the Georges River on the old railway bridge at Como and discharges into the two elevated Penshurst reservoirs.

The 27 km length of pipeline main was constructed in four sections. The first section commences at the outlet of the Woronora Dam and then follows the left bank of the Woronora River. It crosses the river on a concrete causeway and continues along the right bank to No. 1 tunnel, approximately 400 m in length, some 3.2 km from the dam. The line then follows Heathcote Creek to near it's junction with the Woronora River.

The second section follows the right bank of the Woronora River as far as No. 2 tunnel, 13.5 km from the dam, where it continues on to cross Forbes Creek. The tunnel is approximately 244 m long and had to be lined with concrete because of the poor strata encountered. The main crosses the Forbes Creek on a specially designed structure. A pressure valve is located at Forbes Creek to reduce the pressure on the main downstream. The section ends at Grand Parade, Sutherland, where 20 inch (508mm) and 18 inch (457mm) branches feed the Sutherland Reservoir.

In the third section from Grand Parade to Como the main is laid partly above ground and partly in trench and crosses under the railway line near Jannali in a concrete culvert. At the southern end of the railway bridgeover the Georges River, the 48 inch (1.22m) main bifurcates

into two 24 inch (0.61m) mains which are carried across the river on brackets welded to the lower chord on each side of the bridge.

After passing over the Georges River the fourth section of the main reverts to 48 inch (1.22m) diameter and follows the eastern side of the railway line to Oatley. At this point it deviates and proceeds principally underground along streets to the intersection of Hillcrest Avenue and Laycock Road, Penshurst,whereby a 36 inch (0.91 m) branch runs to the Penshurst Reservoirs.

Physical condition and/or
Archaeological potential:
Good
Date condition updated:27 Aug 09
Modifications and dates:
Originally camouflaged during WW2 against potential threat or saboutage. After this period it was painted silver and then in 1980 the pipelines were repainted green to blend in with native bushland.

A program of maintenance on the pipeline rectified leaking joints.

Further information:
SCA owns the first 200m of pipe, immediately downstream of the dam. The remainder is owned by Sydney Water.
Current use:
Water Supply Pipeline
Former use:
Water Supply Pipeline

History

Historical notes:
The Woronora Dam was the fifth of the water supply dams built as part of the development of Sydney's water supply, and represented the first occasion where the water supply was to be provided from somewhere other than the four dams of the Upper Nepean Scheme (i.e. Cataract, Cordeaux, Avon and Nepean Dams).

Construction of the Woronora Dam commenced in 1927, with the two objectives of providing a water supply for the Sutherland/Cronulla area, and supplementing the Upper Nepean Scheme whilst the Warragamba Dam was being built. The dam and pipelines were designed by the Metropolitan Water Sewerage and Drainage Board in conjunction with the PWD and it was the first dam built entirely by the Board, after the transfer of the construction division from the PWD.

The primary function of the Woronora Pipeline when first constructed was to convey water from Woronora Dam to Penshurst Reservoir. Consequently areas previously served by pumping could be supplied with gravitational water. Since it's construction however, expansion in the Sutherland Shire has lead to the pipeline being used to supply Sutherland and Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park, and the areas just north of Georges River.

The scheme adopted by the Board in 1925, for the development of the Woronora Catchment,

was concerned with the supply of only the Cronulla and Sutherland areas, and provided for the construction of a low dam with a 15 inch (380mm) trunk main and pumping station. When the Board decided in 1929 to fully exploit the catchment for Metropolitan Supply, the amended scheme provided for a much higher dam and a larger diameter pipeline to Penshurst. Supply was given to Sutherland and Cronulla by the erection of a pumping station on the pipeline (opposite Heathcote), a reservoir near Heathcote Railway Station and other incidental works.

Financial difficulties that arose early in 1930 resulted in the suspension of operations, which were not resumed until 1936. The amended programme provided for a 48 inch (1.22 m) diameter pipeline. Further delays were experienced and it was not until 1940 that it was possible to accelerate progress with a view to completing work by June, 1941. However, the heavy demand for steel arising from the war created extreme difficulty in securing delivery of the necessary pipes and commissioning of the pipeline did not occur until November, 1942.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Environment - cultural landscape-Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings	(none)-
3. Economy-Developing local, regional and national economies	Health-Activities associated with preparing and providing medical assistance and/or promoting or maintaining the well being of humans	(none)-
4. Settlement-Building settlements, towns and cities	Towns, suburbs and villages-Activities associated with creating, planning and managing urban functions, landscapes and lifestyles in towns, suburbs and villages	(none)-
4. Settlement-Building settlements, towns and cities	Utilities-Activities associated with the provision of services, especially on a communal basis	(none)-

Assessment of significance

SHR Criteria a)

[Historical significance]

The Woronora-Penshurst Pipeline is historically significant because of it's relationship with the Woronora Dam, the fifth of the water supply dams built as part of Sydney's water supply. Woronora Dam was completed in 1942 and is the only one of Sydney's water supply dams which is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. The dam was built with the objective of supplementing Sydney's water supply whilst the much larger Warragamba Dam was being constructed. The pipelines were constructed with the purpose of transfering water from the dam site on Woronora River, near Waterfall, to the Penshurst Reservoirs, whence the Cronulla/Sutherland area could be supplied with gravitational water.

SHR Criteria c)

[Aesthetic significance]

The pipeline was originally camouflaged during the second world war. It was repainted silver after the war period. Around 1980 environmental measures resulted in the pipes being repainted green to blend in with the natural bushland.

The pipeline also passes through an area which is now the Heathcote National Park.

SHR Criteria d)

[Social significance]

The Woronora - Penshurst pipeline is socially significant as it supplies water from Woronora Dam to the areas of Sutherland, Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park and the areas just north of Georges River and as such is likely to be held in high regard by the broad community for the function it serves.

The completion of the Woronora Dam was a significant step in the continuing process of providing reliable water supply to Sydney and sorrounding areas. It further served the purpose of providing an interim measure, when it was realised that the growth of Sydney would require a water supply augmentation of a magnitude which could only be met by the construction of a major dam on the Warragmba River.

The construction of the pipeline allowed for the career of Sir William Hudson to advance. He was the resident engineer on the Woronora Dam/Pipeline project and went on to be the Engineer-in-Chief of the Water Board and the first Commissioner of the Snowy Mountains Scheme.

The Woronora Dam and Pipeline also strengthened Sydney's defences During WW2 by supplying an independent and alternate supply to the Upper Nepean Scheme in case of emergency.

SHR Criteria e)

[Research potential]

The pipeline is 27.1 km long consisting of 42 inch (1.07m) mild steel spirally welded pipes. A corkscrew technique was used in order to obtain a large diameter pipeline, as only small width sheet steel was available at the time of construction. A lack of expansion joints has resulted in minor leakages along the length of the pipeline.

The pipeline did not have adequate expansion joints when built. This caused some leakage of joints at later stages.

The pipeline has numerous river and creek crossings along it's route. At Woronora River and Forbes Creek the pipeline crosses the water via single pipe aqueducts. At Georges River the pipeline birfurcates and crosses the water via the former Como Railway Bridge. This bridge is significant as it is a Whitton's Lattice Girder Bridge and was built in 1885. The pipeline birfurcates when it crosses the bridge in order to equalise the load on the structure. The bridge is no longer used by the railway and is now owned by Sydney Water. It is presently used only for pedestrian and bicycle access.

The pipeline also passes through a rock tunnel known as Dingo Tunnel.

SHR Criteria f)

[Rarity]

One of a number of water supply pipelines in Sydney.

SHR Criteria g)

[Representativeness]

Representative of water supply pipelines and of infrastructure associated with the Woronora Dam which is the only one of Sydney's water supply dams that is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system.

Integrity/Intactness:

Considerably intact

Assessment criteria:

Items are assessed against the State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Recommended management:

Recommended Management: Manage the place and its components in accordance with the NSW Heritage Office Management Principles and Guidelines for NSW Agencies. Recommended Management: Implement the Conservation Management Plan for Woronora Dam (Graham Brookes & Assoc., 2007). Recommended Management: Undertake environmental impact assessment (EIA) when planning works on the site (refer to SCA's EIA Policy). Recommended Management: Implement bushfire management plans for the Metropolitan Special Area. Recommended Management: Carry out annual condition inspections and report condition in SCA annual report. Recommended Management: Consult experienced heritage practitioners and the SCA's Planning and Assessment Team during the preparation and execution of works to the place. Recommended Management: Prepare a maintenance schedule for the item(s) in Maximo.

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - s.170 NSW State agency heritage register	Woronora-Penshurst Pipeline	002271			

Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Sydney Water Heritage Study	1996	002271	Graham Brooks and Associates Pty Ltd	GRAHAM BROOKS AND ASSOCIATES PTY LTD	Yes

References, internet links & images

None

Note: internet links may be to web pages, documents or images.



(Click on thumbnail for full size image and image details)

Data source

The information for this entry comes from the following source:

Name:

State Government

Database number:

4580022

File number:

002271

Return to previous page

Item details

Name of item:
Woronora-Penshurst Pipeline
Type of item:
Built
Group/Collection:
Utilities - Water
Category:
Water Pipe
Primary address:
Woronora Dam to Penshurst Reservoir, Woronora, Sutherland, Penshurst, NSW 2217
Local govt. area:
Kogarah

Boundary:

The physical boundary and curtilage of the Woronora-Penshurst Pipeline extends to the boundary of SWC land along the route of the pipeline. The curtilage includes the original pipeline and all infrastructure associated with the pipeline such as bridges, tunnels, valvehouses, flow metres, cross-connections and pumping stations.

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Woronora Dam to Penshurst Reservoir	Woronora, Sutherland, Penshurst	Kogarah			Primary Address
Woronora Dam to Penshurst Reservoir	Woronora, Sutherland, Penshurst	Sutherland			Primary Address

Statement of significance:

The Woronora-Penshurst Pipeline is significant because of its relationship with the Woronora Dam, the fifth of the water supply dams built as part of Sydney's water supply. Woronora Dam was completed in 1942 and is the only one of Sydney's water supply dams which is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. The dam and pipeline were built with the objective of supplementing Sydney's water supply whilst the much larger Warragamba Dam was being constructed.

The Woronora - Penshurst pipeline is culturally significant as it supplies water from Woronora Dam to the areas of Sutherland, Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park and the areas just north of Georges River.

The pipeline is 27.1 km long and consists of 42 inch (1.07m) mild steel spirally welded pipes. The pipeline has technical significance because of its corkscrew construction method. At the time of construction only small width steel sheets were available and in order to obtain a large diameter pipeline these were welded together in a spiral technique.

The pipeline crosses the Como Railway Bridge which was converted to a cycleway bridge by SWC. The bridge is of State Significance and listed by the National Trust of Australia (NSW) and is on the Register of the National Estate. The bridge was constructed by John Whitton

and a significant technical accomplishment. It was placed into service in 1885 and is the tenth in a series of twelve related bridges. It was the first of the series with six spans (earlier bridges having 1 to 4 spans). When completed it was the fourth longest metal truss bridge in Australia. It carried single track railway lines which were the first in Sydney to be electrified in 1926.

The operational and physical curtilage of the pipeline extends to the original pipelines and all the supporting/associated structures. The visual curtilage extends further as the pipeline is a major feature of the landscape between Woronora Dam and Penshurst.

Date significance updated: 11 Jul 00

Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the Department of Premier and Cabinet copyright and disclaimer.

Description

Designer/Maker:
MWS&D Board / PWD
Builder/Maker:
Water Board
Construction years:
1936-1942
Physical description:
Woronora Dam is the only one of Sydney's major water supply storage dams which is not primarily part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. It has the smallest catchment area, 85 sq km, of any of the water supply dams. The Dam is located on the Woronora River, just downstream of its confluence with the Waratah Rivulet, about 6 km northwest of the township of Waterfall.

Water is discharged from the lake via two 3 feet (0.9m) diameter pipes in the base of the dam, these lead to a valvehouse located at the bottom of the downstream face of the wall. The water then flows along a 16.1 mile (27 km) pipeline, consisting of 42 inch (1.07m) mild steel spirally welded pipes lined internally with 1 3/8 inch (34mm) cement mortar. The pipeline crosses the Georges River on the old railway bridge at Como and discharges into the two elevated Penshurst reservoirs.

The 27 km length of pipeline main was constructed in four sections. The first section commences at the outlet of the Woronora Dam and then follows the left bank of the Woronora River. It crosses the river on a concrete causeway and continues along the right bank to No. 1 tunnel, approximately 400 m in length, some 3.2 km from the dam. The line then follows Heathcote Creek to near its junction with the Woronora River.

The second section follows the right bank of the Woronora River as far as No. 2 tunnel, 13.5 km from the dam, where it continues on to cross Forbes Creek. The tunnel is approximately 244 m long and had to be lined with concrete because of the poor strata encountered. The main crosses the Forbes Creek on a specially designed structure. A pressure valve is located at Forbes Creek to reduce the pressure on the main downstream. The section ends at Grand

Parade, Sutherland, where 20 inch (508mm) and 18 inch (457mm) branches feed the Sutherland Reservoir.

In the third section from Grand Parade to Como the main is laid partly above ground and partly in trench and crosses under the railway line near Jannali in a concrete culvert. At the southern end of the railway bridgeover the Georges River, the 48 inch (1.22m) main bifurcates into two 24 inch (0.61m) mains which are carried across the river on brackets welded to the lower chord on each side of the bridge.

After passing over the Georges River the fourth section of the main reverts to 48 inch (1.22m) diameter and follows the eastern side of the railway line to Oatley. At this point it deviates and proceeds principally underground along streets to the intersection of Hillcrest Avenue and Laycock Road, Penshurst, whereby a 36 inch (0.91 m) branch runs to the Penshurst Reservoirs.

Physical condition and/or
Archaeological potential:
Generally good physical condition except for leaking joints a certain locations.
Date condition updated:09 Jan 01
Modifications and dates:
Originally camouflaged during WW2 against potential threat or sabotage. After this period it was painted silver and then in 1980 the pipelines were repainted green to blend in with native bushland.
Current use:
Water Supply Pipeline
Former use:
Water Supply Pipeline

History

Historical notes:
The Woronora Dam was the fifth of the water supply dams built as part of the development of Sydney's water supply, and represented the first occasion where the water supply was to be provided from somewhere other than the four dams of the Upper Nepean Scheme (ie Cataract, Cordeaux, Avon and Nepean Dams).

Construction of the Woronora Dam commenced in 1927, with the two objectives of providing a water supply for the Sutherland/Cronulla area, and supplementing the Upper Nepean Scheme whilst the Warragamba Dam was being built. The dam and pipelines were designed by the Metropolitan Water Sewerage and Drainage Board in conjunction with the PWD and it was the first dam built entirely by the Board, after the transfer of the construction division from the PWD.

The primary function of the Woronora Pipeline when first constructed was to convey water from Woronora Dam to Penshurst Reservoir. Consequently areas previously served by pumping could be supplied with gravitational water. Since it's construction however, expansion in the Sutherland Shire has lead to the pipeline being used to supply Sutherland and Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park, and the areas just north of Georges River.

The scheme adopted by the Board in 1925, for the development of the Woronora Catchment, was concerned with the supply of only the Cronulla and Sutherland areas, and provided for the construction of a low dam with a 15 inch (380mm) trunk main and pumping station. When the Board decided in 1929 to fully exploit the catchment for Metropolitan Supply, the amended scheme provided for a much higher dam and a larger diameter pipeline to Penshurst. Supply was given to Sutherland and Cronulla by the erection of a pumping station on the pipeline (opposite Heathcote), a reservoir near Heathcote Railway Station and other incidental works.

Financial difficulties that arose early in 1930 resulted in the suspension of operations, which were not resumed until 1936. The amended program provided for a 48 inch (1.22 m) diameter pipeline. Further delays were experienced and it was not until 1940 that it was possible to accelerate progress with a view to completing work by June, 1941. However, the heavy demand for steel arising from the war created extreme difficulty in securing delivery of the necessary pipes and commissioning of the pipeline did not occur until November, 1942.

Historic themes

Australian theme (abbrev)	New South Wales theme	Local theme
3. Economy-Developing local, regional and national economies	Environment - cultural landscape-Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings	(none)-
3. Economy-Developing local, regional and national economies	Health-Activities associated with preparing and providing medical assistance and/or promoting or maintaining the well being of humans	(none)-
4. Settlement-Building settlements, towns and cities	Towns, suburbs and villages-Activities associated with creating, planning and managing urban functions, landscapes and lifestyles in towns, suburbs and villages	(none)-
4. Settlement-Building settlements, towns and cities	Utilities-Activities associated with the provision of services, especially on a communal basis	(none)-

Assessment of significance

SHR Criteria a)

[Historical significance]

The Woronora-Penshurst Pipeline is historically significant because of its relationship with the Woronora Dam, the fifth of the water supply dams built as part of Sydney's water supply. Woronora Dam was completed in 1942 and is the only one of Sydney's water supply dams which is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system. The dam was built with the objective of supplementing Sydney's water supply whilst the much larger Warragamba Dam was being constructed. The pipelines were constructed with the purpose of transferring water from the dam site on Woronora River, near Waterfall, to the Penshurst Reservoirs, whence the Cronulla/Sutherland area could be supplied with gravitational water.

SHR Criteria c)

[Aesthetic significance]

The pipeline was originally camouflaged during the second world war. It was repainted silver after the war period. Around 1980 environmental measures resulted in the pipes being repainted green to blend in with the natural bushland.

The pipeline also passes through an area which is now the Heathcote National Park.

SHR Criteria d)

[Social significance]

The Woronora - Penshurst pipeline is socially significant as it supplies water from Woronora Dam to the areas of Sutherland, Cronulla, Engadine, Heathcote, Helensburgh, Stanwell Park and the areas just north of Georges River and as such is likely to be held in high regard by the broad community for the function it serves..

The completion of the Woronora Dam was a significant step in the continuing process of providing reliable water supply to Sydney and surrounding areas. It further served the purpose of providing an interim measure, when it was realised that the growth of Sydney would require a water supply augmentation of a magnitude which could only be met by the construction of a major dam on the Warragamba River.

The construction of the pipeline allowed for the career of Sir William Hudson to advance. He was the resident engineer on the Woronora Dam/Pipeline project and went on to be the Engineer-in-Chief of the Water Board and the first Commissioner of the Snowy Mountains Scheme.

The Woronora Dam and Pipeline also strengthened Sydney's defences During WW2 by supplying an independent and alternate supply to the Upper Nepean Scheme in case of emergency.

SHR Criteria e)

[Research potential]

The pipeline is 27.1 km long consisting of 42 inch (1.07m) mild steel spirally welded pipes. A corkscrew technique was used in order to obtain a large diameter pipeline, as only small width sheet steel was available at the time of construction. A lack of expansion joints has resulted in minor leakages along the length of the pipeline.

The pipeline did not have adequate expansion joints when built. This caused some leakage of joints at later stages.

The pipeline has numerous river and creek crossings along its route. At Woronora River and Forbes Creek the pipeline crosses the water via single pipe aqueducts. At Georges River the pipeline bifurcates and crosses the water via the former Como Railway Bridge. This bridge is significant as it is a Whitton's Lattice Girder Bridge and was built in 1885. The pipeline bifurcates when it crosses the bridge in order to equalise the load on the structure. The bridge is no longer used by the railway and is now owned by Sydney Water. It is presently used only for pedestrian and bicycle access.

The pipeline also passes through a rock tunnel known as Dingo Tunnel.

SHR Criteria f)

[Rarity]

One of a number of water supply pipelines in Sydney.

SHR Criteria g)

[Representativeness]

Representative of water supply pipelines and of infrastructure associated with the Woronora Dam which is the only one of Sydney's water supply dams that is not part of the Upper Nepean/Warragamba/Shoalhaven interconnected system.

Integrity/Intactness:

Considerably intact

Assessment criteria:

Items are assessed against the State Heritage Register (SHR) Criteria to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Recommended management:

Manage the place and its significant components in accordance with the State Owned Heritage Asset Management Guidelines. Where no Conservation Management Plan, Heritage Assessment or Statement of Heritage Impact is in place, or where works are outside the scope existing heritage documentation, assess heritage impacts of proposed works in accordance with Sydney Water Environment Impact Assessment procedures. Undertake a Heritage Assessment and/or Statement of Heritage Impact as required by EIA procedures. Where the item is listed in a Local Environmental Plan Schedule of Heritage items, determine if works are exempt from approval under the LEP provisions. Where works are not exempt, obtain necessary approvals from the local council, in accordance with SWC EIA Guidelines. Undertake archival and photographic recording before major changes, in accordance with Heritage Council guidelines. Lodge copies of the archival record with the Sydney Water Archives and the NSW Heritage Office.

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - s.170 NSW State agency heritage register		002271	01 Jan 00		

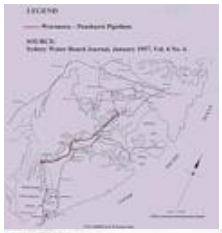
Study details

Title	Year	Number	Author	Inspected by	Guidelines used
Sydney Water Heritage Study	1996	002271	Graham Brooks and Associates Pty Ltd	GRAHAM BROOKS AND ASSOCIATES PTY LTD	Yes

References, internet links & images

None

Note: internet links may be to web pages, documents or images.



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State Government

Database number:

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File number:

002271

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Appendix 2 Initial proposed concept plans

Transport for NSW

SUTHERLAND SHIRE COUNCIL AND HOLSWORTHY AREA

MR512 - HEATHCOTE ROAD

WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER HEATHCOTE / HOLSWORTHY

ROAD DESIGN

CONCEPT DESIGN

LOCALITY PLAN

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DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
COVER SHEET

A3

RMS REGISTRATION No.	PART
DS2020 / 000318	1

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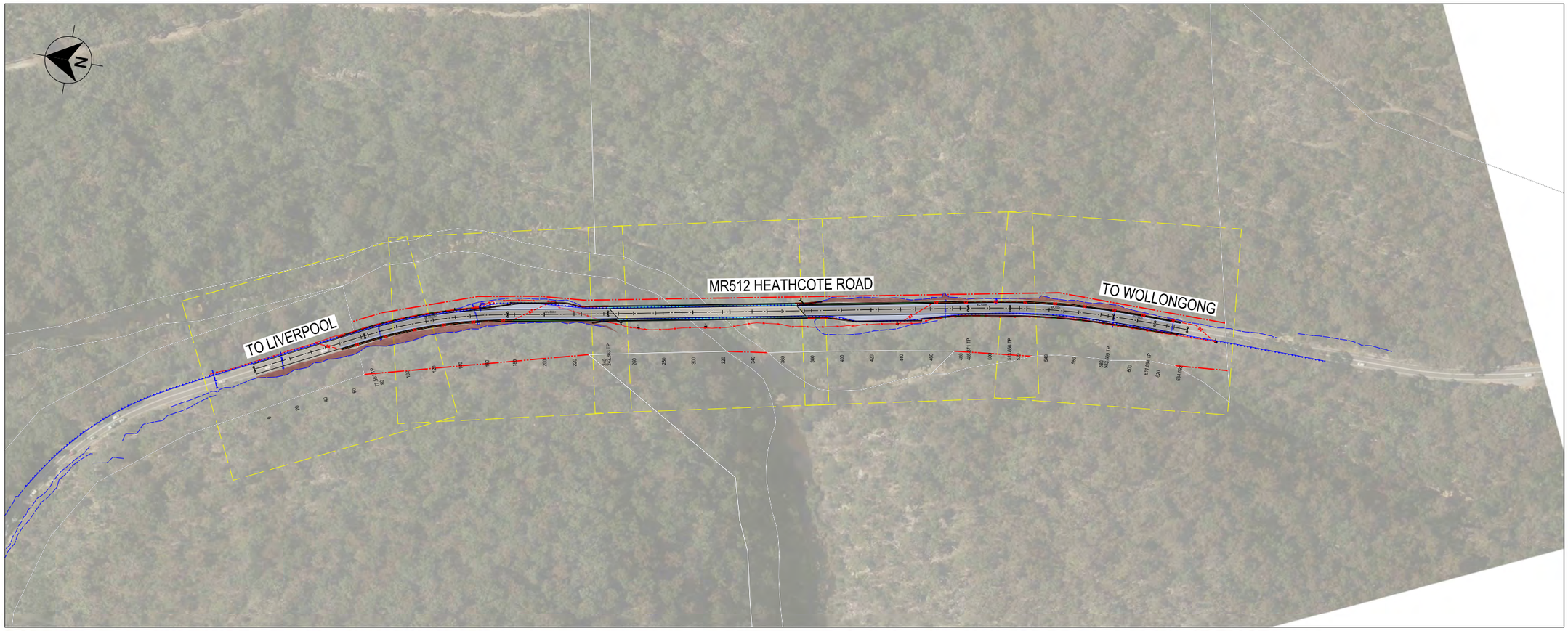

SHEET INDEX

SHEET NUMBER	CODE	NAME
GE0001 - GE0002	GE	COVER, INDEX SHEET AND GENERAL NOTES
RD0001 - RD0002	RD	TYPICAL CROSS SECTIONS
RD1001 - RD1005	RD	PLAN AND UTILITIES
RD1101 - RD1105	RD	LONGITUDINAL SECTIONS
RC0001 - RC0008	RC	CROSS SECTIONS
UT1100 - UT1500	UT	UTILITY AND DRAINAGE
ST1100 - ST1307	ST	RETAINING WALL PLAN, LONGITUDINAL SECTIONS AND CROSS SECTIONS
GT0001	GT	GEOTECHNICAL TREATMENTS

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STOPPING SIGHT DISTANCE	CAR

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MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
SHEET INDEX AND KEY PLAN

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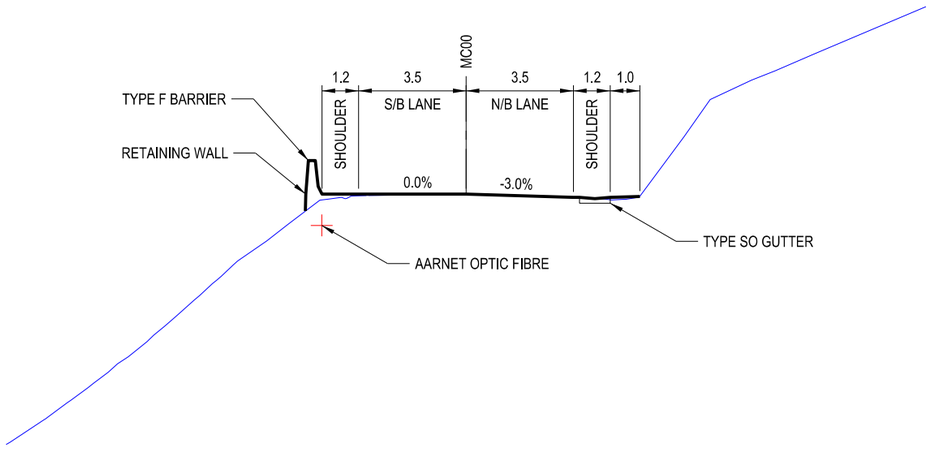
ISSUE: 1



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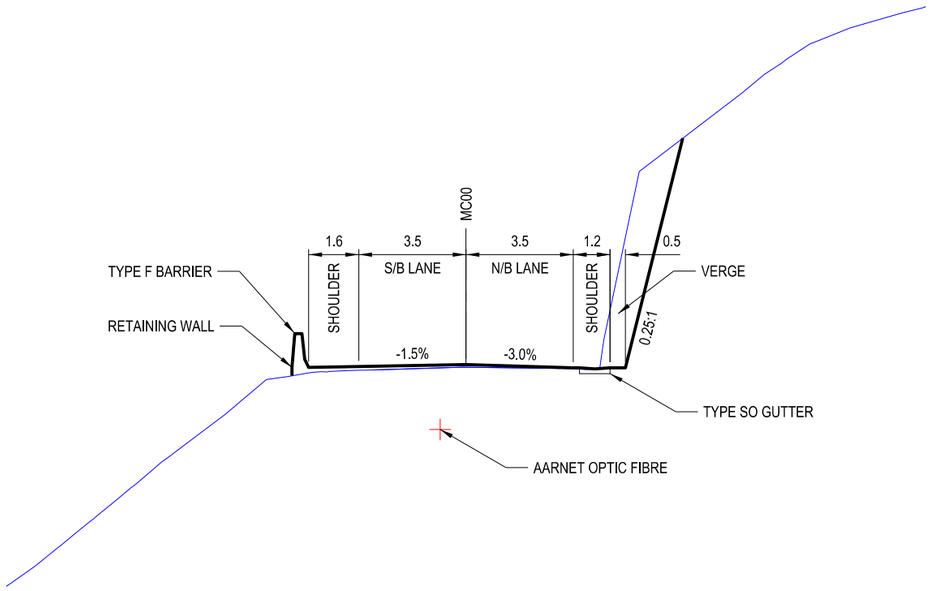

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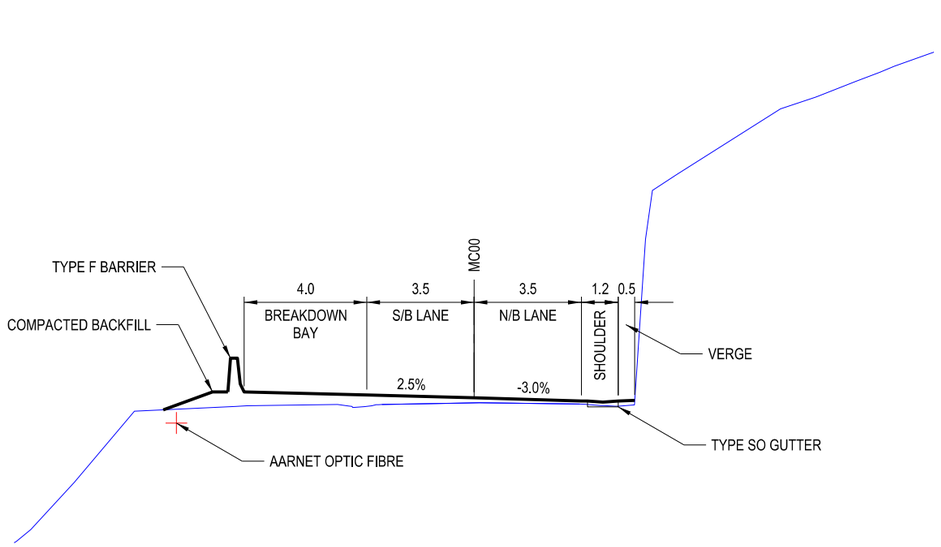

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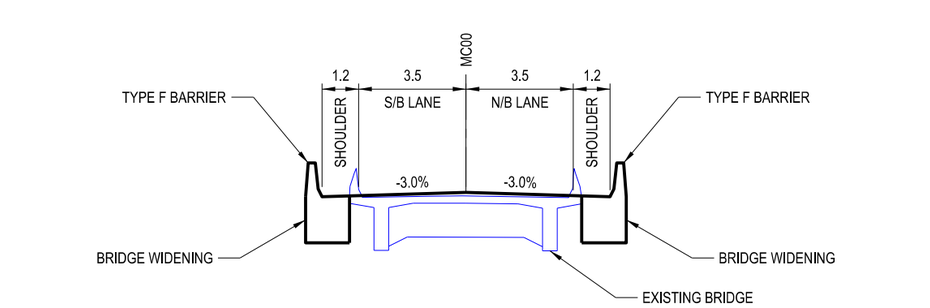

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SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY TYPICAL CROSS SECTIONS

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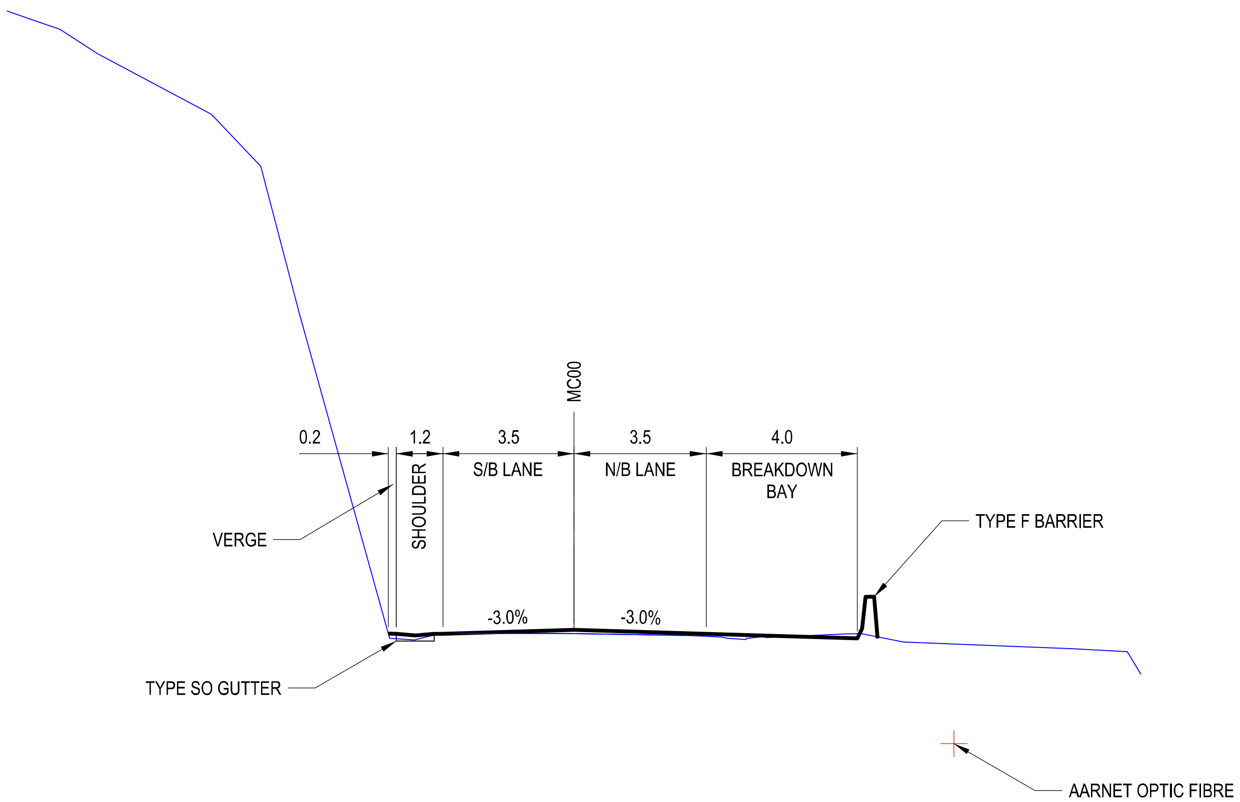

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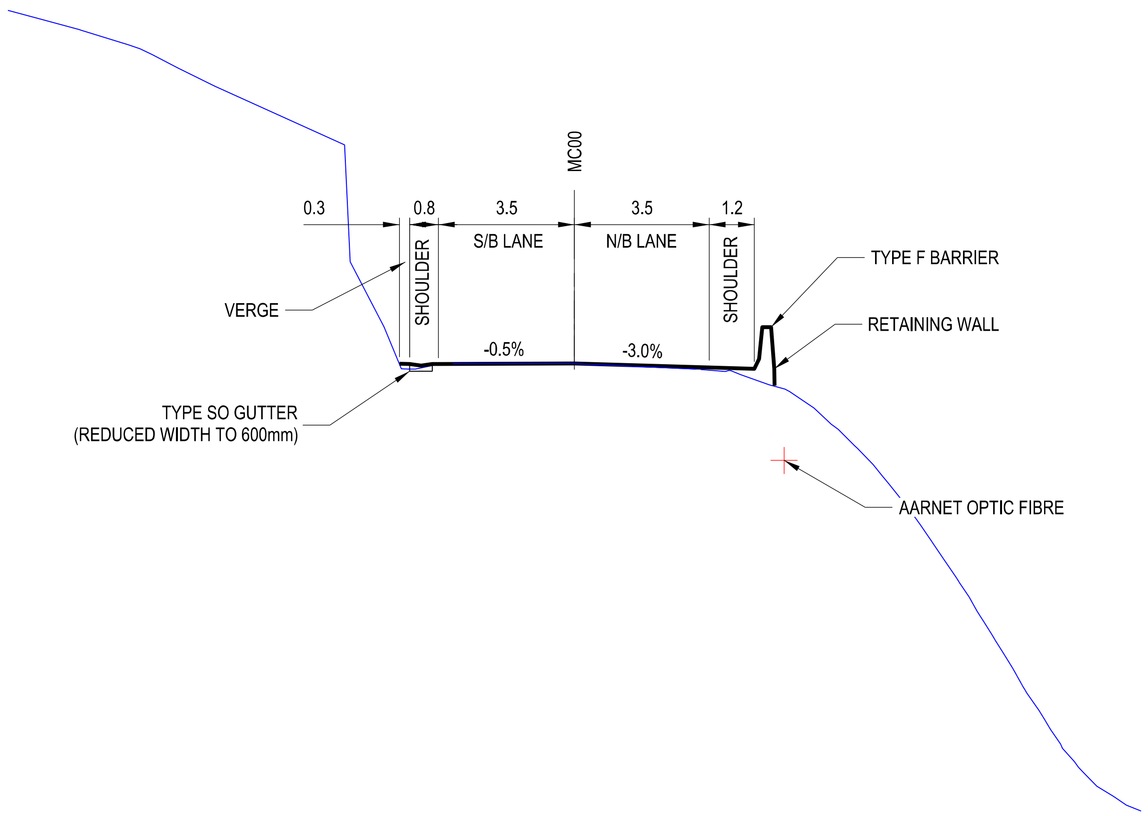

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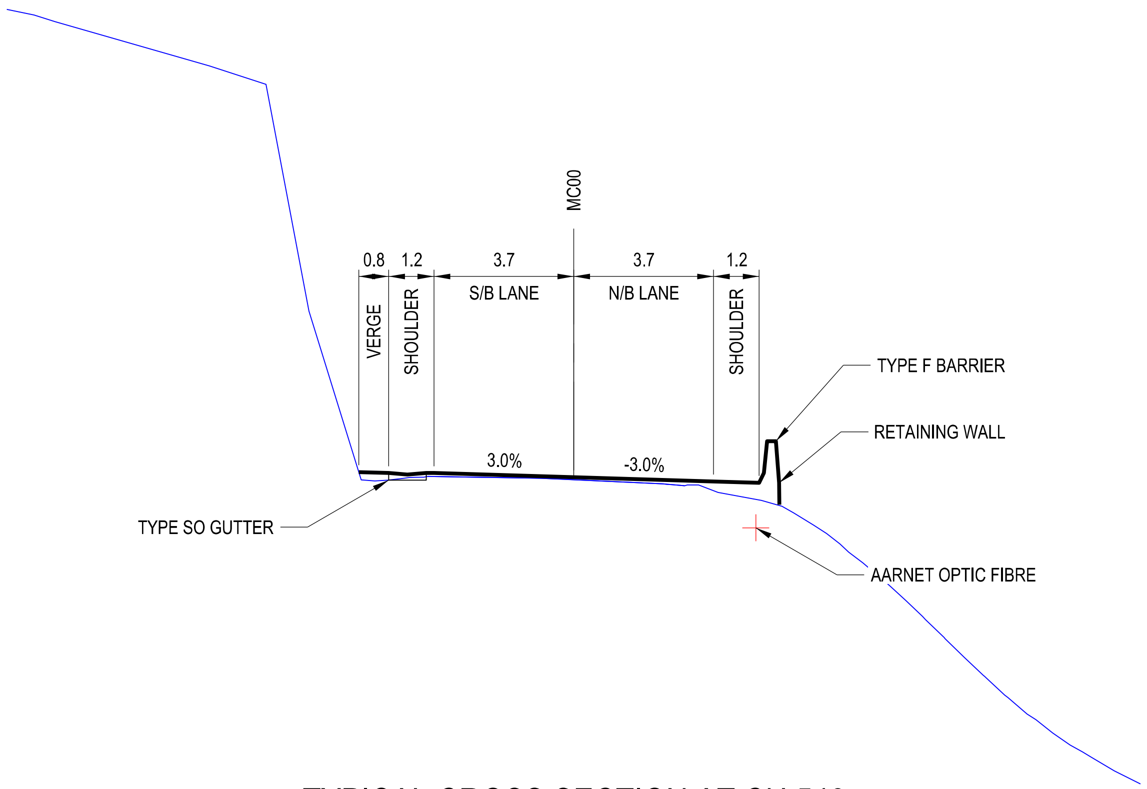

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TYPICAL CROSS SECTIONS

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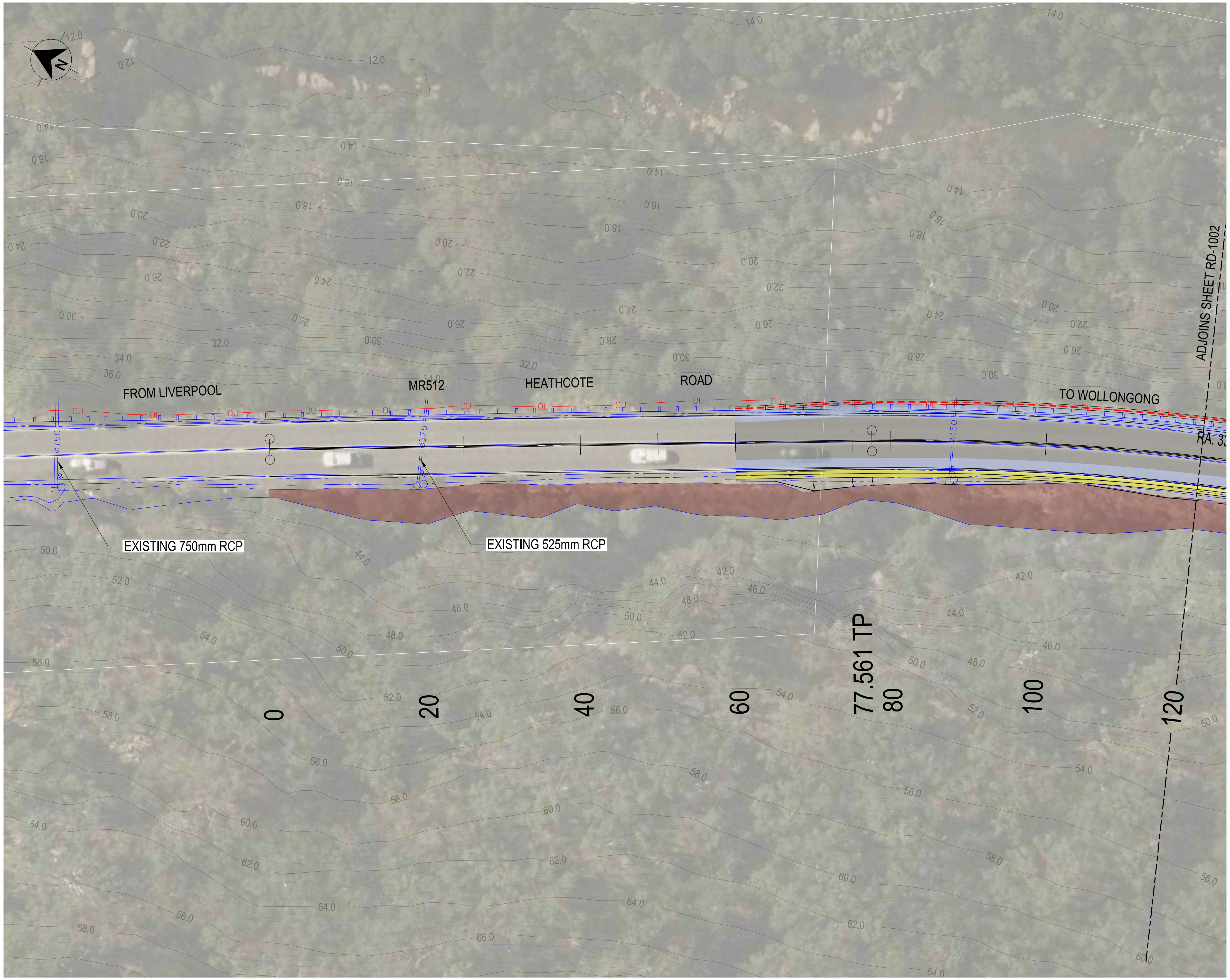
SHEET No. RD-0002
ISSUE 1



LEGEND

- DIGITISED CADASTRAL BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- ROCK CUTTING
- NEW PAVEMENT
- MILL AND RESHEET EXISTING PAVEMENT
- BRIDGE WIDENING
- SO GUTTER
- MODIFIED SO GUTTER WITH CONDUIT BANK
- PROPOSED RETAINING WALL
- OPTICAL FIBRE

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RD-1001.dgn

EXTERNAL REFERENCE FILES | REV | DATE | AMENDMENT / REVISION DESCRIPTION | WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 — SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME: 24/08/2020 1:07:41 PM — PLOT BY: jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT — Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

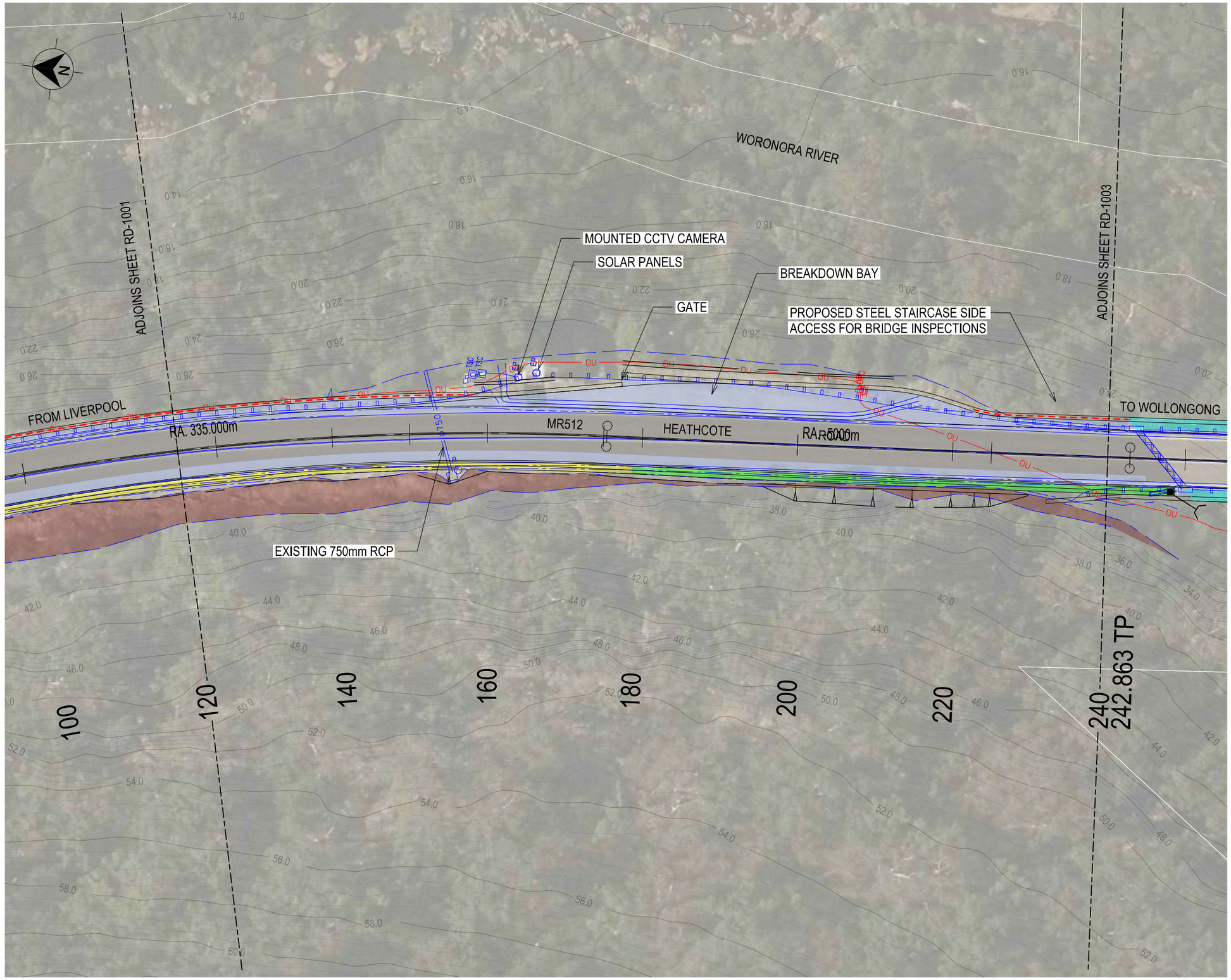
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No. RD-1001 — ISSUE 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

- DIGITISED CADASTRAL BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- ROCK CUTTING
- NEW PAVEMENT
- MILL AND RESHEET EXISTING PAVEMENT
- BRIDGE WIDENING
- SO GUTTER
- MODIFIED SO GUTTER WITH CONDUIT BANK
- PROPOSED RETAINING WALL
- OU — OPTICAL FIBRE

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn	DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RD-1002.dgn	PLOT DATE / TIME: 24/08/2020 1:07:44 PM — PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 — SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES, WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No. RD-1002 — ISSUE 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020

LEGEND

- DIGITISED CADASTRAL BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- ROCK CUTTING
- NEW PAVEMENT
- MILL AND RESHEET EXISTING PAVEMENT
- BRIDGE WIDENING
- SO GUTTER
- MODIFIED SO GUTTER WITH CONDUIT BANK
- PROPOSED RETAINING WALL
- OU — OPTICAL FIBRE

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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PLOT DATE / TIME: 24/08/2020 1:07:48 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

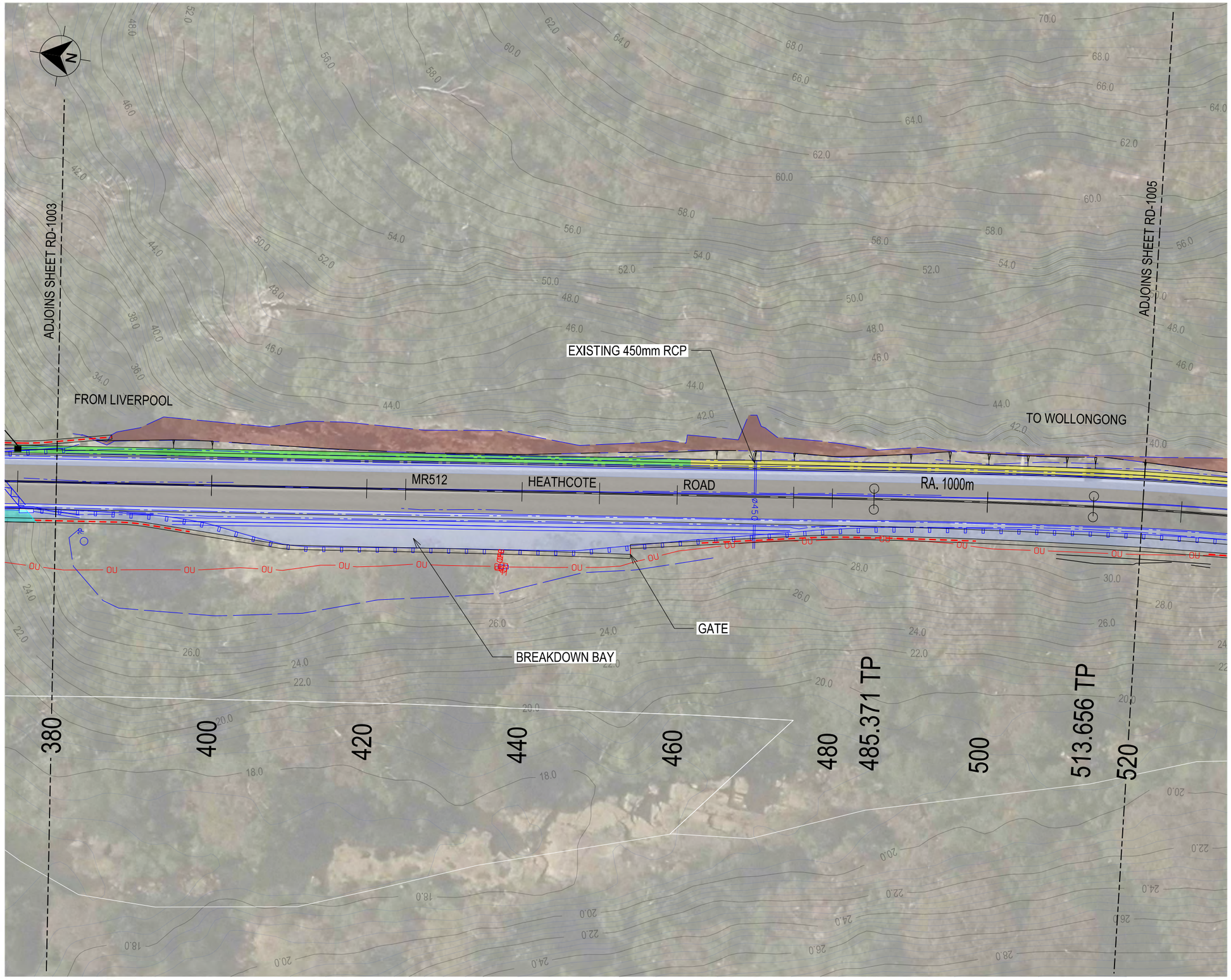
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.:
SHEET No.: RD-1003
ISSUE: 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

- DIGITISED CADASTRAL BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- ROCK CUTTING
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- BRIDGE WIDENING
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- PROPOSED RETAINING WALL
- OU OPTICAL FIBRE

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

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PLOT DATE / TIME 24/08/2020 1:07:49 PM
PLOT BY jshenouda

CLIENT
NSW GOVERNMENT Transport for NSW

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY PLAN

A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

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TECHNICAL & PROJECT SERVICES
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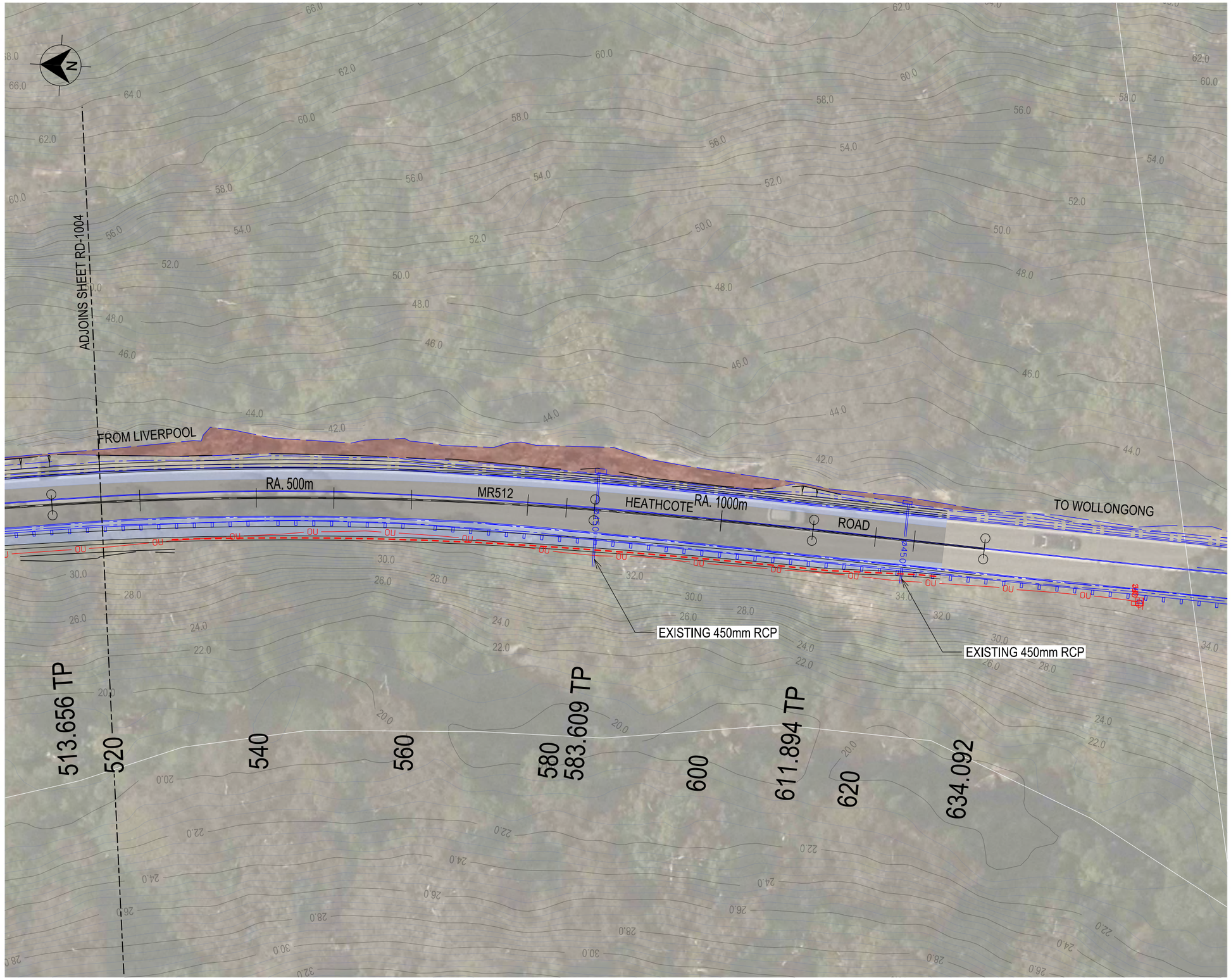
RMS REGISTRATION No. DS2020 / 000318
PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. RD-1004
ISSUE 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

- DIGITISED CADASTRAL BOUNDARY
- PROPOSED PROPERTY BOUNDARY
- ROCK CUTTING
- NEW PAVEMENT
- MILL AND RESHEET EXISTING PAVEMENT
- BRIDGE WIDENING
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NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

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PLOT DATE / TIME 24/08/2020 1:07:51 PM
PLOT BY jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT Transport for NSW

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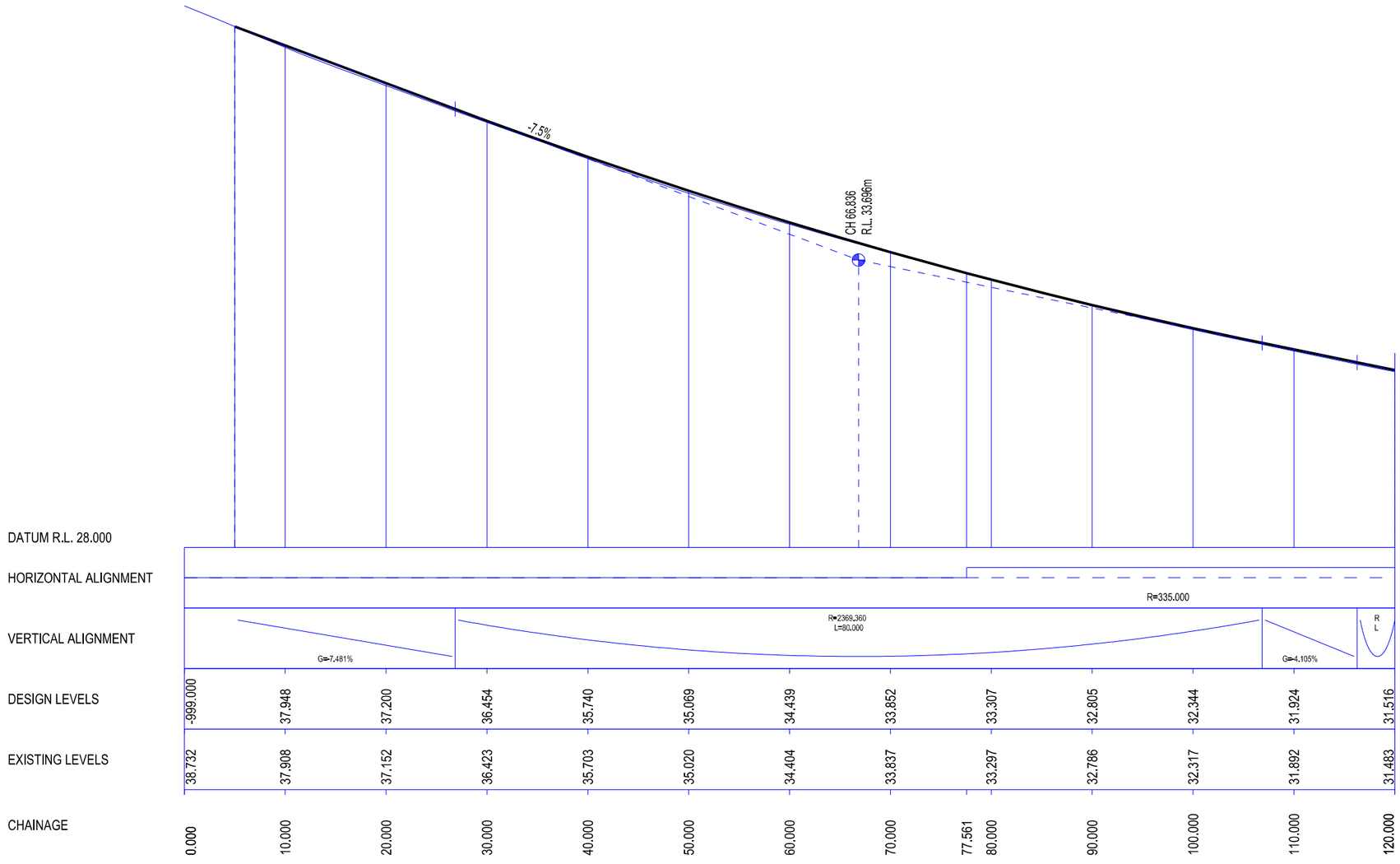
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY PLAN

A3

RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. RD-1005
ISSUE 1



LONGITUDINAL SECTION ALONG HEATHCOTE ROAD (MC00)

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Longsection-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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PLOT DATE / TIME 24/08/2020 1:07:53 PM
PLOT BY jshenouda

CLIENT
NSW GOVERNMENT Transport for NSW

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS
A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
HORIZONTAL SCALE 1:500m
0 1 2 3 4
VERTICAL SCALE 1:100m

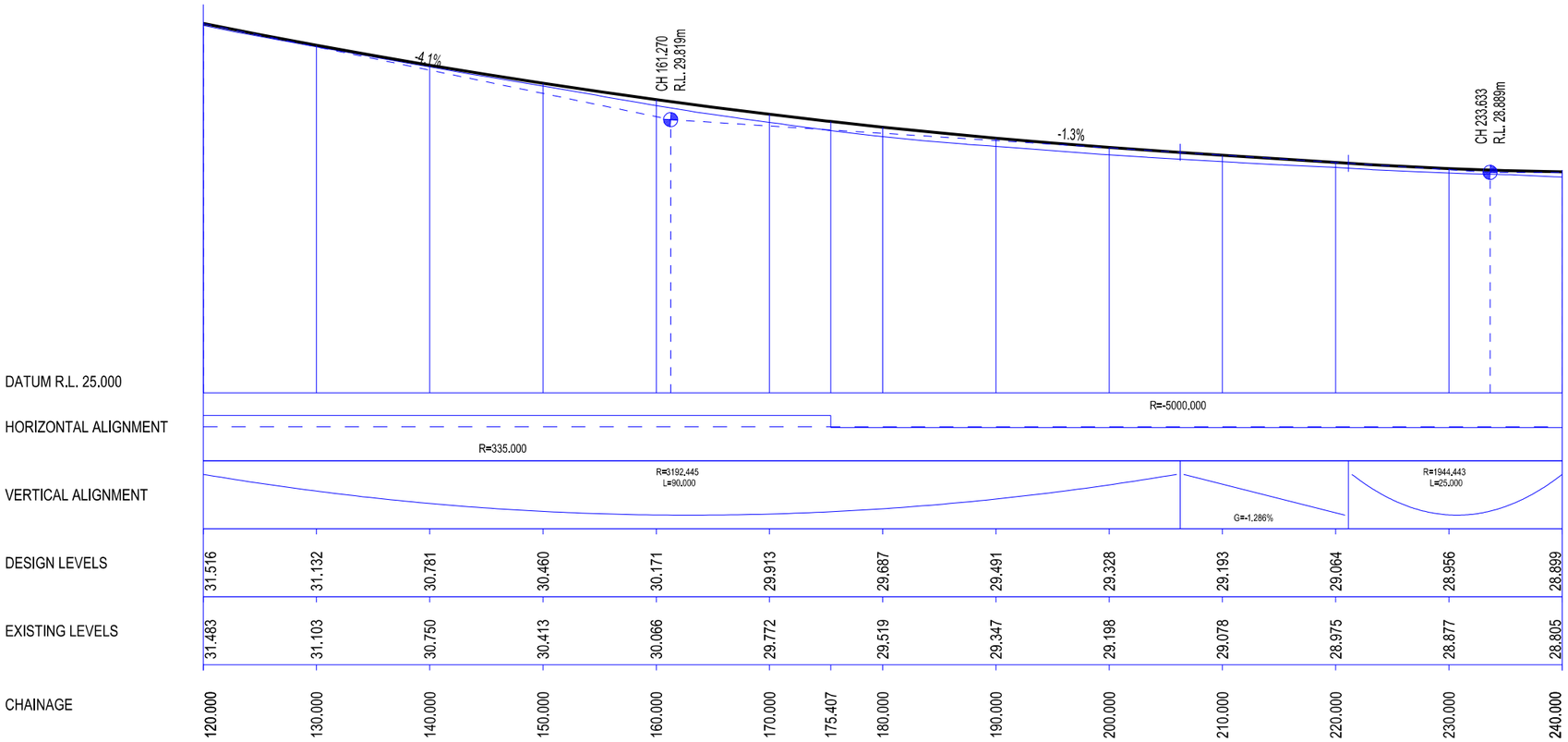
CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. RD-1101
ISSUE 1



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140.000	30.781	30.750
150.000	30.460	30.413
160.000	30.171	30.066
170.000	29.913	29.772
175.407		
180.000	29.687	29.519
190.000	29.491	29.347
200.000	29.328	29.198
210.000	29.193	29.078
220.000	29.064	28.975
230.000	28.956	28.877
240.000	28.899	28.805

LONGITUDINAL SECTION ALONG HEATHCOTE ROAD (MC00)

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RD-1102.dgn

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
HORIZONTAL SCALE 1:500m
0 1 2 3 4
VERTICAL SCALE 1:100m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME: 24/08/2020 1:07:53 PM
PLOT BY: jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
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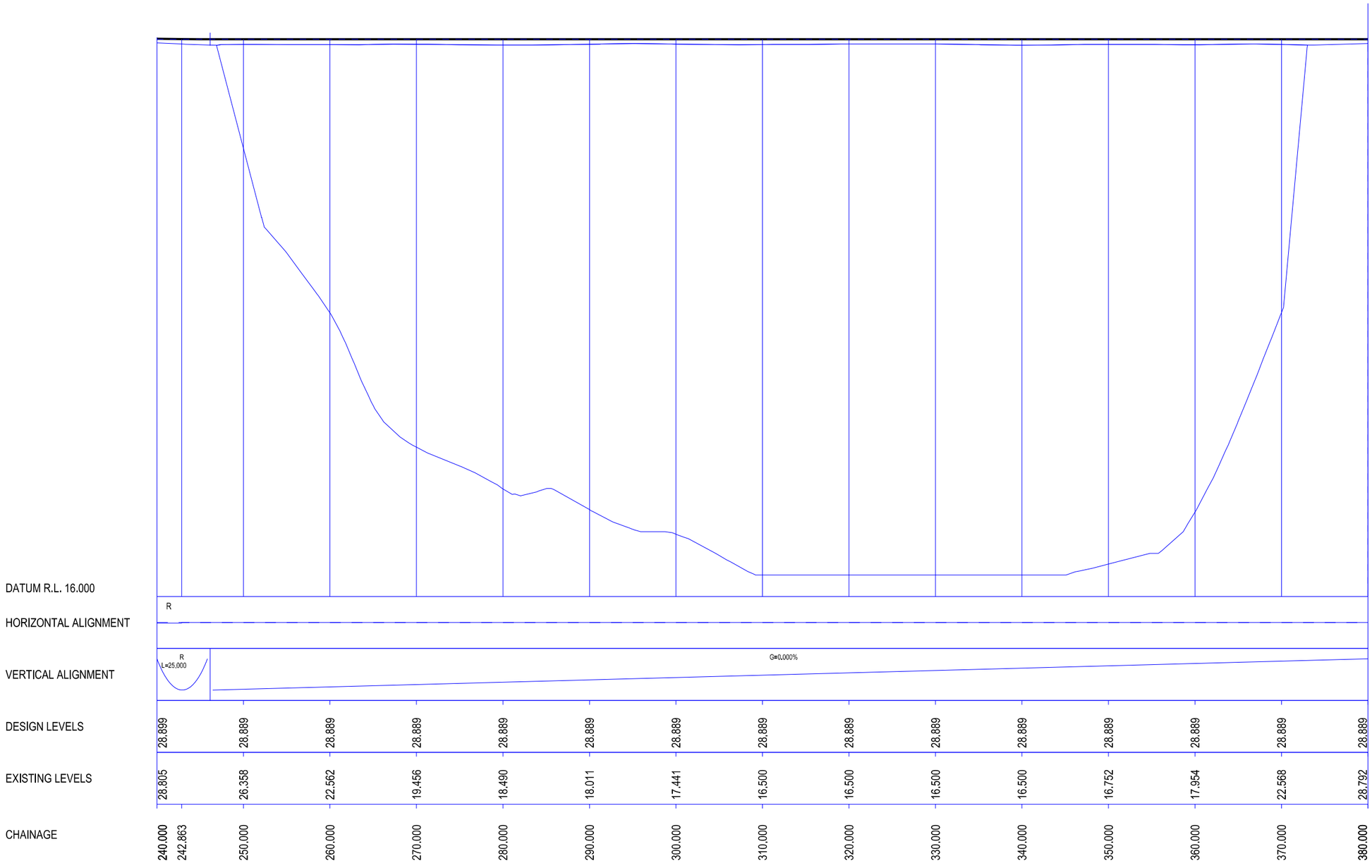
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. RD-1102
ISSUE 1



LONGITUDINAL SECTION ALONG HEATHCOTE ROAD (MC00)

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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PLOT DATE / TIME 24/08/2020 1:07:54 PM
PLOT BY jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
HORIZONTAL SCALE 1:500m
0 1 2 3 4
VERTICAL SCALE 1:100m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT Transport for NSW

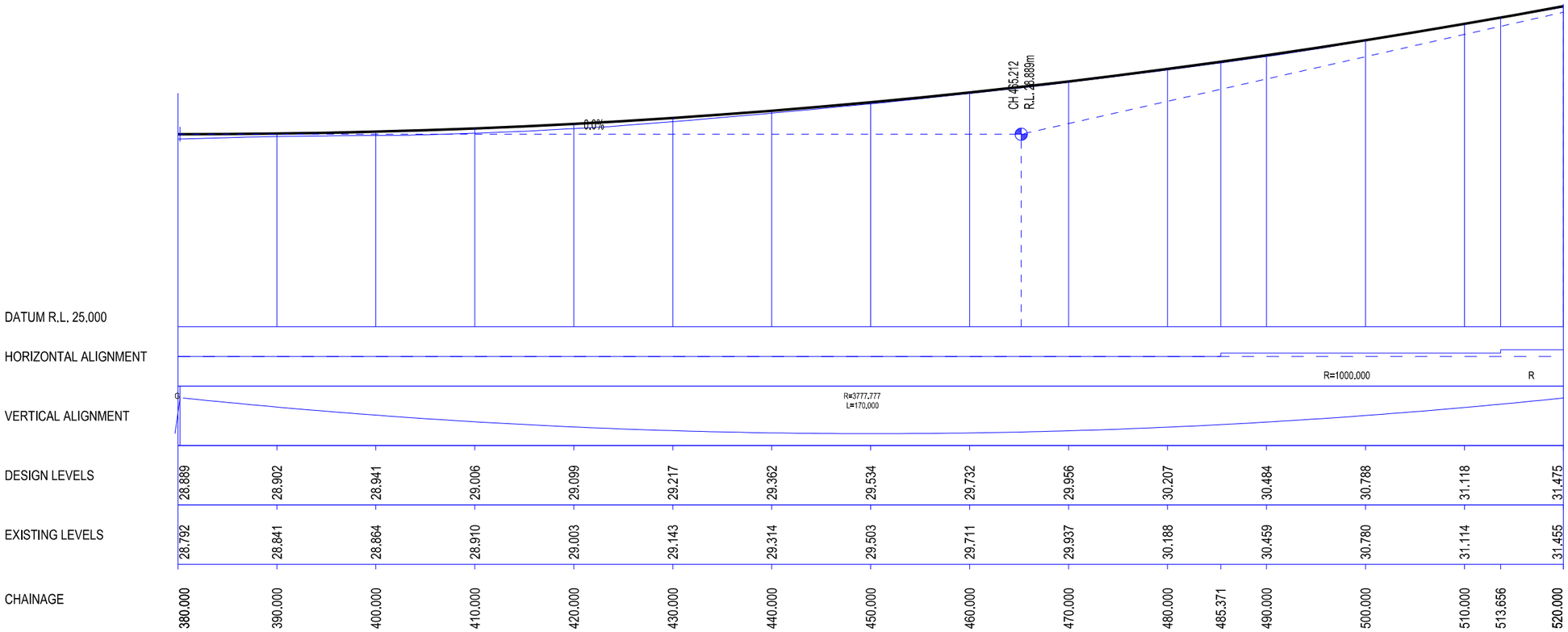
PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318
PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No.: RD-1103
ISSUE 1



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EXISTING LEVELS	28.792	28.841	28.864	28.910	29.003	29.143	29.314	29.503	29.711	29.937	30.188		30.459	30.780	31.114		31.455
CHAINAGE	380.000	390.000	400.000	410.000	420.000	430.000	440.000	450.000	460.000	470.000	480.000	485.371	490.000	500.000	510.000	513.656	520.000

LONGITUDINAL SECTION ALONG HEATHCOTE ROAD (MC00)

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Longsection-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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PLOT DATE / TIME
24/08/2020 1:07:54 PM
PLOT BY
jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
HORIZONTAL SCALE 1:500m
0 1 2 3 4
VERTICAL SCALE 1:100m

CO-ORDINATE SYSTEM
MGA ZONE 56
HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318

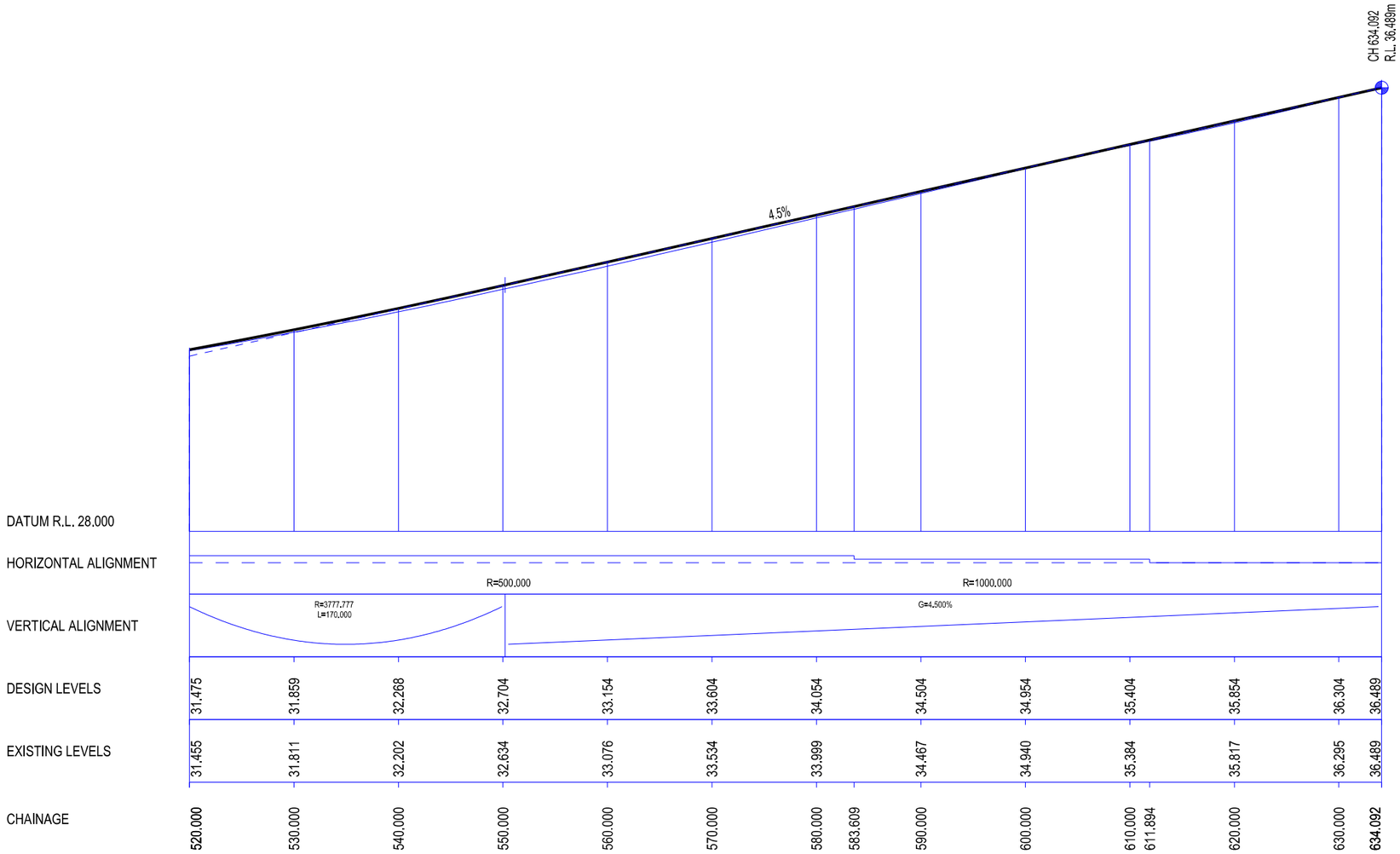
PART
1

ISSUE STATUS
DESIGN STAGE - CONCEPT

EDMS No.

SHEET No.
RD-1104

ISSUE
1



LONGITUDINAL SECTION ALONG HEATHCOTE ROAD (MC00)

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Longsection-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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PLOT DATE / TIME: 24/08/2020 1:07:54 PM
PLOT BY: jshenouda

CLIENT: NSW GOVERNMENT Transport for NSW

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS

A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15 20
HORIZONTAL SCALE 1:500m
0 1 2 3 4
VERTICAL SCALE 1:100m

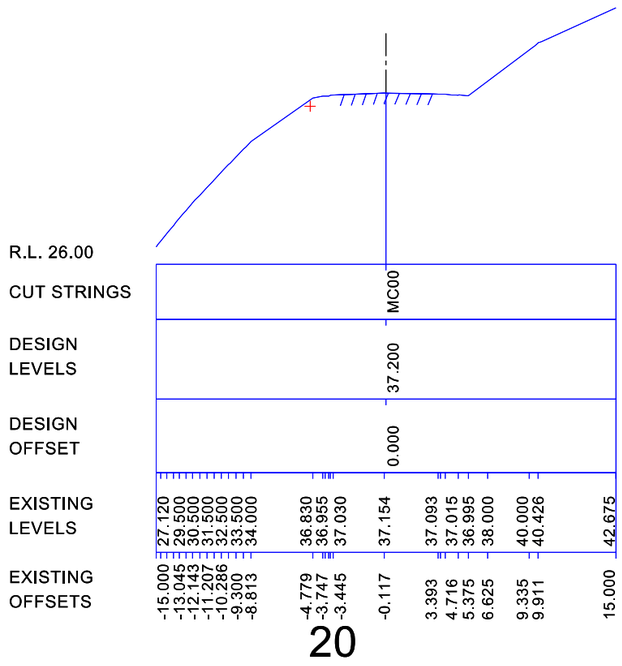
CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

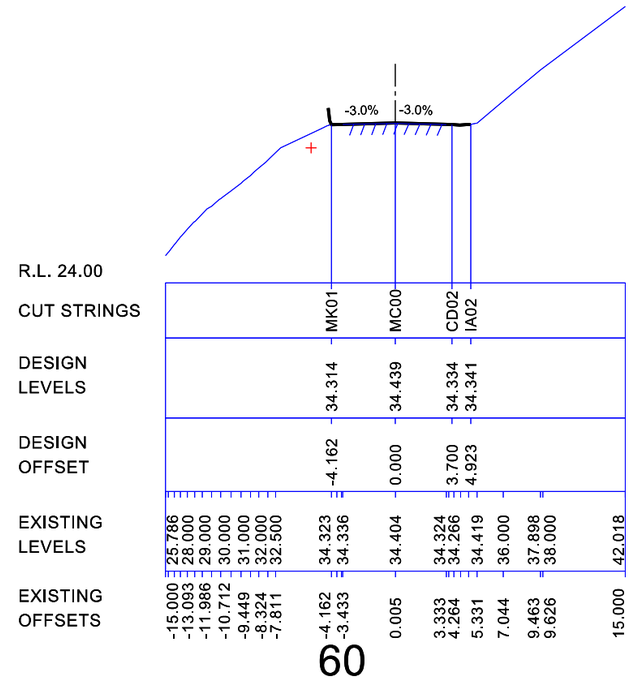
DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

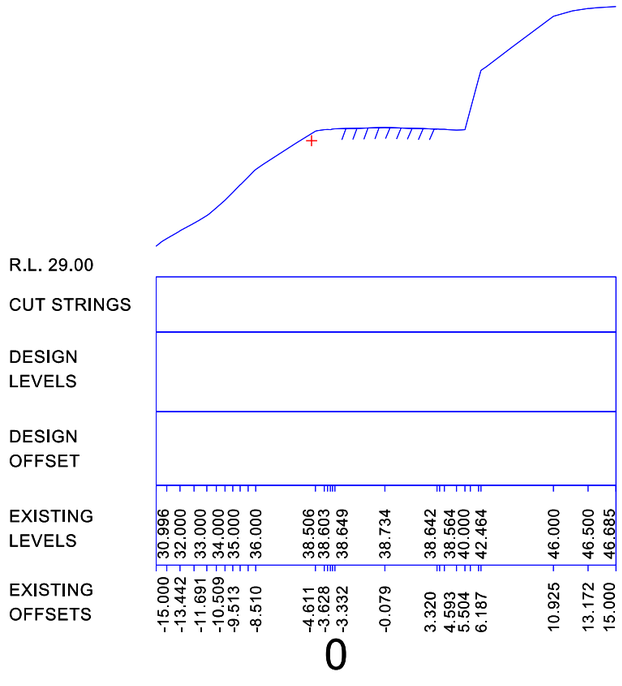
TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

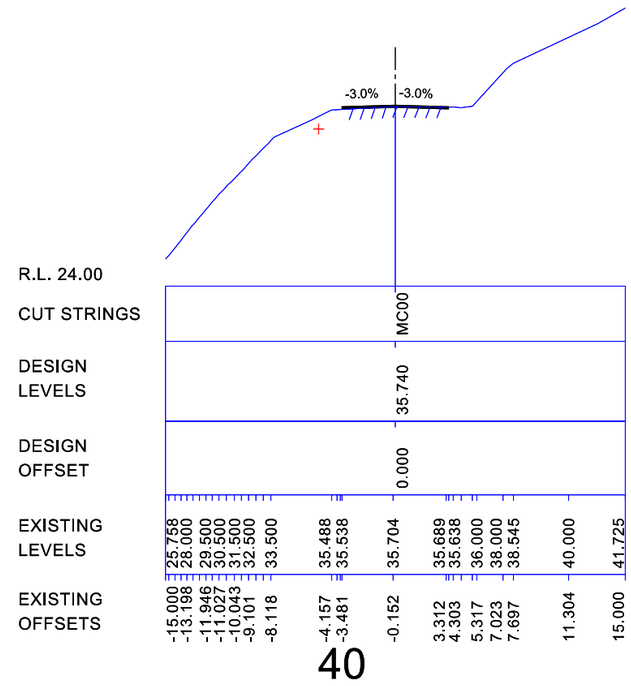
PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. RD-1105
ISSUE 1









NOT FOR CONSTRUCTION

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DESIGN LOT CODE

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PLOT DATE / TIME
24/08/2020 1:07:55 PM

PLOT BY
jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT
Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318

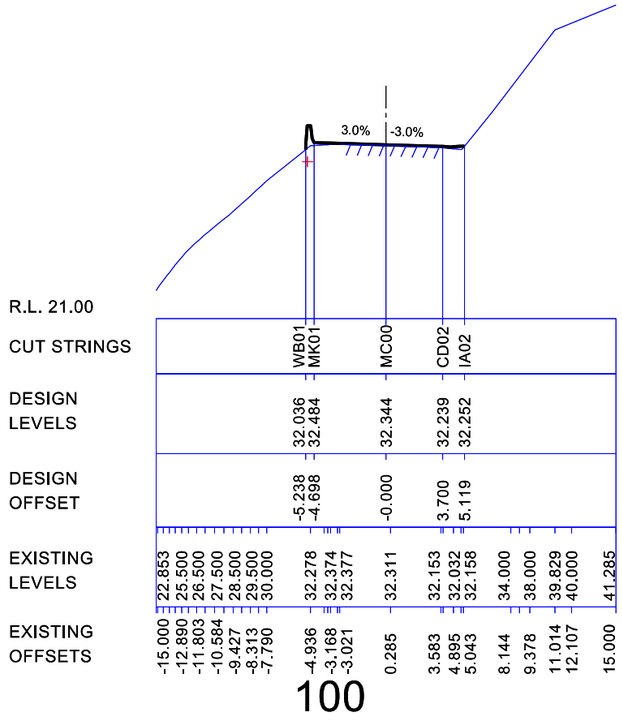
PART 1

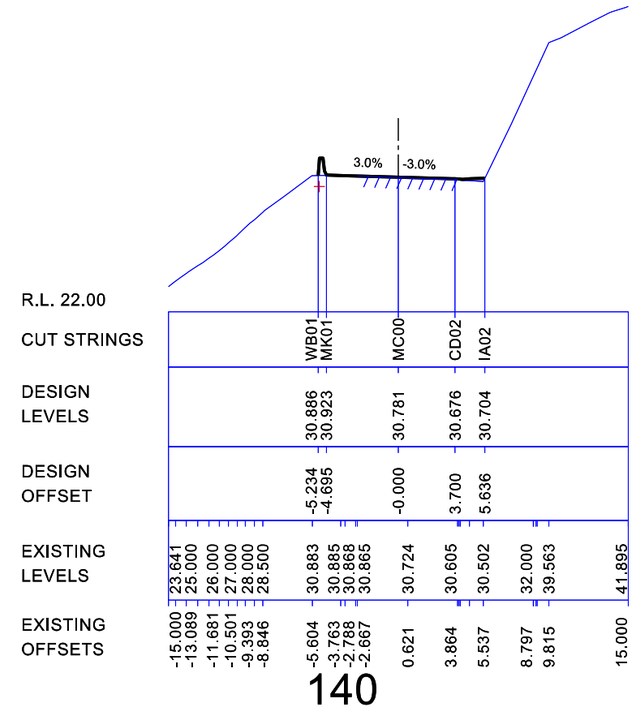
ISSUE STATUS
DESIGN STAGE - CONCEPT

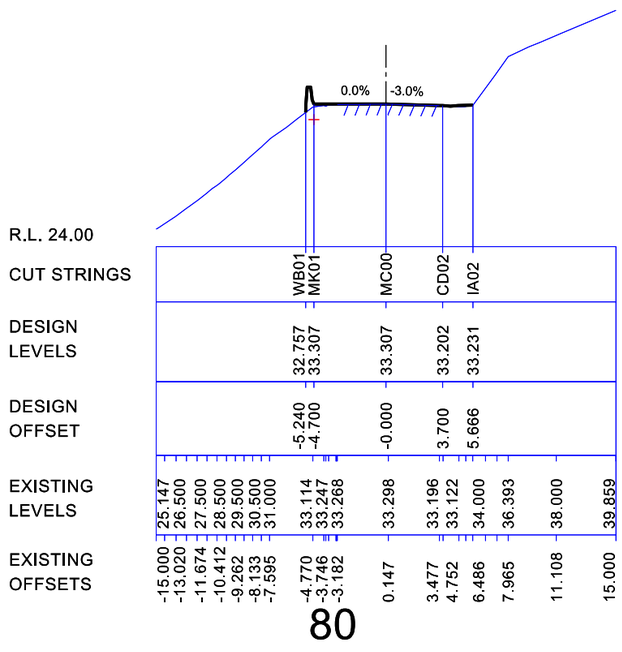
EDMS No.

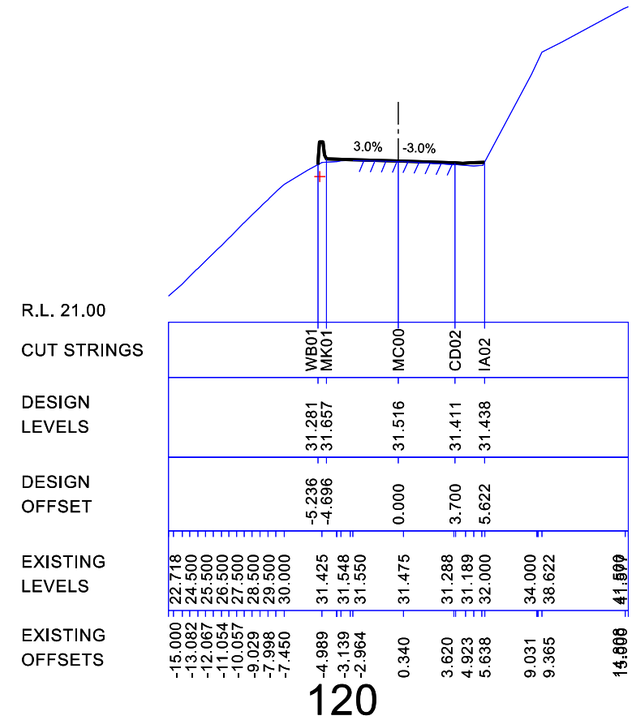
SHEET No. RC-0001

ISSUE 1









R.L. 21.00

CUT STRINGS	WB01	MK01	MC00	CD02	IA02
DESIGN LEVELS	32.036	32.484	32.344	32.239	32.252
DESIGN OFFSET	-5.238	-4.698	-0.000	3.700	5.119

EXISTING LEVELS	EXISTING OFFSETS
22.853	-15.000
25.500	-12.890
26.500	-11.803
27.500	-10.584
28.500	-9.427
29.500	-8.313
30.000	-7.790
32.278	-4.936
32.374	-3.168
32.377	-3.021
32.311	0.285
32.153	3.583
32.032	4.895
32.158	5.043
34.000	8.144
38.000	9.378
39.829	11.014
40.000	12.107
41.285	15.000

100

R.L. 22.00

CUT STRINGS	WB01	MK01	MC00	CD02	IA02
DESIGN LEVELS	30.886	30.923	30.781	30.676	30.704
DESIGN OFFSET	-5.234	-4.695	-0.000	3.700	5.636

EXISTING LEVELS	EXISTING OFFSETS
23.641	-15.000
25.000	-13.089
26.000	-11.681
27.000	-10.501
28.000	-9.393
28.500	-8.846
30.883	-5.604
30.885	-3.763
30.868	-2.788
30.865	-2.667
30.724	0.621
30.605	3.864
30.502	5.537
32.000	8.797
39.563	9.815
41.895	15.000

140

R.L. 24.00

CUT STRINGS	WB01	MK01	MC00	CD02	IA02
DESIGN LEVELS	32.757	33.307	33.307	33.202	33.231
DESIGN OFFSET	-5.240	-4.700	-0.000	3.700	5.666

EXISTING LEVELS	EXISTING OFFSETS
25.147	-15.000
26.500	-13.020
27.500	-11.674
28.500	-10.412
29.500	-9.262
30.500	-8.133
31.000	-7.595
33.114	-4.770
33.247	-3.746
33.268	-3.182
33.298	0.147
33.196	3.477
33.122	4.752
34.000	6.486
36.393	7.965
38.000	11.108
39.859	15.000

80

R.L. 21.00

CUT STRINGS	WB01	MK01	MC00	CD02	IA02
DESIGN LEVELS	31.281	31.657	31.516	31.411	31.438
DESIGN OFFSET	-5.236	-4.696	0.000	3.700	5.622

EXISTING LEVELS	EXISTING OFFSETS
22.718	-15.000
24.500	-13.082
25.500	-12.067
26.500	-11.054
27.500	-10.057
28.500	-9.029
29.500	-7.998
30.000	-7.450
31.425	-4.989
31.548	-3.139
31.550	-2.964
31.475	0.340
31.288	3.620
31.189	4.923
32.000	5.638
34.000	9.031
38.622	9.365
41.509	14.808
41.577	15.000

120

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50mm ON A3 SIZE ORIGINAL

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PLOT BY
jshenouda

EXTERNAL REFERENCE FILES

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT | Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

A3

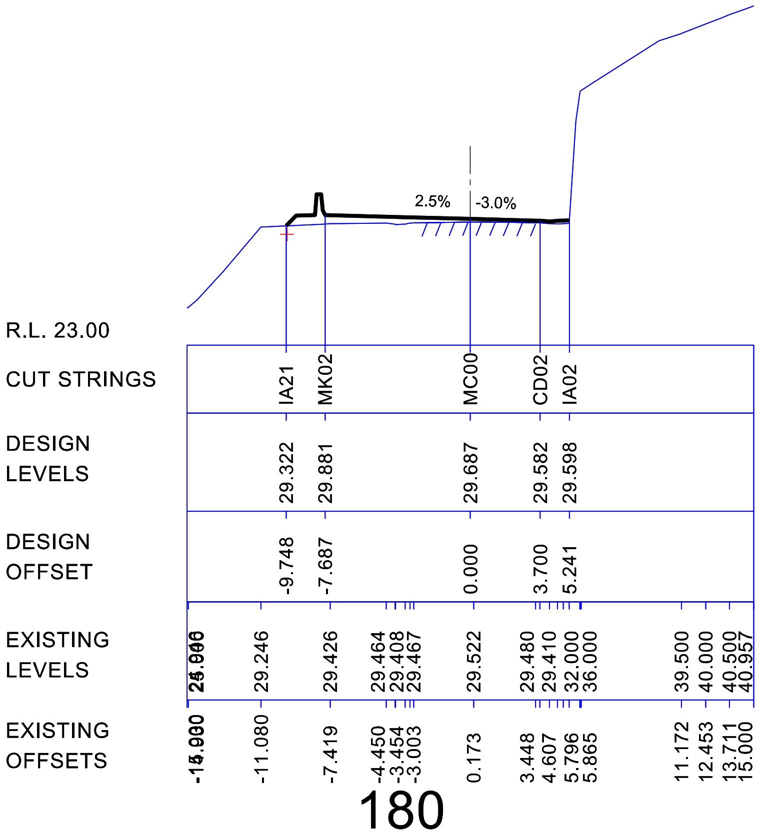
RMS REGISTRATION No. DS2020 / 000318
PART 1

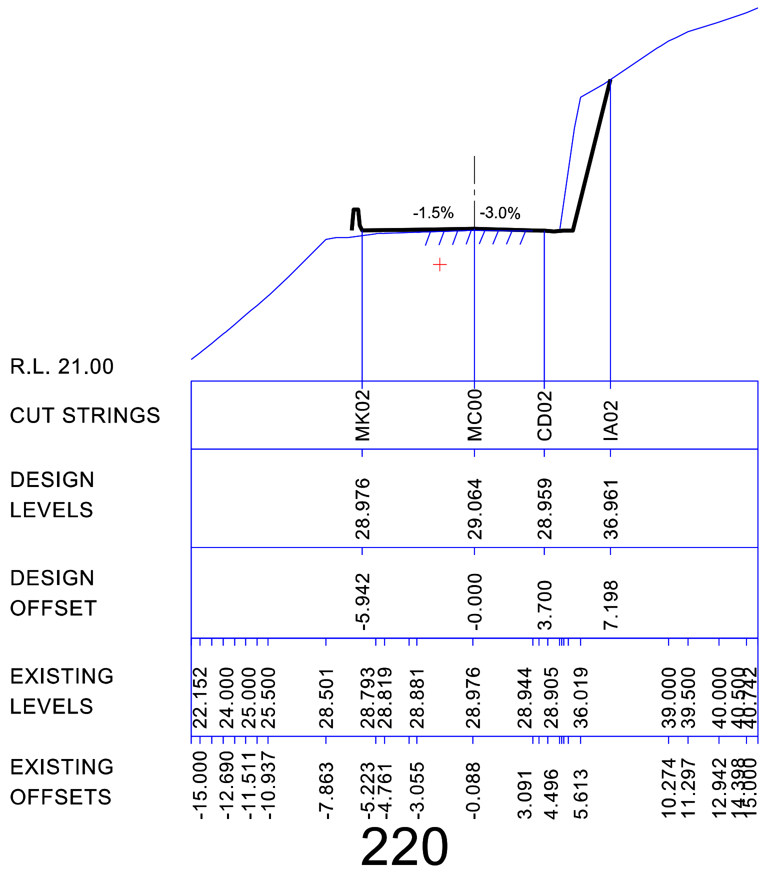
ISSUE STATUS
DESIGN STAGE - CONCEPT

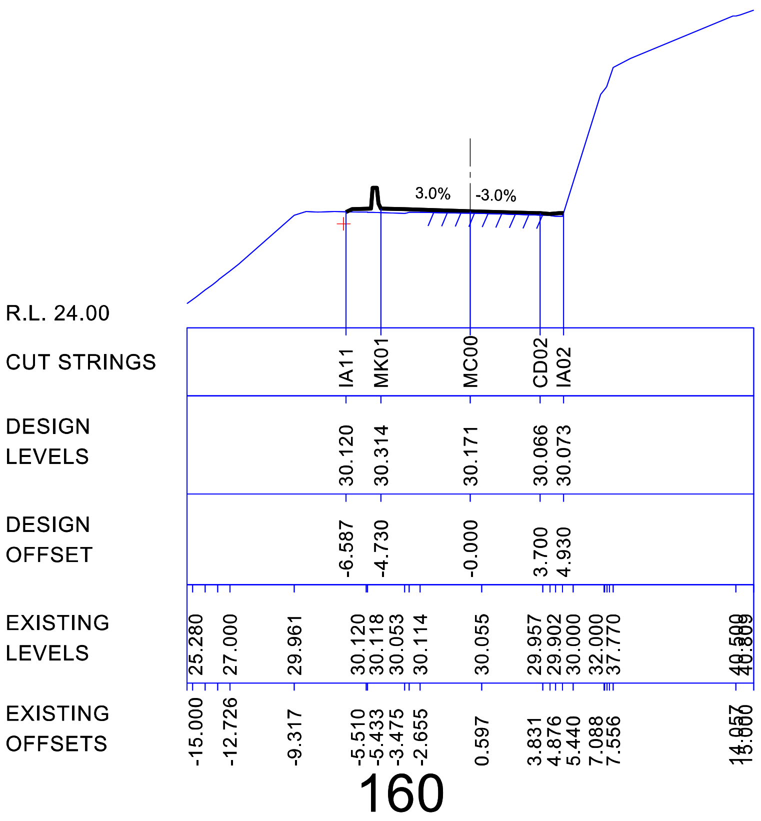
EDMS No.

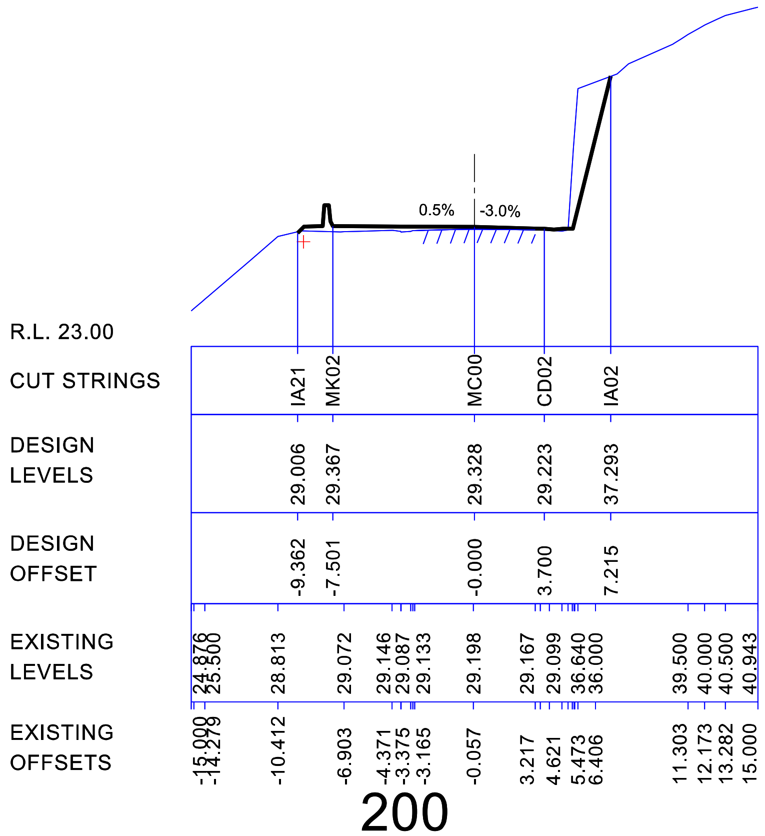
SHEET No. RC-0002

ISSUE 1









NOT FOR CONSTRUCTION

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50mm ON A3 SIZE ORIGINAL

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DESIGN LOT CODE	
DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RC-0003.dgn
PLOT DATE / TIME	24/08/2020 1:07:56 PM
PLOT BY	jshenouda
EXTERNAL REFERENCE FILES	
SCALES ON A3 SIZE DRAWING	0 5 10 15 SCALE 1:400m
CO-ORDINATE SYSTEM	MGA ZONE 56
HEIGHT DATUM	AHD
DRAWINGS / DESIGN PREPARED BY	TRANSPORT FOR NSW INFRASTRUCTURE AND PLACE TECHNICAL & PROJECT SERVICES ENGINEERING SERVICES ROAD DESIGN ENGINEERING

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

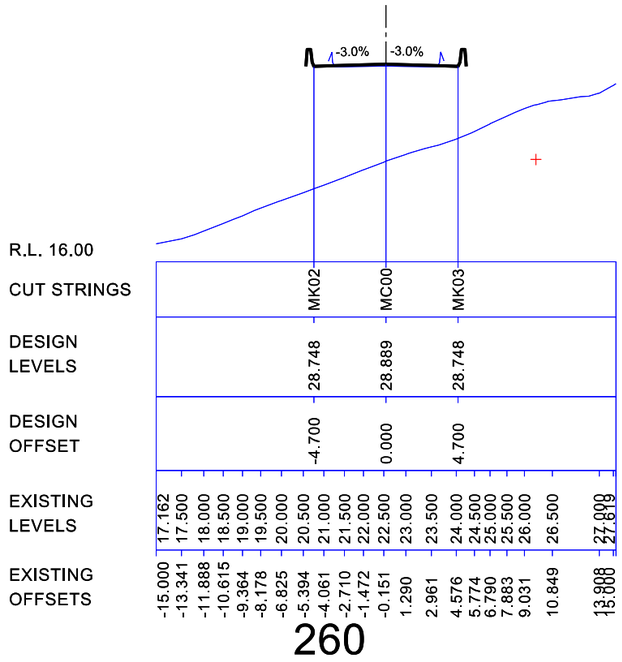
CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

A3

RMS REGISTRATION No.	DS2020 / 000318
PART	1
ISSUE STATUS	DESIGN STAGE - CONCEPT
EDMS No.	
SHEET No.	RC-0003
ISSUE	1



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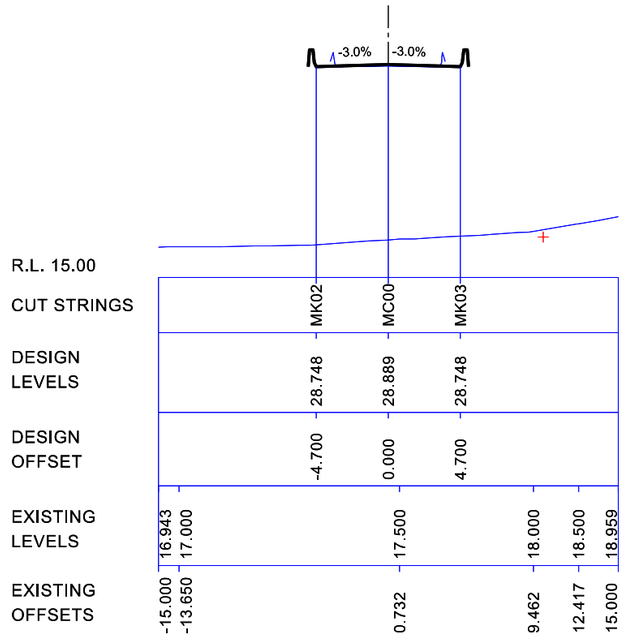

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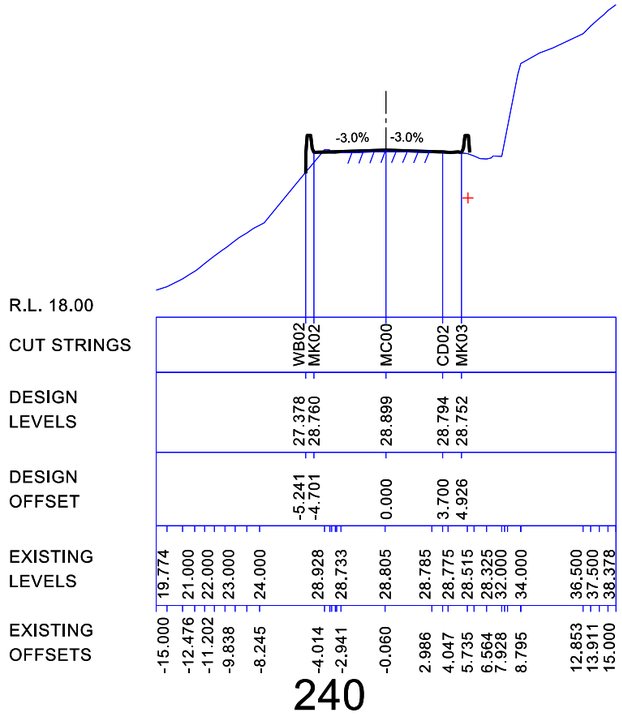

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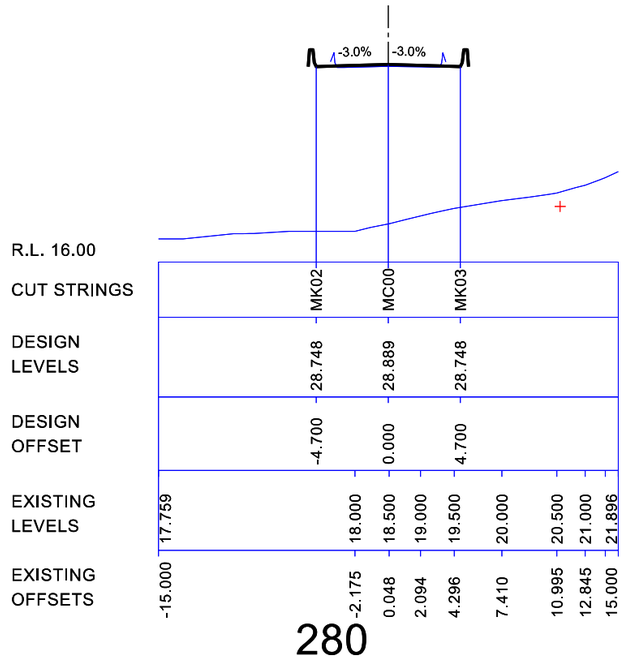

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THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
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								DRAWN: J. A. SHENOUDA XX.XX.XX		
								DRG CHECK: P. K. WASSELL XX.XX.XX		
								DESIGN: J. A. SHENOUDA XX.XX.XX		
								DESIGN CHECK: P. K. WASSELL XX.XX.XX		
								DESIGN MNGR: X. X. XXXXXXXX XX.XX.XX		
						CO-ORDINATE SYSTEM: MGA ZONE 56	HEIGHT DATUM: AHD	PROJECT MNGR: C. JORDAN XX.XX.XX		

CLIENT: NSW GOVERNMENT Transport for NSW

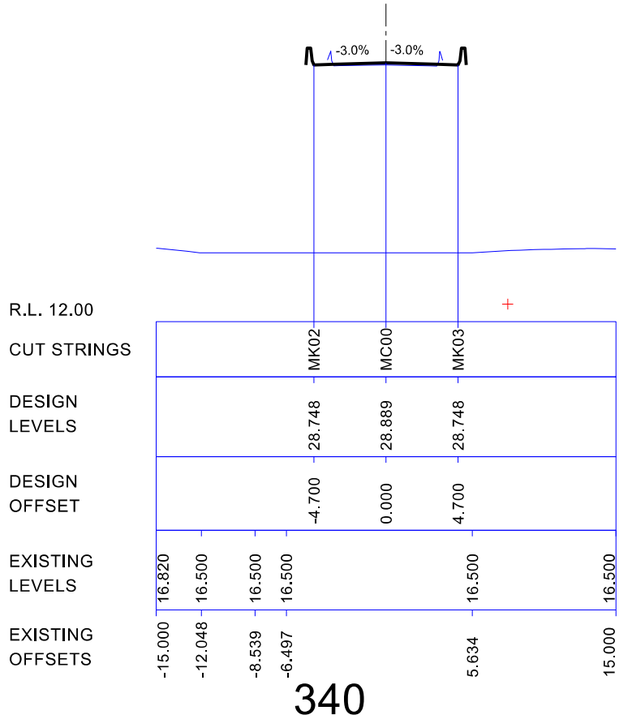
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

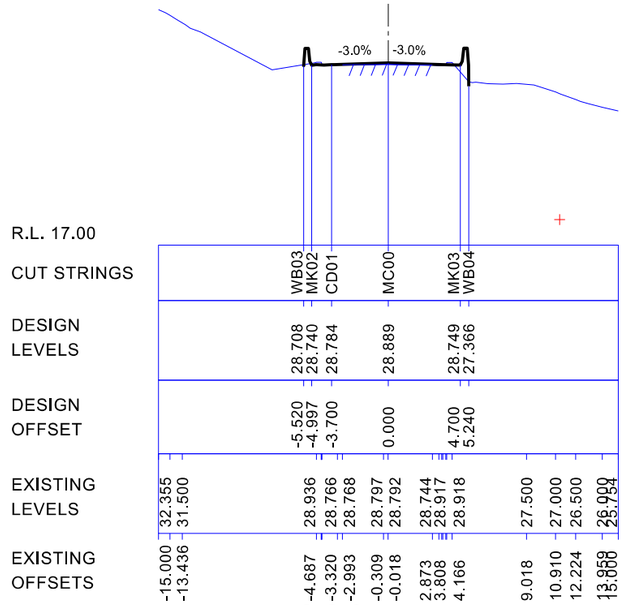
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

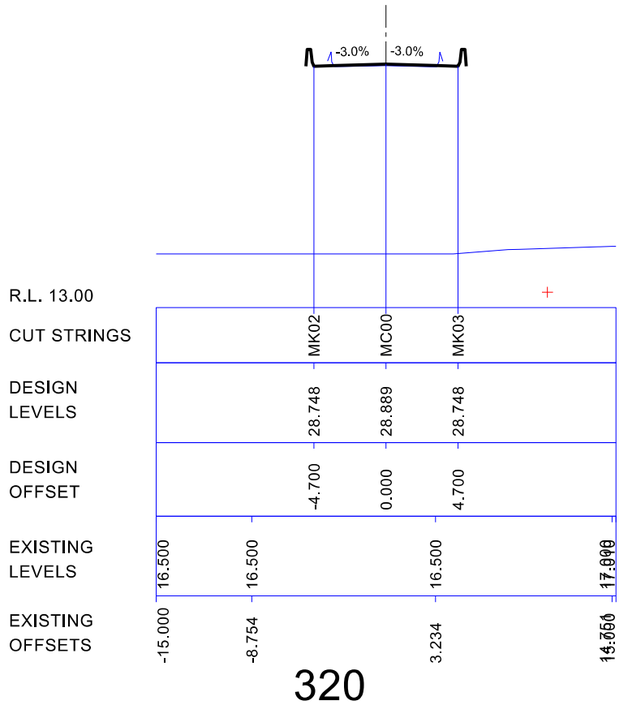
A3

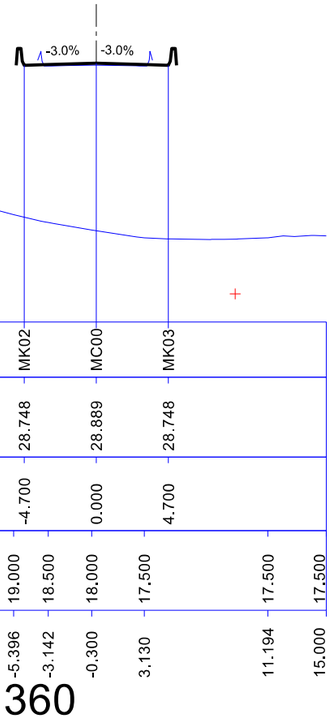
RMS REGISTRATION No.: DS2020 / 000318 | PART: 1

ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No.: RC-0004 | ISSUE: 1









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320

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DESIGN LOT CODE

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME
24/08/2020 1:07:56 PM

PLOT BY
jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318

PART 1

ISSUE STATUS
DESIGN STAGE - CONCEPT

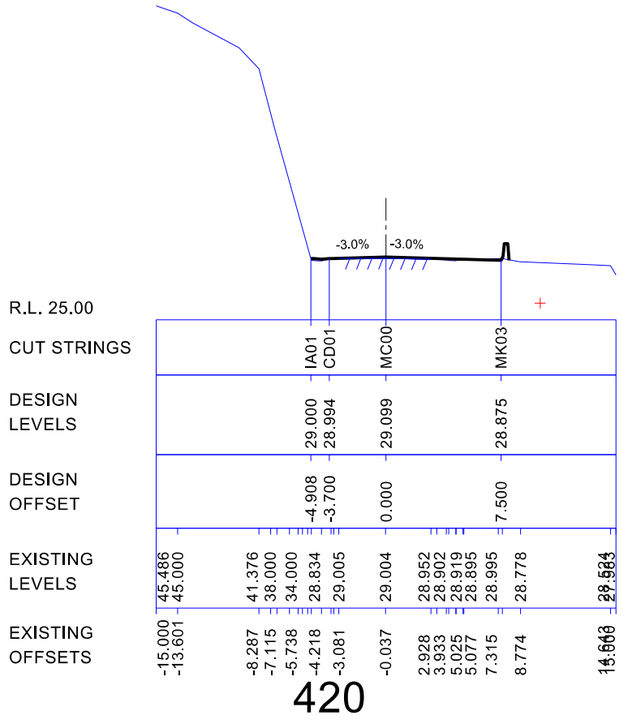
EDMS No.

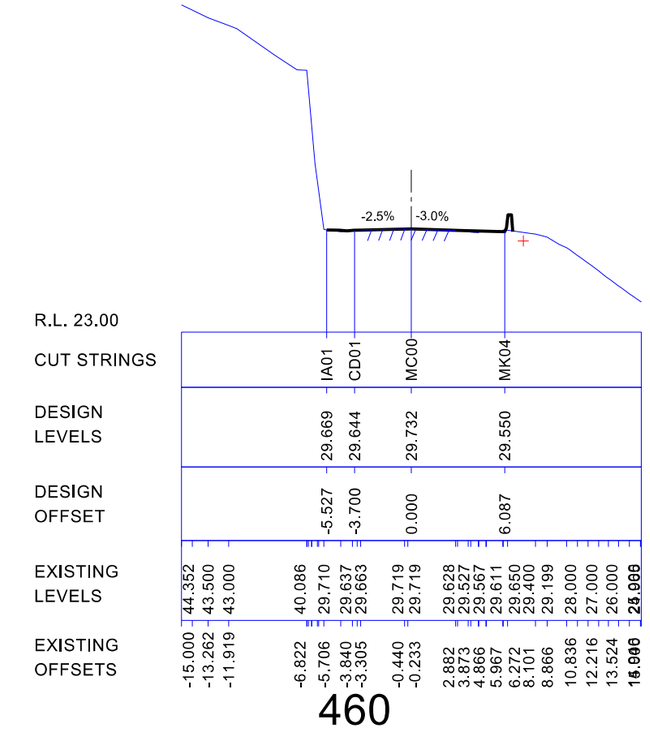
SHEET No.
RC-0005

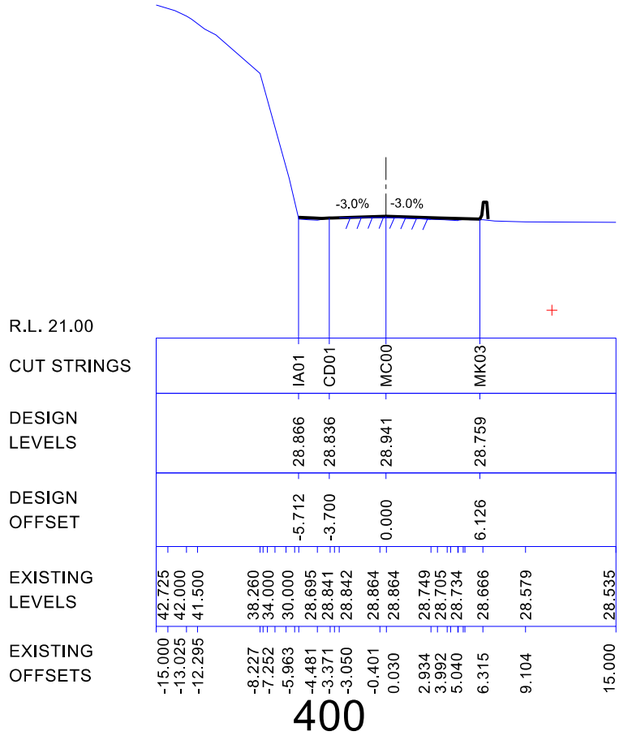
ISSUE
1

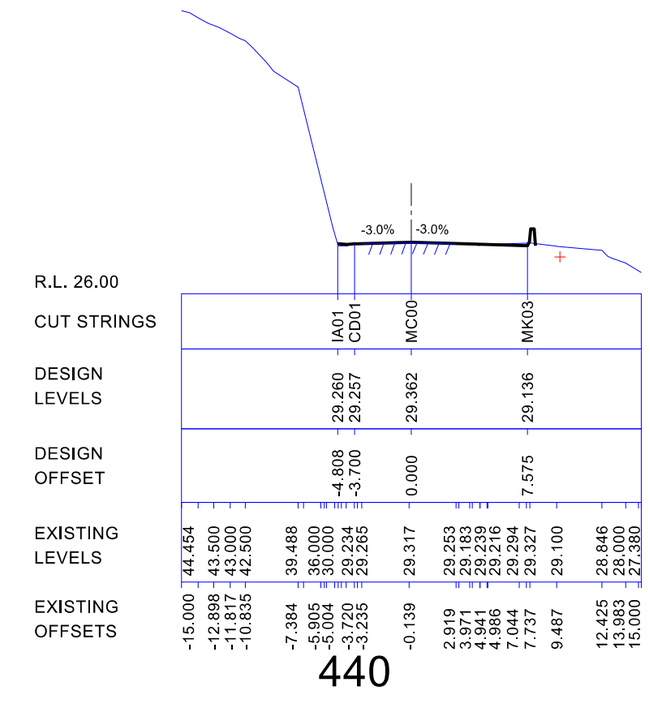
PRELIMINARY

PRELIMINARY CONCEPT DESIGN - 24/08/2020









NOT FOR CONSTRUCTION

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EXTERNAL REFERENCE FILES	REV / DATE / AMENDMENT / REVISION DESCRIPTION	WVR No. / APPROVAL	SCALES ON A3 SIZE DRAWING: 0 5 10 15, SCALE 1:400m
			CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES, WESTERN SYDNEY PROJECT OFFICE

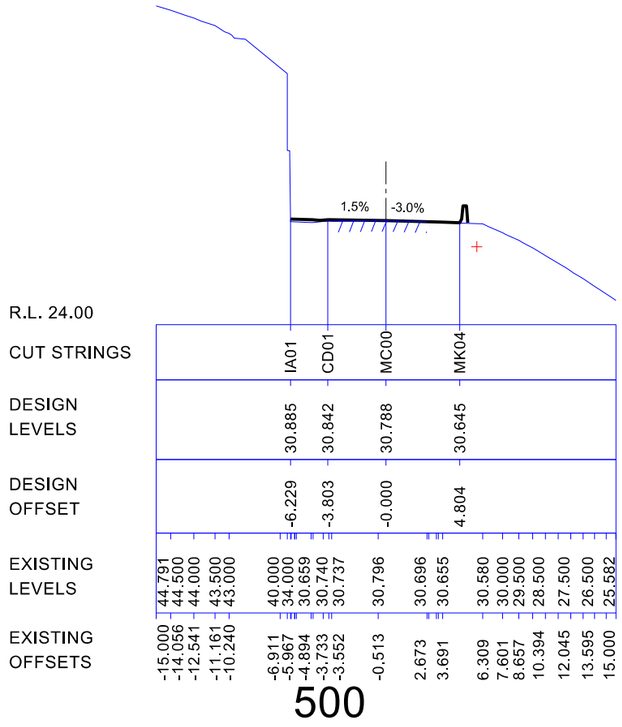
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY CROSS SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No. RC-0006 — ISSUE 1

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
50mm ON A3 SIZE ORIGINAL



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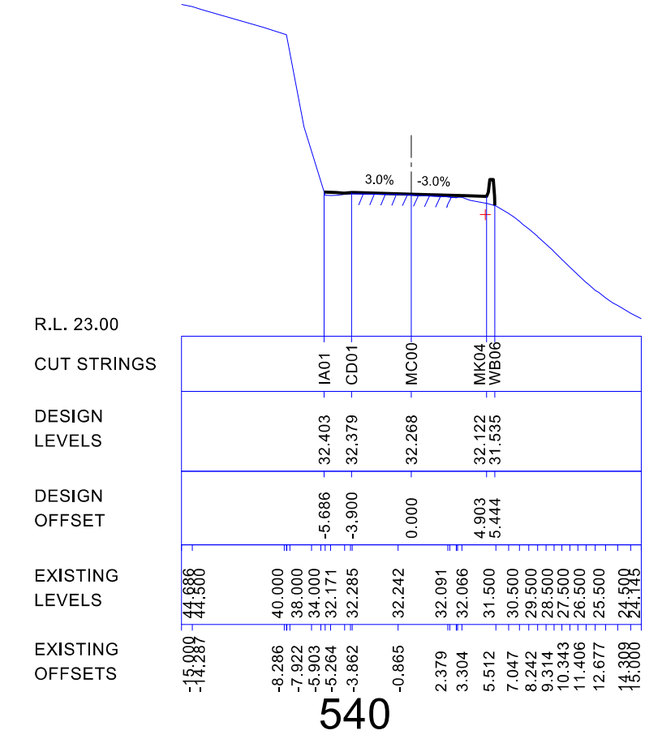

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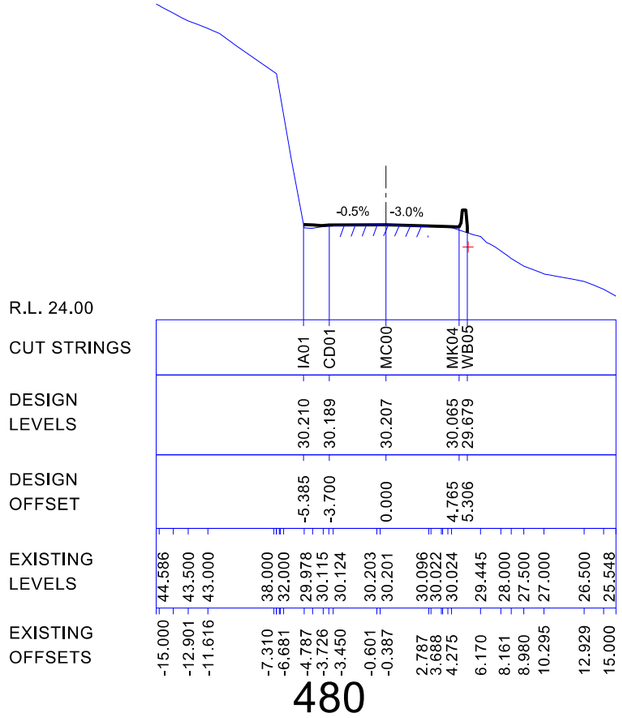

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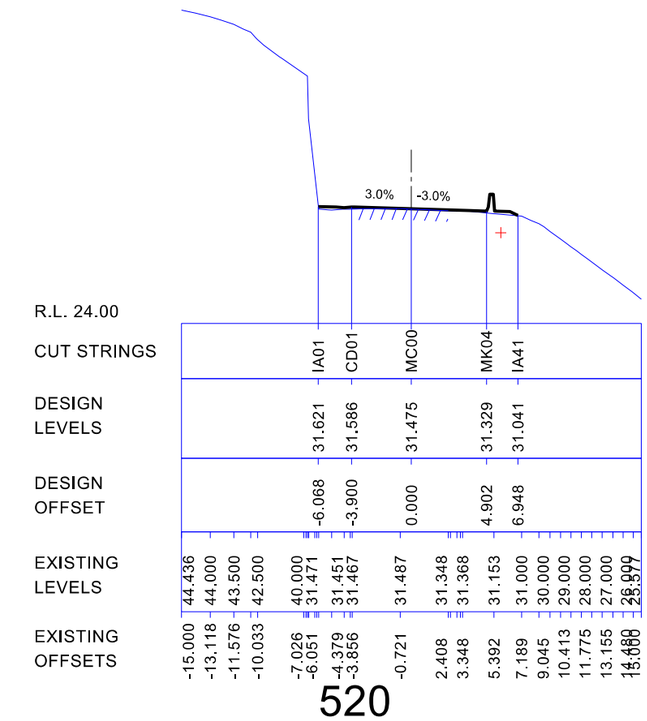


520

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RC-0007.dgn

PLOT DATE / TIME: 24/08/2020 1:07:57 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 SCALE 1:400m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

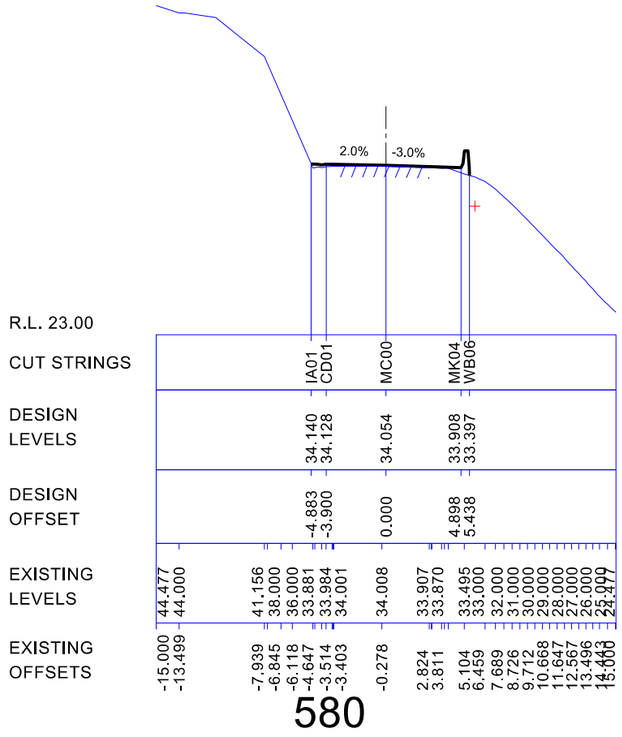
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

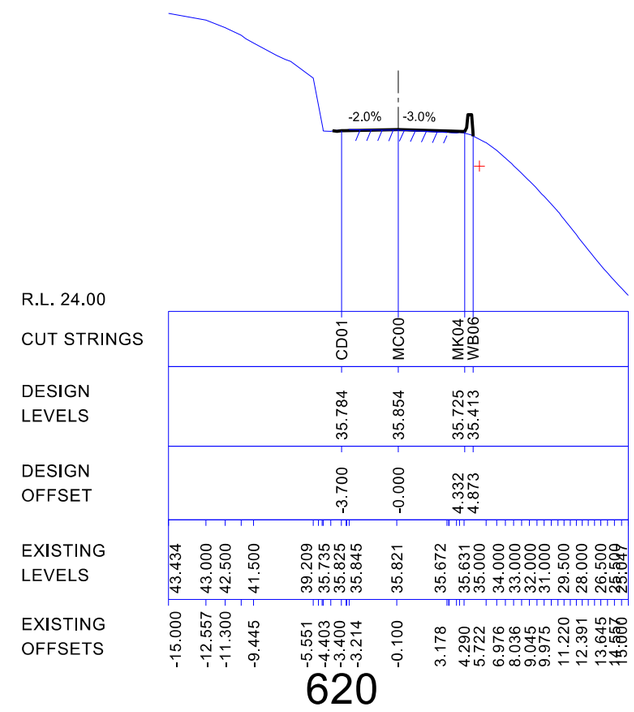
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

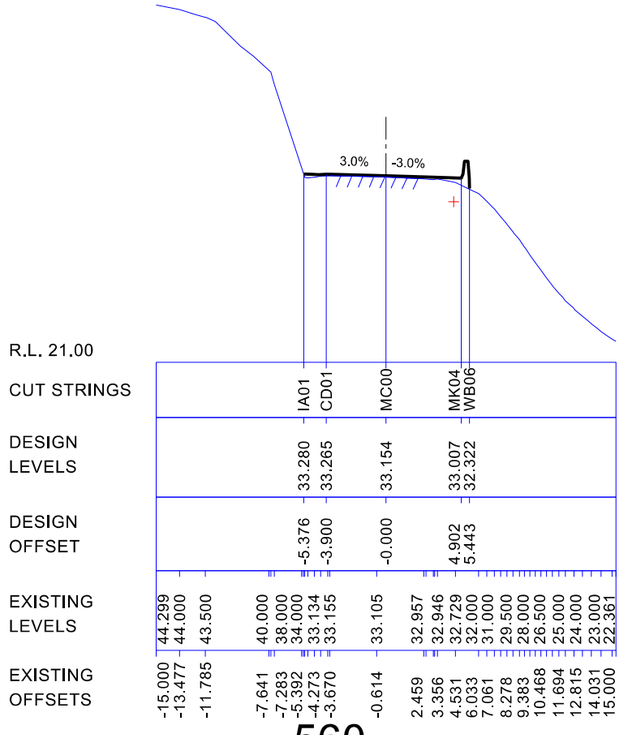
A3

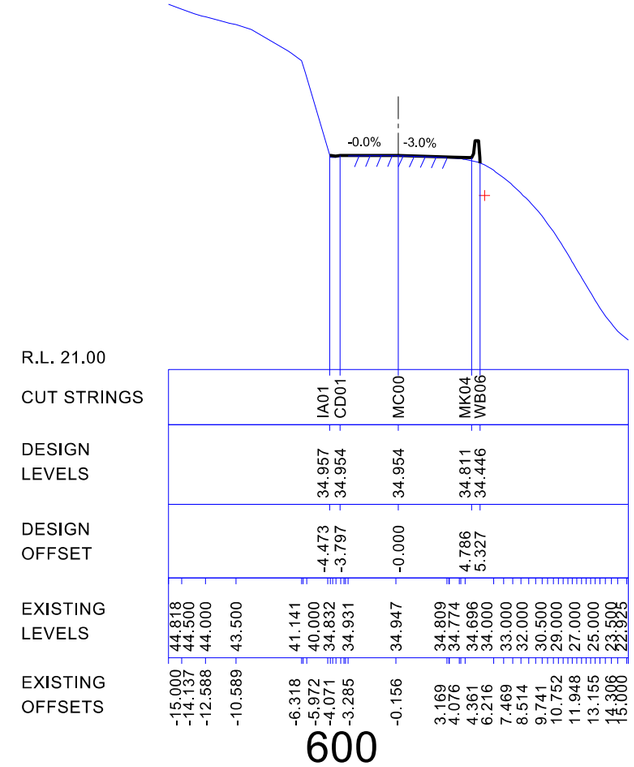
RMS REGISTRATION No. DS2020 / 000318 | PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No. RC-0007 | ISSUE 1









R.L. 23.00

CUT STRINGS	DESIGN LEVELS	DESIGN OFFSET
IA01	34.140	-4.883
CD01	34.128	-3.900
MC00	34.054	0.000
MK04	33.908	4.898
WB06	33.397	5.438

EXISTING LEVELS	EXISTING OFFSETS
44.477	-15.000
44.000	-13.499
41.156	-7.939
38.000	-6.845
36.000	-6.118
33.881	-4.647
33.984	-3.514
34.001	-3.403
34.008	-0.278
33.907	2.824
33.870	3.811
33.495	5.104
33.000	6.459
32.000	7.689
31.000	8.726
30.000	9.712
29.000	10.668
28.000	11.647
27.000	12.567
26.000	13.496
25.000	14.443
24.477	15.000

580

R.L. 24.00

CUT STRINGS	DESIGN LEVELS	DESIGN OFFSET
CD01	35.784	-3.700
MC00	35.854	-0.000
MK04	35.725	4.332
WB06	35.413	4.873

EXISTING LEVELS	EXISTING OFFSETS
43.434	-15.000
43.000	-12.557
42.500	-11.300
41.500	-9.445
39.209	-5.551
35.735	-4.403
35.825	-3.400
35.845	-3.214
35.821	-0.100
35.672	3.178
35.631	4.290
35.000	5.722
34.000	6.976
33.000	8.036
32.000	9.045
31.000	9.975
29.500	11.220
28.000	12.391
26.500	13.645
25.500	14.557
25.047	15.000

620

R.L. 21.00

CUT STRINGS	DESIGN LEVELS	DESIGN OFFSET
IA01	33.280	-5.376
CD01	33.265	-3.900
MC00	33.154	-0.000
MK04	33.007	4.902
WB06	32.322	5.443

EXISTING LEVELS	EXISTING OFFSETS
44.299	-15.000
44.000	-13.477
43.500	-11.785
40.000	-7.641
38.000	-7.283
34.000	-5.392
33.134	-4.273
33.155	-3.670
33.105	-0.614
32.957	2.459
32.946	3.356
32.729	4.531
32.000	6.033
31.000	7.061
29.500	8.278
28.000	9.383
26.500	10.468
25.000	11.694
24.000	12.815
23.000	14.031
22.361	15.000

560

R.L. 21.00

CUT STRINGS	DESIGN LEVELS	DESIGN OFFSET
IA01	34.957	-4.473
CD01	34.954	-3.797
MC00	34.954	-0.000
MK04	34.811	4.786
WB06	34.446	5.327

EXISTING LEVELS	EXISTING OFFSETS
44.818	-15.000
44.500	-14.137
44.000	-12.588
43.500	-10.589
41.141	-6.318
40.000	-5.972
34.832	-4.071
34.931	-3.285
34.947	-0.156
34.809	3.169
34.774	4.076
34.696	4.361
34.000	6.216
33.000	7.469
32.000	8.514
30.500	9.741
29.000	10.752
27.000	11.948
25.000	13.155
23.500	14.306
22.925	15.000

600

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-RC-0008.dgn

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME
24/08/2020 1:07:57 PM

PLOT BY
jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS

A3

RMS REGISTRATION No. DS2020 / 000318

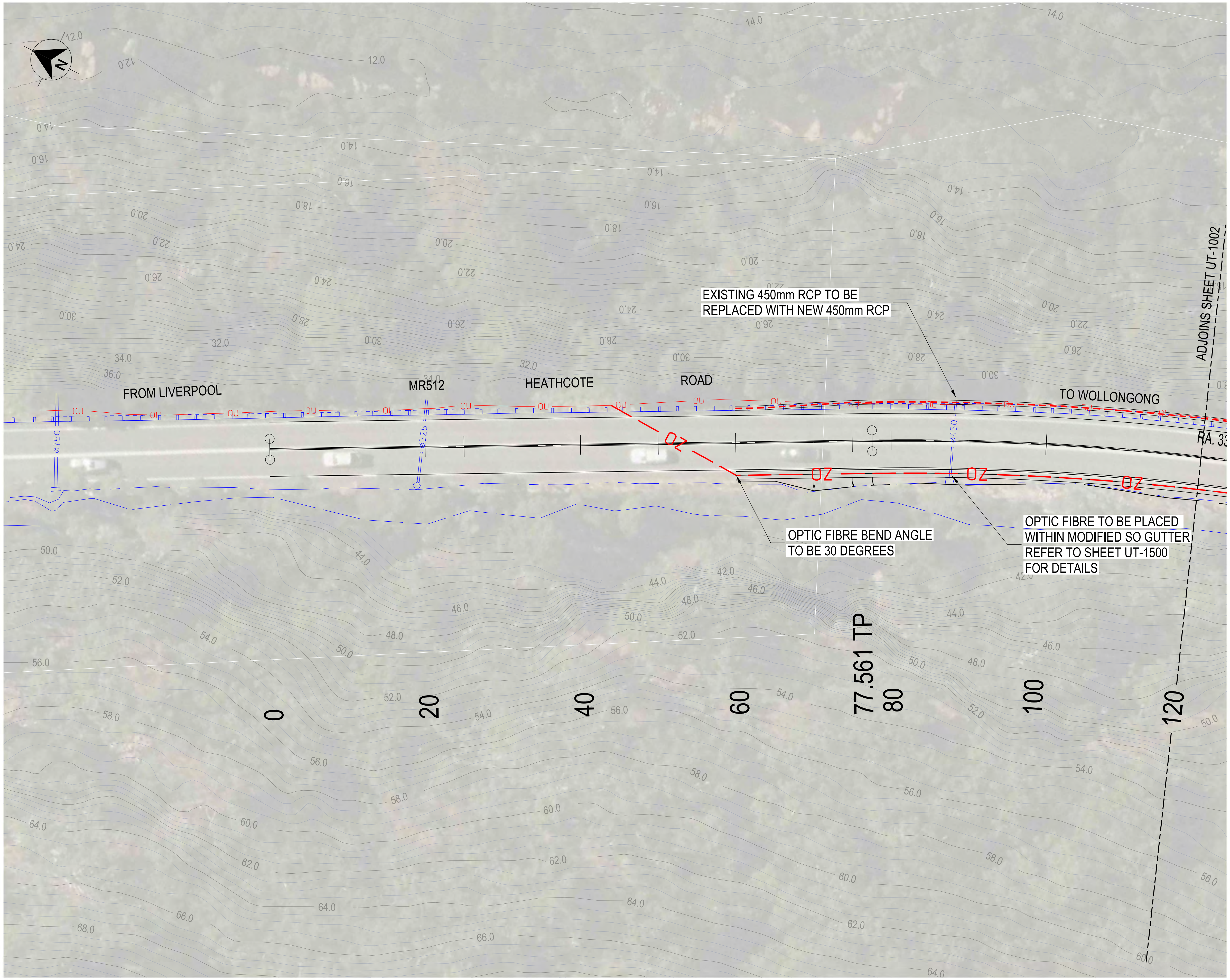
PART
1

ISSUE STATUS
DESIGN STAGE - CONCEPT

EDMS No.

SHEET No.
RC-0008

ISSUE
1



LEGEND

- OU — EXISTING AARNET OPTIC FIBRE
- OZ — PROPOSED RELOCATION OF AARNET OPTIC FIBRE

NOTES

1. The utilities depicted on this drawing have been surveyed and are shown on TFNSW drawings DS2020 / xxxxxx. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plan obtained by dialing Ph 1100 or fax 1300 652 077 (Dial Before You Dig). caution should be exercised when working in the vicinity of all utility services.
2. The drainage design shown on this drawing is indicative only.

NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING — FILE NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1001.dgn

PLOT DATE / TIME: 24/08/2020 1:07:58 PM — PLOT BY: jshenouda

EXTERNAL REFERENCE FILES | REV | DATE | AMENDMENT / REVISION DESCRIPTION | WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 — SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY: TRANSPORT FOR NSW, INFRASTRUCTURE AND PLACE, TECHNICAL & PROJECT SERVICES, ENGINEERING SERVICES, ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT — Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES, WESTERN SYDNEY PROJECT OFFICE

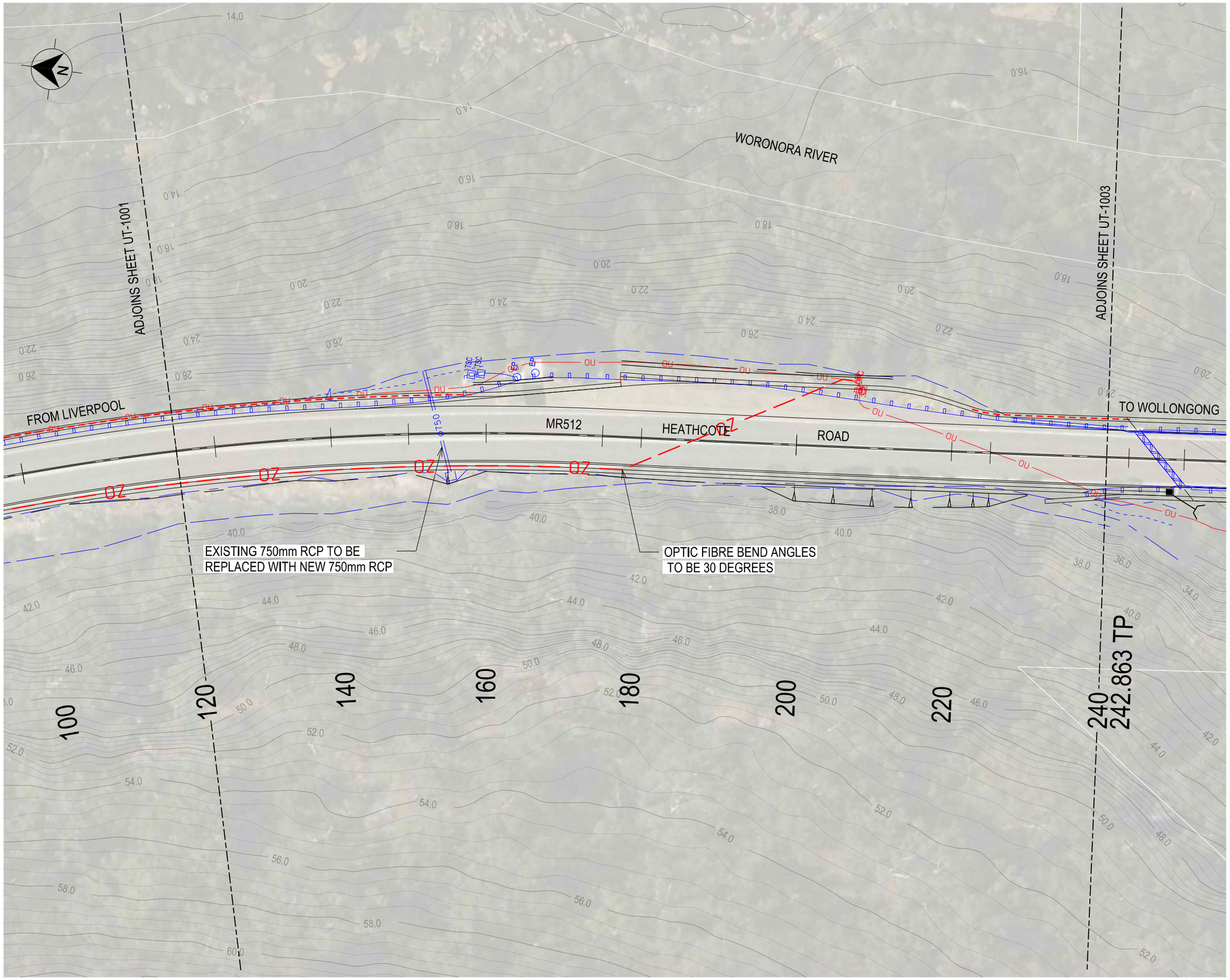
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
UTILITIES AND DRAINAGE - PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No. UT-1001 — ISSUE 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

OU — EXISTING AARNET OPTIC FIBRE

OZ — PROPOSED RELOCATION OF AARNET OPTIC FIBRE

NOTES

1. The utilities depicted on this drawing have been surveyed and are shown on TFNSW drawings DS2020 / xxxxxx. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plan obtained by dialing Ph 1100 or fax 1300 652 077 (Dial Before You Dig). caution should be exercised when working in the vicinity of all utility services.

2. The drainage design shown on this drawing is indicative only.

NOT FOR CONSTRUCTION

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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1002.dgn

PLOT DATE / TIME: 24/08/2020 1:08:02 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

	NAME	DATE
TITLE		
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

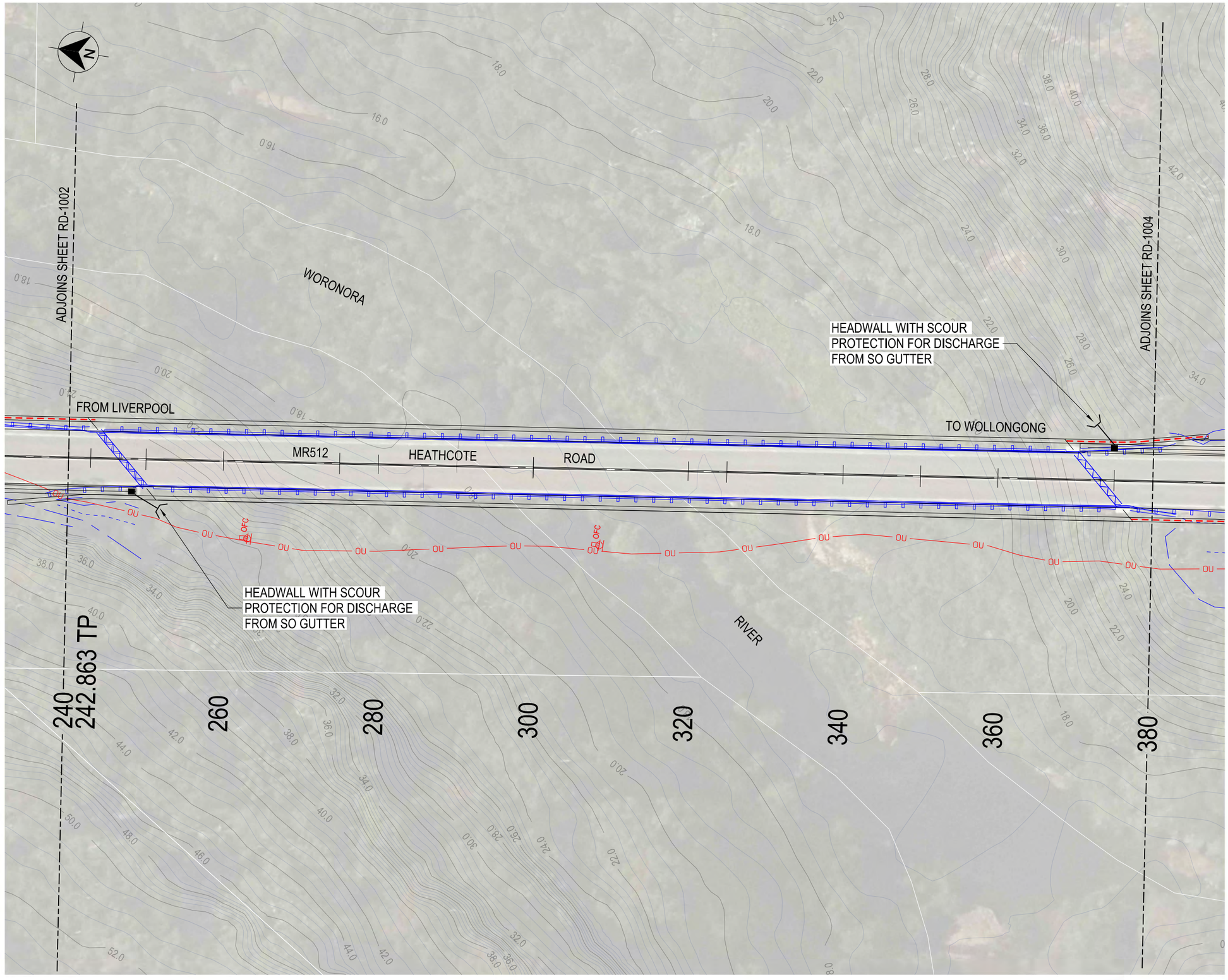
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
UTILITIES AND DRAINAGE - PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 | PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No. UT-1002 | ISSUE 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

OU — EXISTING AARNET OPTIC FIBRE

OZ — PROPOSED RELOCATION OF AARNET OPTIC FIBRE

NOTES

1. The utilities depicted on this drawing have been surveyed and are shown on TFNSW drawings DS2020 / xxxxxx. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plan obtained by dialing Ph 1100 or fax 1300 652 077 (Dial Before You Dig). caution should be exercised when working in the vicinity of all utility services.

2. The drainage design shown on this drawing is indicative only.

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME	C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn
DESIGN LOT CODE	
DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1003.dgn
PLOT DATE / TIME	24/08/2020 1:08:09 PM
PLOT BY	jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING

0 5 10 15 20

SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56

HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY

TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

	NAME	DATE
TITLE		
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
UTILITIES AND DRAINAGE - PLAN

A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

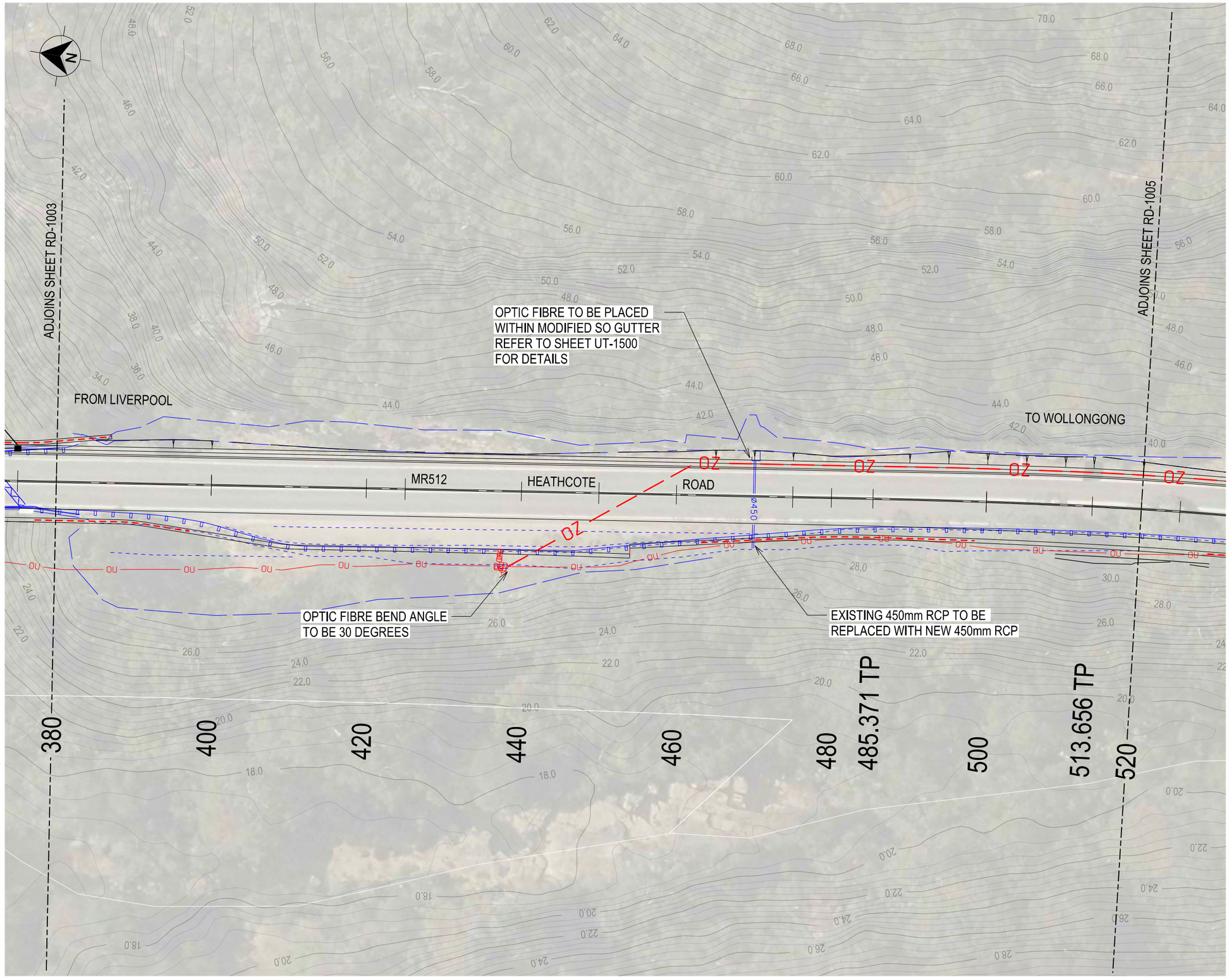
ISSUE STATUS: DESIGN STAGE - CONCEPT

EDMS No.:

SHEET No.: UT-1003

ISSUE: 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

OU — EXISTING AARNET OPTIC FIBRE

OZ — PROPOSED RELOCATION OF AARNET OPTIC FIBRE

NOTES

1. The utilities depicted on this drawing have been surveyed and are shown on TFNSW drawings DS2020 / xxxxxx. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plan obtained by dialing Ph 1100 or fax 1300 652 077 (Dial Before You Dig). caution should be exercised when working in the vicinity of all utility services.

2. The drainage design shown on this drawing is indicative only.

NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1004.dgn

PLOT DATE / TIME: 24/08/2020 1:08:10 PM
PLOT BY: jshenouda

CLIENT: NSW GOVERNMENT Transport for NSW

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
UTILITIES AND DRAINAGE - PLAN

A3

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

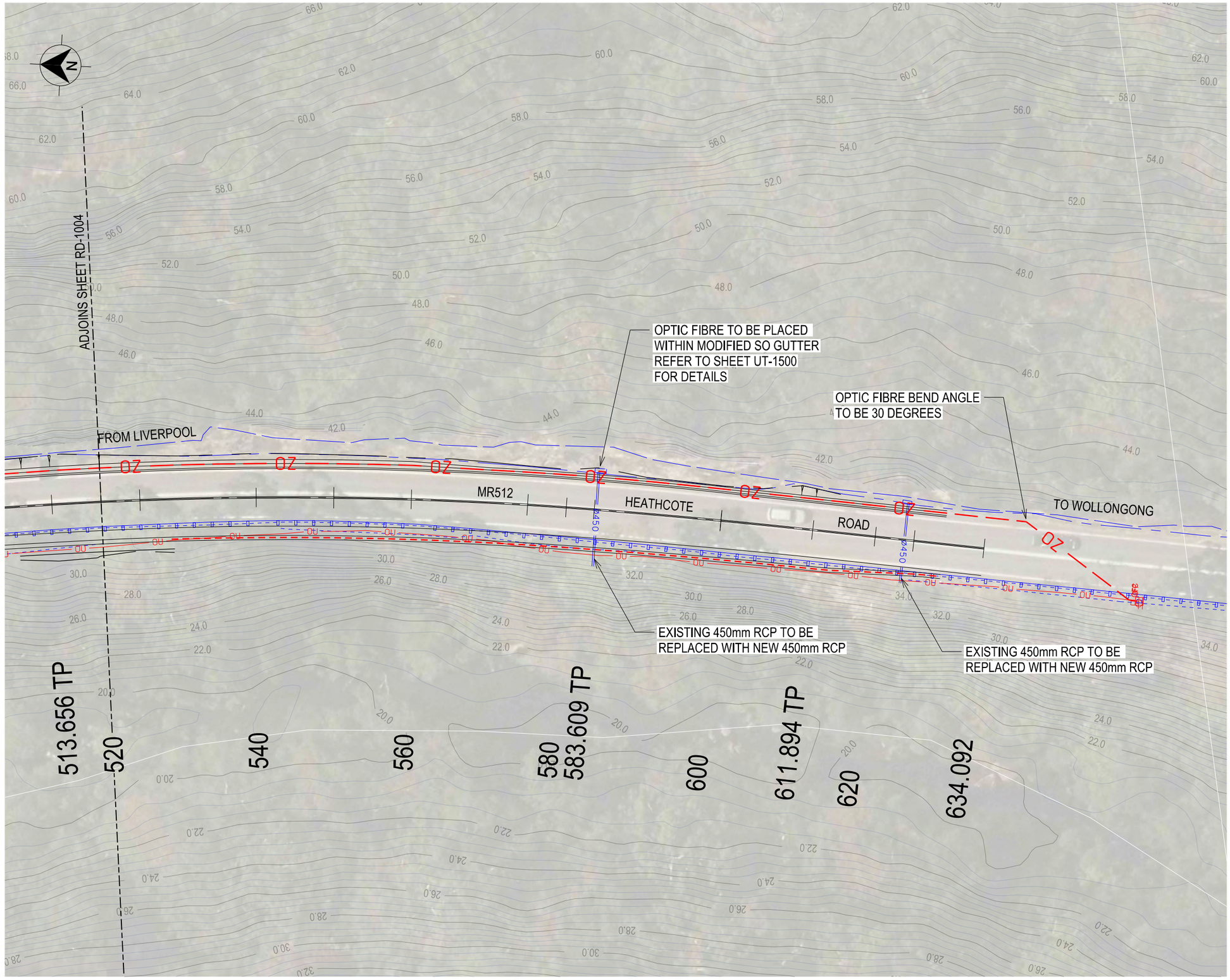
	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

RMS REGISTRATION No. DS2020 / 000318 — PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.:
SHEET No.: UT–1004
ISSUE: 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020



LEGEND

OU — EXISTING AARNET OPTIC FIBRE

OZ — PROPOSED RELOCATION OF AARNET OPTIC FIBRE

NOTES

1. The utilities depicted on this drawing have been surveyed and are shown on TFNSW drawings DS2020 / xxxxxx. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plan obtained by dialing Ph 1100 or fax 1300 652 077 (Dial Before You Dig). caution should be exercised when working in the vicinity of all utility services.

2. The drainage design shown on this drawing is indicative only.

NOT FOR CONSTRUCTION

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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1005.dgn

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 | HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME: 24/08/2020 1:08:13 PM | PLOT BY: jshenouda

	NAME	DATE
TITLE		
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

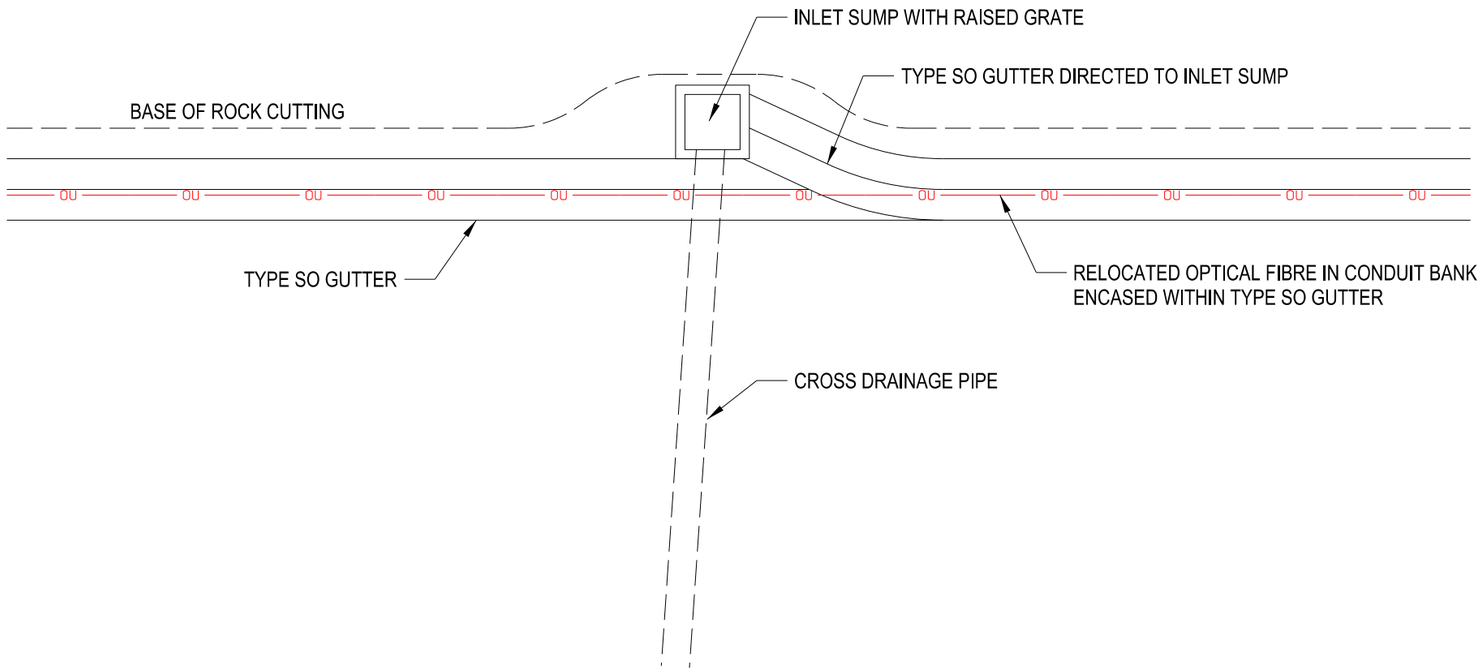
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY UTILITIES AND DRAINAGE - PLAN

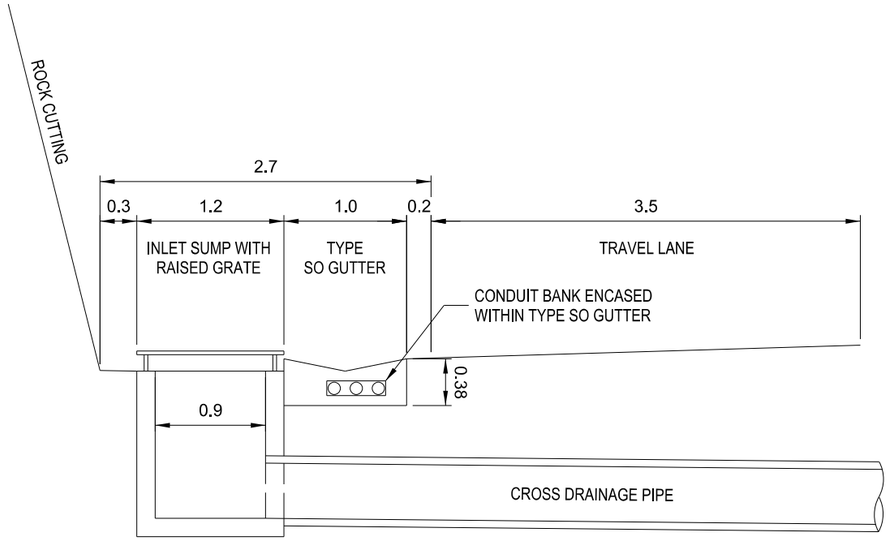
A3

RMS REGISTRATION No. DS2020 / 000318 | PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No. UT-1005 | ISSUE 1



PLAN VIEW



SECTION VIEW

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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Details-NTS.dgn

DESIGN LOT CODE:

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-UT-1500.dgn

PLOT DATE / TIME: 24/08/2020 1:08:16 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: NOT TO SCALE

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

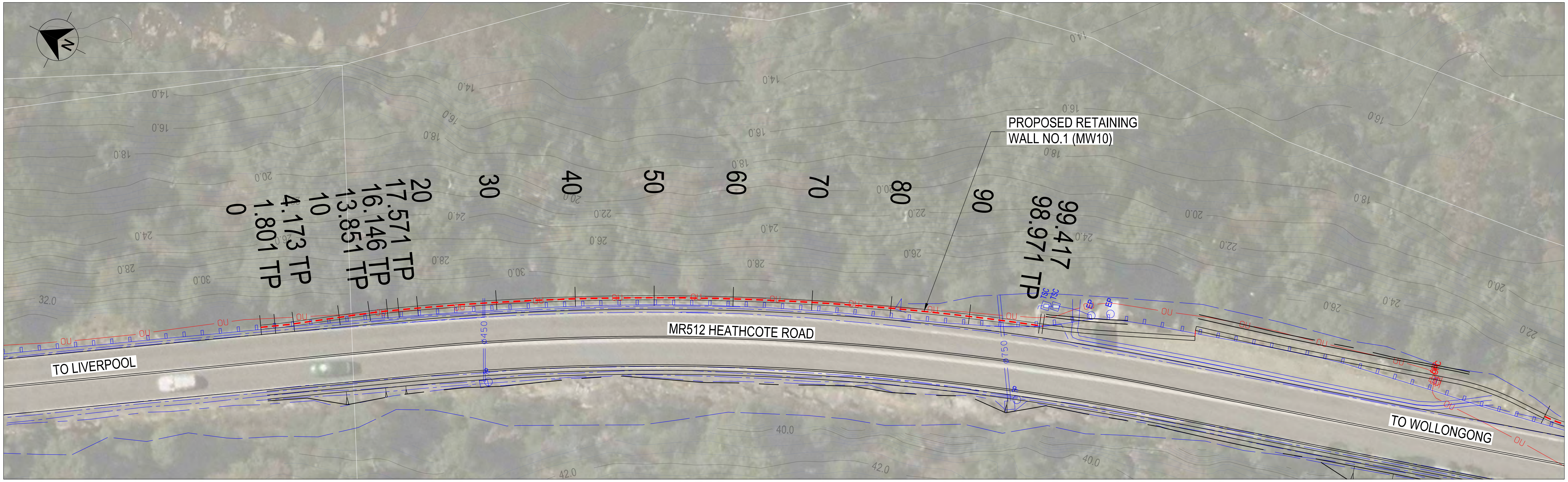
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY DRAINAGE AND UTILITIES - DETAILS

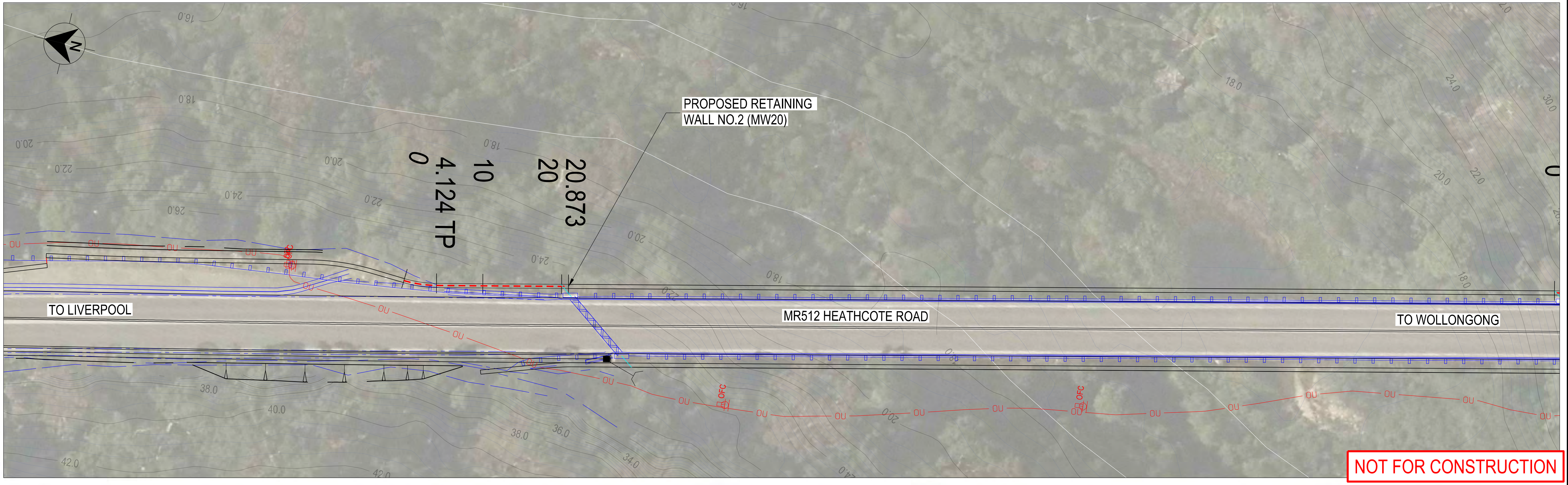
A3

RMS REGISTRATION No.: DS2020 / 000318
PART: 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.:
SHEET No.: UT-1500
ISSUE: 1

PRELIMINARY CONCEPT DESIGN - 24/08/2020





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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Plan-1-500.dgn				DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING — FILE NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1100.dgn	
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 SCALE 1:500m	DRAWINGS / DESIGN PREPARED BY: TRANSPORT FOR NSW INFRASTRUCTURE AND PLACE TECHNICAL & PROJECT SERVICES ENGINEERING SERVICES ROAD DESIGN ENGINEERING
						CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD	

PLOT DATE / TIME		PLOT BY
24/08/2020 1:08:19 PM		jshenouda
TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

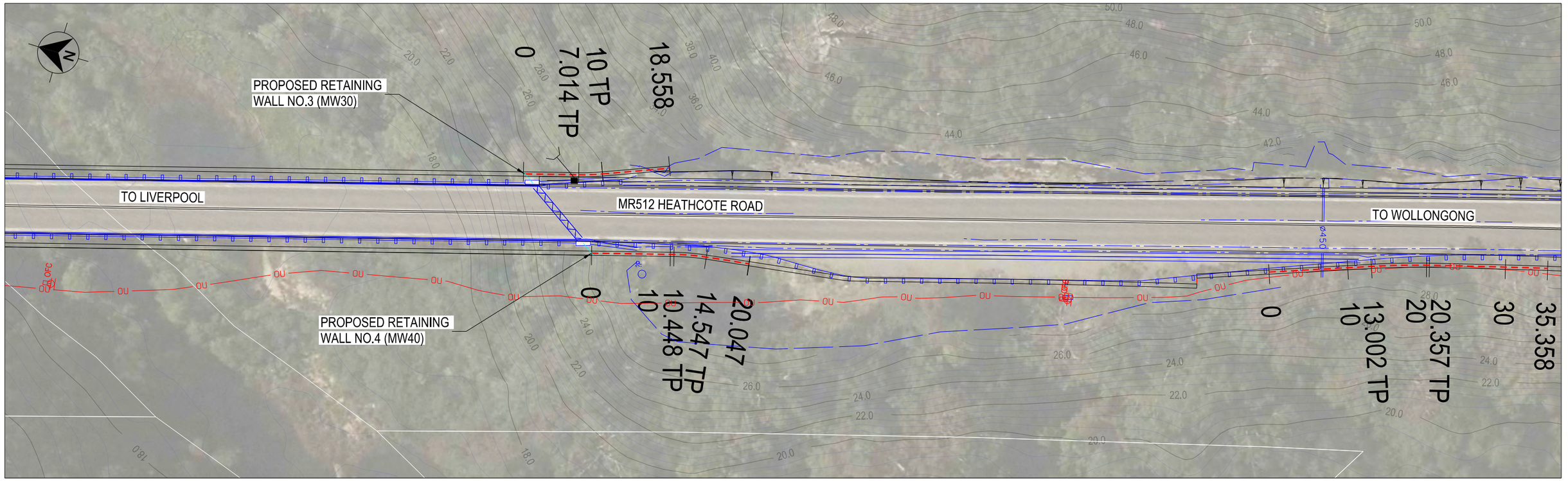
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

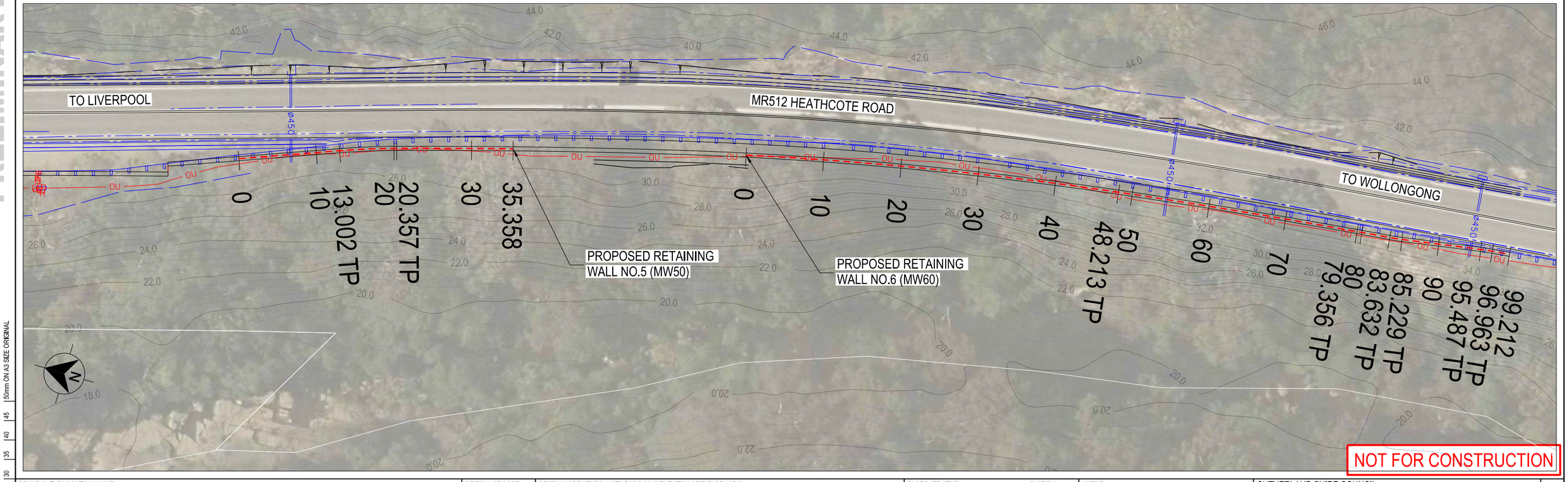
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
PLAN VIEW: RETAINING WALLS 1 & 2

A3

RMS REGISTRATION No.	DS2020 / 000318		PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT	EDMS No.	SHEET No. ST-1100	ISSUE 1

PRELIMINARY





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50mm ON A3 SIZE ORIGINAL

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DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING — FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1101.dgn					
EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 20 — SCALE 1:500m

CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME: 24/08/2020 1:08:20 PM — PLOT BY: jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

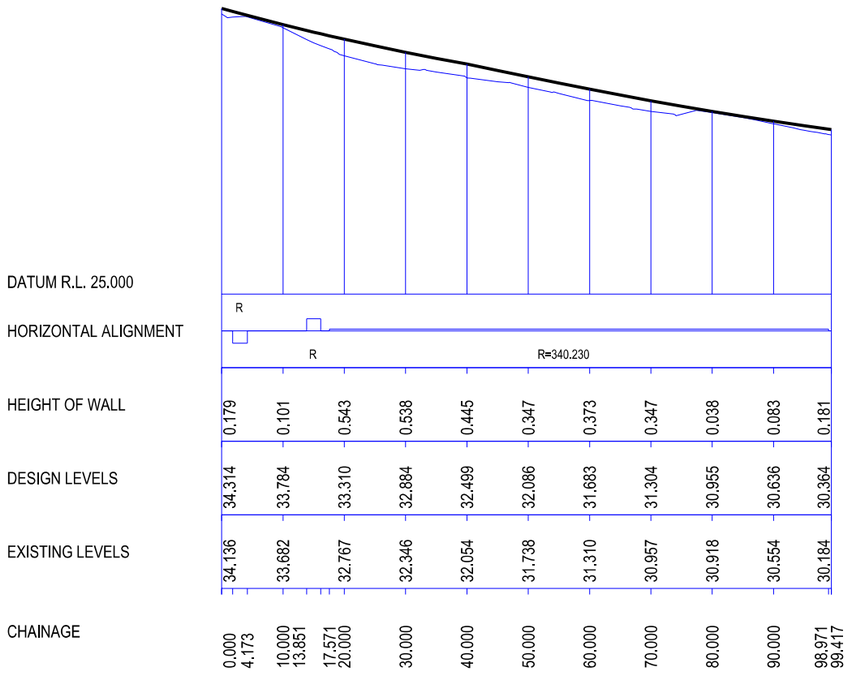
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
PLAN VIEW: RETAINING WALLS 3 TO 6

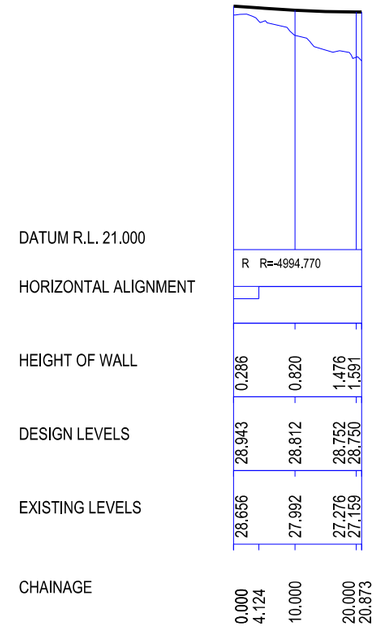
A3

RMS REGISTRATION No. DS2020 / 000318 — PART 1

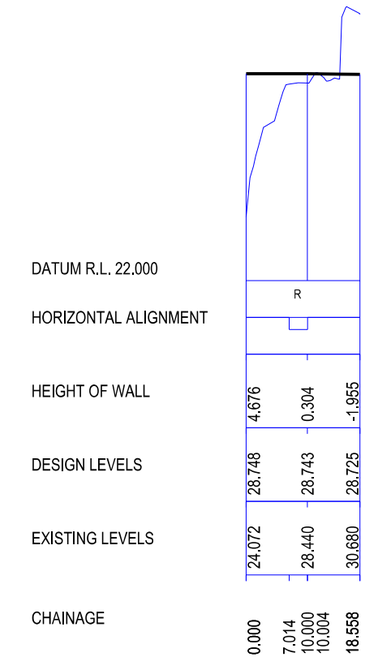
ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No. ST-1101 — ISSUE 1



LONGITUDINAL SECTION - RETAINING WALL 1 (MW10)



LONGITUDINAL SECTION
RETAINING WALL 2 (MW20)



LONGITUDINAL SECTION
RETAINING WALL 3 (MW30)

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1200.dgn

PLOT DATE / TIME: 24/08/2020 1:08:22 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 10 20 30 40
HORIZONTAL SCALE 1:1000m
0 2 4 6 8
VERTICAL SCALE 1:200m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

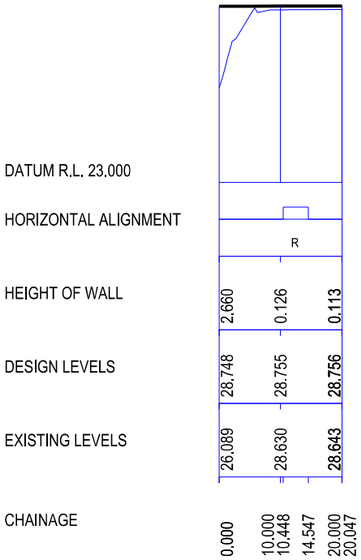
CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

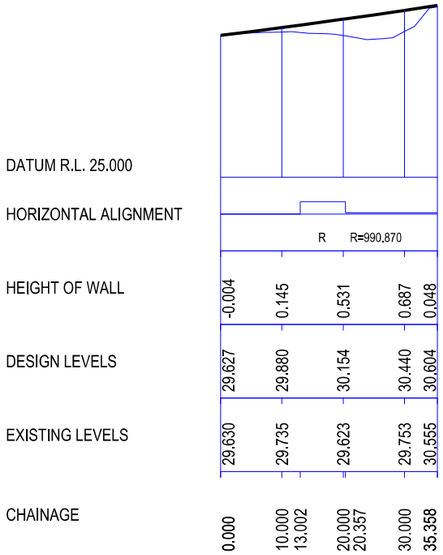
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS: RETAINING WALLS 1 - 3

A3

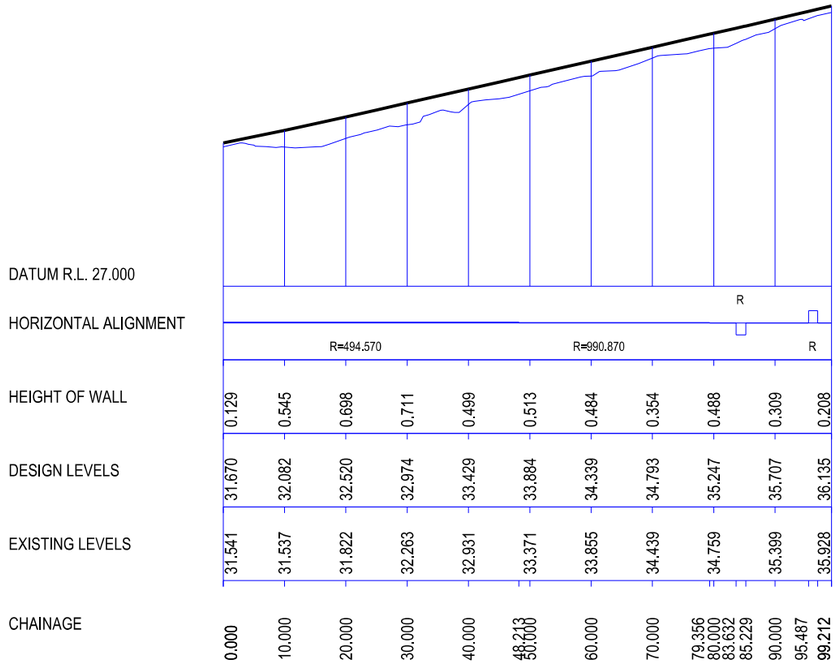
RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. ST-1200
ISSUE 1



LONGITUDINAL SECTION ALONG RETAINING WALL 4 (MW40)



LONGITUDINAL SECTION ALONG RETAINING WALL 5 (MW50)



LONGITUDINAL SECTION ALONG RETAINING WALL 6 (MW60)

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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Longsection-1-1000.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1201.dgn

PLOT DATE / TIME: 24/08/2020 1:08:23 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
HORIZONTAL SCALE 1:1000m (0 10 20 30 40)
VERTICAL SCALE 1:200m (0 2 4 6 8)

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

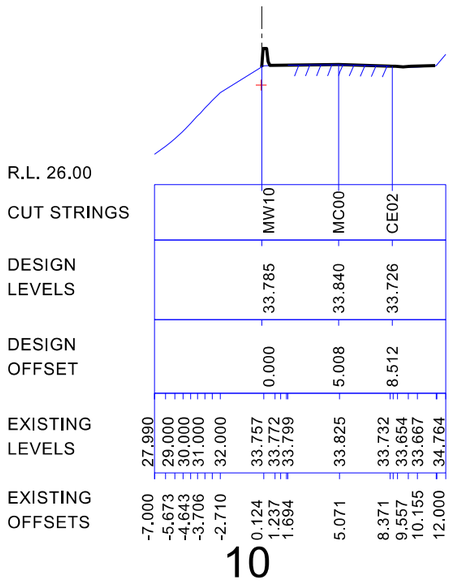
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

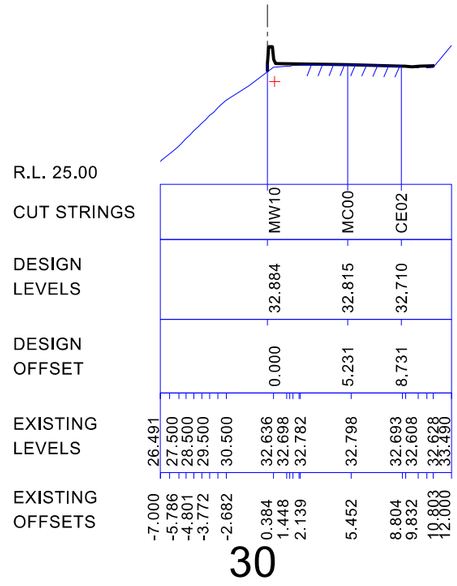
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
LONGITUDINAL SECTIONS: RETAINING WALLS 4 TO 6

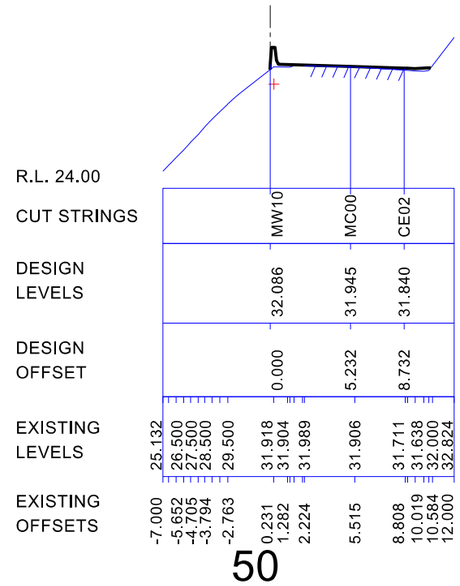
A3

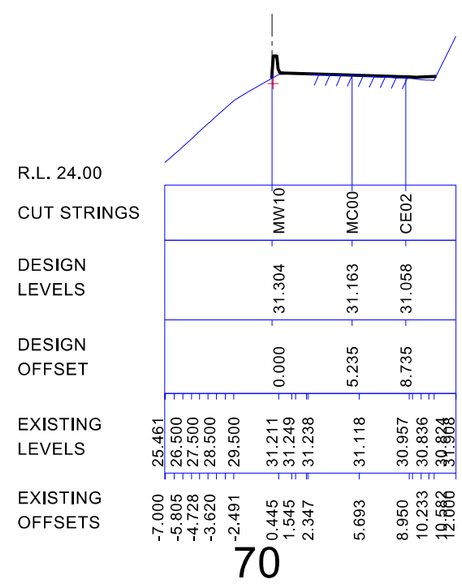
RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. ST-1201
ISSUE 1

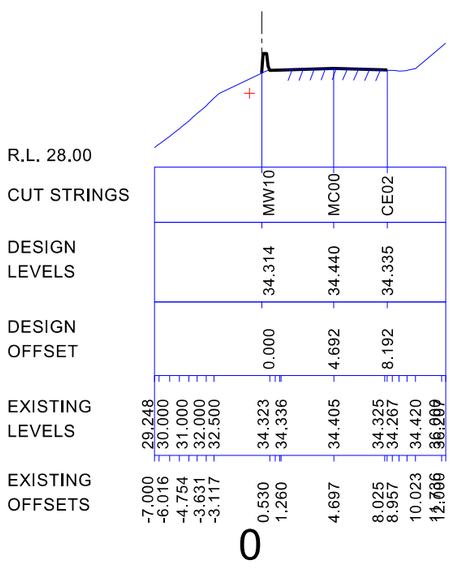
PRELIMINARY CONCEPT DESIGN - 24/08/2020

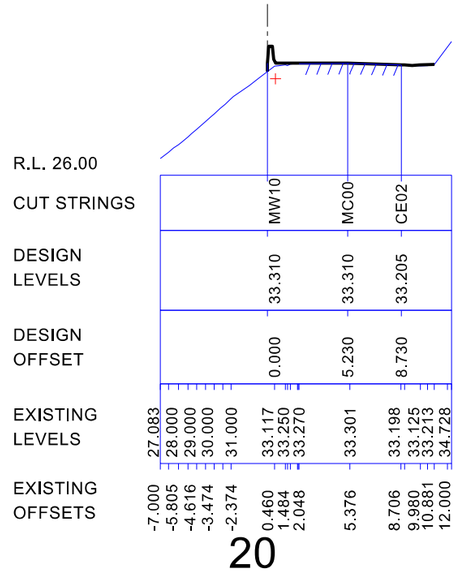


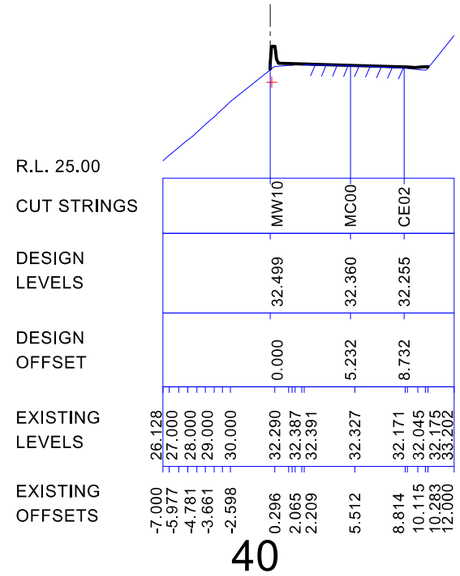


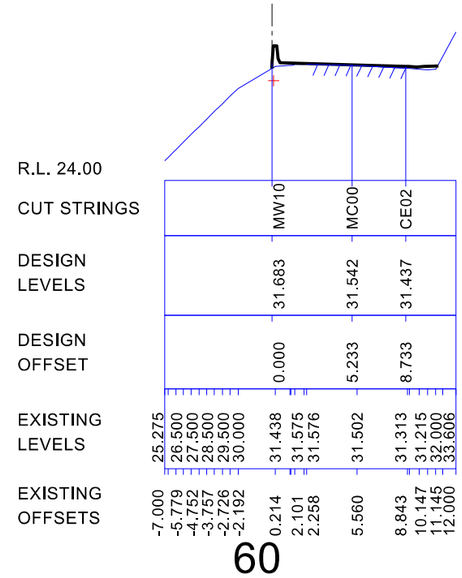












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50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn	DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1300.dgn	PLOT DATE / TIME: 24/08/2020 1:08:23 PM — PLOT BY: jshenouda
EXTERNAL REFERENCE FILES	REV / DATE / AMENDMENT / REVISION DESCRIPTION	WVR No. / APPROVAL	SCALES ON A3 SIZE DRAWING: 0 5 10 15 SCALE 1:400m
		CO-ORDINATE SYSTEM: MGA ZONE 56 — HEIGHT DATUM: AHD	DRAWINGS / DESIGN PREPARED BY: TRANSPORT FOR NSW, INFRASTRUCTURE AND PLACE, TECHNICAL & PROJECT SERVICES, ENGINEERING SERVICES, ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

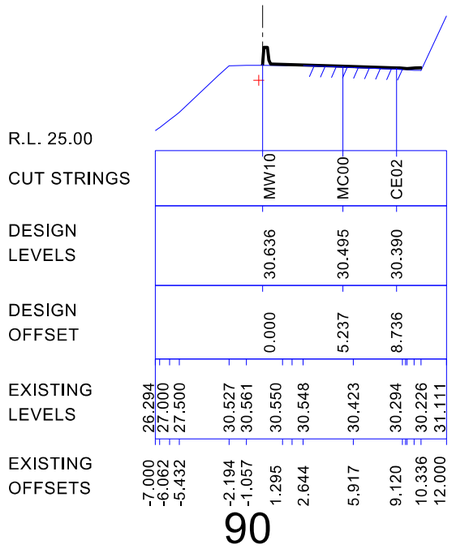
PREPARED FOR: TECHNICAL & PROJECT SERVICES, WESTERN SYDNEY PROJECT OFFICE

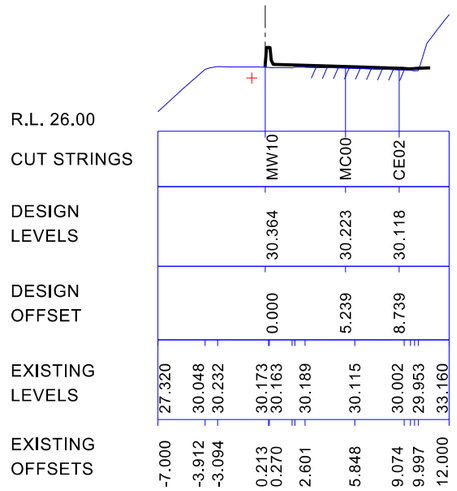
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 1

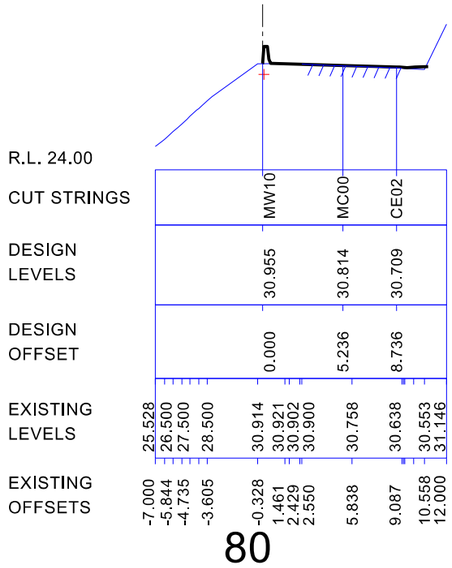
A3

RMS REGISTRATION No.: DS2020 / 000318 — PART: 1

ISSUE STATUS: DESIGN STAGE - CONCEPT — EDMS No. — SHEET No.: ST-1300 — ISSUE: 1







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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1301.dgn

PLOT DATE / TIME: 24/08/2020 1:08:23 PM
PLOT BY: jshenouda

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 SCALE 1:400m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

	NAME	DATE
TITLE		
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

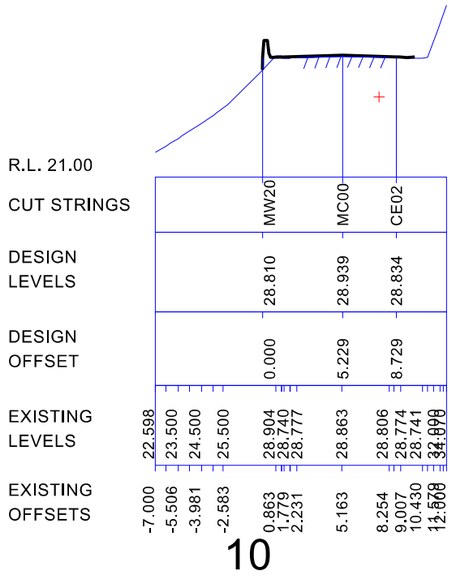
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

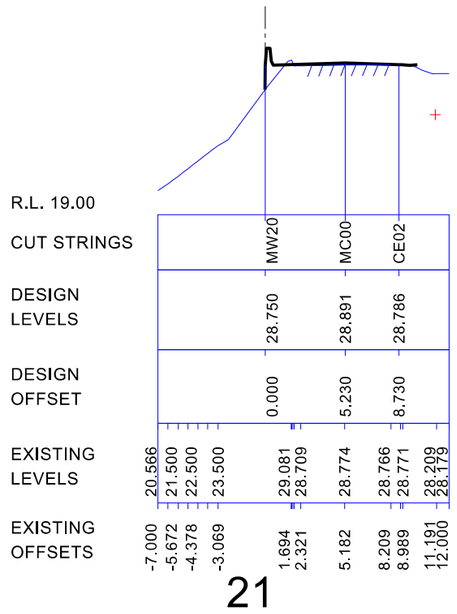
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 1

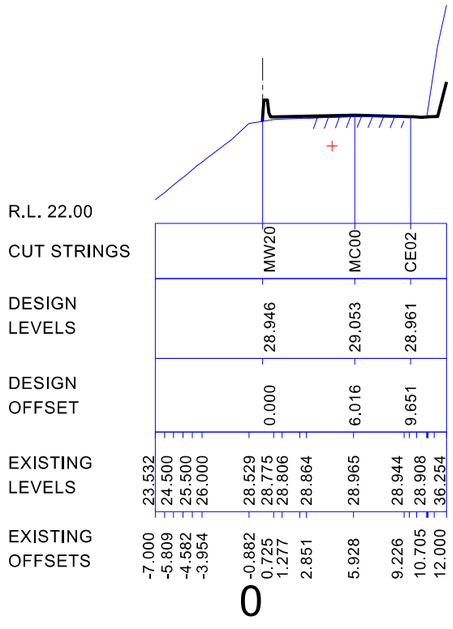
A3

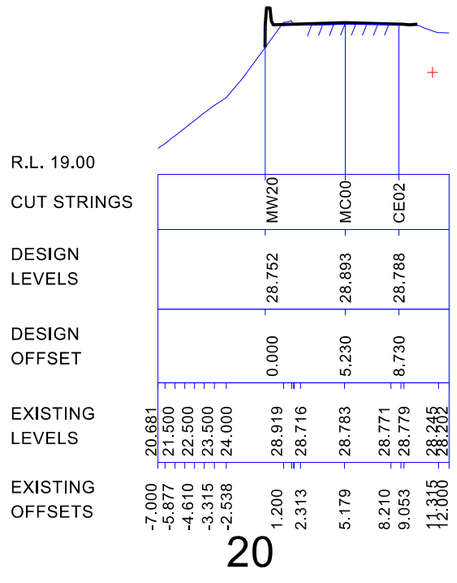
RMS REGISTRATION No. DS2020 / 000318
PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.:
SHEET No. ST-1301
ISSUE 1









THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

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NOT FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME
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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME
24/08/2020 1:08:24 PM

PLOT BY
jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 2

A3

RMS REGISTRATION No. DS2020 / 000318

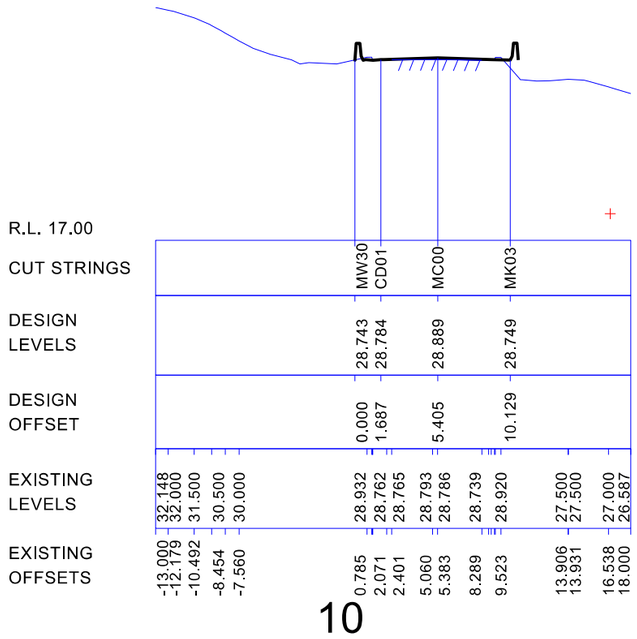
PART
1

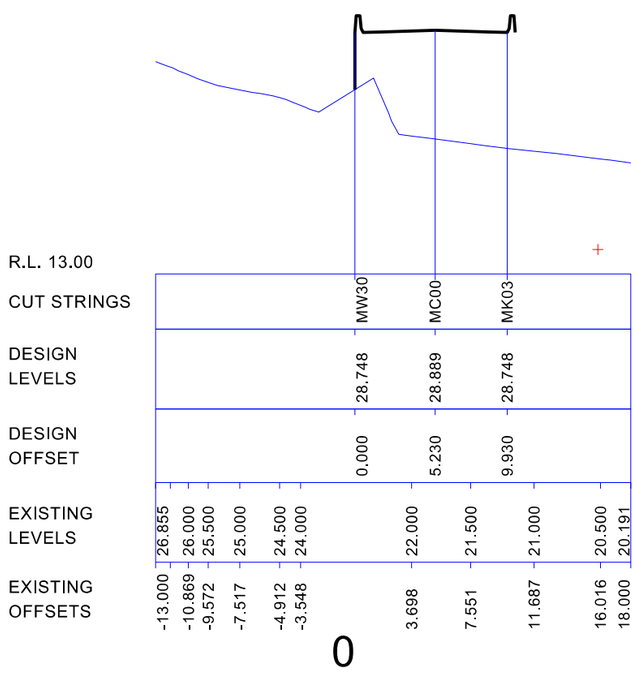
ISSUE STATUS
DESIGN STAGE - CONCEPT

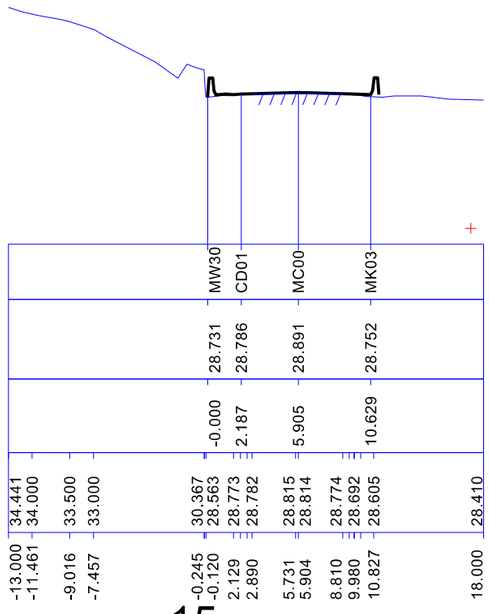
EDMS No.

SHEET No.
ST-1302

ISSUE
1







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DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
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SCALE 1:400m

CO-ORDINATE SYSTEM
MGA ZONE 56

HEIGHT DATUM
AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME
24/08/2020 1:08:24 PM

PLOT BY
jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT
NSW GOVERNMENT Transport for NSW

PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 3

A3

RMS REGISTRATION No. DS2020 / 000318

PART 1

ISSUE STATUS
DESIGN STAGE - CONCEPT

EDMS No.

SHEET No.
ST-1303

ISSUE
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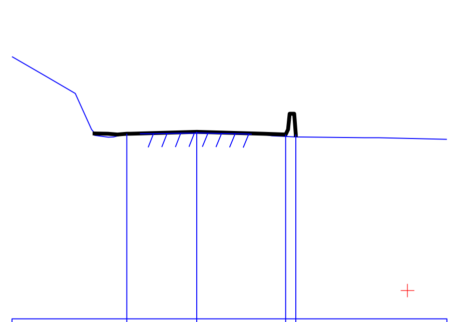

R.L. 19.00

CUT STRINGS	CD01	MC00	MK03									
DESIGN LEVELS	28.791	28.896	28.755									
DESIGN OFFSET	-8.930	-5.230	-0.530									
EXISTING LEVELS	32.750	30.921	28.713	28.776	28.790	28.831	28.832	28.774	28.686	28.630	28.582	28.498
EXISTING OFFSETS	-15.000	-11.652	-10.640	-9.008	-8.239	-5.424	-5.217	-2.331	-1.234	-0.017	3.717	8.000

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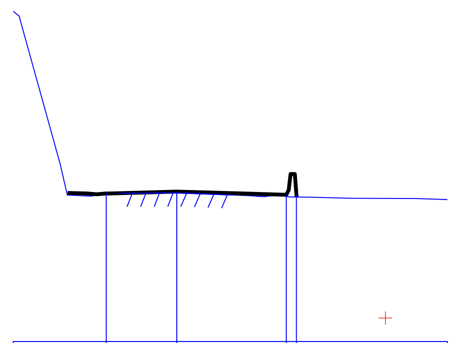

R.L. 21.00

CUT STRINGS	CD01	MC00	MK03	MW40									
DESIGN LEVELS	28.830	28.932	28.756	28.756									
DESIGN OFFSET	-10.074	-6.338	-0.530	0.000									
EXISTING LEVELS	38.452	32.000	28.752	28.824	28.836	28.862	28.861	28.745	28.708	28.738	28.651	28.573	28.470
EXISTING OFFSETS	-15.000	-12.943	-12.131	-10.052	-9.413	-6.714	-6.310	-3.382	-2.375	-1.141	-0.379	2.877	8.000

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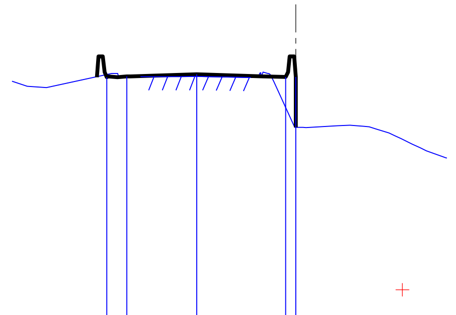

R.L. 16.00

CUT STRINGS	MK02	CD01	MC00	MK03								
DESIGN LEVELS	28.746	28.784	28.889	28.748								
DESIGN OFFSET	-9.985	-8.930	-5.230	-0.530								
EXISTING LEVELS	28.500 / 28.520	28.932	28.757	28.762	28.785	28.777	28.723	28.928	26.000	25.500	25.000	24.466
EXISTING OFFSETS	-15.000 / -14.996	-9.738	-8.545	-8.215	-5.631	-5.260	-2.372	-1.388	4.240	5.562	6.593	8.000

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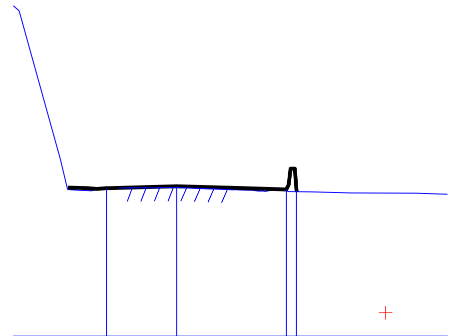

R.L. 21.00

CUT STRINGS	CD01	MC00	MK03	MW40									
DESIGN LEVELS	28.829	28.932	28.756	28.756									
DESIGN OFFSET	-10.068	-6.332	-0.530	0.000									
EXISTING LEVELS	38.450	32.000	28.752	28.824	28.835	28.862	28.861	28.745	28.708	28.738	28.651	28.573	28.469
EXISTING OFFSETS	-15.000	-12.957	-12.127	-10.047	-9.406	-6.706	-6.304	-3.375	-2.370	-1.134	-0.378	2.884	8.000

20

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DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1304.dgn

PLOT DATE / TIME: 24/08/2020 1:08:24 PM
PLOT BY: jshenouda

CLIENT

EXTERNAL REFERENCE FILES | REV | DATE | AMENDMENT / REVISION DESCRIPTION | WVR No. | APPROVAL

SCALES ON A3 SIZE DRAWING: 0 5 10 15 SCALE 1:400m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

NSW GOVERNMENT Transport for NSW

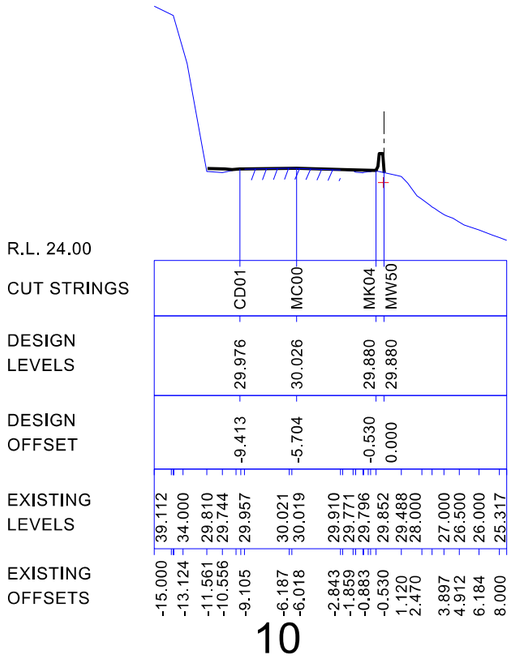
PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

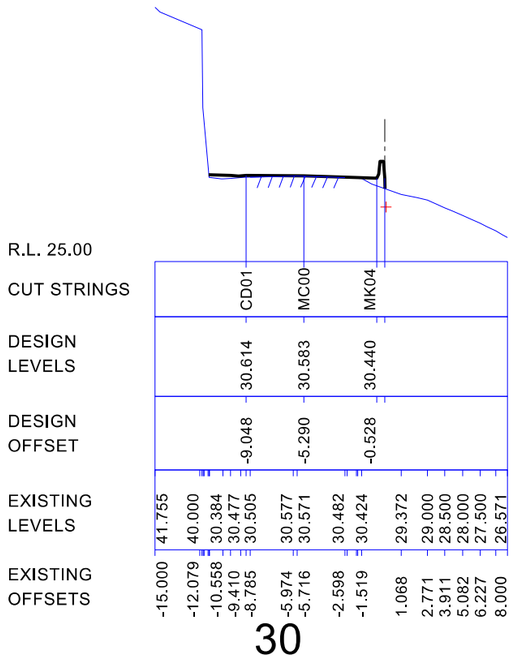
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 4

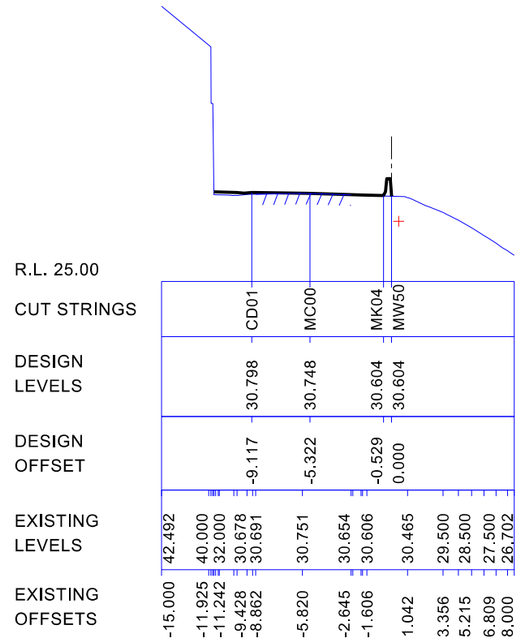
A3

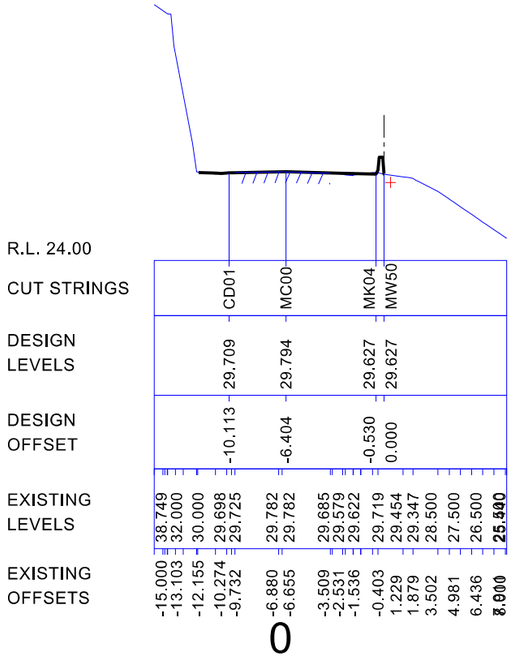
RMS REGISTRATION No. DS2020 / 000318
PART 1

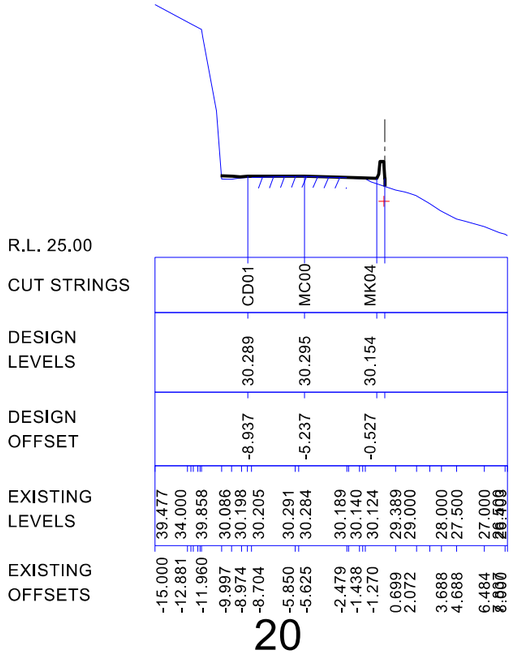
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. ST-1304
ISSUE 1





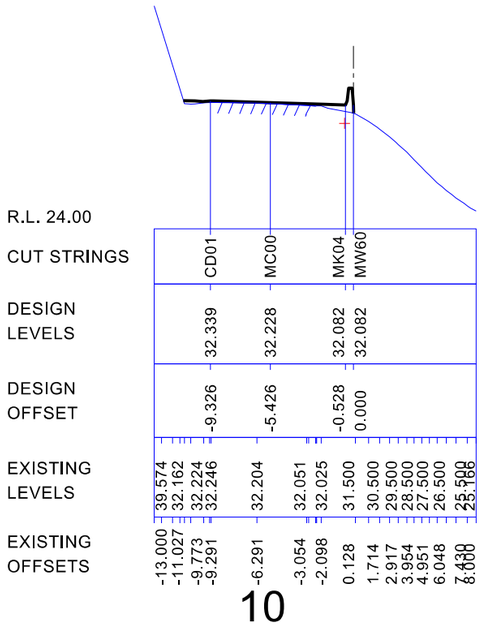


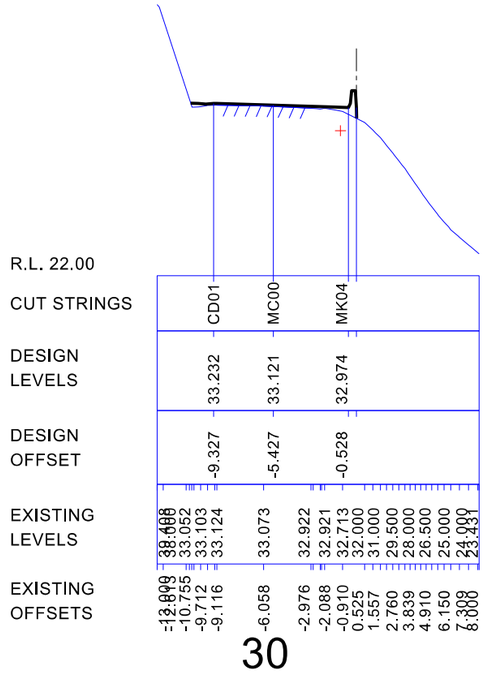


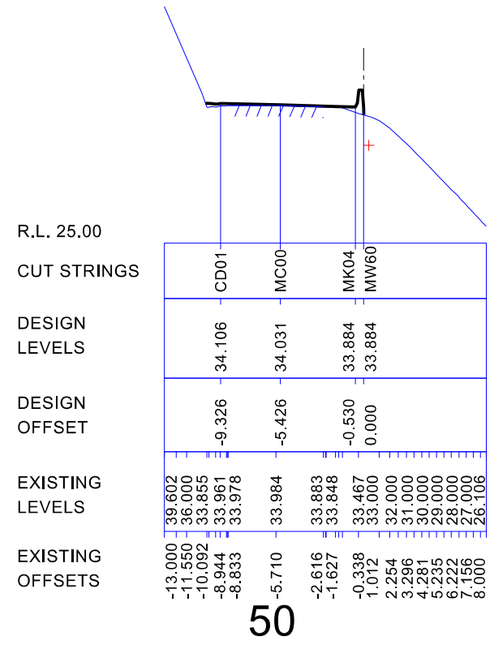


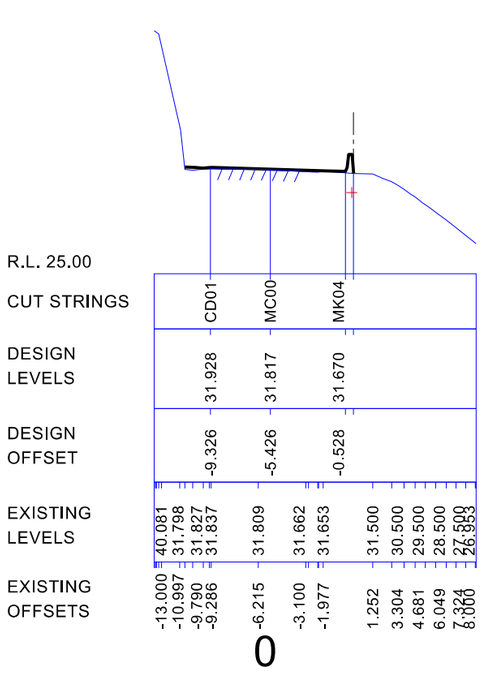
NOT FOR CONSTRUCTION

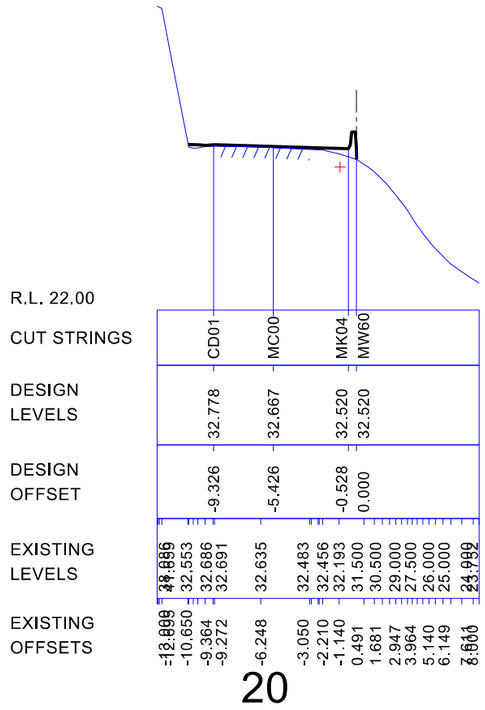
DRAWING FILE LOCATION / NAME: C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn	DESIGN LOT CODE	DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING: FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1305.dgn		PLOT DATE / TIME: 24/08/2020 1:08:25 PM	PLOT BY: jshenouda	CLIENT: NSW GOVERNMENT Transport for NSW	SUTHERLAND SHIRE COUNCIL MR512 - HEATHCOTE ROAD WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY CROSS SECTIONS: RETAINING WALL 5	A3
EXTERNAL REFERENCE FILES	REV / DATE / AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING: 0 5 10 15 SCALE 1:400m	DRAWINGS / DESIGN PREPARED BY: TRANSPORT FOR NSW INFRASTRUCTURE AND PLACE TECHNICAL & PROJECT SERVICES ENGINEERING SERVICES ROAD DESIGN ENGINEERING	TITLE / NAME / DATE: DRAWN J. A. SHENOUDA XX.XX.XX; DRG CHECK P. K. WASSELL XX.XX.XX; DESIGN J. A. SHENOUDA XX.XX.XX; DESIGN CHECK P. K. WASSELL XX.XX.XX; DESIGN MNGR X. X. XXXXXXXX XX.XX.XX; PROJECT MNGR C. JORDAN XX.XX.XX	PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE	RMS REGISTRATION No. DS2020 / 000318	PART 1
				CO-ORDINATE SYSTEM: MGA ZONE 56	HEIGHT DATUM: AHD			ISSUE STATUS: DESIGN STAGE - CONCEPT	EDMS No.	SHEET No. ST-1305	ISSUE 1

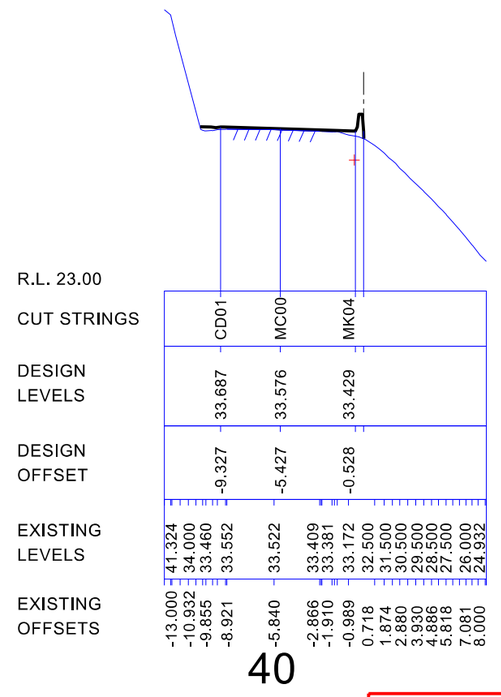












R.L. 24.00

CUT STRINGS	CD01	MC00	MK04	MW60
DESIGN LEVELS	32.339	32.228	32.082	32.082
DESIGN OFFSET	-9.326	-5.426	-0.528	0.000

EXISTING LEVELS	EXISTING OFFSETS
39.574	-13.000
32.162	-11.027
32.224	-9.773
32.246	-9.291
32.204	-6.291
32.051	-3.054
32.025	-2.098
31.500	0.128
30.500	1.714
29.500	2.917
28.500	3.954
27.500	4.951
26.500	6.048
25.500	7.430
25.166	8.000

10

R.L. 22.00

CUT STRINGS	CD01	MC00	MK04
DESIGN LEVELS	33.232	33.121	32.974
DESIGN OFFSET	-9.327	-5.427	-0.528

EXISTING LEVELS	EXISTING OFFSETS
39.408	-13.000
38.000	-12.815
33.052	-10.755
33.103	-9.712
33.124	-9.116
33.073	-6.058
32.922	-2.976
32.921	-2.088
32.713	-0.910
32.000	0.525
31.000	1.557
29.500	2.760
28.000	3.839
26.500	4.910
25.000	6.150
24.000	7.309
23.431	8.000

30

R.L. 25.00

CUT STRINGS	CD01	MC00	MK04	MW60
DESIGN LEVELS	34.106	34.031	33.884	33.884
DESIGN OFFSET	-9.326	-5.426	-0.530	0.000

EXISTING LEVELS	EXISTING OFFSETS
39.602	-13.000
36.000	-11.550
33.855	-10.092
33.961	-8.944
33.978	-8.833
33.984	-5.710
33.883	-2.616
33.848	-1.627
33.467	-0.338
33.000	1.012
32.000	2.254
31.000	3.296
30.000	4.281
29.000	5.235
28.000	6.222
27.000	7.156
26.106	8.000

50

R.L. 25.00

CUT STRINGS	CD01	MC00	MK04
DESIGN LEVELS	31.928	31.817	31.670
DESIGN OFFSET	-9.326	-5.426	-0.528

EXISTING LEVELS	EXISTING OFFSETS
40.081	-13.000
31.798	-10.997
31.827	-9.790
31.837	-9.286
31.809	-6.215
31.662	-3.100
31.653	-1.977
31.500	1.252
30.500	3.304
29.500	4.681
28.500	6.049
27.500	7.324
26.953	8.000

0

R.L. 22.00

CUT STRINGS	CD01	MC00	MK04	MW60
DESIGN LEVELS	32.778	32.667	32.520	32.520
DESIGN OFFSET	-9.326	-5.426	-0.528	0.000

EXISTING LEVELS	EXISTING OFFSETS
38.086	-13.000
41.699	-12.893
32.553	-10.650
32.686	-9.364
32.691	-9.272
32.635	-6.248
32.483	-3.050
32.456	-2.210
32.193	-1.140
31.500	0.491
30.500	1.681
29.000	2.947
27.500	3.964
26.000	5.140
25.000	6.149
24.000	7.611
23.752	8.000

20

R.L. 23.00

CUT STRINGS	CD01	MC00	MK04
DESIGN LEVELS	33.687	33.576	33.429
DESIGN OFFSET	-9.327	-5.427	-0.528

EXISTING LEVELS	EXISTING OFFSETS
41.324	-13.000
34.000	-10.932
33.460	-9.855
33.552	-8.921
33.522	-5.840
33.409	-2.866
33.381	-1.910
33.172	-0.989
32.500	0.718
31.500	1.874
30.500	2.880
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28.500	4.886
27.500	5.818
26.000	7.081
24.932	8.000

40

NOT FOR CONSTRUCTION

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0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

DRAWING FILE LOCATION / NAME
C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Xrefs\X-HR_border_A3-Cross_section-1-400.dgn

DESIGN LOT CODE

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
FILE NAME : C:\Users\jshenouda\OneDrive - Transport for NSW\Projects\HRB Widening\Drawings\02 Concept Design\Sheets\DS2020-000318-DC-ST-1306.dgn

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

SCALES ON A3 SIZE DRAWING
0 5 10 15
SCALE 1:400m

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

PLOT DATE / TIME: 24/08/2020 1:08:25 PM
PLOT BY: jshenouda

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

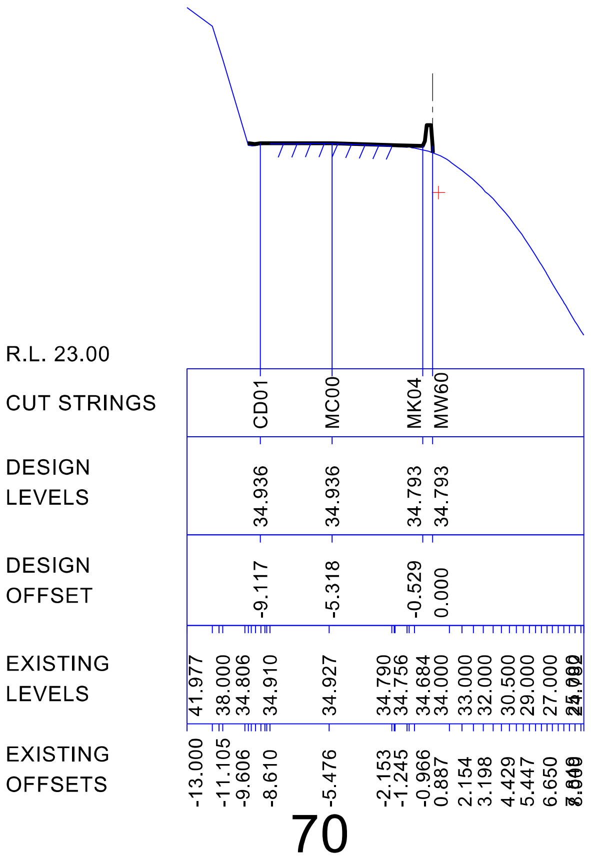
CLIENT
NSW GOVERNMENT Transport for NSW

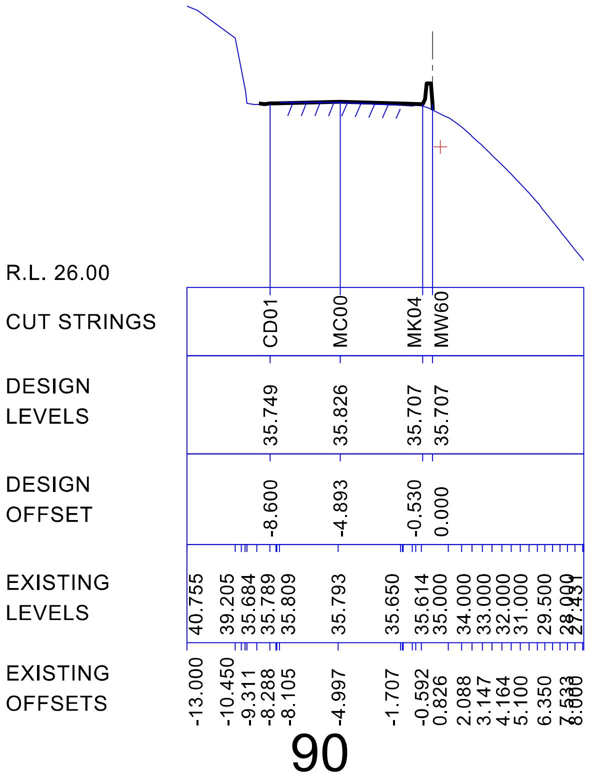
PREPARED FOR
TECHNICAL & PROJECT SERVICES
WESTERN SYDNEY PROJECT OFFICE

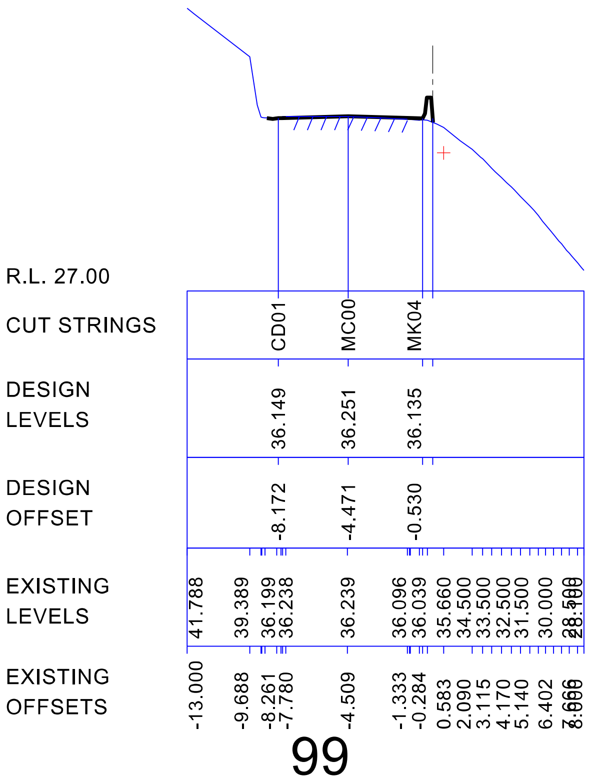
SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE
OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 6

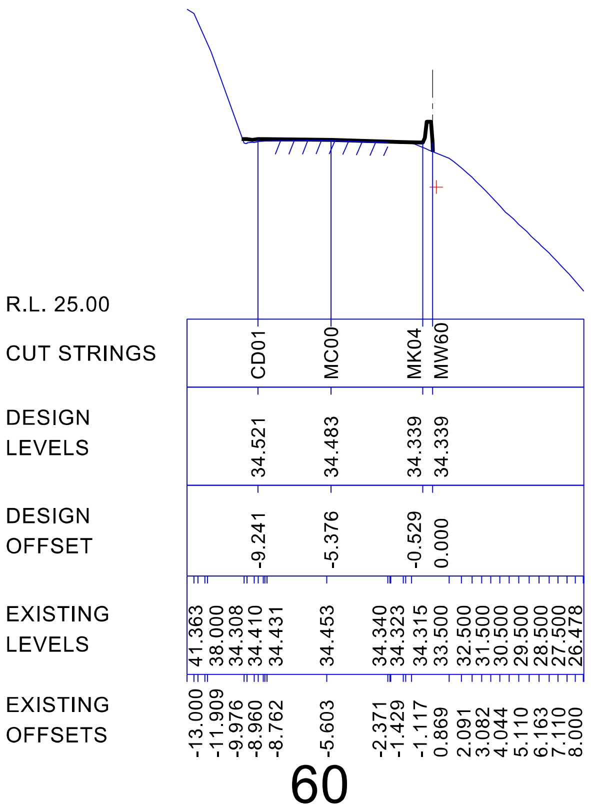
A3

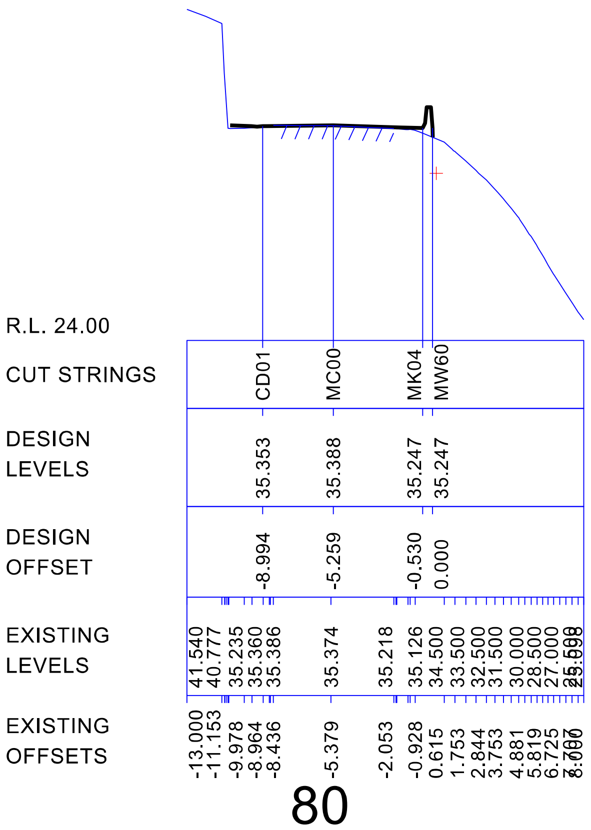
RMS REGISTRATION No. DS2020 / 000318
PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT
EDMS No.
SHEET No. ST-1306
ISSUE 1











NOT FOR CONSTRUCTION

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED | 50mm ON A3 SIZE ORIGINAL

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CO-ORDINATE SYSTEM	MGA ZONE 56
HEIGHT DATUM	AHD
DRAWINGS / DESIGN PREPARED BY	TRANSPORT FOR NSW INFRASTRUCTURE AND PLACE TECHNICAL & PROJECT SERVICES ENGINEERING SERVICES ROAD DESIGN ENGINEERING

TITLE	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW

PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
CROSS SECTIONS: RETAINING WALL 6

A3

RMS REGISTRATION No. DS2020 / 000318 | PART 1

ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No. ST-1307 | ISSUE 1

Table 1. Design parameters for cutting design – medium to high strength rock		
Angle	**Max. batter height in medium to high strength rock**	**Comments**
0.25:1 to vertical	15m	Will require treatment to achieve ARL4-5. Geotechnical supervision and inspection during construction required. Benches where required to be 4m wide.

Table 2. Design parameters for cutting design – low strength rock and residual soils		
Angle	**Max. batter height in low strength rock and residual soils**	**Comments**
2:1	1.5m	Will require treatment to achieve ARL4-5. Steeper soil slopes may require support in the form of soil nails to meet FOS requirements. Geotechnical supervision and inspection during construction required

Table 3 Batter treatment requirements – design options			
Option	**Remedial measures**	**South Cut**	**North Cut**
1. Minimal excavation – minor reshaping of existing batters to remove pinch points	Scaling and deveg	Clear trees from batter and 3m from crest. Close up geotechnical inspection. Remove loose rock from cut face using hand tools.	
	Rock bolts	Allow 20 x 4m rock bolts (lower to ARL4-5)	Allow 10 x 4m rock bolts. (lower to ARL4-5)
	Shotcrete	Potential in areas of weak rock if disturbed by trimming	Unlikely to be required
	Rock fall mesh	0-230m from bridge allow 3000m^2	0-140m from bridge, allow 1500m^2
	Crest Drains	Clear existing crest drains	
2. New cuttings north and south set back 2m from existing. Near Vertical batters in sandstone	Scaling and deveg	Clear trees 3m above. Close up geotechnical inspection. Groom new cut faces	
	Rock bolts	Allow 70 x 4m bolts	Allow 20 x 4m bolts
	Shotcrete	Allow 250m2 (similar to existing – covers shale near base)	Allow 100m2 – possible treatment of weak rock at north end.
	Rock fall mesh	0-230m from bridge allow 3500m2	0-140m from bridge, allow 2000m2
	Crest Drains	Clear existing crest drains	
	Retaining walls	May be required if widening into soil or weak rock steeper than 2:1	

NOT FOR CONSTRUCTION

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EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL

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CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY:
TRANSPORT FOR NSW
INFRASTRUCTURE AND PLACE
TECHNICAL & PROJECT SERVICES
ENGINEERING SERVICES
ROAD DESIGN ENGINEERING

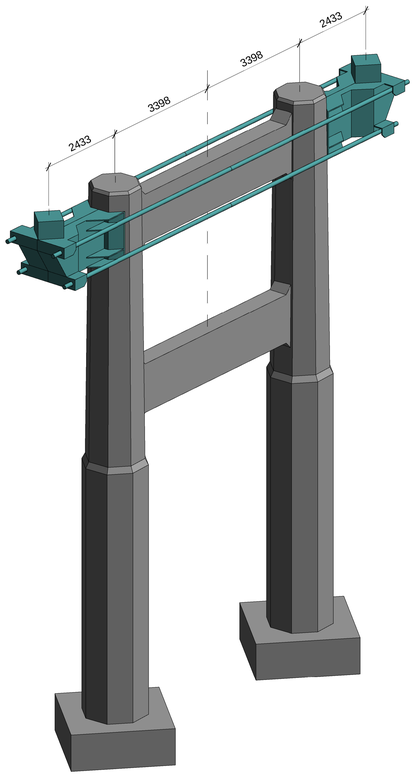
	NAME	DATE
DRAWN	J. A. SHENOUDA	XX.XX.XX
DRG CHECK	P. K. WASSELL	XX.XX.XX
DESIGN	J. A. SHENOUDA	XX.XX.XX
DESIGN CHECK	P. K. WASSELL	XX.XX.XX
DESIGN MNGR	X. X. XXXXXXXX	XX.XX.XX
PROJECT MNGR	C. JORDAN	XX.XX.XX

CLIENT: NSW GOVERNMENT Transport for NSW
PREPARED FOR: TECHNICAL & PROJECT SERVICES WESTERN SYDNEY PROJECT OFFICE

SUTHERLAND SHIRE COUNCIL
MR512 - HEATHCOTE ROAD
WIDENING OF ROAD APPROACHES TO BRIDGE OVER WORONORA RIVER, HEATHCOTE/HOLSWORTHY
GEOTECHNICAL TREATMENT

A3

RMS REGISTRATION No. DS2020 / 000318 | PART 1
ISSUE STATUS: DESIGN STAGE - CONCEPT | EDMS No. | SHEET No. GT-0001 | ISSUE 1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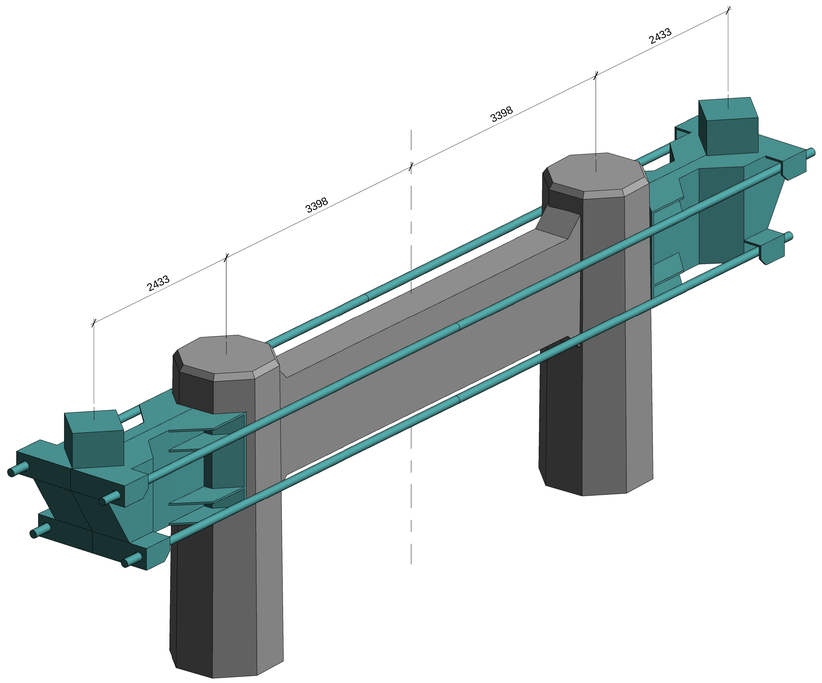
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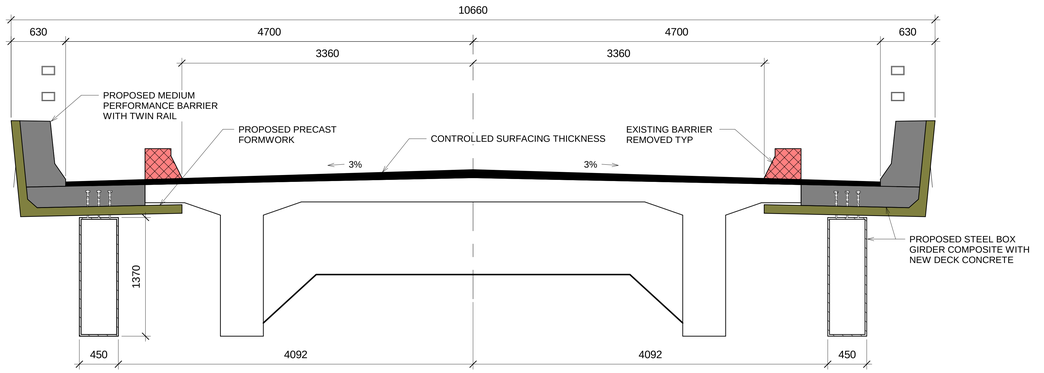
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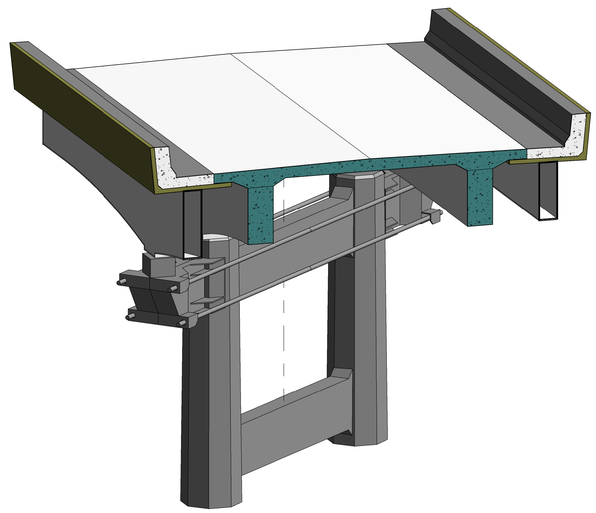
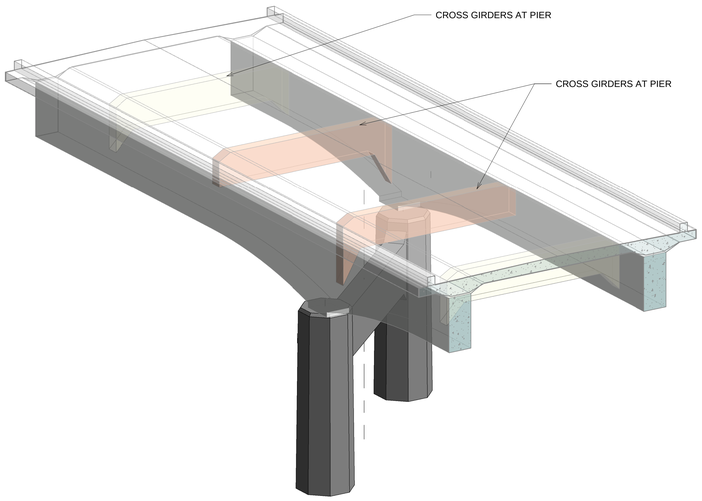
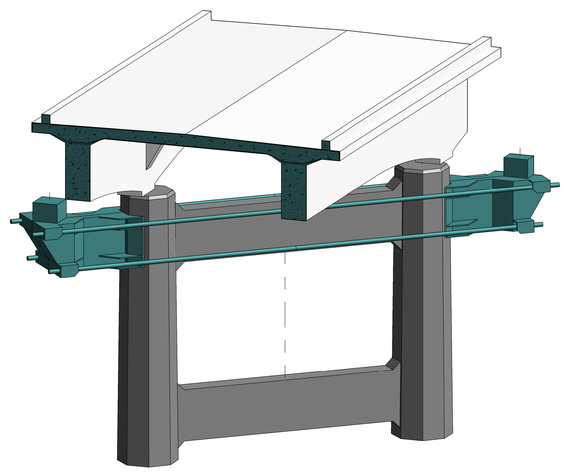
PROPOSED MEDIUM PERFORMANCE BARRIER WITH TWIN RAIL
PROPOSED PRECAST FORMWORK
CONTROLLED SURFACING THICKNESS
EXISTING BARRIER REMOVED TYP
3%
3%
PROPOSED STEEL BOX GIRDER COMPOSITE WITH NEW DECK CONCRETE
1370
450
4092
4092
450




CROSS GIRDERS AT PIER
CROSS GIRDERS AT PIER

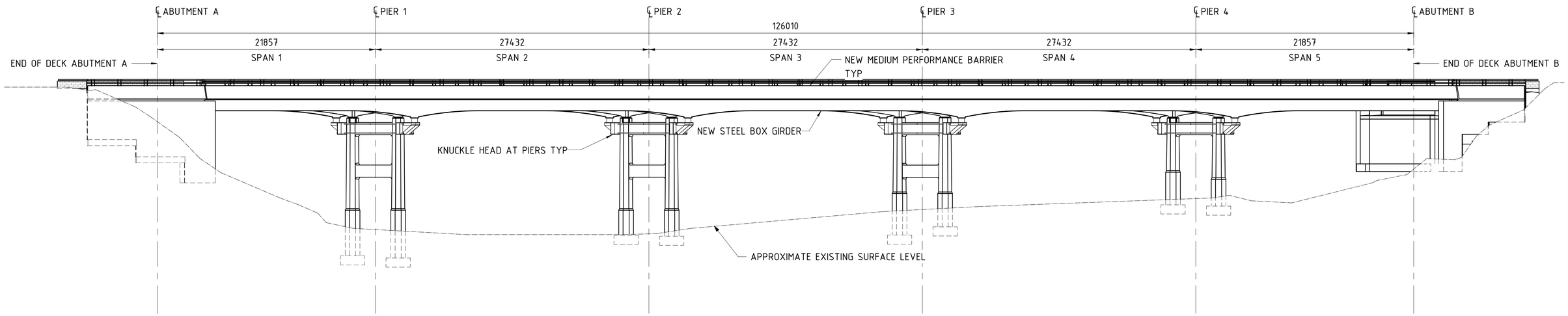


Appendix 3 Detailed concept designs

#003

FROM HEATHCOTE

TO HOLDSWORTH



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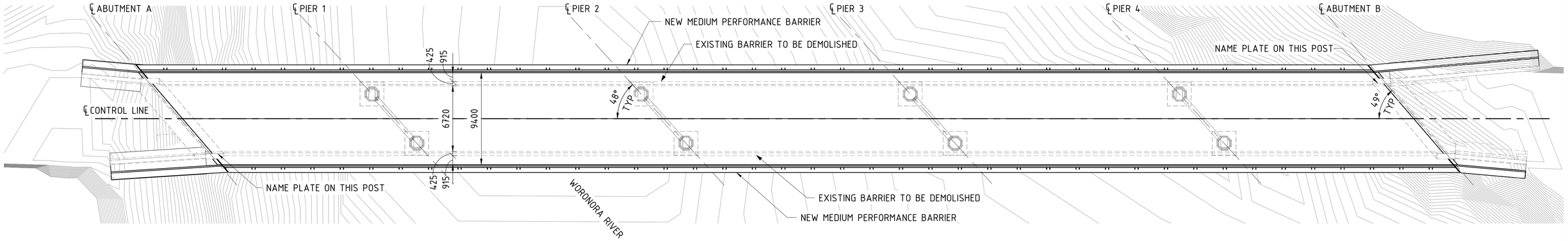
APPROXIMATE EXISTING SURFACE LEVELS ALONG CONTROL LINE (RL)	32.86	25.73	26.23	28.50	31.00	36.71
CONTROL LINE CHAINAGE	0.00	21.857	49.289	76.721	104.153	126.01

EXISTING & WIDENING ELEVATION

FROM HEATHCOTE

TO HOLDSWORTH



EXISTING & WIDENING PLAN

GENERAL NOTES

SCALE 0 4 8 12 m (4 2) OR AS SHOWN.

DT601*554

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Plot Date & Time: 10/14/2020 3:57:38 PM

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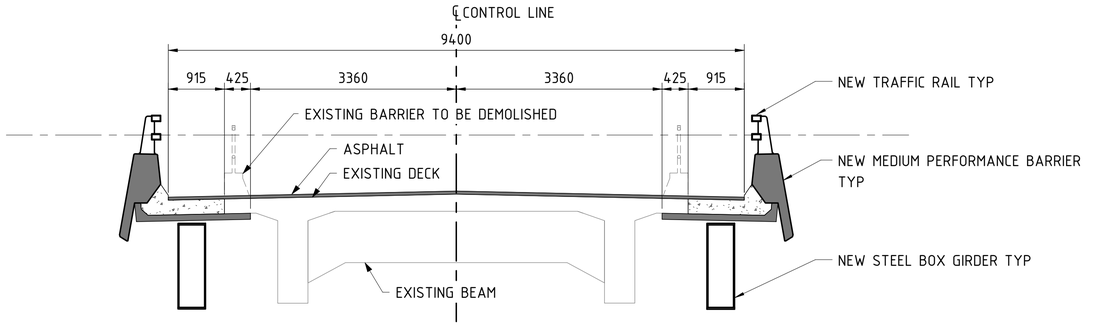

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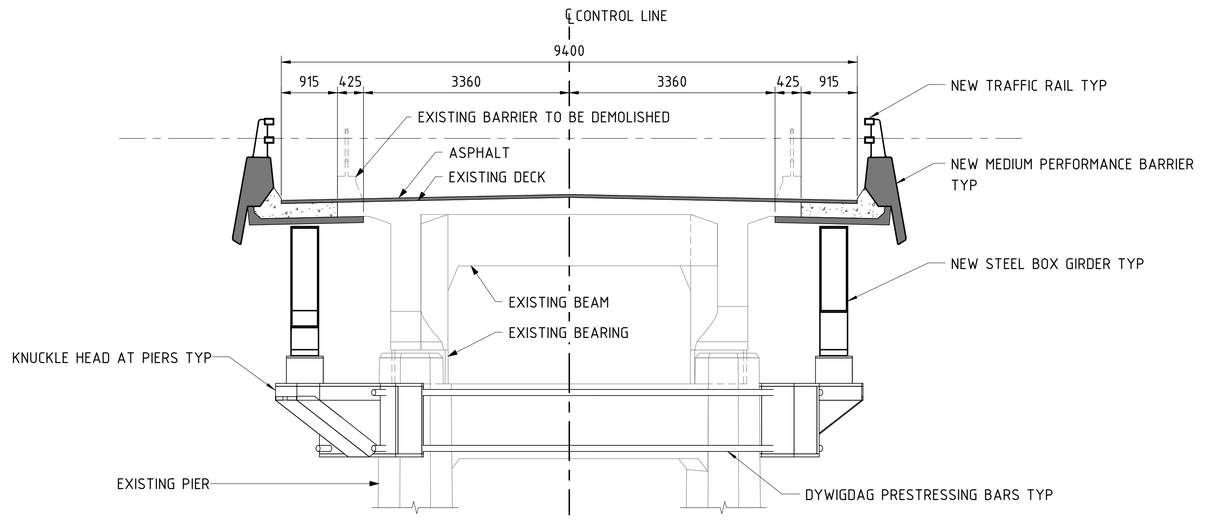


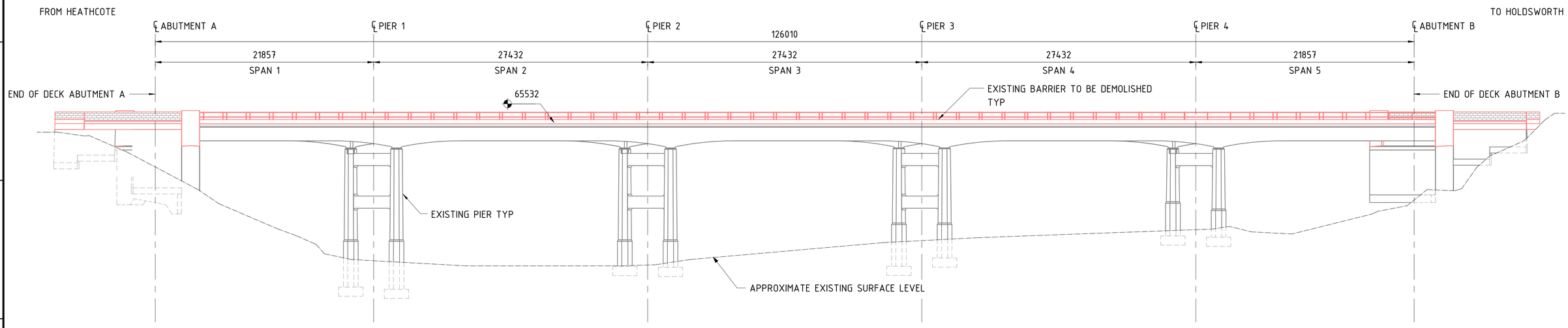
TYPICAL SECTION AT PIER

GENERAL NOTES

SCALE 0 1000 2000 3000 mm (1000 500) OR AS SHOWN.

DT801*504

#003



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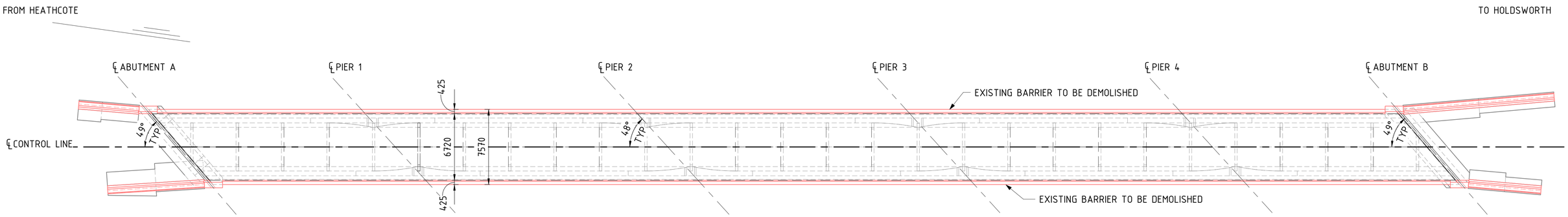

EXISTING PLAN

GENERAL NOTES

SCALE 0 4 8 12 m (4 2) OR AS SHOWN.

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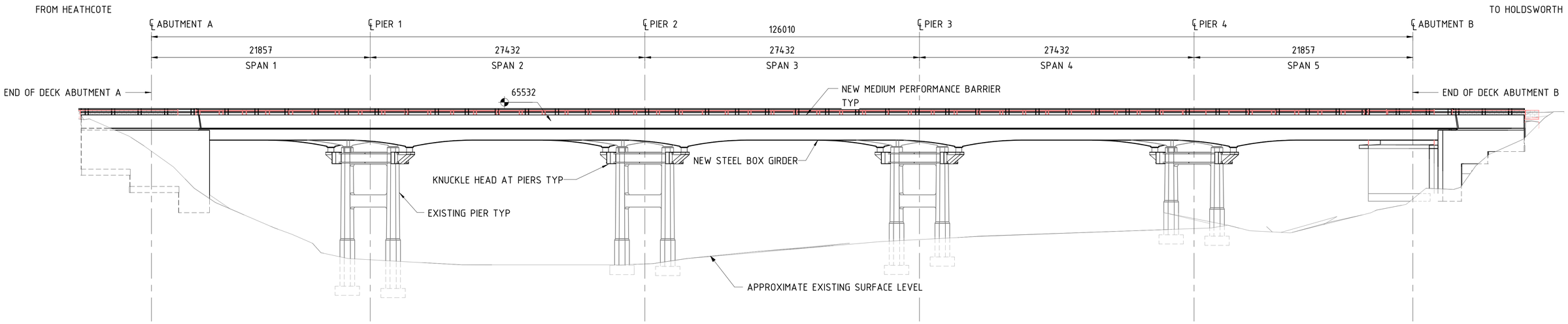

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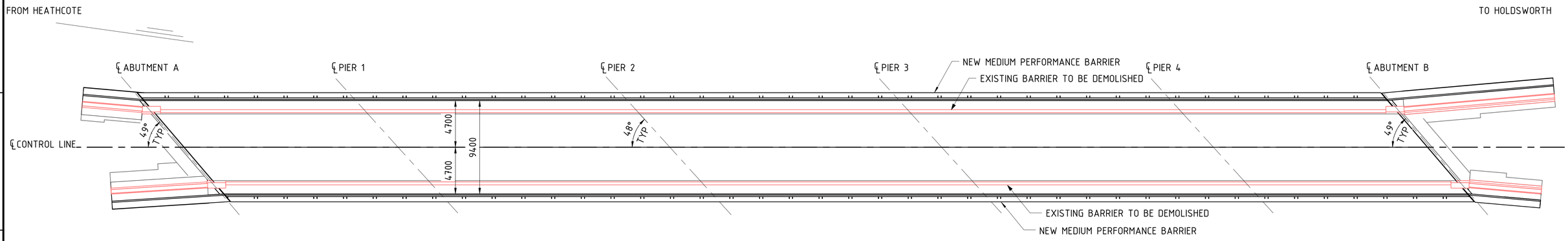

WIDENING PLAN

GENERAL NOTES

SCALE 0 4 8 12 m (4 2) OR AS SHOWN.

DT601*554

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Plot Date & Time 10/14/2020 3:57:40 PM

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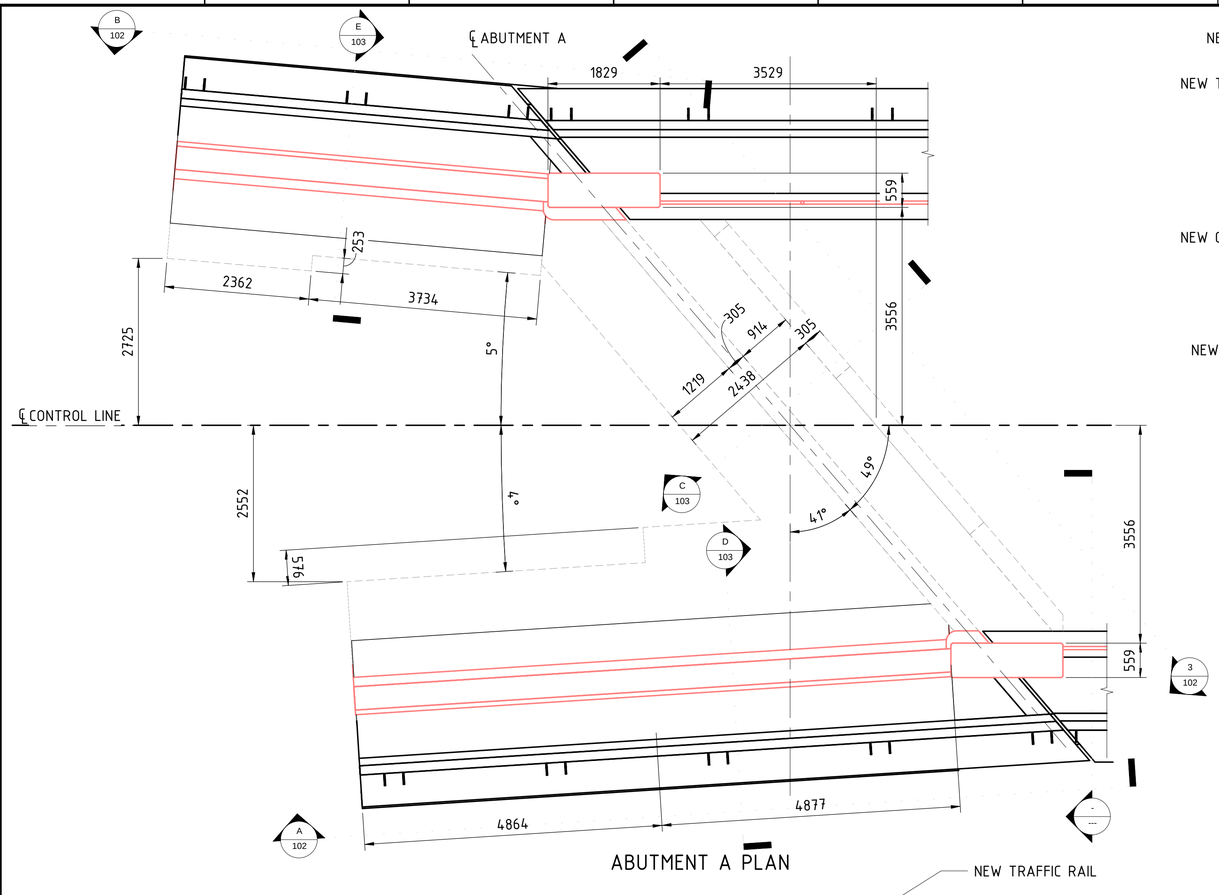

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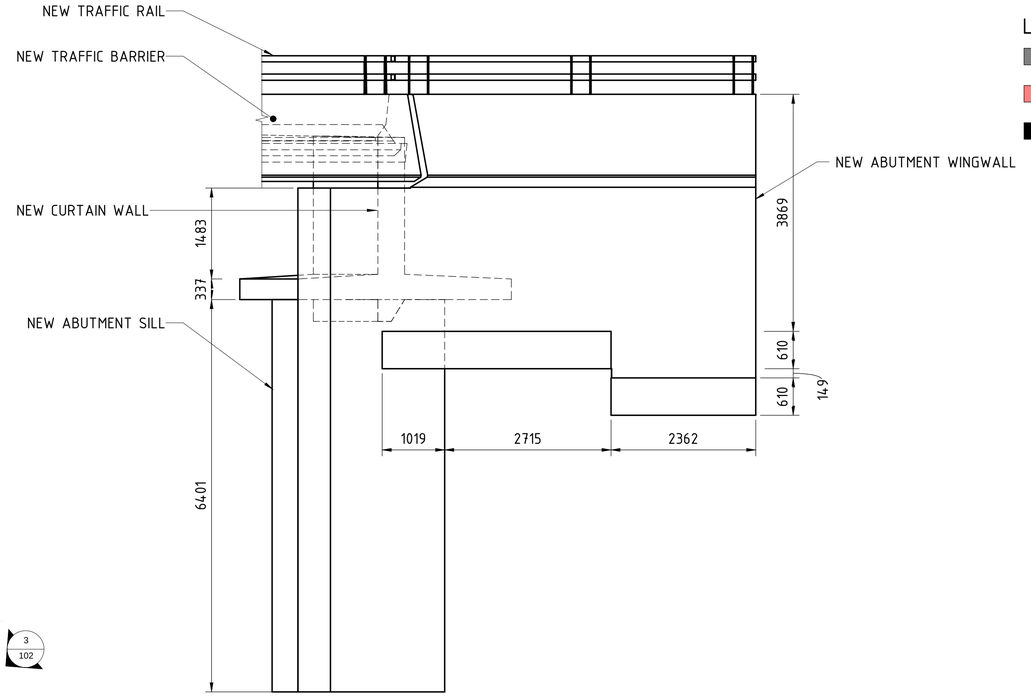

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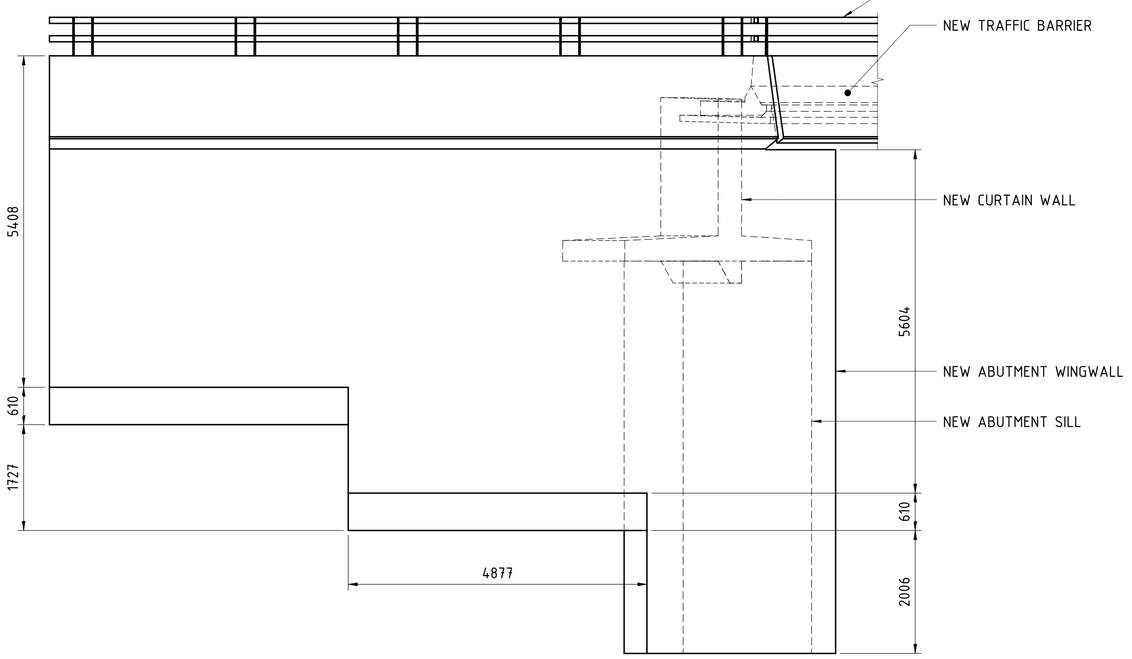

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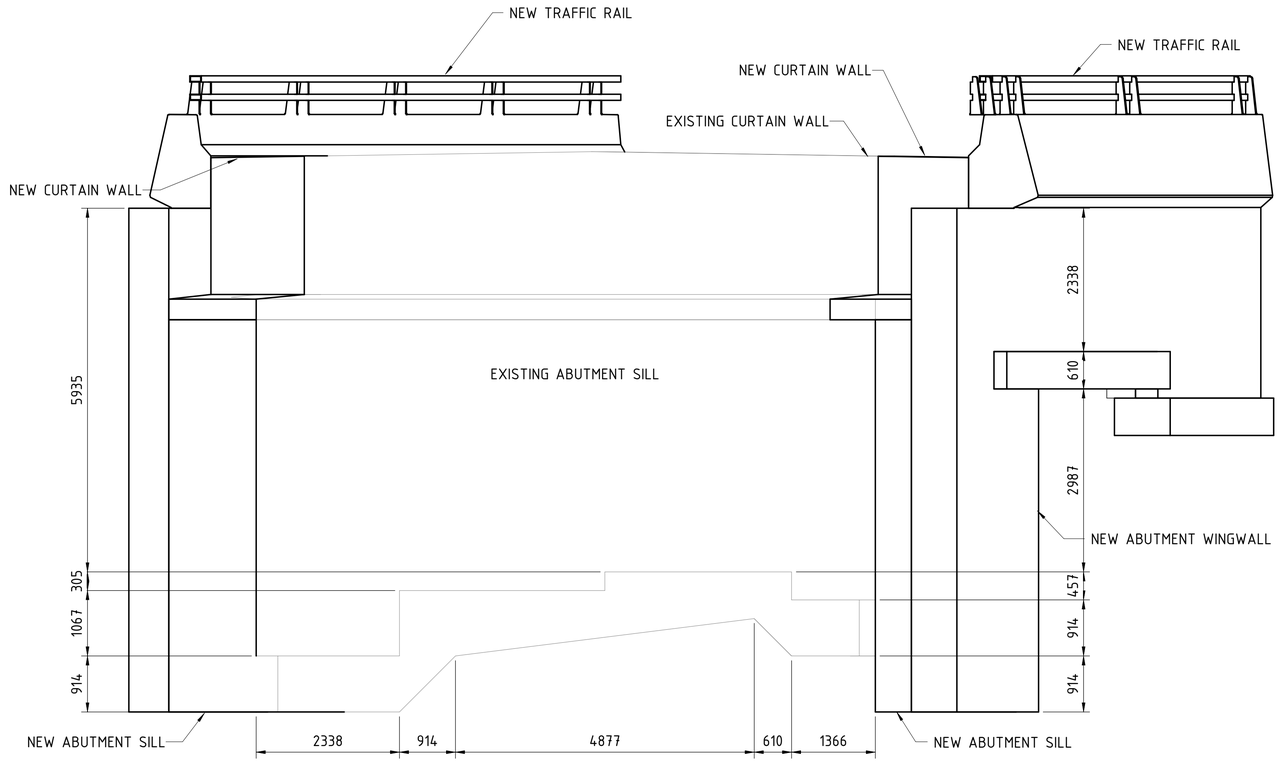

FRONT ELEVATION

GENERAL NOTES

SCALE 0 1000 2000 3000 mm
1000 500
OR AS SHOWN.

DT801*554

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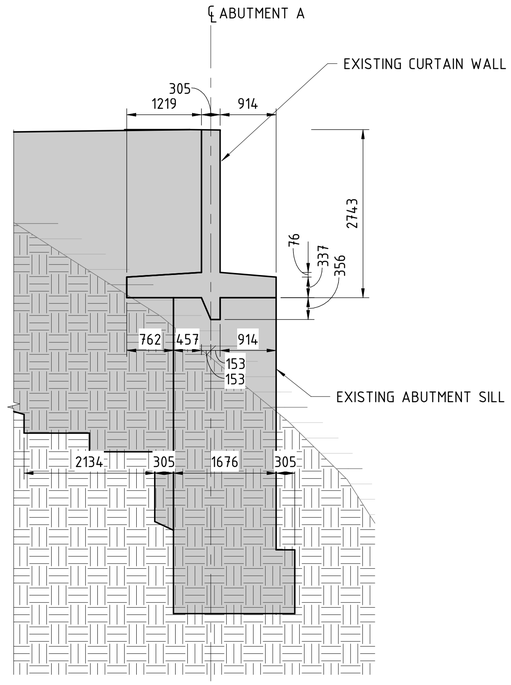

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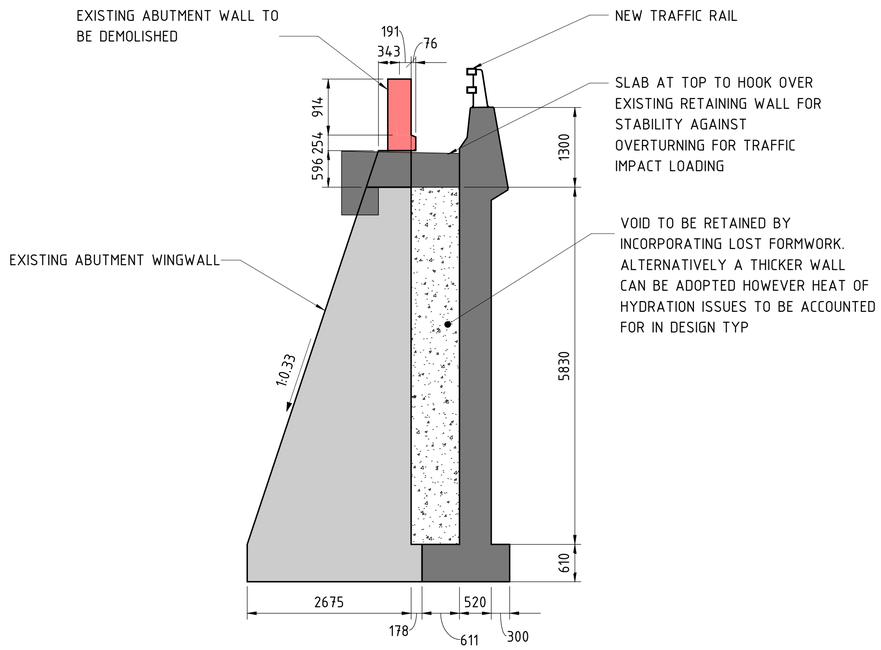

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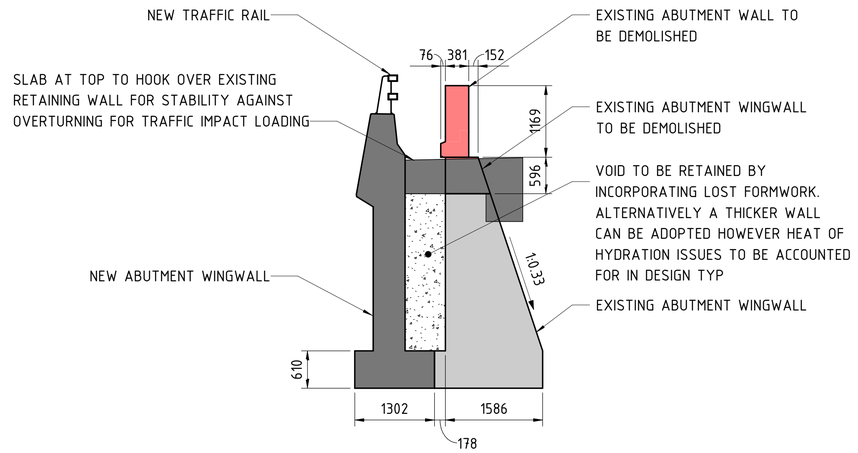
LEGEND

- EXISTING
- DEMOLISH
- NEW



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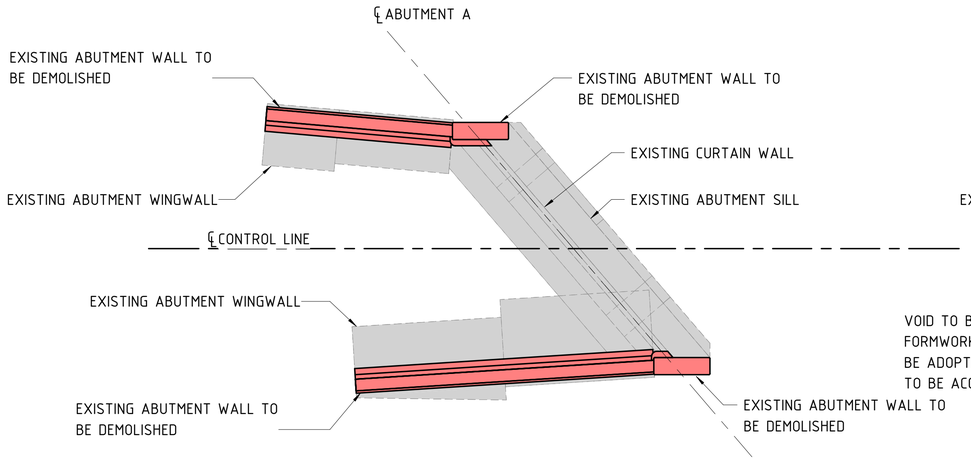

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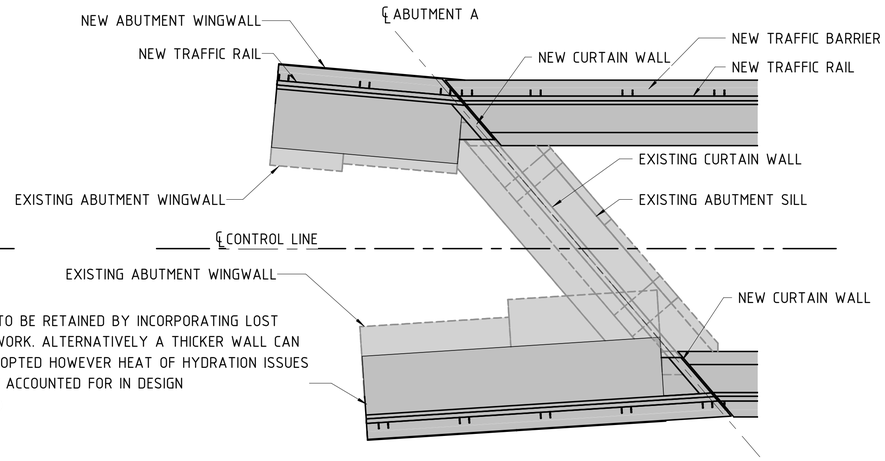

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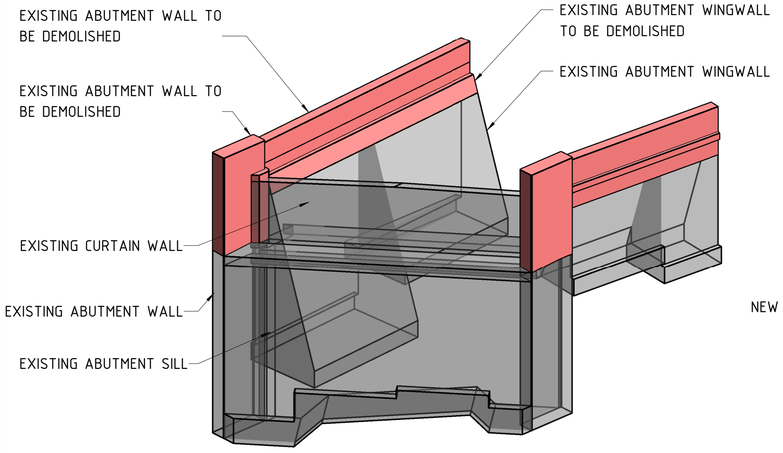
LEGEND

- EXISTING
- DEMOLISH
- NEW



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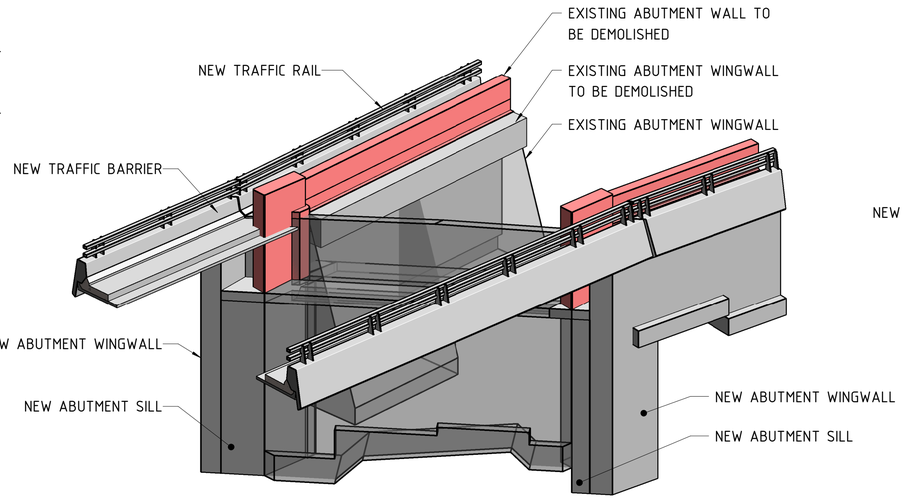

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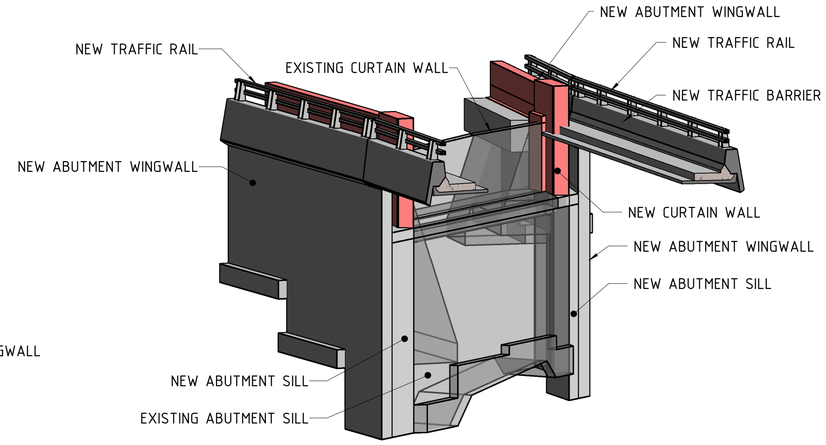

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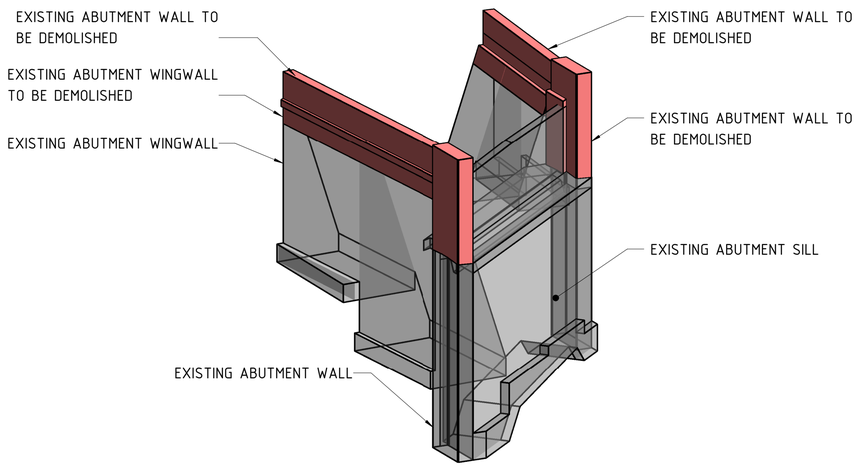

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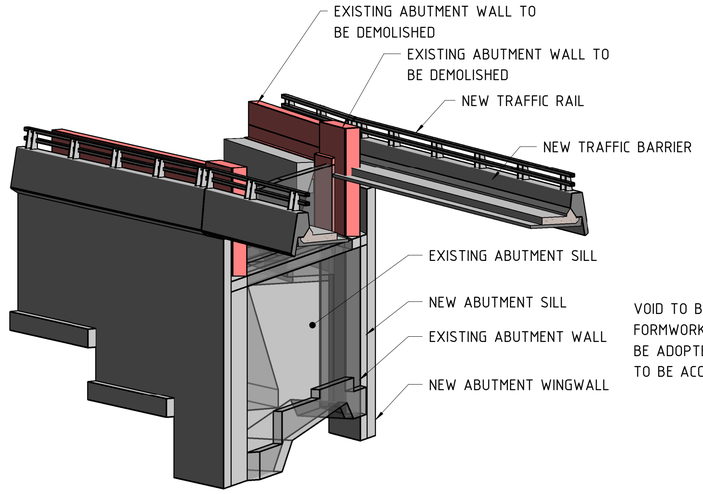

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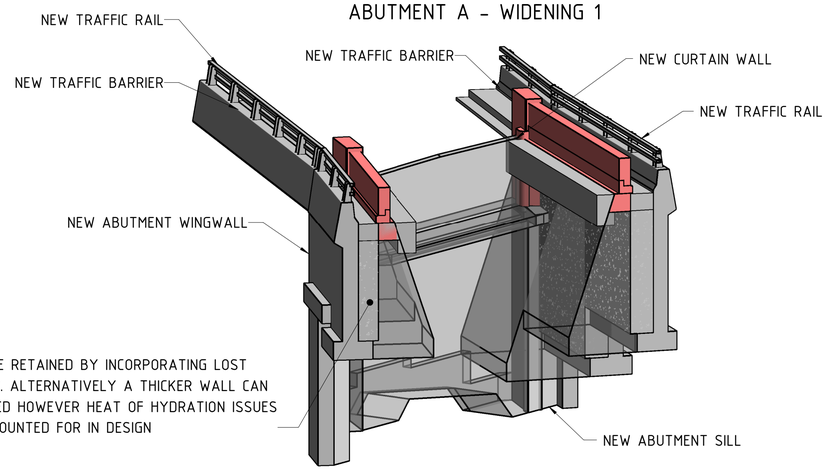

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GENERAL NOTES

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Plot Date & Time 10/14/2020 3:57:46 PM

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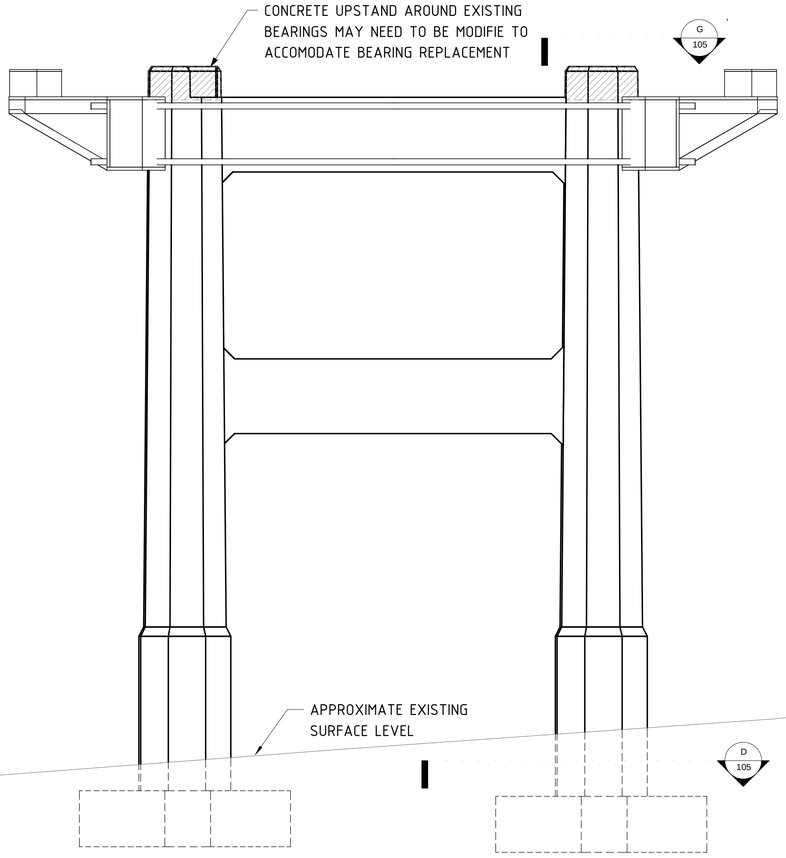

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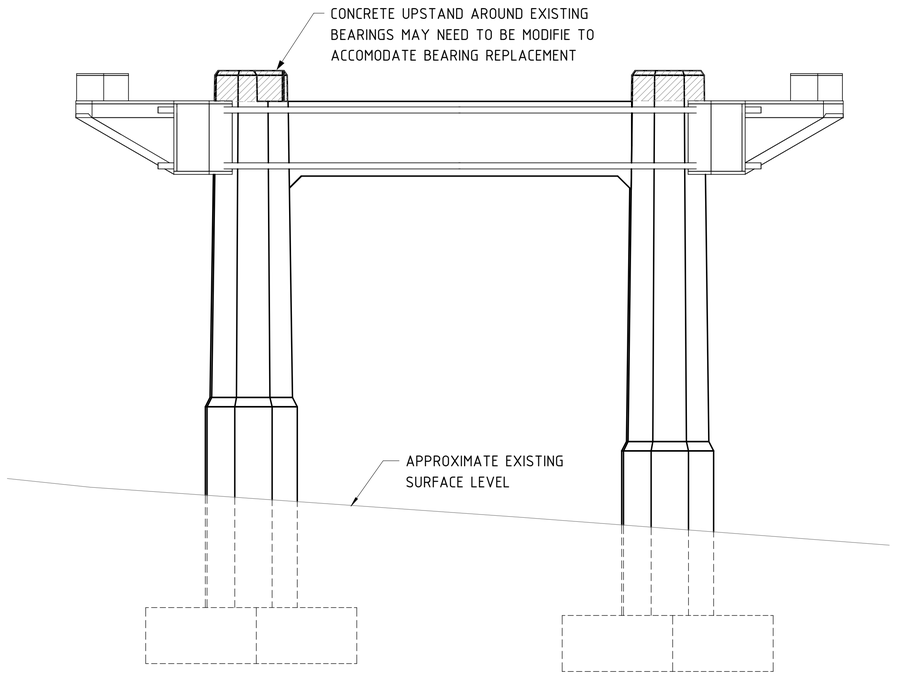

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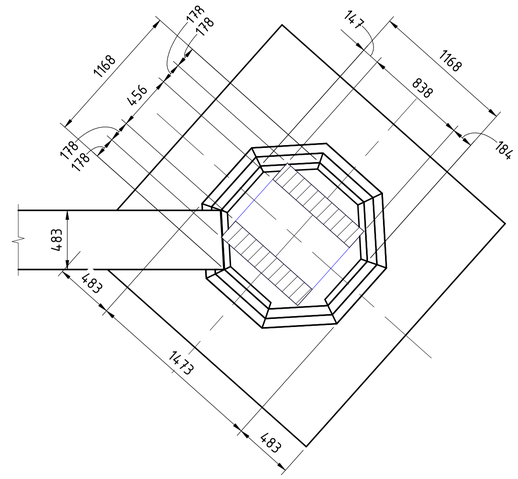

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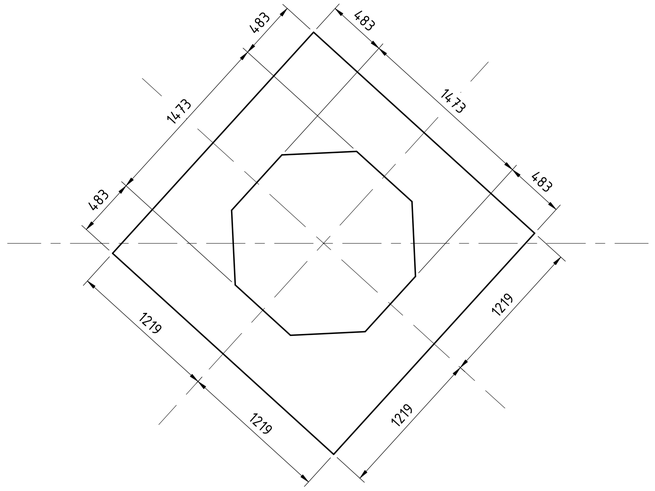
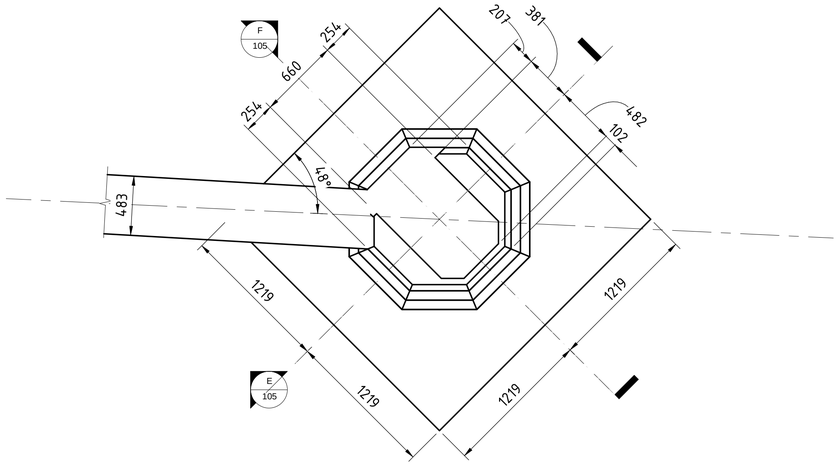
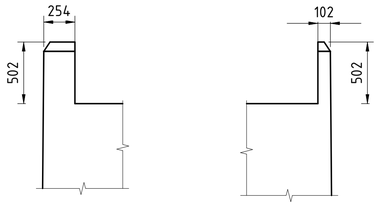


SECTION D
1 : 25



SECTION G
1 : 25



PIER 1,2 & 4

SECTION E
1 : 25

SECTION F
1 : 25

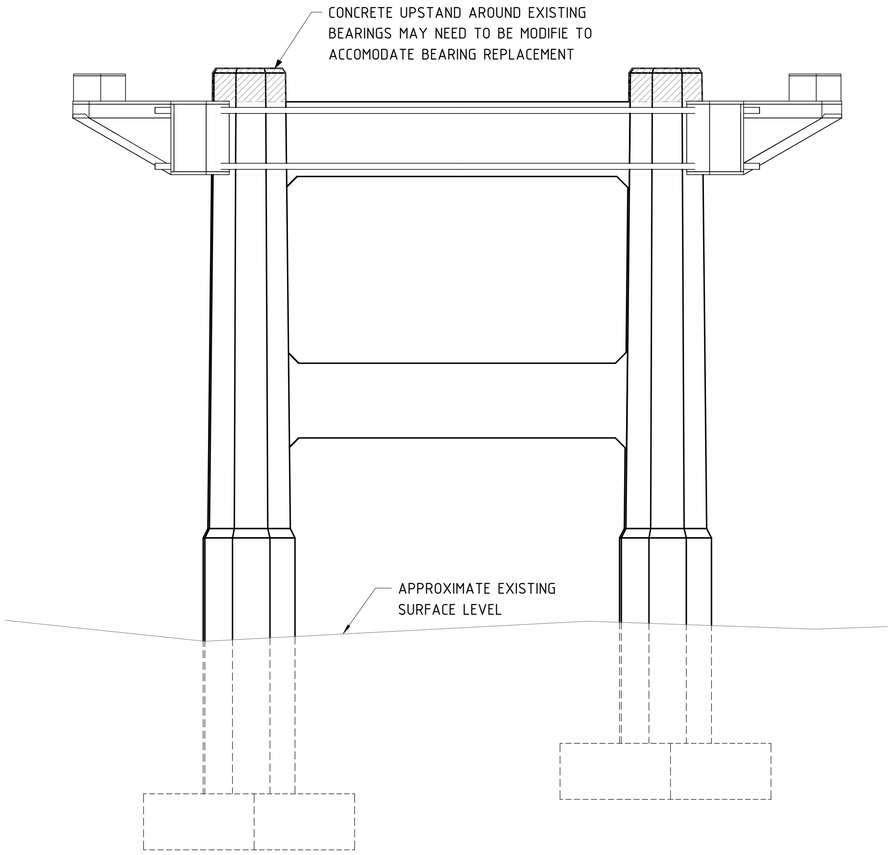
GENERAL NOTES

SCALE 0 1000 2000 3000 mm
1000 500
OR AS SHOWN.

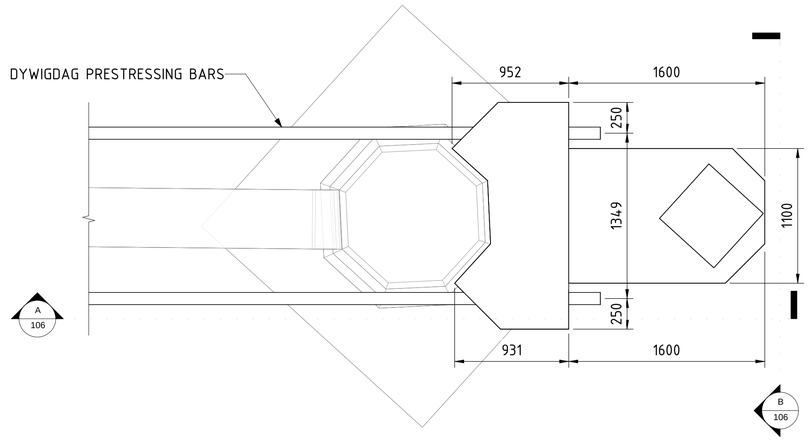
DT801*554

File Name BIM 360://509971 - Heathcote Road Bridge Widening/Heathcote Bridge_Widening.rvt
Plot Date & Time 10/14/2020 3:57:47 PM

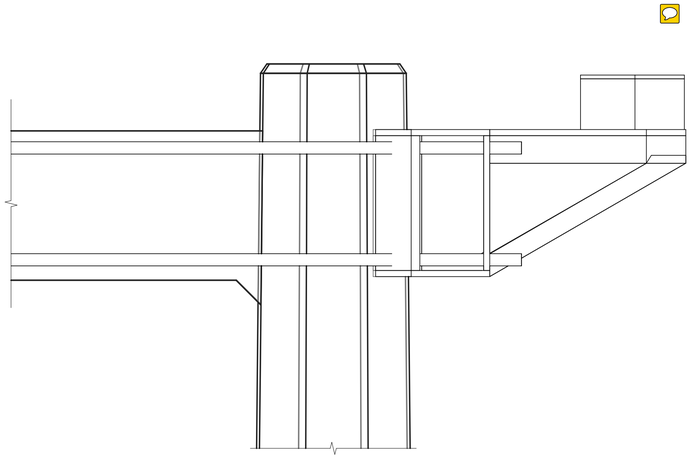
#003



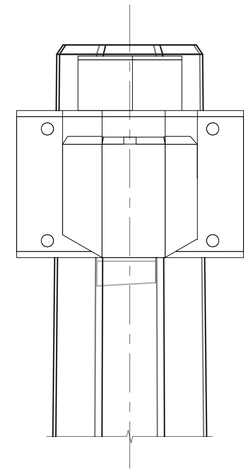
PIER 3 ELEVATION



KNUCKLE HEAD PLAN



SECTION A 106
1 : 25



SECTION B 106
1 : 25

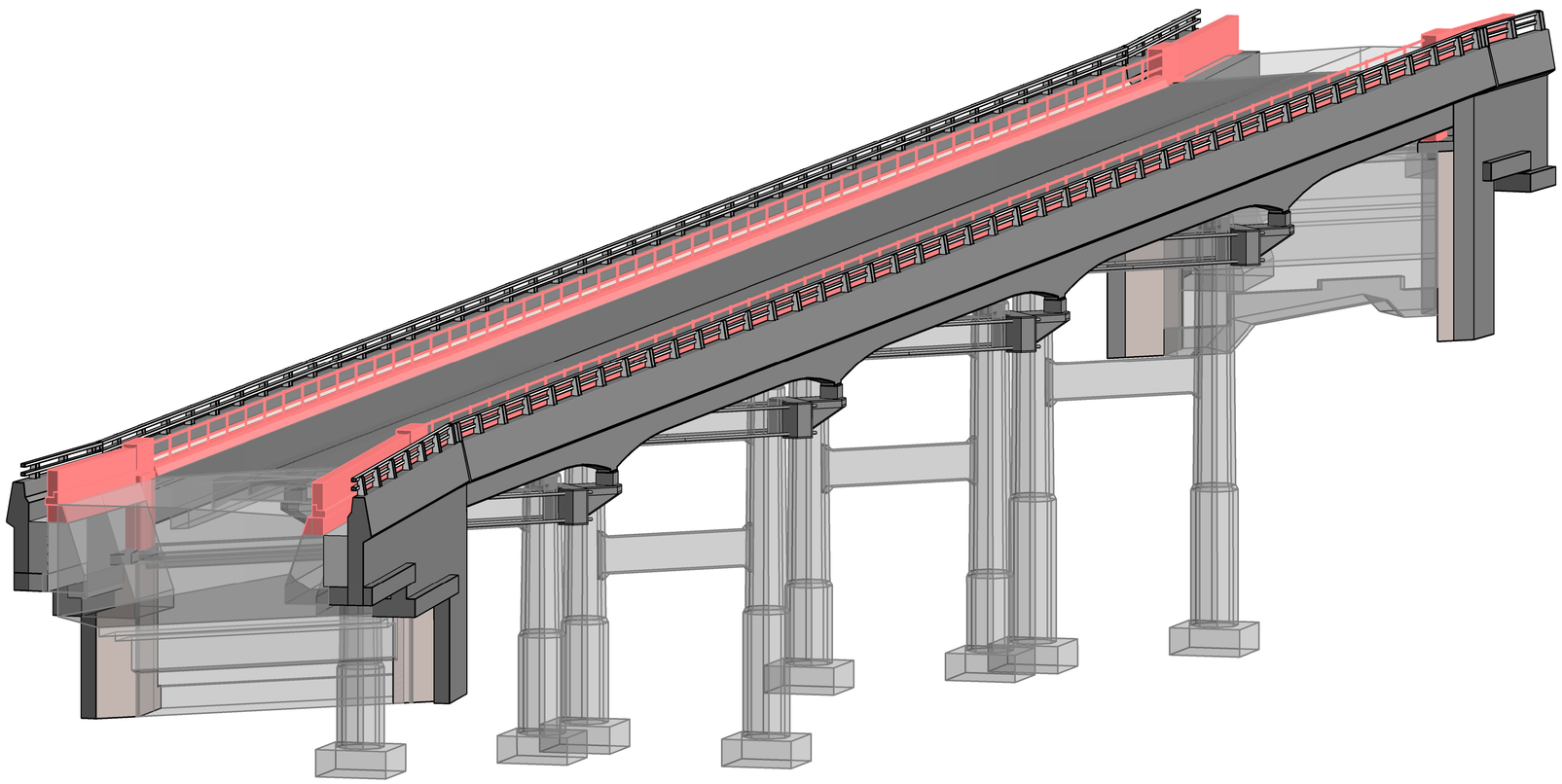
GENERAL NOTES

SCALE 0 1000 2000 3000 mm
1000 500
0 500 1000 1500 mm
500 250
OR AS SHOWN.

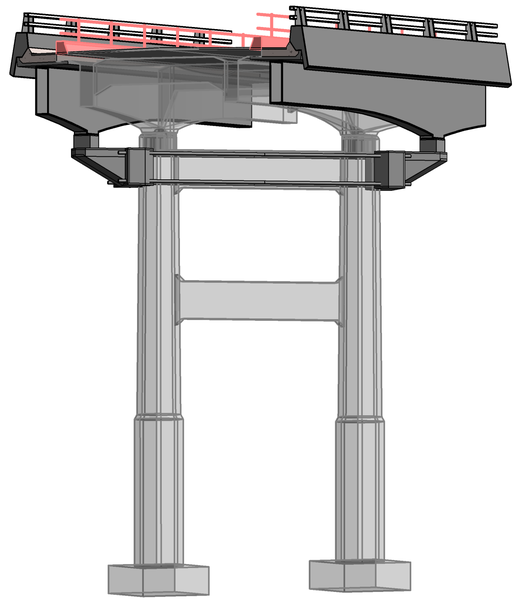
DT801*554

File Name: BIM 360://509971 - Heathcote Road Bridge Widening/Heathcote Bridge_Widening.rvt
Plot Date & Time: 10/14/2020 3:57:47 PM

#003



EXISTING & WIDENING MODEL



EXISTING PIER MODEL

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Plot Date & Time 10/14/2020 3:58:38 PM
DT601*554

Appendix 4 Visual Impact Assessment