REPORT

Little Sandy Bridge Bank Stabilisation -Detail Design

Review of Environmental Factors

Client: Camden Council

Reference: PA3130-RHD-WM-AU-RP-EN-0001
Status: Final/P.01
Date: 9 September 2024

Royal HaskoningDHV
Enhancing Society Together

HASKONING AUSTRALIA PTY LTD.

Level 15
99 Mount Street
North Sydney NSW 2060
Australia
Water & Maritime

Phone: +61 2 8854 5000
Email: info@au.rhdhv.com
Website: royalhaskoningdhv.com

Document title:	Little Sandy Bridge Bank Stabilisation -Detail Design
Subtitle:	Review of Environmental Factors
Reference:	PA3130-RHD-WM-AU-RP-EN-0001
Your reference	Click or tap here to enter text.
Status:	P.01/Final
Date:	9 September 2024
Project name:	Little Sandy Bridge Detailed Design
Project number:	PA3130
Author(s):	Andrew Fielding

Drafted by:	Andrew Fielding
Checked by:	Andrew Morris
Date:	9/9/2024
Approved by:	Andrew Morris
Date:	9/9/2024

Classification
Project related

Table of Contents

1 Introduction 1
1.1 Overview 1
1.2 Background 1
1.3 Structure of this Document 1

2 Project Proposal 3
2.1 General 3
2.2 Consideration of Alternatives and Justification of Proposal 3
2.2.1 Option 2C – Sheet Pile Protection 3
2.2.2 Option 2D – Widening of Right-Hand Side Bank 4
2.2.3 "Do Nothing" 4
2.3 Preferred Option 4
2.4 Construction Methodology 5
2.4.1 Construction Materials 5
2.4.2 Plant and Equipment 5
2.4.3 Contractors Compound 5
2.5 Construction Duration/Program 5
2.5.1 Working Hours 6
2.5.2 Restoration 6

3 Planning and Legislative Requirements 6
3.1 Land Use and Ownership 6
3.2 NSW Planning and Approvals 7
3.2.1 Local government planning and policy 8
3.2.2 State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021 8
3.2.3 Other State legislative and policy requirements 9
3.2.4 Standards Applying to Construction 9
3.3 Commonwealth Legislation 10
3.4 Consultation 11

4 Environmental Assessment 12
4.1 Initial Overview of Site and Impacts 12
4.2 Hydrodynamics 12
4.2.1 Site Conditions 12
4.2.2 Potential Impacts 12
4.3 Soils and Geology 13
4.3.1 Site Conditions 13
4.3.2 Potential Impacts 13
4.4 Water Quality 13

4.4.1 Site Conditions 13
4.4.2 Potential Impacts 14
4.5 Ecology 14
4.5.1 Site Conditions 14
4.5.1.1 State Vegetation Mapping 18
4.5.1.2 Biodiversity Values 18
4.5.1.3 Threatened Species Search 19
4.5.1.4 Test of Significance 21
4.5.2 Potential Impacts 23
4.5.3 Consideration of Wombat and Platypus Habitat 23
4.6 Visual Impacts 24
4.6.1 Site Conditions 24
4.6.2 Potential Impacts 24
4.7 Noise 24
4.7.1 Site Conditions 24
4.7.2 Potential Impacts 24
4.8 Air Quality 25
4.8.1 Site Conditions 25
4.8.2 Potential Impacts 25
4.9 Waste Management 25
4.9.1 Site Conditions 25
4.9.2 Potential Impacts 25
4.10 Traffic and Parking 26
4.10.1 Site Conditions 26
4.10.2 Potential Impacts 26
4.11 Existing Users, Access and Safety 26
4.11.1 Site Conditions 26
4.11.2 Potential Impacts 27
4.12 Heritage and Archaeology 27
4.12.1 Site Conditions 27
4.12.2 Potential Impacts 27

5 Recommended Mitigation and Control Measures 28
5.1 Environmental Management Plan 28
5.2 Summary of Environmental Control Measures 28

6 Summary of Environmental Factors 33
6.1 Consideration of Factors in Clause 171 of the EP&A Regulation 33
6.2 Consideration of Matters of National Environmental Significance 34

7 Conclusions 35

8 Decision Statement 36

8.1 Certification 36

8.2 Decision Statement 36

Table of Tables

Table 1 Standards for Monitoring and Auditing of Construction Performance 9

Table 2 Proposed Environmental Safeguards and Mitigation Measures 28

Table 3 Factors in determining the likely impacts of an activity on the environment 33

Table 4 Matters of national environmental significance that must be considered 34

Table of Figures

Figure 1-1 Location of Little Sandy Bridge, Camden 2

Figure 1-2 Close Up of Little Sandy Bridge Site 2

Figure 2-1 Contractor's compound location. 6

Figure 3-1 Camden LEP 2010 Land Use Zoning Map for the Study Area. 7

Figure 4-1 Vegetated riverine corridor on the eastern bank and western bank and open reserve either side. 15

Figure 4-2 Vegetation upstream of the bridge (current as of May 2024 16

Figure 4-3 Vegetation downstream of the bridge (current as of May 2024) 16

Figure 4-4 DCP 2019 Environmentally Sensitive Land 17

Figure 4-5 State Vegetation Type Map 18

Figure 4-6 Biodiversity Values Map (SEED Portal, 2023) 19

Figure 4-7 NSW Bionet Species Sightings 20

Appendices

Appendix A - Concept Design

Appendix B – Detail Design Drawings

Appendix C – Hydraulic Assessment

Appendix D – Threatened Species Search

Appendix E – AHIMS Search

1 Introduction

1.1 Overview

This document comprises a Review of Environmental Factors (REF) for the scour and erosion protection works, along with bridge lengthening at Little Sandy Bridge, across the Nepean River at Camden. It is a written statement prepared for Camden Council (Council) that considers the impact of the proposed bridge lengthening, scour and erosion protection works on the natural and built environment, and the proposed methods of mitigating or ameliorating any adverse effects.

1.2 Background

Little Sandy Bridge was re-constructed in 2014, the old bridge (c. 1994) was demolished as part of the reconstruction works. The design for the 2014 reconstruction included a grout-filled mattress forming the abutment scour protection. In 2016, early signs that the grout-filled mattress was showing distress were recorded, but no significant failure was observed. In February 2020, it was observed that the grout-filled mattress scour protection of the eastern abutment had been completely undermined and in places had failed, likely as a result of the recent flood event of 7-9 February 2020. The undermining of the eastern abutment and approach slab has resulted in Council closing the Little Sandy Bridge pedestrian / cycle link across the river.

Council proposed to undertake the works in 2 stages. The Stage 1 scour and erosion protection works consisted of construction of a rock revetment at the eastern abutment sufficient to allow the safe reopening of the bridge. This work was completed in 2020.

The subsequent Stage 2 of works was to comprise a permanent solution for the stabilisation of the existing embankment and protection of the footpath asset. This work was not initiated prior to the commencement of multiple floods during 2021 and 2022 that occurred as part of the La Nina weather pattern experienced by eastern Australia. These flood events have further undermined the eastern river abutment, resulting in outflanking of the eastern abutment and regression of the river bank. As a result, further investigations have been undertaken to confirm the preferred option to stabilise the river bank.

1.3 Structure of this Document

This REF has been prepared in support of the proposed scour works and bridge lengthening construction activities on behalf of the proponent and determining authority, Council, under Part 5 of the *Environmental Planning & Assessment Act, 1979 (EP&A Act).*

In summary this REF details:

- The introduction and background to the project (Section 1)
- A description of the project proposal and consideration of alternatives (Section 2)
- A review of the environmental planning framework (Section 3)
- An assessment of the environmental effects (Section 4)
- Identification of the proposed mitigation and control measures that should be employed (Section 5), and
- A summary of the REF and its findings (Section 6).

A location plan of the site is included below in **Figure 1-1**. A close up of the site in question is presented in **Figure 1-2**.

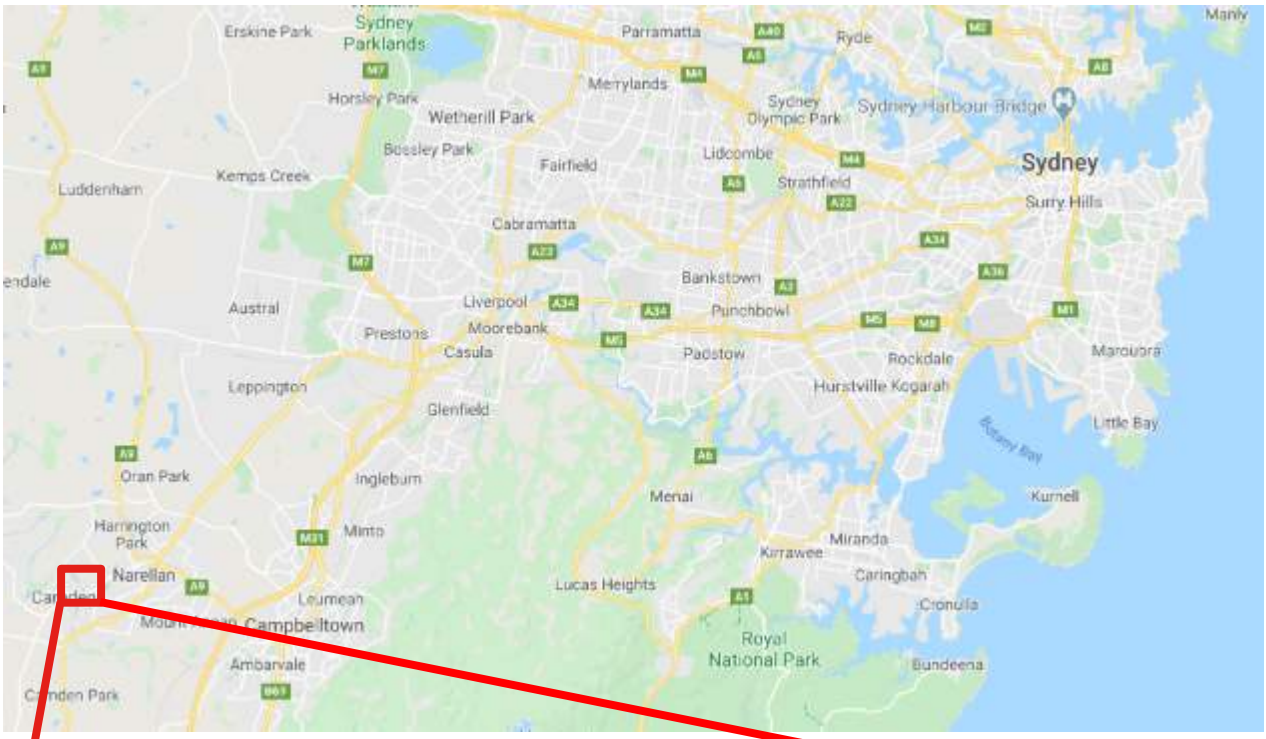


Figure 1-1 Location of Little Sandy Bridge, Camden

Figure 1-2 Close Up of Little Sandy Bridge Site

2 Project Proposal

2.1 General

Camden Council engaged Royal HaskoningDHV (RHDHV) to undertake an options investigation for the repair of the eastern abutment at the Little Sandy Bridge pedestrian crossing of the Nepean River at Camden. The engagement is focussed towards providing a permanent solution for the stabilisation of the existing embankment and protection of the footpath asset. This followed three separate flood events, in the order of 20% to 10% Annual Exceedance Probability (AEP) events that resulted in the progressive erosion and instability of the existing eastern river bank during 2021. Four options were originally developed for the works and were discussed in the Bank Stabilisation, Little Sandy Bridge, Camden memorandum (RHDHV, September 2022).

2.2 Consideration of Alternatives and Justification of Proposal

With the design objectives in mind, two concept design options were further developed to stabilise the existing embankment with 2 options deemed not suitable for further development. The options were developed based on the design scour level. Sketches of the proposed concept options are provided in **Appendix A**. A potential “do nothing” scenario was also considered.

2.2.1 Option 2C – Sheet Pile Protection

Option 2C involves the installation of sheet piling on both banks from the top of the existing bridge deck (RL 58.8 mAHD on the eastern bank and RL 58.4 mAHD on the right bank) to the design scour level – resulting in a retained height of approximately 7.5m. The sheet piling will be embedded into the riverbed a further 7.5m, resulting in a total depth of 15m. The sheet piling is installed behind the existing piers on the left and right banks and extends at 45 degrees from the deck of the bridge, upstream and downstream of the bridge deck, and is embedded approximately 5 meters into the bank to protect against outflanking of the structure.

Dead man anchors extend into the bank of the river at 2 metres intervals, up to 15 metres in length and 12 metres embedment into the bank. The sheet piling would be detailed further as part of detail design, should this option be progressed. The surface level behind the sheet pile wall on the western bank is reinstated to a minimum level of RL 58.4 mAHD. The design incorporates riprap protection in front of the sheet piles extended to the bottom of the bank. The size of the proposed scour protection is derived from the Isbach equation as documented in “Guidelines for the Design and Construction of Flexible Revetments Incorporating Geotextiles for Inland Waterways” (PIANC, 1987).

Assuming igneous rock protection, the proposed scour protection has been sized as follows:

- Armour D50 = 520mm diameter, 2 layers, 900mm total thickness. • Underlayer D50 = 240mm diameter, 2 layers, 360mm total thickness. • Texcel 900R Geotextile Underlay.
- D90 = 800mm diameter (1.5*D50) The above scour protection has been based on an average velocity in the bank of 3.0 m/s.

2.2.2 Option 2D – Widening of Right-Hand Side Bank

Option 2D proposed widening of the right bank by a minimum of 3 metres which is equivalent to the 3m depth of potential scour which is predicted to occur below the bottom of bank. By grading the slope on the widened bank by 1V:2.5H, a channel widening of approximately 7 metres is achieved. The channel cross-sectional area is increased by approximately 50m2 extra cross-sectional area under the bridge, representing cross-sectional area increase of approximately 35%. The bridge deck is extended by approximately 20 metres from the right-most pier, at a level of RL 58.4 mAHD.

Two additional sets of piers are provided to support the additional bridge span, to a level of RL 43.1 mAHD per the original SMEC design of the bridge (or as determined from detail designThe design incorporates riprap protection on the bank, extended to the bottom of the bank. The size of the proposed scour protection is derived from the Isbach equation as documented in “Guidelines for the Design and Construction of Flexible Revetments Incorporating Geotextiles for Inland Waterways” (PIANC, 1987).

Assuming igneous rock protection, the proposed scour protection has been sized as follows:

- Armour D50 = 750mm diameter, 2 layers, 900mm total thickness. • Underlayer D50 = 300mm diameter, 2 layers, 360mm total thickness.
- Texcel 900R Geotextile Underlay.
- D90 = 800mm diameter (1.5*D_{50})

The above scour protection has been based on an average velocity in the bank of 3.0 m/s, accounting for eddying and turbulence adjacent to the bridge structure. On the left abutment, only scour protection is proposed to protect the existing bank.

2.2.3 “Do Nothing”

The option to do nothing, leaving the existing bridge to deteriorate and allow no connectivity and the existing river bank to further erode, particularly during times of flooding. Do nothing is not considered an acceptable outcome, given the amenity and usage of the area adjoining the river and the connectivity provided by the bridge crossing.

2.3 Preferred Option

From the further investigated, Option 2D is the preferred option. This is for the following reasons:

- Option 2D has the lower cost of Construction, including contingencies between Option 2C and Option 2D.
- Option 2D provides a greater waterway area beneath the bridge than Option 2C, thereby reducing the likelihood of ongoing scour issues due to narrowing of the river channel. That is, Option 2D provides a better overall hydraulic outcome compared with Option 2C.
- While there will be challenges to construct any option, in our opinion the challenges associated with Option 2D are less. This is because:
    - Installation of the sheetpile will require either a barge or placement of an incremental piling works platform. The piling works platform would need to be constructed of materials that are sufficient to support the piling rig, while not of a

material that sheetpile will be unable to penetrate. For example, armour rock would be preferred, however this would create challenges in terms of sheetpiling.
- Installation of the dead man required by option 2C anchors over the waters edge introduces an additional degree of complexity for this option.

The preferred option is under further development and refinement as part of a detail design engagement which commenced in February 2024. A copy of the detail design documentation, as prepared for tender, is presented in **Appendix B**.

2.4 Construction Methodology

The proposed works methodology would comprise the following stages of construction:

- Site establishment installation of environmental controls including silt curtain
- Site clearing and grubbing
- Supply and installation of the additional bridge section, including piling and associated temporary works
- Removal of existing loose fill
- Placement of geotextile underlayer
- Placement of additional fill to address subsequent scour of the river bank.
- Placement of rock armour
- Civil works

2.4.1 Construction Materials

The main material components of the construction works would be rock, geotextile and concrete. The works would require approximately 8,000 t of rock. Additional engineered fill material will be required to fill the scour that has occurred. Rock would be delivered by truck most likely comprising 8t capacity tippers, taking a route along Macarthur Road and River Road. Concrete for the construction of the bridge and reinstatement of the pathway would be required.

2.4.2 Plant and Equipment

A range of plant and equipment would be utilised on the project, these would include:

- Piling rig for installation of piles
- Crane to lift in place precast bridge elements
- Small excavator for placement of rock
- Small barge to install silt curtain and to place some rock, with a larger barge if the contractor elects to pile from the barge.
- Trucks for delivery of building materials such as rock and geotextile

2.4.3 Contractors Compound

It is proposed that the contractor's compound with storage areas and worker facilities would be located in the areas shown in **Figure 2-1**.

2.5 Construction Duration/Program

The estimated construction time for the works would be 24 weeks

2.5.1 Working Hours

The following working hours are proposed:

- Monday to Friday 7am to 5pm
- Saturday 7am to 1pm
- No work on Sunday or Public Holidays

2.5.2 Restoration

At the completion of the works the site would be cleared of all surplus materials, temporary fences and the like and restored to not less than the pre-construction condition. A pre-construction dilapidation survey would be used as a basis of assessing the pre-construction condition of the site.

A post-construction dilapidation survey would be undertaken to ensure satisfactory restoration of the site. Any damage to the roads, pathways and other site features would be made good.

Figure 2-1 Contractor's compound location.

3 Planning and Legislative Requirements

3.1 Land Use and Ownership

The land classification of the site at the eastern abutment of Little Sandy Bridge is RE1 – public recreation under the Camden Local Environmental Plan 2010 with land also zoned RE1 on the western side of the bridge at the end of Chellaston Street (refer **Figure 4-6**).

Figure 3-1 Camden LEP 2010 Land Use Zoning Map for the Study Area.

The proposed revetment works fall on Lot 1/-/DP185957. The proposed location of the contractors compound also falls on Lot 1/-/DP185957. The Nepean River is Crown Land under the care, control and management of Council.

3.2 NSW Planning and Approvals

The New South Wales (NSW) environmental planning legislative framework provides for the classification of developments, and the assessment of impacts from developments and activities. This framework comprises:

- EP&A Act 1979
- EP&A Regulations 2021
- Environmental Planning Instruments (EPI) made under the EP&A Act (i.e. State Environmental Planning Policies (SEPP), Regional Environmental Plans (REP), and Local Environmental Plans (LEP)); and
- Other planning codes, policies, guidelines and strategies that relate to any proposed development of a site including Development Control Plans (DCP) and Council codes and policies.

The statutory basis for planning and environmental assessment in NSW is set out in the EP&A Act 1979 and the EP&A Regulations 2021.

Part 4 of the EP&A Act sets out the development assessment requirements for those developments that require consent. Part 5 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by or on behalf of public authorities that are permissible without development consent.

As set out in **Section 3.2.2**, the proposed works fall under Part 5 of the EP&A Act. Under Part 5 of the EP&A Act, the Minister or public authority which is responsible for deciding whether to approve or proceed with an activity (called a "determining authority") must examine and take into account to the fullest extent possible all matters which are likely to affect the environment if the activity goes ahead (Division 5.1 EP&A Act). As such, the proposed works require the preparation of an Environmental Assessment. The factors to be taken into account in an Environmental Assessment are listed under Clause 171 of the EP&A Regulation.

Where it is identified that an activity under Part 5 of the EP&A Act is likely to significantly affect the environment, threatened species, populations, ecological communities or their habitats, an Environmental Impact Statement (EIS) must be prepared. On the basis of items listed under Clause 171 of the EP&A Regulation, it is considered that the proposed works at Little Sandy Bridge are not likely to significantly affect the environment and an EIS is not required. Therefore, the REF contained herein represents the environmental assessment as required under Part 5 of the EP&A Act.

3.2.1 Local government planning and policy

The *Environmental Planning and Assessment Act 1979* is the governing legislation for planning and controlling land uses and development within NSW. Camden Council's planning provisions as enabled by this Act include the Camden Local Environmental Plan 2010.

The Camden Local Environmental Plan 2010 has been developed in accordance with NSW Planning and Infrastructure (P&I) to control development via land zonings and other relevant planning provisions.

The objectives of the RE1 zoning the works fall within are:

- To enable land to be used for public open space or recreational purposes.
- To provide a range of recreational settings and activities and compatible land uses.
- To protect and enhance the natural environment for recreational purposes.

The *State Environmental Planning Policy (Transport and Infrastructure) 2021* legislation discussed below overrides the LEP however, it is considered that the works at Little Sandy Bridge and subsequent reopening of the bridge for use by the community meets the objectives of the zoning.

3.2.2 State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021

SEPP (Transport and Infrastructure) 2021 aims to facilitate the effective delivery of infrastructure within NSW by public authorities. It does this by prescribing the infrastructure related works that may be undertaken without development consent, although the public authority may still be required to obtain an approval, licence or permit under another Act, such as the Fisheries Management Act 1994.

Division 19 of the SEPP (Transport and Infrastructure) 2021 allows for development for the purpose of soil conservation works may be carried out by or on behalf of a public authority without consent on any land. The works, being for the purpose of halting erosion are consistent with this provision. Therefore, development consent is not required for the works and the works are classified as an activity under Part 5 of the EP&A Act.

3.2.3 Other State legislative and policy requirements

Relevant additional State Legislation that would potentially apply to the proposed works includes the following:

- Protection of the Environment Operations Act 1997 (POEO Act) - Activities should be carried out in a manner which does not result in the pollution of waters.
- Crown Lands Management Act 2016 - To undertake activities on Crown Land, a licence is required from the Department of Industry – Lands (Crown Land). In this instance, the works are on Council Land or in the case of the Nepean River, Crown Land under the care and management of Council. A licence is therefore not required.
- Biodiversity Conservation Act 2017 - The potential impact of the proposal on threatened species has been assessed. The assessment for this REF determined that there is not likely to be a significant effect on threatened species, populations and/or ecological communities listed in the NSW Fisheries Management Act or NSW Biodiversity Conservation Act, or their habitats from the proposed activities. Therefore, a species impact statement is not required.
- Fisheries Management Act 1994 (FM Act) - Permits under Part 7 of the Act are required for dredging and reclamation, temporarily or permanently obstructing fish passage, and harming marine vegetation. As the works involve placement of rock within the waterway, a permit for dredging and reclamation is required under Part 7 of the FM Act is required.
- Water Management Act 2000 – Under the Water Act, approval is required to undertake controlled activities on waterfront land. However, the Water Management Regulation 2011 outlines a number of exemptions for controlled activities. Where a public authority is carrying out the controlled activity on or in waterfront land, approval from the Office of Water is not required.
- National Parks and Wildlife Act 1974- Under the act, consent is required from Heritage NSW for destruction or damage of Aboriginal cultural heritage objects and also outlines whether it's likely that the project will disturb any of these items.

3.2.4 Standards Applying to Construction

The following standards (see **Table 1**) would apply to the works themselves in terms of the monitoring and auditing of performance.

Table 1 Standards for Monitoring and Auditing of Construction Performance

Item	Regulation
Water	*Protection of the Environment Operations Act 1997* *Protection of the Environment Operations (General) Regulation 2009* ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
Soil Erosion and Sediment Control	Soil and Water Management for Urban Development' (NSW Department of Housing, 1993). `Urban Erosion Sediment Control' (Department of Conservation and Land Management, 1992). Soil Erosion and Sediment Control – Engineering Guidelines for Construction sites - Institution of Engineers 1996.

Item	Regulation
	Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004)
Air	*Protection of the Environment Operations Act 1997* *Protection of the Environment Operations (General) Regulation 2009* AS3580 Methods of Sampling and Analysis of Ambient Air.
Noise and Vibration	*Protection of the Environment Operations Act 1997* *Protection of the Environment Operations (General) Regulation 2009* NSW EPA Noise Manual AS1055.1 and AS1055.2 Acoustics - Description and Management of Environmental Noise. AS2436 Guide to Noise Control on Construction, Maintenance and Demolition sites. AS2659.1 Guide to the Use of Sound Measuring Equipment. AS2659 Sound Level Meters.
Flora and Fauna	*Biodiversity Conservation Act 2017* *Fisheries Management Act 1994*
Cultural Heritage	*Heritage Act 1977* *Heritage Regulations 2012*
Dangerous Goods	*Dangerous Goods Act 2008* *Dangerous Goods (General) Regulation 2014* *Environmentally Hazardous Chemicals Act 2017* *Environmentally Hazardous Chemicals Regulation 1994* AS1216 Classification, Hazard Identification and Information Systems for Dangerous Goods. AS1678 Emergency Procedure Guides - Transport AS1940 Storage and Handling of Flammable and Combustible Liquids. AS2508 Safe Storage and Handling Information Cards for Hazardous Materials. AS2809 Road Tank Vehicles for Dangerous Goods. AS2931 Selection and Use of Emergency Procedure Guides for Transport of Dangerous Goods.

3.3 Commonwealth Legislation

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) requires that proposals for development or “actions” that have, will have, or are likely to have, a significant impact on any matter of national environmental significance are to be referred to the Commonwealth Environment Minister for consideration and approval.

The EPBC Act identifies the following matters of national environmental significance:

- World heritage
- National heritage
- Wetlands of international importance
- Listed threatened species and communities
- Listed migratory species
- Protection of the environment from nuclear actions, and
- Marine environment.

The proposed works would not have a significant impact on any of the above, therefore, referral to the Federal Minister for approval is not required.

3.4 Consultation

No formal consultation has been deemed necessary as part of the REF. A Fisheries permit will be required as part of the proposed works.

A communications plan will be prepared for this project by Council to ensure that nearby residents and users of the shared pathway are provided with information prior to the project commencement, and that timing of the works can be managed to minimise impacts on the community.

A direct point of contact will be provided in all communications to ensure that community members can seek further information or have any concerns or questions addressed.

The communications plan includes the use of temporary signage, development of a fact sheet for nearby residents, and provision of information on Council's website and social media channels.

Camden Council will also undertake internal consultation as part of the planning of the project with the following:

- Team Leader Major Projects
- Team Leader Sport and Community Facilities Planning
- Manager Open Space and Sustainability
- Natural Resources Officer
- Team Leader Open Spaces
- Team Leader Floodplain Management
- Communications Advisor

4 Environmental Assessment

This section considers the existing site conditions and the potential impacts for those environmental sensitivities considered relevant at the site. Mitigation and control measures are provided for both construction and operational phases in **Section 5** and **Table 2**.

4.1 Initial Overview of Site and Impacts

The site for the proposed works is localised to approximately a 50 metre stretch of riverbank with a contractor compound located to the east of the works on a cleared open grassed Council reserve. The works would have discrete and localised environmental impacts, with potential effects upon:

a. Hydrodynamics
b. Soils and Geology
c. Water quality
d. Ecology
e. Visual quality
f. Noise levels
g. Air Quality
h. Waste levels
i. Traffic
j. Public access, use and safety
k. Heritage and archaeology

4.2 Hydrodynamics

4.2.1 Site Conditions

The Nepean River has its headwaters near Robertson, about 100 kilometres south of Sydney. The river flows north in an unpopulated water catchment area into Nepean Reservoir. From the dam, the river continues to flow north and forms the western edge of Sydney, flowing past the town of Camden.

Water level conditions in the Nepean River at Little Sandy Bridge at Camden are governed by catchment rainfall and release from dams in the upper Nepean system including Cataract, Cordeaux, Nepean and Avon dams. The Nepean River is subject to flooding. A hydraulic impact assessment has been undertaken to determine the change in peak velocities as a result of the reduction in cross sectional area due to the rock revetment proposed to remediate the eastern abutment of Little Sandy Bridge. A full copy of this assessment is included in **Appendix C**.

4.2.2 Potential Impacts

The hydraulic modelling undertaken of Option 2D indicated that there is a reduction in flow velocity through the site, as a consequence of the widening of the channel. There is no notable change in flood level in the 1% AEP event.

4.3 Soils and Geology

4.3.1 Site Conditions

A geotechnical investigation was undertaken at the site by JK Geotechnics in June 2020. This has been supplemented by investigations in February 2024.

The investigations encountered a sandy fill layer of up to 0.9 m (possible fill) overlying alluvial sand and clay down to the limit of the investigation. No observations (visual or odour) indicated the presence of contamination. No potential acid sulfate soils (PASS) was identified at the site. The strata were described as:

- Poorly compacted sandy fill;
- Very loose to loose alluvial sands; and
- Stiff to very stiff alluvial clay.
- Rock was encountered around RL 41 mAHD, comprising very low to low strength siltstone increasing to medium to high strength siltstone.

Based on the investigations and a review of available geological information, the alluvial sand soils are present at the site to a considerable depth. From the previous design, it is expected that piles will need to be socketed into bedrock.

4.3.2 Potential Impacts

Any river sand that will be disturbed during the placement of rock is considered to be uncontaminated and a natural material. In accordance with the principals of waste minimisation, and to reduce the volume of materials required to be imported to site, wherever possible any sand recovered during the works will be reused on site.

There is a risk of erosion of exposed excavations during the works. This will be managed through erosion and sediment controls presented in **Table 2** to be documented as part of the detail design drawing set.

The likelihood of any unexpected material or areas of contamination is considered low. However, adoption of mitigation and control measures if this were to eventuate is recommended and these have been identified and presented in **Table 2**.

4.4 Water Quality

4.4.1 Site Conditions

The Nepean River is a highly dynamic and naturally turbid environment. Turbidity levels are influenced by river flow and inflows from smaller creeks and tributaries. High turbidity is generally observed during large rainfall events. Water quality at the site would also be influenced by catchment land uses such as agriculture and residential areas.

Overall, it is considered that water quality in the vicinity of Little Sandy Bridge is good and not subject to any apparent or known significant contamination issues.

4.4.2 Potential Impacts

There is potential for a short term and localised reduction in water quality due to the need for demolition of the existing abutment structure, disturbance of the riverbank during excavation, placement of new material and stockpiling of materials.

There is potential for waste material from construction activities to enter the surrounding river, including fuel and oil from construction machinery, garbage and waste materials from the works.

Movement and stockpiling of materials could lead to additional sediment entering creek waters if not handled and stored correctly. This would also include material stuck to excavator tracks and moved offsite during transit.

Any water quality issues would be short term and confined to the construction phase only (i.e. approximately eight weeks). It is anticipated that all of these impacts could be mitigated or avoided through standard construction site good practice, as detailed in the ESCP included in **Appendix B** and presented in **Table 2**.

As such, potential impacts on water quality have been assessed as being limited and of low risk.

The completed works are expected to result in improved localised water quality as a result of the reduced potential for scour and erosion of the riverbank. The materials used in the works are essentially inert and should not lead to any water quality concerns in the short-term or long-term.

4.5 Ecology

4.5.1 Site Conditions

In the area of the proposed bank stabilisation works, the landward zone is principally a vegetated riverine corridor extending approximately 50m in width. An extensive Council reserve of cleared grassed land is located behind the riverine corridor (refer **Figure 4-1**) within which it is proposed to locate the contractor's work compound. Chellaston Reserve is located behind the western bank.

Figure 4-1 Vegetated riverine corridor on the eastern bank and western bank and open reserve either side.

The riverine vegetation comprises grasses, weeds, small casuarinas and small eucalypts. Taller trees are located towards the top of the bank (**Figure 4-2** and **Figure 4-3**) showing vegetation upstream and downstream of the site). Much of the vegetation has been eroded as a result of the flooding experienced during 2021 to present.

Figure 4-2 Vegetation upstream of the bridge (current as of May 2024

Figure 4-3 Vegetation downstream of the bridge (current as of May 2024)

Vegetation mapping describes the riverine corridor as Riparian Forest (NPWS 2012) (refer **Figure 4-4**). It is further described as River-Flat Eucalypt Forest and listed in NSW as an Endangered Ecological Community (EEC). The forest in the vicinity of Little Sandy Bridge is considered to be in a disturbed and degraded condition.

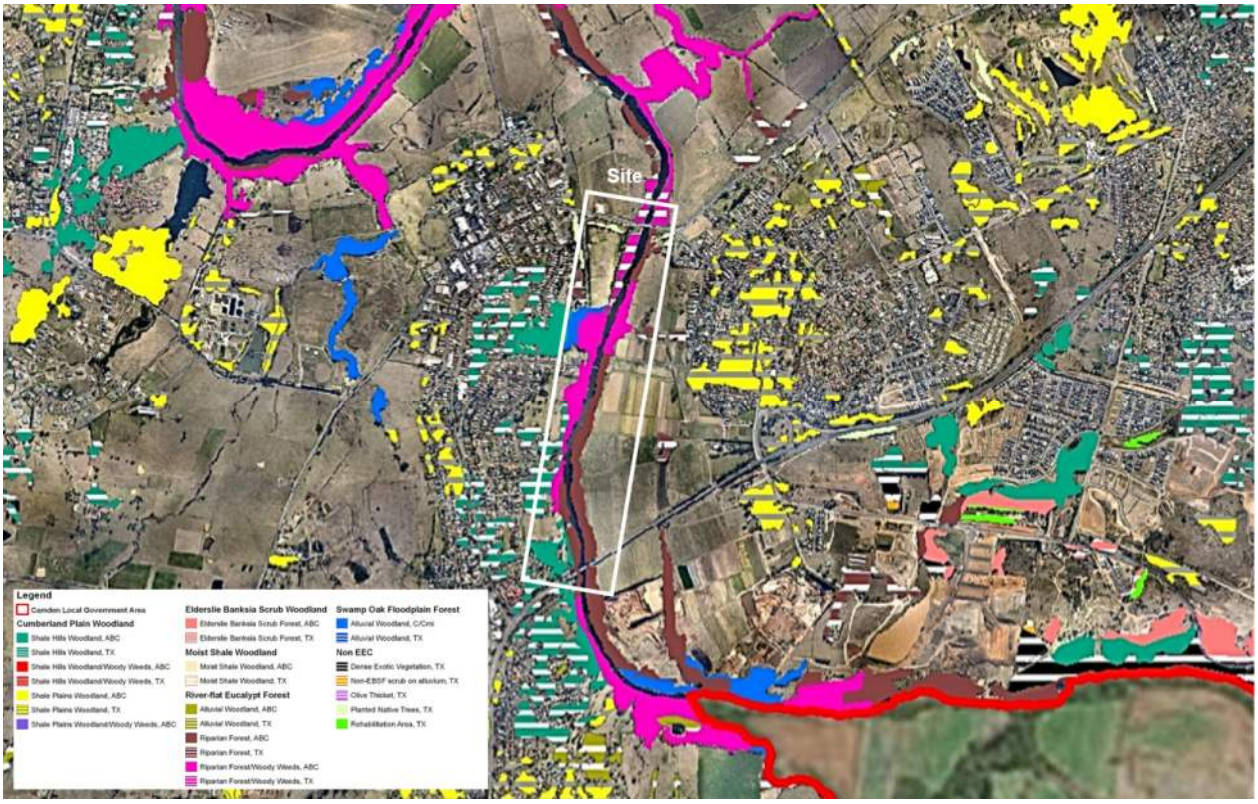


Figure 4-4 DCP 2019 Environmentally Sensitive Land

No aquatic vegetation was observed in the waterway. A number of dead branches were observed upstream and downstream of the works, some partly in the waterway.

One of the objectives of the *Fisheries Management Act 1994* is to 'conserve key fish habitats'. Key Fish Habitats have been mapped throughout NSW and are defined to include all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. The Nepean River at Camden is classified as a Key Fish Habitat (DPI, 2007).

A desktop study has also been undertaken of available information and included searches of several online databases:

- *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (http://www.environment.gov.au/erin/ert/epbc/index.html); and
- NSW Atlas of NSW Wildlife database (http://www.bionet.nsw.gov.au/);
- Office of Environment and Heritage (OEH) Threatened Species Database (http://www.environment.nsw.gov.au/threatenedspeciesapp/).

4.5.1.1 State Vegetation Mapping

The State Vegetation Type Map (SVTM) is a regional-scale map of each of the three levels of the NSW vegetation classification hierarchy. It maps the distribution of each Plant Community Type (PCT), Vegetation Class and Vegetation Formation, across all tenures in NSW. PCTs represent the finest level of a hierarchy applied to the classification and description of native vegetation across NSW. Revised PCTs for eastern NSW were viewed via the SEED Portal and indicated the presence of Cumberland Bangalay x Blue Gum Riverflat Forest (PCT ID: 3145) and Cumberland Blue Box Riverflat Forest (PCT ID: 4024). The map is displayed below in **Figure 4-5**.

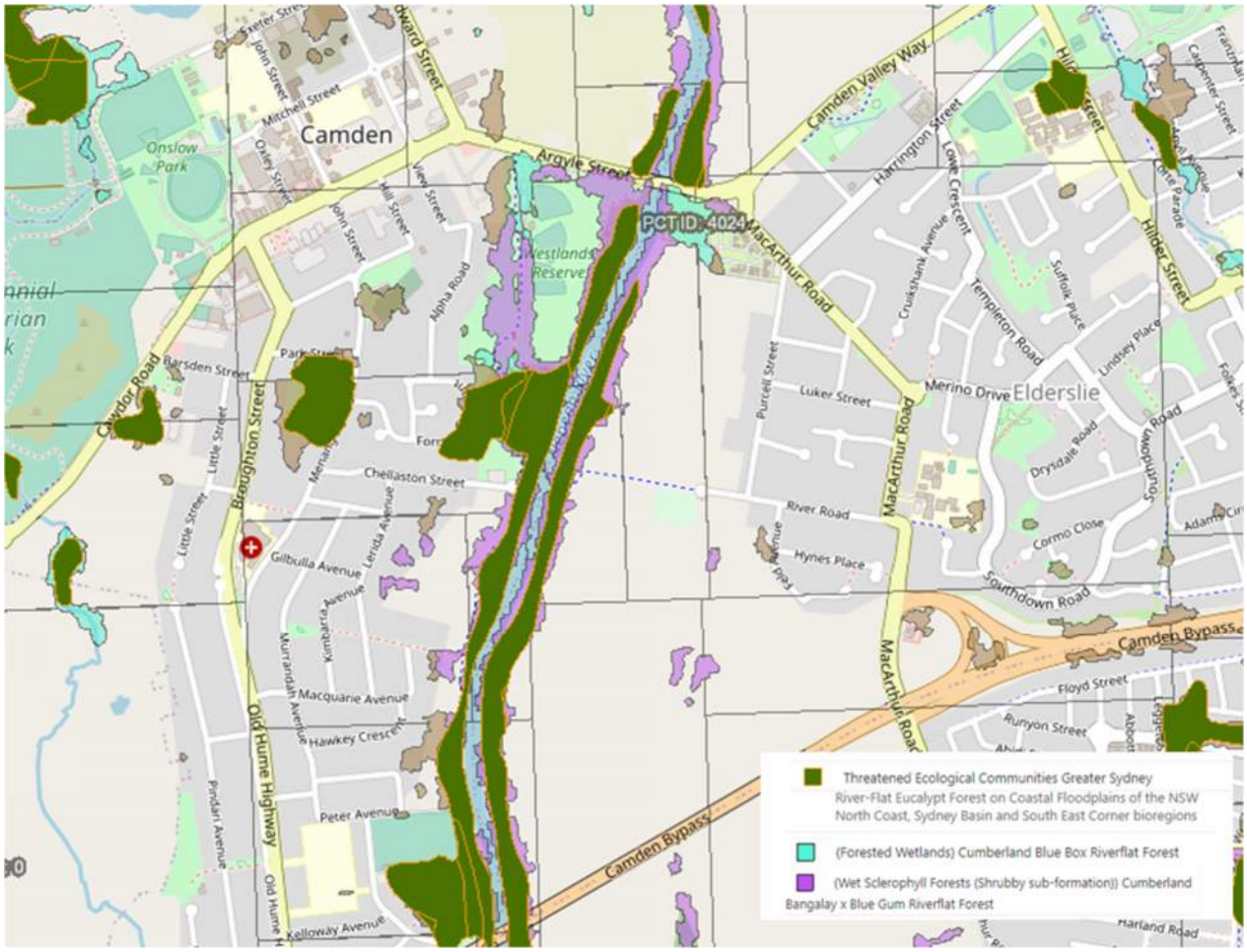


Figure 4-5 State Vegetation Type Map

4.5.1.2 Biodiversity Values

The Biodiversity Values Map identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The BV Map is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal, however for Part 5 activities, an activity is “likely to significantly affect threatened species” if it is carried out in an area of outstanding biodiversity value or likely to significantly affect threatened species or ecological communities, or their habitats, according to the test in section 7.3 of the Biodiversity Conservation Act 2016 which will be included in S**ection 4.5.1.4** below. Because the test shows that no threatened species are significantly impacted the biodiversity offset scheme threshold trigger does not apply.

Council may voluntarily opt into the BOS and a Biodiversity Development Assessment Report (BDAR) would need to be prepared under this scenario. Below (**Figure 4-6**) is the mapping output of biodiversity values across the site.

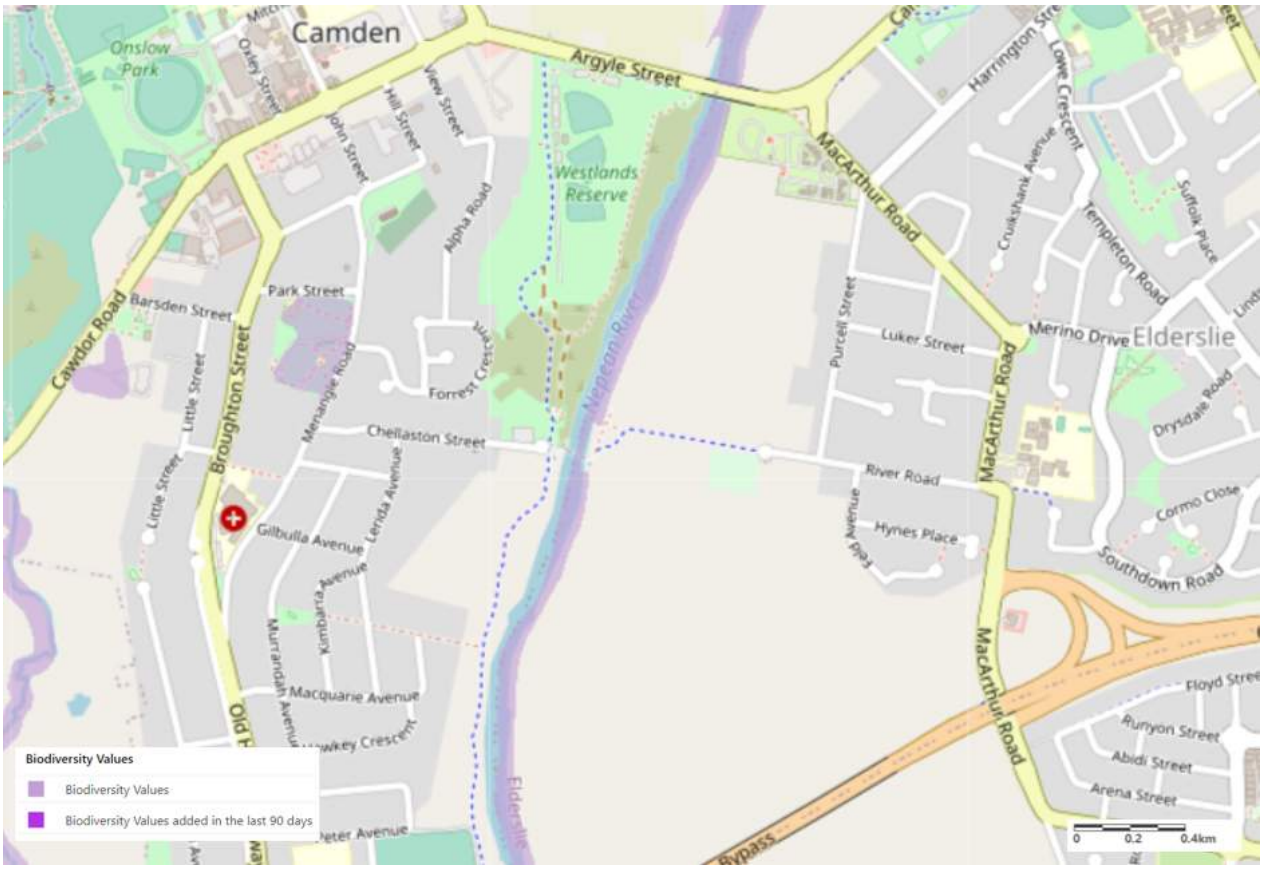


Figure 4-6 Biodiversity Values Map (SEED Portal, 2023)

4.5.1.3 Threatened Species Search

As per NSW Bionet Species Sightings and Threatened biodiversity profile search, vegetation sightings are further described as Camden White Gum listed in NSW as 'critically endangered' and commonwealth listed as 'vulnerable'.

The EPBC Act Protected Matters Search Tool identified 45 threatened and 14 migratory species likely to occur within a 1 km radius of the site in question. The NSW Wildlife Atlas search also revealed an extensive list of plant and animal species that are known or predicted to occur in the search area and are listed as threatened under the Biodiversity Conservation Act or the EPBC Act (refer **Figure 4-7**). Both reports have been collated and attached in **Appendix D.**

Figure 4-7 NSW Bionet Species Sightings

All critically endangered species occurring in Nepean River were plant species such as the Camden White Gum (*Eucalyptus benthamii*) and the Mountain Cedar Wattle (*Acacia elata*). All other species (faunal or floral) in the direct site were not listed as threatened. Nearby (but not in the direct site) vulnerable and/or endangered faunal species of note were the Powerful Owl (*Ninox strenua*), Swift Parrot (*Lathamus discolor*), Curlew Sandpiper (*Calidris ferruginea*) and the Regent Honeyeater (*Anthochaera phrygia*) which contain details of each below:

Powerful Owl (*Ninox strenua*) – *Vulnerable (NSW Status)*
The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest and requires large tracts of forest or woodland. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. The Powerful Owl was identified as vulnerable in NSW under the Biodiversity Conservation Act and is known to occur nearby Nepean River but not in the direct site. The Powerful Owl is known to roost in dense vegetation; thus, they may nest and roost in very close proximity and should be noted.

The Powerful Owl is known to roost in dense vegetation, and nest in close proximity. The closest known breeding pair is located at Elizabeth Macarthur Reserve and they have been observed breeding and roosting during Spring. No Powerful Owls are identified at the construction site or the immediate locality and are unlikely to be breeding or roosting at these construction sites given the proximity to Elizabeth Macarthur Reserve and the requirement that Powerful Owls require a large habitat If Powerful Owls are

sighted at the construction sites or adjacent vegetation, a buffer zone of 100 metres is required around breeding / roosting Powerful Owl.

Swift Parrot (*Lathamus discolor*) – *Critically Endangered (Commonwealth Status)*
The Swift Parrot migrates to the Australian south-east mainland between February and October and occur only where eucalypts are profusely flowering or where there is an abundant lerp (from sap-sucking bugs) infestation. The Swift Parrot forages sites on a cyclic basis depending on food availability and specifically favours certain tree species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (Corymbia maculate), Red Bloodwood (C. gummifera) and Forest Red (Gum E. tereticornis). Based on the site description, the typical habitat for a Swift Parrot is not present therefore the species is unlikely to be impacted by the works.

Curlew Sandpiper *(Calidris ferruginea) – Critically Endangered (Commonwealth Status)*
The Curlew Sandpiper is a small migratory bird that breeds in Siberia and migrates to Australia for the non-breeding period, between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It roosts on shingle, shell, or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. The chance of Curlew Sandpiper's to reside in the site area is quite low, due to its migratory behaviour, unique breeding location and lack of roosting grounds. Therefore, the proposed works are unlikely to impact the Curlew Sandpiper.

The Regent Honeyeater *(Anthochaera Phrygia) – Critically Endangered (Commonwealth Status)*
The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia, and only breeds in 3 key locations - north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Considering the lack of available feeding sources and particular breeding grounds, the chance of encountering the Regent Honeyeater during works is low.

Many of these species are unlikely to occur at the site, only nearby in a 10kmx10km radius. None of the species are considered likely to be impacted as a result of the works. If fauna species are observed to persistently occupy areas in the immediate vicinity of work zones, the contractor is to cease work activities and notify Council. It is the contractor's responsibility to also inform workers of their obligations and possible offences under the NSW National Parks and Wildlife Act and Australian EPBC Act with respect to threatened and migratory species. See **Table 2** for the comprehensive list of mitigation measures if species are found at the site.

Notwithstanding these extensive lists of species potentially occurring in the vicinity of the erosion sites, it should be noted that the foreshore and riverbed is a modified environment due to past construction at the site, is subject to ongoing erosion, and it is unlikely to provide habitat for threatened species. These species will be addressed in the test of significance below.

4.5.1.4 Test of Significance

Assessment Provision: *(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction [BC Act section 7(1)(a)]*

Response: The works are at site that are primarily disturbed riverbank absent of vegetation. An assessment of each species against this criteria is as follows:

- The site represents habitat that may be utilised by the powerful owl for hunting and/or roosting. However the scale of the works will not impact the species to the point where it will become extinct locally;
- The swift parrot is unlikely to use the area due to lack of food species;
- The curlew sand piper is unlikely to use the area due to most feeding and roosting for the species occurs in or around intertidal flats, which are not present at site; and
- The regent honeyeater is unlikely to be impacted due to a lack of food species in the area

Assessment Provision: *(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction [BC Act section 7(1)(b)]*

Response: The Endangered Ecological Community (EEC) "River-flat Eucalypt Forest" with interspersed woody weed vegetation community occurs along the Nepean River in the locality of the site. At the construction site which is highly disturbed, this is best described as exotic vegetation / woody weeds or completely stripped of vegetation. Therefore no adverse effect on the EEC "River-flat Eucalypt Forest" (RFEF) is likely or will the composition RFEF be substantially or adversely modified that its local occurrence is likely to be placed at risk of extinction. The works will not impact on adjoining vegetation that may comprise component of RFEF. Temporary protective fencing will be installed to protect adjoining vegetation.

Assessment Provision: *(c) in relation to the habitat of a threatened species or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

Response: The scale of the works is small with minimal removal of vegetation, the works will not alter the habitat in a negative way, and may increase habit value by lessening erosion in the area.

Assessment Provision: *(c) in relation to the habitat of a threatened species or ecological community: (ii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality [BC Act section 7(1)(c)]*

Response: The habitat to be removed offers some refuge for but minimal habitat value. Clearing of these areas would have minimal impact on the species utilising the area.

Assessment Provision: *(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly) [BC Act section 7(1)(d)]*

Response: There are no declared areas within the site nor within close proximity to the site. It is therefore unlikely that the works will impact on any declared area of outstanding biodiversity value.

Assessment Provision: *(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process [BC Act section 7(1)(e)]*

Response: Clearing of native vegetation are listed as a key threatening processes within the TSC Act. Clearing of native vegetation would be minimal and restricted to the immediate area of the works, as such, the impacts from these activities are considered to be minimal. Mitigation measures in the form of rehabilitation planning would encourage the regeneration vegetation on the site once works are completed.

Summary: The proposed development would not affect critical habitat and there is unlikely to be a significant impact on threatened species, populations or ecological communities or their habitat. The activity associated with the proposed development may cause some localised disturbance to the community present on this land but it is not considered significant.

4.5.2 Potential Impacts

The proposed works are expected to cause limited impacts on ecology. The works would be undertaken almost entirely from the concrete pathway and adjacent grassy areas, as well as reinstating the eroded and failed river bank. The proposal will require localised clearing to facilitate the future works. These areas will be replanted and re-instated.

The proposed contractors work compound would be coordinated to avoid removal of any vegetation. In addition, there may be a need to prune or potentially remove some trees to allow the excavator to slew around in the area of the works at the river's edge.

The construction activities may result in minor disturbances to the bed sediments and result in a temporary reduction in water quality. However, impacts to riverine species and the river environment would be short term and localised. A silt curtain would be used at the site to be documented as part of an erosion and sediment control plan and presented in **Table 2** (refer **Section 5.2**).

Temporary noise disturbances to fauna may also occur as a result of the works, although any impact would be minor in the context of typical activities undertaken in an urban area. In addition, the capacity for mobile fauna to relocate would minimise the potential for any disturbances to these species.

No snags will be removed from within the waterway and there will be no obstruction to the free passage of fish.

The use of appropriate mitigation and control measures to avoid and ameliorate any impacts on ecology are recommended and these have been identified and presented in **Table 2**.

4.5.3 Consideration of Wombat and Platypus Habitat

The scour and bank stabilisation site is a location where erosion has occurred and the river bank has been washed away. Options to monitor for the presence of wombats and platypus are summarised in **Table 2** (refer **Section 5.2**).

4.6 Visual Impacts

4.6.1 Site Conditions

The site is used primarily for recreation and is situated in a bushland setting along a river. The eroded bridge abutment is not visible from nearby roadways and properties. The bridge abutment and adjacent riverbank is heavily eroded.

Floodplains along the Nepean River at Camden are identified within the Camden DCP (S2.16.9) as a culturally significant landscape. The project will act to ensure the protection of the existing landscape values by undertaking bank stabilisation and protection works to prevent the further erosion and damage to the bank and surrounding areas.

4.6.2 Potential Impacts

The works are expected to cause minimal and temporary impact on the visual amenity of the site and adjacent areas during construction. Impacts would be in the form of earthworks, the presence of vehicles, plant, equipment, stockpiles and the potential for increased turbidity in the river adjacent to the site.

Construction of the rock revetments will change the eroded shoreline to a uniform rocky foreshore improving the amenity of the site. Although the proposed works will change the aesthetics of the site, the finished revetment will protect the site from further erosion increasing its visual amenity.

4.7 Noise

4.7.1 Site Conditions

The site is located along the Nepean River in the historic town of Camden. There are however no residential or commercial dwellings immediately adjacent to the site. The closest sensitive receivers to construction noise relevant to the proposed works are the residences along Chellaston Street but these are located more than 200 m away.

Overall, given that the site is mostly a recreational area in a bushland setting along a river, the background noise levels are considered to be low.

4.7.2 Potential Impacts

Construction activity on site would be undertaken during the following normal working hours, in accordance with the Interim Construction Noise Guideline (DECC, 2009):

- Monday to Friday 7am to 5pm
- Saturday 7am to 1pm
- No work on Sundays or Public Holidays

Any variation to the above hours would require the approval of Council, which would only be considered having regard to any potential for noise impacts on the surrounding recreational area and nearby residential amenity.

The proposed construction activities would involve excavation, concreting and rock placement. Excavation would be in sandy soils and there would be no excavation into bedrock involving use of rock hammers, for example. Other construction activities would be consistent with those commonly encountered on residential and commercial building sites.

Although the existing background noise level at the site are considered to be low, no significant noise impacts would be expected due to the works.

The receptors most likely to be affected are the residences along Chellaston Street.

Whilst there is no avoiding noise impacts at construction sites, there are standard construction good practice noise safeguards and mitigation measures that would be expected on site, as outlined in **Section 5** and **Table 2**. With those measures in place it is anticipated that noise impacts during this the works would be acceptable to local receptors given their temporary nature and the necessary requirement for the works.

There would be no impact on noise levels during the operational phase of the works.

4.8 Air Quality

4.8.1 Site Conditions

Existing air quality at the site is presumed to have low levels of pollutants, such as particulate matter and oxides, owing to its location away from major industrial and/or commercial areas. A Regional Air Quality Index is calculated by DPIE at Camden and is generally rated as either ‘Good’ or ‘Very ‘Good’.

4.8.2 Potential Impacts

Excavation and rock placement as well as the transport and/or delivery of rock material to site may result in the localised, temporary generation of dust. Truck movements may also result in dust generation across the site. It is expected that any potential air quality impacts would be effectively mitigated through the control measures listed in **Table** 2.

4.9 Waste Management

4.9.1 Site Conditions

Waste inputs in this area would most likely be confined to that left by recreational users of the area. Garbage bins are located at Chellaston Reserve on the western bank of the river and are emptied as part of Council’s waste collection services.

Overall, the site appears to have very low levels of garbage or waste on it.

4.9.2 Potential Impacts

The proposed works may generate the following waste during construction:

- Excavated fill material unsuitable for reuse, and
- General construction waste.

Materials unsuitable for reuse would be transported off site for disposal in accordance with the PEO Act. Any imported material should be Virgin Excavated Natural Material (VENM).

The removal of general construction waste from site is a normal construction contract requirement, progressively and at completion. The scour and erosion protection works once constructed would not generate waste at the site. It is considered that the impacts of the works from waste is negligible. However, it is recommended that standard construction site good practice is adhered to, as detailed in **Table 2**.

4.10 Traffic and Parking

4.10.1 Site Conditions

Access to the eastern abutment of Little Sandy Bridge for the construction works is via the concrete pathway /cycleway leading from the carpark for the leash free dog park at the end of River Road. Access to the western abutment would occur either via barge or via the concrete pathway leading down to the river.

4.10.2 Potential Impacts

The Contractor compound would be located in the large grassed reserve adjacent to the river on the eastern floodplain. During the works, these areas would become inaccessible to the public and other users of the area (refer **Appendix B**).

As noted in **Section 2.3.6**, it is estimated that approximately 8,000 t of rock would need to be imported to site to complete the construction. The rock would be delivered to site by truck, taking a route along MacArthur Road and River Road. Approximately 2,000t of the rock would be delivered to the western side of the river via Chellaston St.

As noted in **Section 2.4**, a small barge may be temporarily used to install the silt curtain at the site and to place some of the rocks on the riverbank.

The rock would be delivered at a rate to match the rate of construction and the available stockpile area. The only other significant vehicular movements would be those associated with the supply of concrete. These vehicular movements would be along main roads and they would not be expected to have any significant impact on traffic. As this site not a main thoroughfare and as the works are temporary, the impacts from the works on traffic and parking are likely to be minor.

It would be a requirement of the construction contract that the Contractor employ persons to control vehicular movements to and from the access road to the site (River Road). Where required, traffic control would be provided for any delivery of materials to the end of Chellaston Street.

4.11 Existing Users, Access and Safety

4.11.1 Site Conditions

Use of Little Sandy Bridge is primarily for recreational purposes. This includes pedestrians and cyclists. Users may include people utilising Chellaston Reserve on the western bank of the river or people using the bridge to transit the area. At present, no access is possible via the bridge and it is closed to the public. This will continue until the completion of these works.

4.11.2 Potential Impacts

At different times during the various stages of the works, the foreshore would be transformed during the construction activity. There would be various items of construction plant on site at different times such as excavators and trucks.

Little Sandy Bridge would remain closed for the duration of the works. Appropriate safety precautions would be taken during the construction activities, such as incorporation of security fencing and construction barrier fencing, to ensure public and worker safety. It would be a requirement of the construction contract that the Contractor employ persons to control vehicular movements to and from the access road to the site (River Road). Additional temporary measures would be installed on the western side of the bridge for the duration where works are being undertaken.

In summary, while there will remain the temporary inconvenience to users of the bridge during the construction period, such inconvenience is considered acceptable to attain the necessary longer term benefits of the scour and erosion protection works.

Following construction of the scour and erosion protection works, there would be no ongoing adverse impacts to users of the bridge and its approaches.

4.12 Heritage and Archaeology

4.12.1 Site Conditions

The EPBC Act Protected Matters Search Tool identified no Commonwealth Heritage Places or National Heritage Places.

There are no Aboriginal places near the site declared under Section 84 of the NP&W Act.

A search of the Council LEP and State Heritage Register confirms numerous items listed for the Camden LGA due to the historic nature of the town Camden. However, no sites were identified in the vicinity of the proposed works.

An Aboriginal Heritage Information Management System (AHIMS) search was conducted. This identified no sites within the area. A copy of the AHIMS search is provided in **Appendix E**.

4.12.2 Potential Impacts

No Aboriginal heritage constraints were identified for the works and no further investigation or impact assessment is required.

The Aboriginal Objects Due Diligence Code states that where a desktop and visual inspection has occurred and concluded that Aboriginal objects are unlikely to occur, an Aboriginal Heritage Impact Permit (AHIP) application will not be necessary. The works may therefore proceed with caution without a further Aboriginal Cultural Heritage Assessment (ACHA) or AHIP.

It is unlikely that there are any unrecorded non-indigenous artefacts within the site as the site has previously been disturbed for past bridge construction.

Nevertheless, the control measures listed in **Table 2** are recommended to ensure that no heritage impacts occur due to the proposed works.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects will apply to unexpected finds. In the event of unexpected finds, work will need to cease and DCCEW be notified by Council.

5 Recommended Mitigation and Control Measures

5.1 Environmental Management Plan

A site-specific construction environmental management plan (CEMP) should be prepared by the Contractor and approved by Council prior to commencement of construction. The Contractor would implement the CEMP during the works and would be responsible for selecting appropriate control measures for the potential impacts identified in this REF. The CEMP should be compliant with the contract technical specifications.

The CEMP would ensure that:

- appropriate control measures for the potential impacts are implemented on the site;
- activities are carried out with due diligence; and
- all activities comply with relevant environmental legislation including conditions of approval, Acts and Regulations, and Standards and Best Management Practices.

With the implementation of the CEMP environmental controls there would not be expected to be significant environmental impacts during construction.

5.2 Summary of Environmental Control Measures

The following **Table 2** identifies the recommended mitigation and control measures that should be put in place to avoid or ameliorate the potential impacts of the replacement works, as discussed in **Section 4**.

Table 2 Proposed Environmental Safeguards and Mitigation Measures

Environmental Safeguard and/or Mitigation Measure
Hydrodynamics
1. The CEMP should identify available streamflow and rainfall gauges upstream of the area of works and nominate triggers following which plant and material should be moved out of the flood affected area. The contractor should also nominate the flood immunity of any site compound and contingency measures to relocate in the event of flooding.
2. The flood immunity of any works or stockpile site should be identified, based on available flood modelling information. Provision should be made to relocate materials in the event of flooding, as much as practical.
3. Avoid excessive or long term stockpiling within the flood affected zone.
Water Quality
4. The Erosion and Sediment Control Plan (ESCP) will be developed for the works, signed off by Council and provided for the contract to implement as part of the overall CEMP. The ESCP must be developed and implemented in accordance with managing Urban Stormwater – Soils

Environmental Safeguard and/or Mitigation Measure
and Construction. Any additional safeguards required under the Fisheries Permit must also be adhered to.
5. Soil erosion and sediment controls should be implemented and maintained in accordance with the requirements of the stormwater management manual *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004).
6. Topsoil excavation and management should be undertaken in line with the Contract Technical Specification.
7. A schedule should be developed for the orderly excavation of material, which minimises the amount of land that is disturbed at any one time and minimises the potential for erosion and sediment transport and is consistent with efficient construction operations.
8. Stockpiles of excavated material should be located on flat ground at least 20 m away from areas subject to run-off and away from established flowpaths. The height of the stockpiles shall not exceed 2 m, unless stockpiles are suitably protected from wind erosion. The Contractor shall protect temporary topsoil stockpiles with diversion drains, silt fences and straw bales to prevent sediment loss.
9. A silt curtain should be installed in the river around the work site to minimise the release of turbid waters into the adjacent waterways. The curtain is to be installed, prior to commencement of any instream works and retained until after the completion of works.
10. Prior to use at the site and / or entry into the waterway, machinery is to be appropriately cleaned, degreased and serviced.
11. Refuelling should be undertaken off site. However, if refuelling on site is required, due care shall be taken to avoid spilling fuel and a tray should be used to catch any accidentally spilt fuel. Plant refuelling/servicing activities to be completed on-land and away from waterway areas.
12. The Contractor should undertake regular inspection of site controls and ensure that all plant and equipment is maintained in good working order with regular servicing.
13. Spill response kits should be maintained onsite for use as required by trained Contractor personnel.
14. No major maintenance of equipment should be undertaken on-site.
15. Timing of works should be planned to avoid, where possible, periods of high rainfall or during storm/wind warnings. Where this is not possible, preparation and tidying should occur around the worksite to reduce the potential for contamination of the waterway from stormwater runoff.
16. Weather forecasts need to be checked regularly during construction. Where flooding or inundation is forecast to the any work area, all equipment and materials need to be removed from the waterway and landside construction zone or appropriately secured above expected flood levels in the area.
17. Tracking of sediment from the construction site via construction equipment onto the road should be minimised. This may include cleaning any machinery in a designated washdown area to prevent tracking of soil off site.
18. The lowest level of hydrocarbons (oil, grease, petrol, diesel) practicable should be stored on site. If storage on-site of hazardous substances is required, then effective bunding should be used.

Environmental Safeguard and/or Mitigation Measure
19. Appropriate site and project inductions/training detailing potential water quality impacts and relevant construction measures and spill and emergency response procedures should be used.
Air Quality
20. A suitable water tanker should be employed to maintain access roads/tracks and haul roads in a damp condition.
21. All trafficable areas that are not sealed should be routinely watered to suppress the formation of dust. Water carts should be provided for routine watering except during wet weather.
Landscape and Visual
22. Impacted areas (i.e. for access, storage and site works) should be returned to pre-construction conditions where possible.
23. All plant and equipment should be kept to a minimal area and be retained within the site compound outside of construction hours (excluding any water bound plant and equipment).
24. The construction site should be kept tidy and an in an orderly fashion at all times to minimise visual impacts to local residents.
Ecology
25. All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage.
26. Any trees located in the vicinity of the contractor compound or construction access should be provided with appropriate protection measures.
27. Workers shall be informed of their obligations and possible offences under the NSW National Parks and Wildlife Act and Australian EPBC Act with respect to threatened and migratory species.
28. The Works shall minimise the destruction of flora and interference with fauna.
29. A qualified ecologist should supervise any vegetation removal
30. Any additional tree proposed to be removed at the time of site works will need to be assessed by Council's Urban Tree and Landscape Offcer and Natural Resource Officer.
31. If a Powerful Owl is known to nest and roost in close proximity to the work sites, a buffer zone of 100 metres will be implemented around breeding / roosting Powerful Owl.
32. Vegetation adjacent to the construction sites will be fenced off during construction to afford protection.
33. Prior to construction commencing, an inspection by Council staff should be undertaken to identify if there is any evidence of wombat dens or platypus burrows in the vicinity of the site, as well as 50 metres in each direction. If there is any evidence then a plan of management for the platypus or wombat should be developed.
34. During construction, daily checks should be undertaken 50 metres in both directions from site to identify any evidence of wombats or platypus. In the event that either species is identified a plan of management should be developed.
35. When revegetating disturbed soil should be levelled and smoothed and sown with a mixture of sterile grass seeds to encourage rapid revegetation and planted out with native plant species representative of the River-Flat Eucalypt Forest.

Environmental Safeguard and/or Mitigation Measure
36. Contractor to cease work activities and notify Council if fauna species are observed to persistently occupy areas in the immediate vicinity of work zones.
37. If native fauna is injured, immediate contact should be made with a wildlife rescue service or a veterinary surgeon.
38. No snags are to be removed, realigned or relocated in the waterway except where they are required as part of the permanent works.
Noise
39. Works should be undertaken during the standard construction hours where practicable (i.e. 7.00 am to 5.00 pm Monday to Friday and 7.00 am to 1.00 pm Saturdays, with no work to be undertaken on Sundays and Public Holidays). However, on occasion works may be required outside of the standard hours to meet the tide conditions and to allow for the works to be delivered on time. Where works are required outside of the standard hours, notification will need to be provided to local residents by Council.
40. Plant to be turned off when not in use (e.g. not left idling).
41. Instructions should be issued to the Contractor that appropriate silencers are to be fitted on all plant and equipment where possible.
42. All residents potentially affected by noise or other environmental issues should be consulted and notified of the scope and duration of the proposed works and potential impacts.
43. The use of horns and alarms are to be minimised.
Traffic Management
44. The Contractor shall coordinate transport to ensure minimum damage to public and other access roads along rock haulage routes.
45. The Contractor shall utilise materials sourced locally wherever possible to limit the use of public roads for long distance hauling of bulk construction materials.
46. The Contractor shall employ persons to control vehicular movements to and from the access road to the site.
47. A traffic management plan, that considers the impacts of construction traffic on the public, including any routes between the compound and the works area should be prepared by an appropriately qualified person. The traffic management plan must also consider management of pedestrians due to the location of works on a high use shared pathway.
Public Access and Safety
48. Prior to commencement of works, boundaries of the construction and access areas need to be marked with temporary barrier fencing. The fencing shall be monitored daily by the site supervisor and immediately repaired or replaced if necessary and shall be removed when construction is completed.
49. Appropriate signage should be installed advising pedestrians and cyclist of the closure of the approach path. The existing bridge closure signage should be maintained.
50. Machinery shall only access the defined work sites via clearly defined routes.

Environmental Safeguard and/or Mitigation Measure
51. Pedestrian access near to or within the Works area shall not be permitted over the duration of the Works.
52. Surrounding residences and businesses should be notified of the proposed works and hours of operation.
53. Community to be notified of construction activities and provided with a mechanism (e.g. phone number) for complaints to be submitted.
Waste Management
54. Waste should be managed in accordance with the philosophy of the waste minimisation hierarchy as follows: a) avoidance, where possible; b) treated, as required and reused onsite; c) recycled, either within the site or offsite; and d) where other alternatives are not possible, wastes would be disposed of at appropriately licensed waste management facilities.
55. Excavated material including fill material should be reused where practicable.
56. Any soils designated for offsite disposal would be tested for ASS and, if visual inspection of the soils indicates contamination may be present or the soils differ significantly from the material types observed during the ground investigations, the soils would also be tested for potential contamination, classified, stored, transported, and disposed of at an appropriately licensed waste facility in accordance with the DECC (2008) *Waste Classification Guidelines*.
57. Appropriate training on the management of waste should be provided to all staff onsite.
58. Any temporary stockpiles of waste should be appropriately covered and/or contained (e.g. bunding) to ensure no waste is washed or blown back into the waterway. If materials do enter the river during the work, they should be recovered immediately
59. Washout of trucks and cleaning of equipment and/or vehicles used during the works should not be undertaken in locations that permit flow of untreated wastewater directly to the open drainage system.
60. Portable toilets should be emptied on a regular basis and human waste disposed of to a local sewage treatment plant.
61. Upon completion of the activities, the site should be cleared of all surplus materials and any remaining waste created by the works.
Heritage
62. If any item of potential non-indigenous significance is found during construction, works should stop, and the matter referred to Council. The NSW Heritage Council would then be contacted in accordance with the *Heritage Act* 1977
63. All relevant staff and contractors are to be trained regarding their statutory obligations and responsibilities under the Heritage Act 1977 and best practice outlined in The Burra Charter 2013, through the site induction and toolbox talks in the event suspected historical cultural material is uncovered.
64. In the event that any potential archaeological finds / items are uncovered during construction works, the contractor must notify the Council Project Manager immediately and cease works

Environmental Safeguard and/or Mitigation Measure
until further instruction. As per Section 8 of the Due Diligence Code of Practice, DCCEW will need to be notified.

6 Summary of Environmental Factors

6.1 Consideration of Factors in Clause 171 of the EP&A Regulation

Clause 171 of the EP&A Regulation 2021 provides a list of factors that must be considered in determining the likely impacts of an activity on the environment.

Following review of the Clause 171 factors outlined below in **Table 3**, the proposed works are not considered to result in significant detrimental environmental impacts. Therefore, it is concluded that an EIS is not required and this REF is considered an appropriate environmental assessment.

Table 3 Factors in determining the likely impacts of an activity on the environment

Clause 171- Factor	Significant impact
a. Any environmental impact on a community?	No
b. Any transformation of a locality?	No
c. Any environmental impact on the ecosystems of the locality?	No
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	No
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	No
f. Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?	No
g. Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	No
h. Any long-term effects on the environment?	No
i. Any degradation of the quality of the environment?	No
j. Any risk to the safety of the environment?	No
k. Any reduction in the range of beneficial uses of the environment?	No
l. Any pollution of the environment?	No
m. Any environmental problems associated with the disposal of waste?	No
n. Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	No

o. Any cumulative environmental effect with other existing or likely future activities?	No
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	No

6.2 Consideration of Matters of National Environmental Significance

Matters of national environmental significance must be considered under the environmental assessment provisions of the *EPBC Act*. No matters of national environmental significance would be impacted by the proposed works, as set out below in **Table 4**.

Table 4 Matters of national environmental significance that must be considered

Matter of National Environmental Significance	Impacted?
a. Any environmental impact on a world heritage property?	No
b. Any Environmental Impact on a National Heritage place?	No
c. Any Environmental Impact on Ramsar Wetlands of international importance?	No
d. Any environmental impact on Commonwealth listed threatened species and ecological communities?	No
e. Any environmental impact on Commonwealth listed migratory species?	No
f. Does any part of the project involve a nuclear action?	No
g. Any environmental impact on the Commonwealth marine environment?	No
h. Any impact on Commonwealth land?	No

7 Conclusions

Council has requested RHDHV undertake the design for the proposed scour and erosion protection works and bridge lengthening works at Little Sandy Bridge, Camden. This REF is a written statement prepared for Council that considers the impact of the proposed works on the natural and built environment, and the proposed methods of mitigating or ameliorating any adverse effects.

The proposed scour and erosion protection works (rock revetment) are to be undertaken under Part 5 of the EP&A Act.

Council is the consent authority for the works and a Part 7 Permit (dredging and reclamation) will be required from DPI Fisheries for placement of rock in the waterway.

Potential impacts primarily relate to water quality, amenity and ecology and have been addressed by this REF. The works are required allow the safe reopening of the bridge. In general, given the localised and temporary nature of the works, it is expected that the project would have few adverse impacts on the surrounding environment, typically of a low to negligible level. Where potential environmental impacts have been identified, control measures have been recommended.

8 Decision Statement

8.1 Certification

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

*Signed*_____

8.2 Decision Statement

The proposed activity is/is not likely to have a significant impact on the environment and therefore an EIS is/is not required;

The proposed activity will/will not be carried out in a declared area of outstanding biodiversity value and is/is not likely to significantly affect threatened species, populations or ecological communities, or their habitats or impact biodiversity values, meaning a SIS and/or BDAR is/is not required.

The proposed activity may/may not proceed

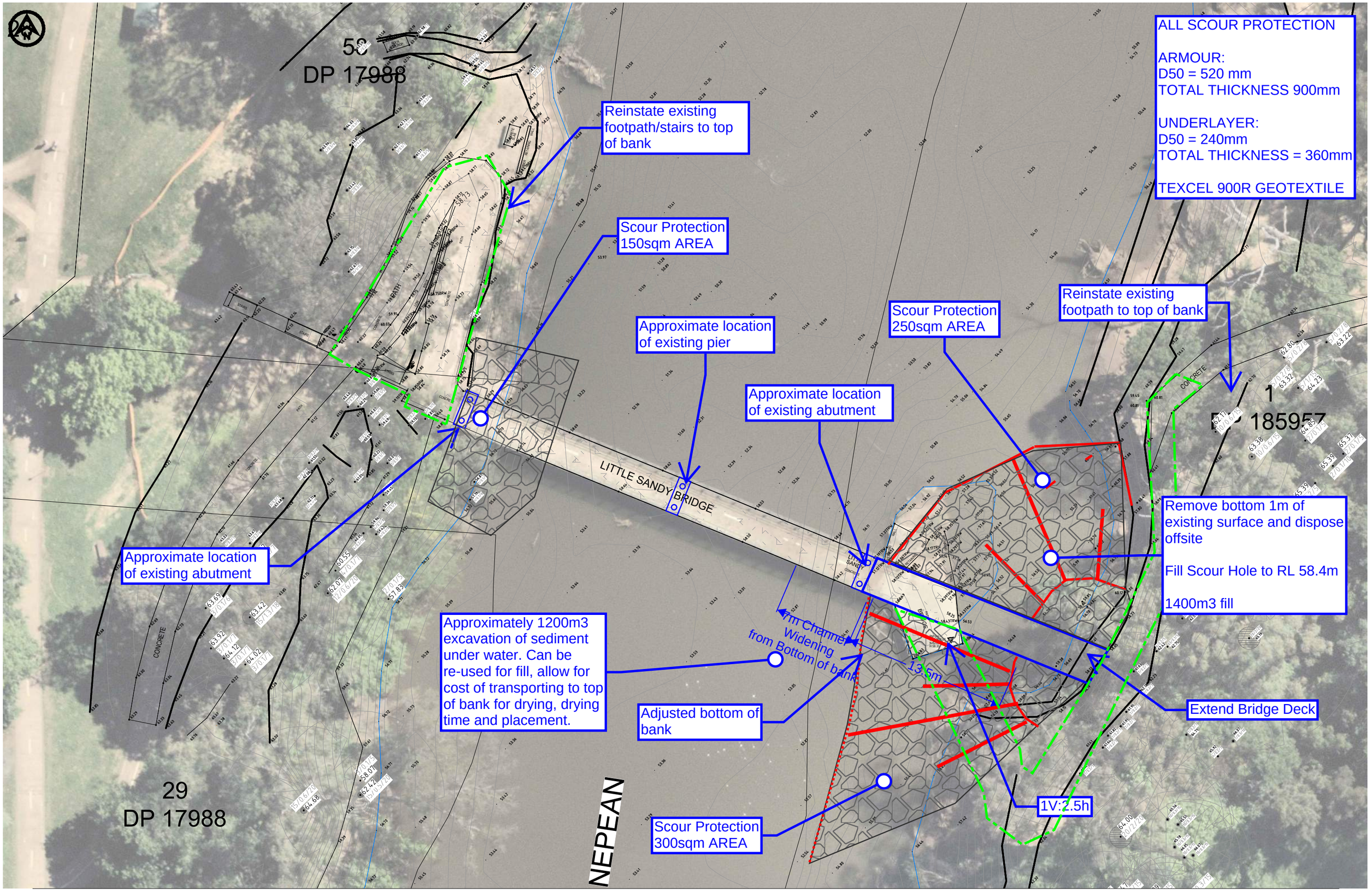
Mitigation measures are/are not required to eliminate, minimise or manage environmental impacts as per ***Section 5****.*

*Signed*_____

Appendix A

Appendix A - Concept Design

Royal HaskoningDHV
Enhancing Society Together



C:\Users\920324\Royal HaskoningDHV\Project-PA3130-SandyCk-Bridge-Rehab - Documents\PA3130 SandyCk Bridge Rehab WIP\05 Options\Additional Hydraulic Investigation\Options Sketches\Sandy Ck Options Plan V01.dwg

LITTLE SANDY BRIDGE - ADDITIONAL HYDRAULIC ASSESSMENT
OPTION 2D CONCEPT DESIGN - CHANNEL WIDENING

SAVED: 23-Dec-22

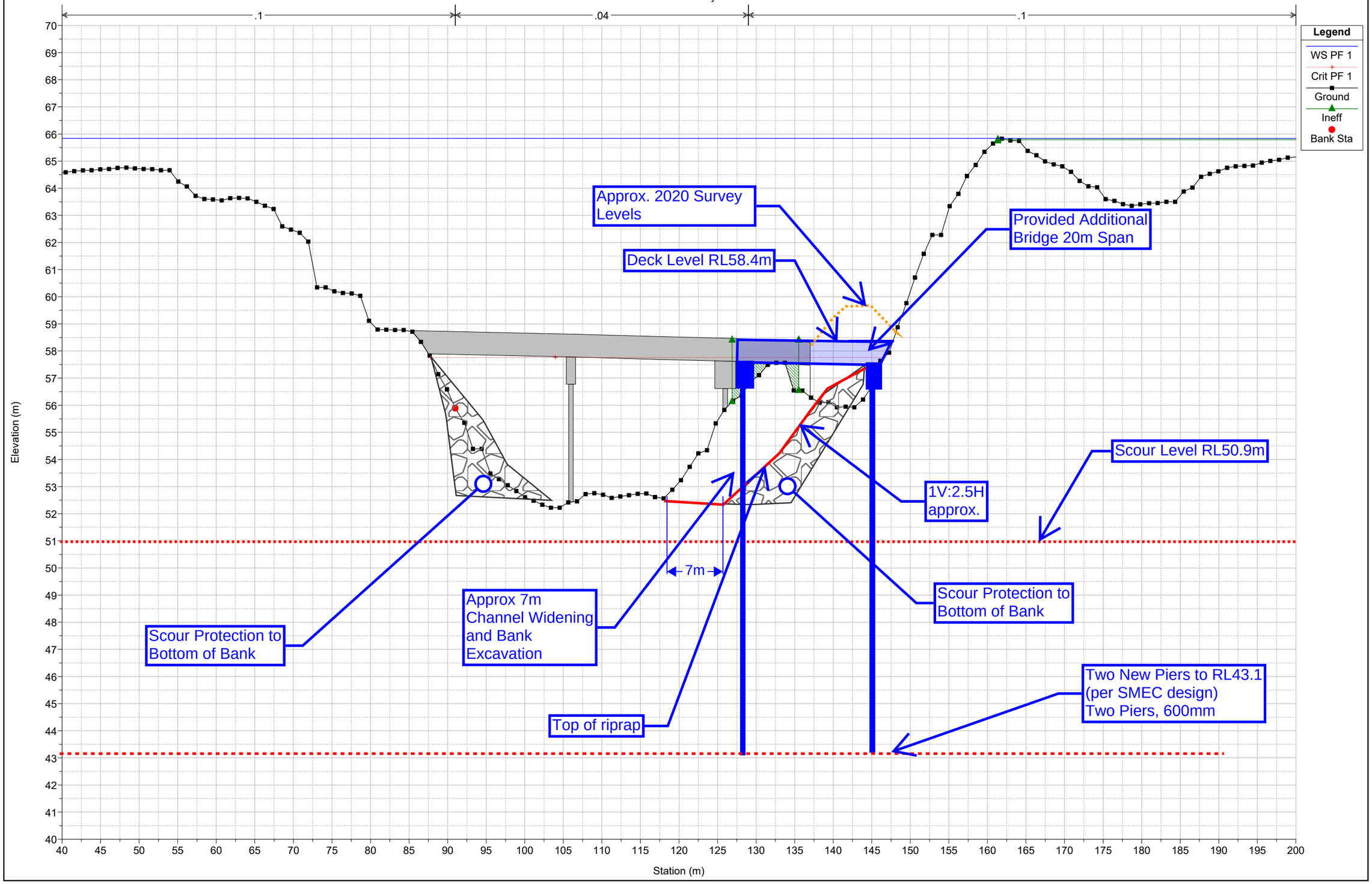
3 0 3 6 9 12 15m

1:150 (A1) 1:300 (A3)

Royal HaskoningDHV
Enhancing Society Together

PA3130_LittleSandyBridge_V01 Plan: Plan 1 Scenario A 21/12/2022

Little Sandy



C:\Users\920324\Royal HaskoningDHV\Project-PA3130-SandyCk-Bridge-Rehab - Documents\PA3130 SandyCk Bridge Rehab WIP\05 Options\Additional Hydraulic Investigation\Options Sketches\Sandy Ck Options Plan V01.dwg

SAVED: 23-Dec-22

LITTLE SANDY BRIDGE - ADDITIONAL HYDRAULIC ASSESSMENT
OPTION 2D CONCEPT DESIGN - CHANNEL WIDENING

Royal HaskoningDHV
Enhancing Society Together

Appendix

Appendix B – Detail Design Drawings

Royal HaskoningDHV
Enhancing Society Together

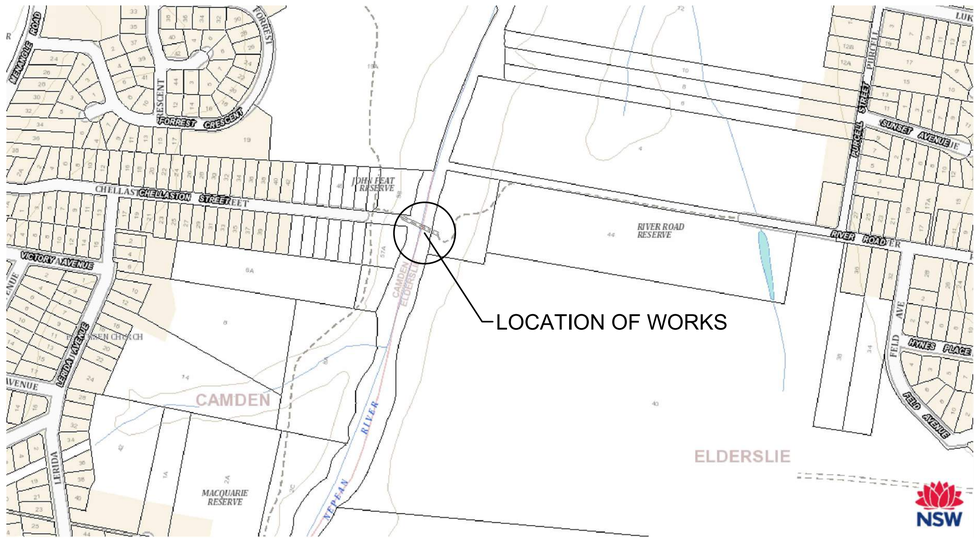
DRAWING No.
PA3130-RHD-00-XX-DR-C-001

DO NOT SCALE

LITTLE SANDY BRIDGE
LENGTHENING AND RIVER BANK PROTECTION WORKS
ELDERSLIE

FOR

CAMDEN COUNCIL



LOCALITY MAP
NTS

DRAWING LIST	
DRAWING TITLE	DRAWING NUMBER
TITLE SHEET DRAWING LIST AND LOCATLITY PLAN	PA3130-RHD-00-XX-DR-C-001
GENERAL NOTES SHEET 1	PA3130-RHD-00-XX-DR-C-002
GENERAL NOTES SHEET 2	PA3130-RHD-00-XX-DR-C-003
EXISTING CONDITION PLAN, DEMOLITION PLAN AND EROSION & SEDIMENT CONTROL DETAILS	PA3130-RHD-00-XX-DR-C-004
SITE PLAN	PA3130-RHD-00-XX-DR-C-005
SECTIONS AND DETAILS SHEET 1	PA3130-RHD-00-XX-DR-C-006
SECTIONS AND DETAILS SHEET 2	PA3130-RHD-00-XX-DR-C-007
SECTIONS AND DETAILS SHEET 3	PA3130-RHD-00-XX-DR-C-008
BRIDGE CIVIL WORKS PLAN AND LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-009
BRIDGE CIVIL WORKS CROSS SECTIONS SHEET 1	PA3130-RHD-00-XX-DR-C-010
BRIDGE CIVIL WORKS CROSS SECTIONS SHEET 2	PA3130-RHD-00-XX-DR-C-011
EASTERN REVETMENT SOUTH OF BRIDGE PLAN AND CL02A - LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-020
EASTERN REVETMENT NORTH OF BRIDGE CL02B - LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-021
EASTERN REVETMENT NORTH OF BRIDGE CL02C - LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-022
EASTERN REVETMENT CATCH DRAIN GRADING ALIGNMENT CL03	PA3130-RHD-00-XX-DR-C-023
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02A SHEET 1	PA3130-RHD-00-XX-DR-C-024
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02A SHEET 2	PA3130-RHD-00-XX-DR-C-025
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02A SHEET 3	PA3130-RHD-00-XX-DR-C-026
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02A SHEET 4	PA3130-RHD-00-XX-DR-C-027
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02B SHEET 1	PA3130-RHD-00-XX-DR-C-028
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02B SHEET 2	PA3130-RHD-00-XX-DR-C-029
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02B SHEET 3	PA3130-RHD-00-XX-DR-C-030
EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02B SHEET 4	PA3130-RHD-00-XX-DR-C-031
~~EASTERN REVETMENT CROSS SECTIONS ALIGNMENT CL02B SHEET 5~~ - SUPERSEDED	PA3130-RHD-00-XX-DR-C-032
EASTERN REVERTMENT - SOUTHERN ROCKBAG STRUCTURE - PLAN AND LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-035
EASTERN REVERTMENT - SOUTHERN ROCKBAG STRUCTURE - CROSS SECTIONS	PA3130-RHD-00-XX-DR-C-036
EASTERN REVERTMENT - NORTHERN ROCKBAG STRUCTURE - PLAN AND LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-037
EASTERN REVERTMENT - NORTHERN ROCKBAG STRUCTURE - CROSS SECTIONS	PA3130-RHD-00-XX-DR-C-038
WESTERN REVETEMENT PLAN AND CL04 - LONGITUDINAL SECTION	PA3130-RHD-00-XX-DR-C-040
WESTERN REVETEMENT CROSS SECTIONS ALIGNMENT CL04 SHEET 1	PA3130-RHD-00-XX-DR-C-041
WESTERN REVETEMENT CROSS SECTIONS ALIGNMENT CL04 SHEET 2	PA3130-RHD-00-XX-DR-C-042
WESTERN REVETEMENT CROSS SECTIONS ALIGNMENT CL04 SHEET 3	PA3130-RHD-00-XX-DR-C-043
WESTERN REVETEMENT CROSS SECTIONS ALIGNMENT CL04 SHEET 4	PA3130-RHD-00-XX-DR-C-044
EROSION & SEDIMENT CONTROL PLAN	PA3130-RHD-00-XX-DR-C-045
LANDSCAPE PLAN	PA3130-RHD-00-XX-DR-C-046

A4 FOR TENDER

AUSTRALIAN HEIGHT DATUM

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
TITLE SHEET
DRAWING LIST AND
LOCATLITY PLAN

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-001	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-002

DO NOT SCALE

1) GENERAL

ANY DISCREPANCIES BETWEEN THESE DRAWINGS AND OTHER DOCUMENTATION SHALL BE REFERRED TO THE SUPERINTENDENT AS APPOINTED BY THE PRINCIPAL PRIOR TO INSTALLATION.

ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THIS PLAN SET, AUSTRALIAN STANDARDS AND CAMDEN COUNCIL SPECIFICATIONS IN THAT ORDER.

WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH A CEMP (CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN) PREPARED BY THE CONTRACTOR. REFERENCE IS MADE TO THE REVIEW OF ENVIRONMENTAL FACTORS (REF) AND THE GEOTECHNICAL REPORT (JK GEOTECHNICS).

THE CONTRACTORS WORK AREA IS CONFINED TO THE SITE AND AS SHOWN ON THESE DRAWINGS UNLESS NOTED OTHERWISE. NO WORK IS TO BE CARRIED OUT ON ADJOINING PROPERTIES WITHOUT WRITTEN PERMISSION FROM THE OWNER AND CAMDEN COUNCIL.

ALL FINISHED GRADING SHALL BE TO THE SATISFACTION OF THE SUPERINTENDENT.

NO WORKS ARE TO BE UNDERTAKEN OUTSIDE OF THE EXTENT OF WORKS SHOWN ON THE DRAWINGS UNLESS INSTRUCTED BY THE SUPERINTENDENT.

ALL NEW WORKS SHALL MAKE A SMOOTH TRANSITION WITH EXISTING WORKS.

THE CONTRACTOR SHALL, ON COMPLETION OF THE WORKS, REMOVE FROM THE SITE AND ALL AREAS UTILISED BY THE CONTRACTOR FOR THE PURPOSE OF THE CONTRACT, ALL PLANT, BUILDINGS, TEMPORARY FENCES, RUBBISH, UNUSED MATERIALS, CONSTRUCTION FACILITIES, TEMPORARY FLOW MANAGEMENT WORKS, AND OTHER MATERIALS BELONGING TO THE CONTRACTOR OR USED UNDER THE CONTRACTOR'S DIRECTION AND LEAVE THE SITE AND SUCH AREAS CLEAN AND TIDY TO THE SATISFACTION OF THE SUPERINTENDENT.

ANY AREAS UTILISED BY THE CONTRACTOR FOR EXECUTION OF THIS CONTRACT SHALL BE FULLY RESTORED TO NOT LESS THAN THE PRE-CONSTRUCTION CONDITION TO THE SATISFACTION OF THE SUPERINTENDENT.

IN DISPOSING OF SUCH RUBBISH AND OTHER MATERIAL, THE CONTRACTOR SHALL NOT DISPOSE OF THEM ON LAND UNDER THE CONTROL OF THE PRINCIPAL. RUBBISH AND OTHER MATERIAL IS TO BE TAKEN OFF SITE AND DISPOSED AT A REGISTERED LANDFILL SITE.

A TREE PROTECTION ZONE (TPZ) IS TO BE ESTABLISHED FOR THE DURATION OF WORK ADJACENT TO ANY TREE.

TREES TO BE RETAINED ARE TO BE PROTECTED IN LINE WITH AS 4970-2009 'PROTECTION OF TREES ON DEVELOPMENT SITES'.

THE FOLLOWING ARE NOT PERMITTED WITHIN THE TPZ:
- MECHANICAL EXCAVATION
- STOCKPILING OF BUILDING MATERIALS, DEBRIS OR SOIL
- VEHICULAR TRAFFIC EXCEPT ON EXISTING PAVED SURFACES
- INSTALLATION OF SERVICE PITS OR HATCHES
- VEHICULAR CROSSINGS
- SEVERING OF TREE ROOTS WITH A DIAMETER GREATER THAN 30mm
- ALTERATION OF SOIL LEVELS AND STRUCTURE

ANY DEFECTS LIABILITY AND MAINTENANCE PERIODS INCLUDED IN THE CONTRACT SHALL BE DEEMED TO BE INCLUDED IN THE TENDER PRICE FOR THE WORKS. A FINAL SIGNOFF SHALL BE PROVIDED BY THE SUPERINTENDENT.

2) DESIGN CRITERIA

DESIGN LIFE – 50- 100 years

SCOUR PROTECTION DESIGN CRITERIA:
- ARI = 100 YR
- PEAK VELOCITIES = 2.8 m/s

3) QUALITY ASSURANCE

THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN A QUALITY ASSURANCE SYSTEM THAT MEETS THE REQUIREMENTS OF THE STANDARD RMS QA ROADWORKS SPECIFICATIONS AND THE CONTRACT.

ALL MATERIALS, MANUFACTURE AND CONSTRUCTION METHODS SHALL COMPLY WITH THE LATEST VERSION OF THE FOLLOWING RMS QA ROADWORKS SPECIFICATIONS:

- R44 EARTHWORKS
- R53 CONCRETE FOR GENERAL WORKS
- R54 GENERAL CONCRETE FOR PAVING
- R63 GEOTEXTILES

RECORDS WHICH COMPLY WITH THE REQUIREMENTS OF THE ABOVE RMS QA SPECIFICATIONS SHALL BE KEPT OF ALL ASPECTS AND STAGES OF THE WORK. DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL MAINTAIN ACCURATE AND UP TO DATE RECORDS AND SHALL CONVEY SUCH RECORDS TO THE SUPERINTENDENT.

DURING CONSTRUCTION, THE CONTRACTOR SHALL MAINTAIN ACCURATE AND UP TO DATE RECORDS AND SHALL MAKE SUCH RECORDS AVAILABLE TO THE SUPERINTENDENT IF REQUESTED. FAILURE TO MAINTAIN RECORDS AS SPECIFIED WILL RESULT IN THE CONTRACTOR RE-INSPECTING COMPLETED WORKS IF INSTRUCTED TO DO SO BY THE SUPERINTENDENT.

AT THE COMPLETION OF THE WORKS THE CONTRACTOR SHALL CERTIFY THAT THOSE WORKS HAVE BEEN UNDERTAKEN AND COMPLETED IN ACCORDANCE WITH THE DRAWINGS, SPECIFICATION AND INSTRUCTIONS ISSUED DURING THE COURSE OF THE CONTRACT.

THE CONTRACTOR SHALL OBTAIN AND KEEP ON SITE ALL RELEVANT MATERIAL SAFETY DATA SHEETS (MSDS) FOR ANY MATERIALS THAT ARE USED IN THE WORKS. ALL TRANSPORTATION, STORAGE AND USE OF THESE MATERIALS SHALL BE IN ACCORDANCE WITH MSDS.

4) WORK HEALTH & SAFETY & ENVIRONMENTAL CONTROLS

IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE ALL WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH NSW WORK HEALTH & SAFETY ACT 2011.

ALL PLANT AND DEBRIS FROM CONSTRUCTION WORKS SHALL BE COMPLETELY REMOVED CLEAR OF THE RIVER AND RETURNED TO THE SITE COMPOUND AT THE COMPLETION OF EACH DAY.

THE CONTRACTOR SHALL NOT CARRY OUT WORKS WHEN THERE IS A RISK OF FLOOD FLOWS IN THE NEPEAN RIVER WHICH WOULD BE A HAZARD TO PERSONNEL, OR CAUSE UNDUE DAMAGE TO PLANT OR MATERIAL. THE CONTRACTOR SHALL MONITOR THE WEATHER IN THE UPSTREAM CATCHMENT AREA AT ALL TIMES AND TAKE STEPS TO ENSURE THAT ADEQUATE WARNING IS GIVEN SO THAT PLANT, MATERIALS AND PERSONNEL CAN BE REMOVED PRIOR TO FLOODING.

WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH A CEMP (CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN) PREPARED BY THE CONTRACTOR. THIS PLAN SHALL DETAIL THE MEASURES WHICH WILL BE USED TO MITIGATE THE RISKS ASSOCIATED WITH FLOODING AT THE SITE, INCLUDING EARLY WARNING, AND MINIMISATION OF THE RISK OF DAMAGE TO THE WORKS.

ENVIRONMENTAL PROTECTION MEASURES SHALL COMPLY WITH THE REQUIREMENTS OF THE RMS QA SPECIFICATIONS G36 AND G38, AS WELL AS THE EROSOION AND SEDIMENTATION CONTROL MEASURES SHOWN WITHIN THESE PLANS.

5) SURVEY

UNLESS STATED OTHERWISE, ALL SURVEY INFORMATION USED FOR THIS DESIGN WAS SOURCED FROM THE
- BATHYMETRIC AND TOPOGRAPHIC SURVEY CONDUCTED BY BEVERIDGE WILLIAMS DATED JULY 2022

A DIAL BEFORE YOU DIG (DBYD) SHALL BE CONDUCTED BY THE CONTRACTOR AND ALL EXISTING SERVICES AND UTILITIES SHALL BE LOCATED, EXPOSED, LEVELLED AND RECORDED PRIOR TO COMMENCEMENT OF ANY WORKS.

ABOVEGROUND UTILITY SERVICES SHOWN ARE INDICATIVE ONLY. CONFIRMATION OF THE EXACT POSITION SHOULD BE MADE TO THE RELEVANT SERVICE AUTHORITIES PRIOR TO ANY WORKS. OTHER SERVICES MAY EXIST WHICH ARE NOT SHOWN

WORKS-AS-EXECUTED SURVEY SHALL BE CONDUCTED BY A REGISTERED SURVEYOR, AT THE COMPLETION OF THE WORKS, EMPLOYED BY THE CONTRACTOR.

ANY ELECTRONIC FILE IS PROVIDED WITHOUT WARRANTY AND SHOULD BE USED ONLY IN CONJUNCTION WITH THE SUPPLIED PDF/PAPER COPY OF THESE PLANS.

CONTOURS ARE AN INDICATION OF LANDFORM AND SHOULD NOT BE TAKEN IN PREFERENCE TO SPOT LEVELS SHOWN.

ALL PUBLIC UTILITIES AFFECTED BY CONSTRUCTION NOT LIMITED BY THOSE SHOWN ON THESE PLANS BUT DISCOVERED DURING CONSTRUCTION SHALL BE RELOCATED AND ADJUSTED AS NECESSARY WITH THE FULL PERMISSION OF THE RELEVANT SERVICE AUTHORITYAND CAMDEN COUNCIL.

THIS WAE SURVEY MUST CONFIRM ALL CRITICAL DESIGN LEVELS HAVE BEEN ACHIEVED. IF DESIGN LEVELS HAVE NOT BEEN ACHIEVED, THE CONTRACTOR IS TO CARRY OUT THE NECESSARY RECTIFICATION TO ACHIEVE COMPLIANCE, TO THE SATISFACTION OF THE PRINCIPAL.

ALL FINAL GRADES AND SURFACES ARE TO BE CARRIED OUT TO SATISFACTION OF THE PRINCIPAL BEFORE LANDSCAPE FINISHING.

THE PRINCIPAL RESERVES THE RIGHT TO CARRY OUT SPOT LEVEL CHECKS OF THE FINAL SURFACES TO CONFIRM QUALITY CONTROL OF ALL LEVELS. IF DISCREPANCIES ARE FOUND, THE CONTRACTOR WILL BE REQUIRED TO RECTIFY THE SURFACES ACCORDINGLY AND PROVIDE CONFIRMATION THAT DESIGN LEVELS HAVE BEEN ACHIEVED.

6) SOIL EROSION AND SEDIMENTATION CONTROL

THE CONTRACTOR SHALL CONSTRUCT OR INSTALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES IN ACCORDANCE WITH THE CONTRACT DOCUMENTATION AND TO THE SATISFACTION OF THE SUPERINTENDENT PRIOR TO ANY DISTURBANCES TO THE SITE. SOIL EROSION AND SEDIMENTATION CONTROL DEVICES SHALL BE TO THE STANDARD RECOMMENDED BY THE NSW DEPARTMENT OF HOUSING'S 'BLUE BOOK' TITLED "MANAGING URBAN STORMWATER – SOILS AND CONSTRUCTION", 2004.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL SOIL EROSION AND SEDIMENTATION CONTROL DEVICES ARE MAINTAINED TO PROTECT ALL DISTURBED AREAS.

FOR FURTHER NOTES REGARDING EROSION PROTECTION THE CONTRACTOR SHALL REFER TO THE DRAWINGS.

THE CONTRACTOR SHOULD BE AWARE THAT THE WORKS AREA IS SUBJECT TO SIGNIFICANT FLOODING.

7) DEMOLITION

CARRY OUT DEMOLITION WORK IN ACCORDANCE WITH AS 2601 MAKING DUE ALLOWANCE FOR THE DETERIORATED CONDITION OF THE STRUCTURE.

PROTECT PROPERTY AND SERVICES WHICH ARE TO REMAIN ON OR ADJACENT TO THE SITE.

LAWFULLY DISPOSE OF ALL DEMOLITION MATERIALS.

ITEMS TO BE DEMOLISHED SHALL BE COMPLETELY REMOVED CLEAR OF THE NEPEAN RIVER. ALL NOMINATED EXISTING STRUCTURES SHALL BE FULLY REMOVED FROM THE BANK UNLESS SUCH REMOVAL RESULTS IN SLOPE INSTABILITY.

8) EARTHWORKS

8.1) GENERAL

FOR THE PURPOSE OF THIS WORK, A GEOTECHNICAL INVESTIGATION WAS UNDERTAKEN JK GEOTECHNICS, DATED 2024, WHICH IS INCLUDED WITHIN THE CONTRACT DOCUMENTATION.

THESE STANDARDS APPLY TO GENERAL EARTHWORKS.
THE EXTENT AND SCOPE OF VEGETATION REMOVAL WORKS SHALL BE DEFINED BY THE SUPERINTENDENT AND SHALL BE AGREED WITH THE CONTRACTOR PRIOR TO COMMENCMENT OF WORK.

WITHIN EXTENTS OF WORK AREA, STRIP ALL TOPSOIL AND ANY DELETERIOUS MATERIAL AND STOCKPILE FOR RE-USE ON-SITE OR DISPOSE OF TO A LICENSED WASTE MANAGEMENT CENTRE.

EXCAVATE, STOCKPILE FOR RE-USE OR DISPOSE OF MATERIAL TO EXPOSE SUB-GRADE AS SPECIFIED IN CUT AREAS.

EXCAVATED MATERIAL THAT MEETS THESE SPECIFICATIONS AND IS VENM MAY BE USED AS FILL SUBJECT TO THE SUPERINTENDENT'S APPROVAL.

TESTING OF ALL COMPACTED LAYERS, INCLUDING SUB-GRADE TO BE ALLOWED FOR BY THE CONTRACTOR.

THE CONTRACTOR SHALL CLASSIFY ALL WASTE MATERIAL THAT REQUIRES OFF-SITE DISPOSAL IN ACCORDANCE WITH THE EPA WASTE CLASSIFICATION GUIDELINES, PART 1: CLASSIFYING WASTE, JULY 2009. DISPOSAL DOCUMENTATION SHALL BE PROVIDED TO CAMDEN COUNCIL FOR RECORD KEEPING PURPOSES. THIS INFORMATION SHALL ACCOMPANY THE CONTRACTOR'S PROGRESS CLAIMS AS SUPPORTING INFORMATION.

IMPORTED FILL MATERIAL – IF REQUIRED (PLACED ABOVE WATER TABLE) SHALL BE WELL GRADED CLEAN FILL CBR ≥ 8%. COMPACTION OF FILL MATERIAL SHALL ACHIEVE 95% STANDARD DRY DENSITY WITHIN -2% TO +2% OF OPTIMUM MOISTURE CONTENT UNLESS NOTIFIED OTHERWISE.

MAXIMUM COMPACTION LAYER THICKNESSES:
- VIBRATORY ROLLER: 250mm THICK LAYERS
- PLATE COMPACTOR: 150mm THICK LAYERS.

ALL EARTHWORKS ARE TO BE CONSTRUCTED TO THE LINES, LEVELS, GRADES AND CROSS SECTIONS SHOWN ON THE DRAWINGS.

9) GEOFABRIC

GEOTEXTILE FILTER FABRIC IS TO BE 'BIDIM' NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT AS NOTED ON THE DRAWINGS.

GEOTEXTILE TO BE LAID ON CONTINUOUS BED FREE OF VOIDS AND SHARP OBJECTS TO PREVENT TEARING

GEOTEXTILE ELEMENTS MAY BE JOINED BY EITHER OVERLAPPING OR SEWING. OVERLAP WIDTHS TO BE NO LESS THAN 1000mm. FOR SEWING, 100mm IS SUFFICIENT USING A NON-BIODEGRADEABLE THREAD.

GEOTEXTILE PLACED IN WATER WILL REQUIRE BALLAST TO SECURE IT IN POSITION.

THE GEOTEXTILE SHALL MEET THE INSPECTION AND ACCEPTANCE CRITERIA SET OUT IN 'RMS SPECIFICATION R63'.

10)ROCK

ALL ROCK SUPPLIED TO THE SITE FOR CONSTRUCTION SHALL BE FRESH OR ONLY SLIGHTLY WEATHERED, NON-FRIABLE, AND FREE FROM CRACKS, CLEAVAGE PLANES, SEAMS AND OTHER DEFECTS WHICH COULD CONTRIBUTE TO THE ACCELERATED BREAKDOWN OF THE STONE.

THE ROCK ARMOUR SHALL COMPLY WITH THE FOLLOWING:

- ROCK ARMOUR SHALL BE ROUGH AND ANGULAR.
- FOR RIP-RAP, THE ARMOUR STONE THICKNESS SHALL COMPRISE AT LEAST TWO LAYERS OF ROCK.
- ROCK SHALL HAVE A MINIMUM DRY BULK DENSITY OF 2,600kg/m^3 TO AS1141.6.1, U.N.O
- SATURATED POINT LOAD STRENGTH (IS50) ≥ 1.5 MPa TO AS4133.4.1
- RESISTANCE TO SALT ATTACK SHALL EXHIBIT A MEAN PERCENTAGE LOSS OF < 5% (TO AS 4456.10, METHOD A)
- SODIUM SOUNDNESS WEIGHT LOSS LESS THAN 9% (TO AS1141.24 TEST METHOD)
- THE RATIO OF THE MAXIMUM DIMENSION OF ANY ROCK TO THE MINIMUM DIMENSION, MEASURED AT RIGHT ANGLES TO THE MAXIMUM DIMENSION SHALL NOT EXCEED 2.5.
- ROCK SHALL CONFORM TO THE SIZE GRADING SHOWN ON THE DRAWINGS.

IF THE CONTRACTOR WISHES TO VARY THE SOURCE OF ROCK, THE CONTRACTOR SHALL SUBMIT TO THE SUPERINTENDENT ADDITIONAL DOCUMENTATION AS LISTED ABOVE THAT DEMONSTRATES THAT THE ROCK FROM THE NEW SOURCE COMPLIES WITH THE REQUIREMENTS OF THE SPECIFICATION.

NO ROCK SHALL BE DELIVERED TO THE SITE WITHOUT WRITTEN AUTHORISATION FROM THE SUPERINTENDENT FOLLOWING ITS CONSIDERATION OF DOCUMENTATION ON THE QUARRY SOURCE, ROCK PROPERTIES AND THE CONTRACTOR'S QUALITY CONTROL PROCEDURES.

THE CONTRACTOR SHALL MAINTAIN A DAILY LOG OF IMPORTED ROCK DELIVERED TO THE SITE. THE LOG SHALL RECORD THE REGISTRATION OF EACH SUPPLY TRUCK, ITS DATE AND TIME OF ARRIVAL ON THE SITE, THE ROCK SUPPLY DOCKET NUMBER ISSUED BY THE QUARRY PERTAINING TO THE DELIVERY AND A SIGNATURE BY A REPRESENTATIVE OF THE CONTRACTOR TO VERIFY THE INFORMATION.

DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TO THE SUPERINTENDENT EACH WEEK A COPY OF THE COMPLETED DAILY ROCK SUPPLY LOG AND THE ORIGINAL SUPPLY DOCKETS PERTAINING TO WORK UNDERTAKEN IN THE PREVIOUS WEEK. THE SUPPLY DOCKETS SHALL INCLUDE A RECORD OF LOADED TRUCK MASS.

ALL ROCK WORK SHALL BE CONSTRUCTED TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS.

A4 FOR TENDER

AUSTRALIAN HEIGHT DATUM

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
GENERAL NOTES
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 88545000
Fax: +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-002	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

THE METHOD OF PLACING THE ROCK SHALL BE SUCH:

- AS TO MINIMISE ITS BREAKDOWN ON HANDLING AND TO PRODUCE MINIMUM FINES.
- THAT SEGREGATION INTO SIZE CLASSES OF ROCK BE KEPT TO A MINIMUM.
- ROCKS ARE WEDGED AND LOCKED TOGETHER SUCH THAT THEY ARE NOT FREE TO MOVE WITHOUT DISTURBING ADJACENT ROCKS.
- UNDERLAYER ROCKS SHALL NOT BE COMPACTED.
- UNDERLAYER ROCK SHALL BE PLACED TO ACHIEVE A DENSITY EQUIVALENT TO 'RANDOM PLACEMENT' WITH EACH ROCK HAVING AT LEAST THREE POINTS OF CONTACT WITH OTHER ROCKS IN THE SAME LAYER.
- THE APPROXIMATE DIAMETER OF VOIDS BETWEEN ARMOUR ROCK SHALL NOT EXCEED 0.5 * D_{N50} AND THE UNDERLAYER SHALL NOT BE VISIBLE AT ANY LOCATION.
- THERE SHALL BE NO FREE ROCKS ON THE SURFACE OF THE ARMOUR LAYER. PIECES OF ARMOURSTONE BROKEN DURING HANDLING OR PLACING SHALL BE REMOVED IMMEDIATELY. SUBJECT TO THE APPROVAL OF THE SUPERINTENDENT, BROKEN PIECES OF ARMOURSTONE MAY BE INCLUDED IN SMALLER GRADINGS.
- SURFACE OF THE ARMOURED SLOPE SHALL PRESENT AN ANGULAR UNEVEN FACE TO THE WATER. ARMOUR ROCK SMALLER THAN THE SPECIFIED MASS GRADING SHALL NOT BE USED TO FILL VOIDS OR TO PROP LARGER ARMOUR UNITS IN ORDER TO ACHIEVE THE REQUIRED PROFILE

THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING ALL ROCK UNDAMAGED DURING CONSTRUCTION.

THE PRIMARY ARMOUR LAYER SHALL HAVE A GRADING THAT CONFORMS TO THE FOLLOWING:

Size	Spherical Diameter (mm)
D0	450
D15	500
D50	600
D100	1100

THE UNDERLAYER SHALL COMPRISE THE FOLLOWING:

Size	Spherical Diameter (mm)
D0	120
D15	170
D50	200
D100	300

11)CONCRETE

GENERAL

ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

CONCRETE SHALL COMPLY WITH A MINIMUM 32 MPA STRENGTH.

THIS CONCRETE SPECIFICATION SHALL APPLY TO THE CONCRETE ELEMENTS CONSTRUCTED AS PART OF THE CIVIL WORKS. THE CONTRACTOR SHALL REFER TO CAMDEN COUNCIL STANDARD DRAWINGS FOR ADDITIONAL INFORMATION AS REQUIRED.

CONCRETE USED IN THE WORKS SHALL BE EITHER REINFORCED CONCRETE OR MASS CONCRETE AS NOTED ON THE DRAWINGS. CONCRETE MIX DESIGN SHALL BE IN ACCORDANCE WITH THESE SPECIFICATIONS.

TESTING AND ASSESSMENT FOR COMPLIANCE OF CONCRETE SHALL BE CARRIED OUT BY THE CONTRACTOR IN ACCORDANCE WITH AS 3600.

CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN ON THE DRAWINGS OR WHERE SPECIFICALLY APPROVED BY SUPERINTENDENT. THEY SHALL BE SCABBLED AND CLEANED AND SHALL HAVE A NEAT CEMENT-WATER SLURRY BRUSHED ON BEFORE POUR CONTINUES.

CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED AS APPROVED BY THE SUPERINTENDENT.

COVER TO REINFORCEMENT TO BE MAINTAINED AT CHAMFERS, DRIP GROOVES, REGLETS, ETC.

FREE DROPPING OF CONCRETE FROM A HEIGHT GREATER THAN 1200mm SHALL NOT BE PERMITTED.

CONCRETE SHALL BE COMPACTED WITH MECHANICAL VIBRATORS.

THE FINISHED CONCRETE SHALL BE DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS AND CRACKS HAVING A CRACK WIDTH EQUAL TO OR GREATER THAN 0.2mm AT THE END OF THE DEFECTS LIABILITY PERIOD. IF CRACKING EXCEEDS THIS LIMIT, THE CONTRACTOR SHALL MAKE GOOD AT HIS EXPENSE, THE CRACKS TO THE SATISFACTION OF THE SUPERINTENDENT WHICH MIGHT COMPRISE REPLACEMENT OF CONCRETE ELEMENT OR SEALING THE CRACKS OR OTHER WORKS.

DURING AND IMMEDIATELY FOLLOWING POURING, THE CONCRETE SHALL BE PROTECTED FROM WIND AND SUN TO PREVENT PLASTIC SHRINKAGE CRACKING. AWNINGS AND WIND BREAKS ARE TO BE UTILISED FOR THIS PURPOSE.

CURING OF ALL CONCRETE IS TO BE ACHIEVED BY KEEPING SURFACES CONTINUOUSLY WET WITH FRESH WATER (NOT SALTWATER) FOR A PERIOD OF 7 DAYS, AND PREVENTION OF LOSS OF MOISTURE FOR A TOTAL OF 14 DAYS FOLLOWED BY A GRADUAL DRYING OUT. USE POLYTHENE SHEETING OR WET HESSIAN AS NECESSARY TO PROTECT CONCRETE SURFACES FROM WIND AND TRAFFIC. DO NOT USE APPLIED CURING AGENTS.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STRUCTURAL SUFFICIENCY OF ALL FORMWORK. FORMWORK SHALL COMPLY WITH AS3610.

REINFORCEMENT

REINFORCEMENT IS TO BE MANUFACTURED IN ACCORDANCE WITH AS/NZS4671 AND SHALL BE FIXED AS SHOWN ON THE DRAWINGS.

PROVIDE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL LTD) CERTIFICATION OF COMPLIANCE WITH AS/NZS4671 FOR ALL REINFORCEMENT.

PROVIDE DOCUMENTATION TO SHOW THAT REINFORCEMENT SUPPLIER AND MILL COMPLIES WITH AS/NZS4671.

ALL REINFORCEMENT SHALL BE GRADE 500.

REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY TRUE IN PROJECTION.

CONCRETE COVERS NOTED ARE MEASURED FROM THE FORMWORK OR GROUND FACE TO THE OUTERMOST REINFORCEMENT COMPONENT.

BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.

SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN OR OTHERWISE APPROVED IN WRITING BY THE SUPERINTENDENT. LAPS SHALL BE IN ACCORDANCE WITH AS 3600 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR.

COGS, HOOKS, SPLICES, LAPS AND PIN DIAMETERS SHALL BE IN ACCORDANCE WITH AS 1100.501-2002.

BAR SHAPES ARE IN ACCORDANCE WITH AS 1100.501-2002.

BENDING AND STRAIGHTENING;
COLD BENDING: BARS CANNOT BE COLD BENT WITHOUT PRIOR APPROVAL FROM THE PROJECT STRUCTURAL ENGINEER CORRECT MINIMUM DIAMETER FORMERS ARE TO BE USED IN ACCORDANCE WITH AS 3600.
HOT BENDING: HOT BENDING MAY ONLY BE CONDUCTED WITH THE APPROVAL OF THE PROJECT STRUCTURAL ENGINEER. HOT BENDING CAN ONLY BE PERFORMED BY A CERTIFIED WELDER. TEST CERTIFICATE OF AFFECTED AREA TO BE OBTAINED.
STRAIGHTENING: WHEN RE-STRAIGHTENING PARTIALLY EMBEDDED BARS, DO NOT BEND OVER FORMERS OF SMALLER DIAMETER THAN PERMITTED IN AS 3600. DO NOT SUBJECT REINFORCEMENT BARS TO IMPACT IN ORDER TO STRAIGHTEN.

A4 FOR TENDER

AUSTRALIAN HEIGHT DATUM

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
GENERAL NOTES
SHEET 2

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

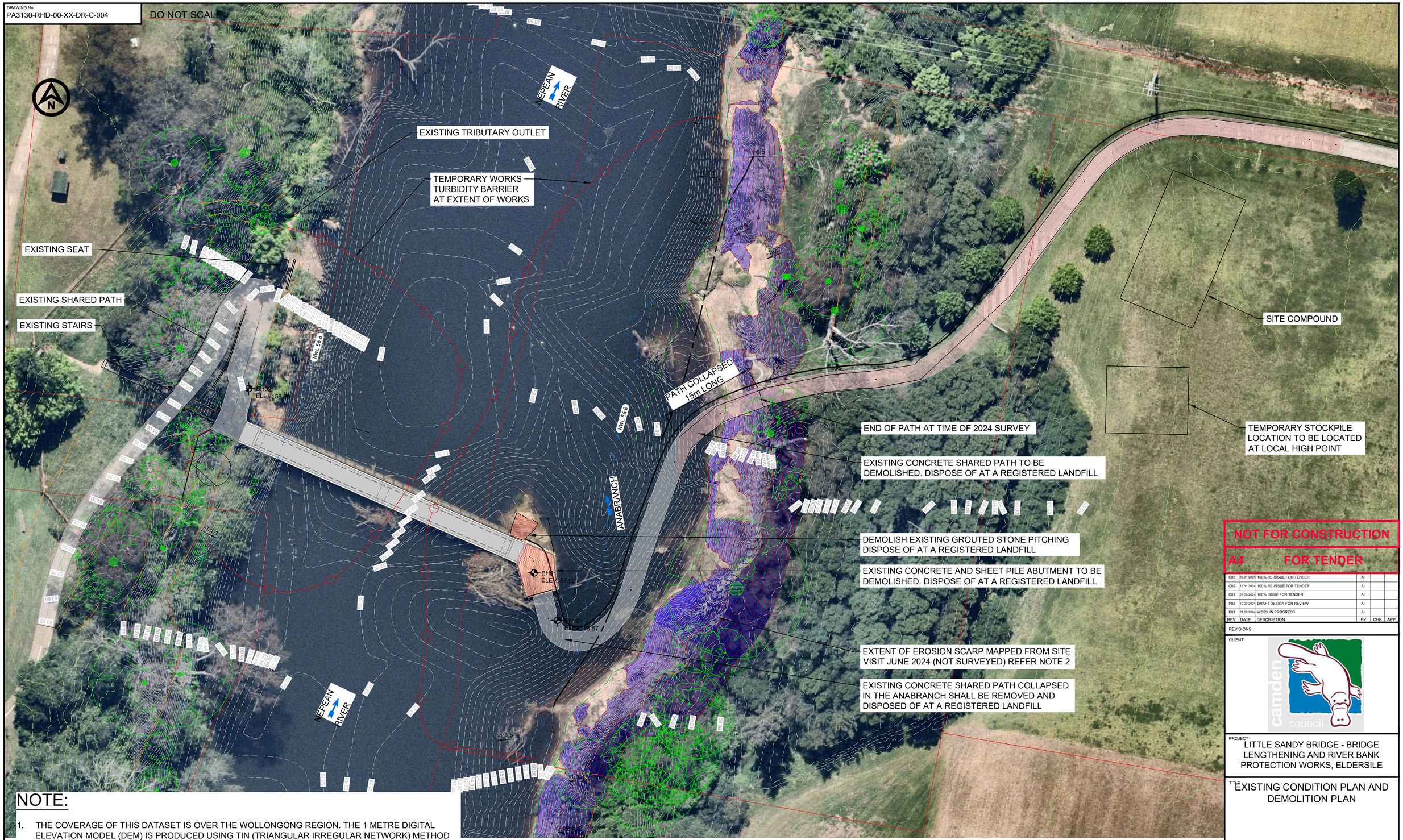
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-003	A4	C03

DRAWING No.
PA3130-RHD-00-XX-DR-C-004

DO NOT SCALE



NOTE:

1. THE COVERAGE OF THIS DATASET IS OVER THE WOLLONGONG REGION. THE 1 METRE DIGITAL ELEVATION MODEL (DEM) IS PRODUCED USING TIN (TRIANGULAR IRREGULAR NETWORK) METHOD OF AVERAGING GROUND HEIGHTS TO FORMULATE A REGULAR GRID. THIS DATA SET CONTAINS A GROUND SURFACE MODEL IN GRID FORMAT DERIVED FROM SPATIAL SERVICES CATEGORY 1 (CLASSIFICATION LEVEL 3) LIDAR (LIGHT DETECTION AND RANGING) FROM AN RIEGL VQ-780I (AEROMETREX PTY LTD). THE MODEL IS NOT HYDROLOGICALLY ENFORCED. THE DATA USED TO CREATE THIS DEM HAS AN ACCURACY OF 0.3m (95% CONFIDENCE INTERVAL) VERTICAL AND 0.8m (95% CONFIDENCE INTERVAL) HORIZONTAL. FOR MORE INFORMATION ON THE DATA ACCURACY, PLEASE REFER TO THE LINEAGE PROVIDED IN THE DATA HISTORY.
2. THE EXTENT OF FEATURES NOMINATED OR DEMOLITION IS BASED ON SURVEY DATED OCT 2024. FURTHER EROSION HAS OCCURRED SUBSEQUENTLY, SOME OF WHICH IS CAPTURED BASED ON SITE MEASUREMENTS. THE CONTRACTOR SHALL UNDERTAKE A SITE VISIT TO SATISFY THEMSELVES ON ANY CHANGES TO THE EXTENT OF THE DEMOLITION CAPTURED ON THESE PLANS.

PLAN
SCALE 1:250

5000 0 5000 10000 15000 20000 25000mm
1:500 (A3) 1:250 (A1)

NOT FOR CONSTRUCTION
A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EXISTING CONDITION PLAN AND DEMOLITION PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 85545000
Fax: +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-004	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-005

DO NOT SCALE

NORTH EAST ROCKBAG STRUCTURE

EXISTING TOP OF BANK 2024

EARLY STABILISATION WORKS BATTER 1IN1.5 REFER LANDSCAPE PLAN

EXISTING TOP OF BANK (2022)

EXISTING SHARED PATH TO REMAIN

WEST BANK ROCK REVETMENT PROTECTION WORKS

DN300 COIR LOGS INSTALLED EACH SIDE OF PATH THROUGH CUTTING

SHARED PATH RE-ALIGNMENT. FOR RAMP GRADES REFER TO DRG. C-0020. ROCK PROTECTION WORKS NORTH OF THE BRIDGE IS SETOUT FROM THE PROPOSED SHARED PATH DESIGN ALIGNMENT

HANDRAIL - MONOWILLS VELOCITY PARTIAL (3 RAIL) OR APPROVED EQUIVALENT

SURFACE INLET PIT WITH DN300 CLASS 4 OUTLET PIPE. PIT IN ACCORDANCE WITH CAMDEN COUNCIL STD. DRG. SD13

EXISTING SHARED PATH FOR DEMOLITION WORKS REFER TO DRG. C-0004

DN300 COIR LOGS INSTALLED EACH SIDE OF PATH THROUGH CUTTING

1 IN 2 ROCK ARMOUR BATTER OR FILL TO SCARP LINE WHICH EVER IS GREATER

REMOVE AND DISPOSE OF THE REMAINING EXISTING TREES WITHIN THE WORKS AREA.

ROCK FILL TO SCARP LINE (2024).

EXISTING SCARP LINE (2024). EROSION OCCURRED POST SURVEY. A NUMBER OF TREES SHOWN IN THE SURVEY HAVE SINCE BEEN LOST.

EXTENT OF EARLY STABILISATION WORKS BATTER 1IN1.5 PLACE ROCKFILL TO FULL EXTENT OF THESE WORKS (PURPLE SHADING)

HISTORIC ACCESS TRACK ALIGNMENT REMOVE AND DISPOSE OF COLLAPSED REMAINING SECTIONS. REFER TO DRG. C-0004

EAST BANK ROCK REVETMENT PROTECTION WORKS

SOUTH EAST ROCKBAG STRUCTURE

EARLY STABILISATION WORKS BATTER 1IN1.5 REFER LANDSCAPE PLAN

NEPEAN RIVER

KANGAROO BRANCH

BH02 ELEV. 58.06

BH01 ELEV. 57.92

BH03 ELEV. 58.57

NWL 56.8

14.64m of 300 NB RCRRJ CLASS 4 @ 1.85%

C 007

D 008

NOTE:

1. THE COVERAGE OF THIS DATASET IS OVER THE WOLLONGONG REGION. THE 1 METRE DIGITAL ELEVATION MODEL (DEM) IS PRODUCED USING TIN (TRIANGULAR IRREGULAR NETWORK) METHOD OF AVERAGING GROUND HEIGHTS TO FORMULATE A REGULAR GRID. THIS DATA SET CONTAINS A GROUND SURFACE MODEL IN GRID FORMAT DERIVED FROM SPATIAL SERVICES CATEGORY 1 (CLASSIFICATION LEVEL 3) LIDAR (LIGHT DETECTION AND RANGING) FROM AN RIEGL VQ-780I (AEROMETREX PTY LTD). THE MODEL IS NOT HYDROLOGICALLY ENFORCED. THE DATA USED TO CREATE THIS DEM HAS AN ACCURACY OF 0.3m (95% CONFIDENCE INTERVAL) VERTICAL AND 0.8m (95% CONFIDENCE INTERVAL) HORIZONTAL. FOR MORE INFORMATION ON THE DATA ACCURACY, PLEASE REFER TO THE LINEAGE PROVIDED IN THE DATA HISTORY.

NOT FOR CONSTRUCTION | A4 | FOR TENDER

PLAN
SCALE 1:250

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
SITE PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

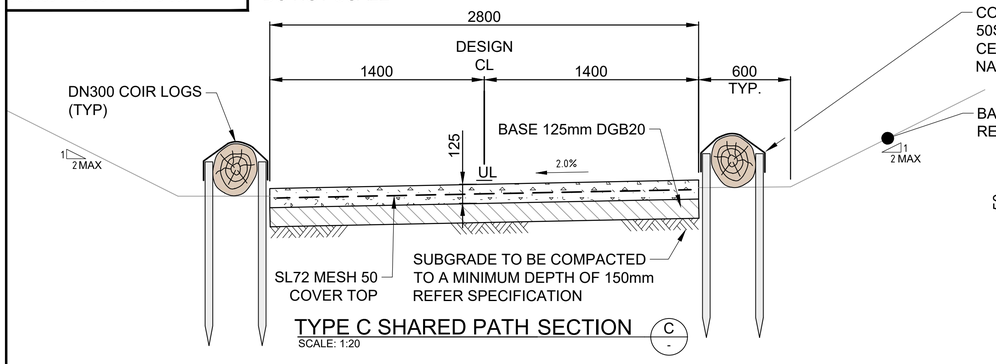
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-005	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-006

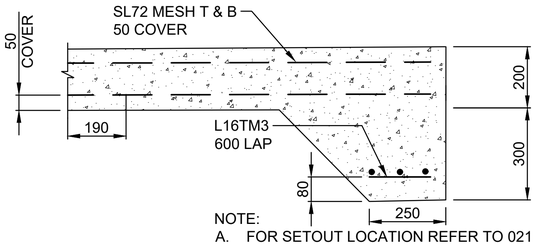
DO NOT SCALE



COIR LOGS IN NATURAL GROUND. DN300 COIR LOGS 3m LONG. 50SQ. HARDWOOD STAKES AT 300mm FROM EACH END AND ONE CENTRAL.. 30x0.8mm GALV. STRAPPING WITH 4xGALV. CLOUT NAILS PER STAKE

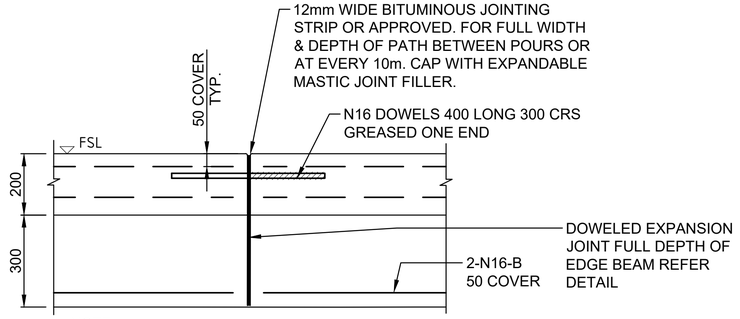
BATTERS VARY 1IN4 TO 1IN2 REFER CROSS SECTIONS

TYPE C SHARED PATH SECTION
SCALE: 1:20 (C -)



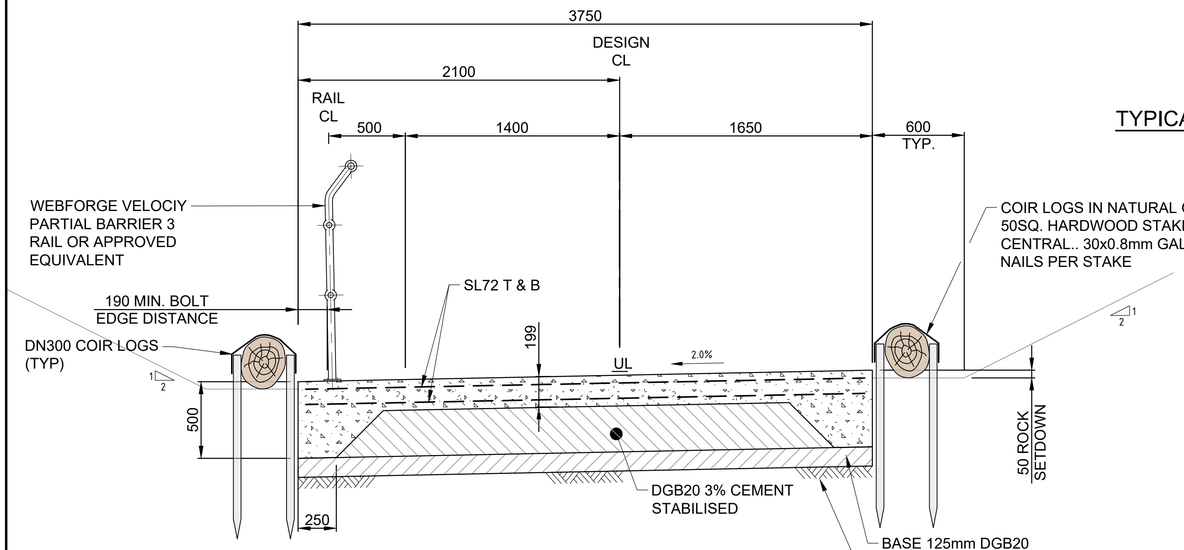
NOTE:
A. FOR SETOUT LOCATION REFER TO 021
B. 32MPa CONCRETE, REFER TO SPECIFICATION
C. F.S.C.J - FULLY SCABBLED CONSTRUCTION JOINT
D. 50 CLEAR CONCRETE COVER U.N.O

TYPICAL EDGE BEAM CONCRETE OUTLINE & REINFORCEMENT DETAIL
NOT TO SCALE



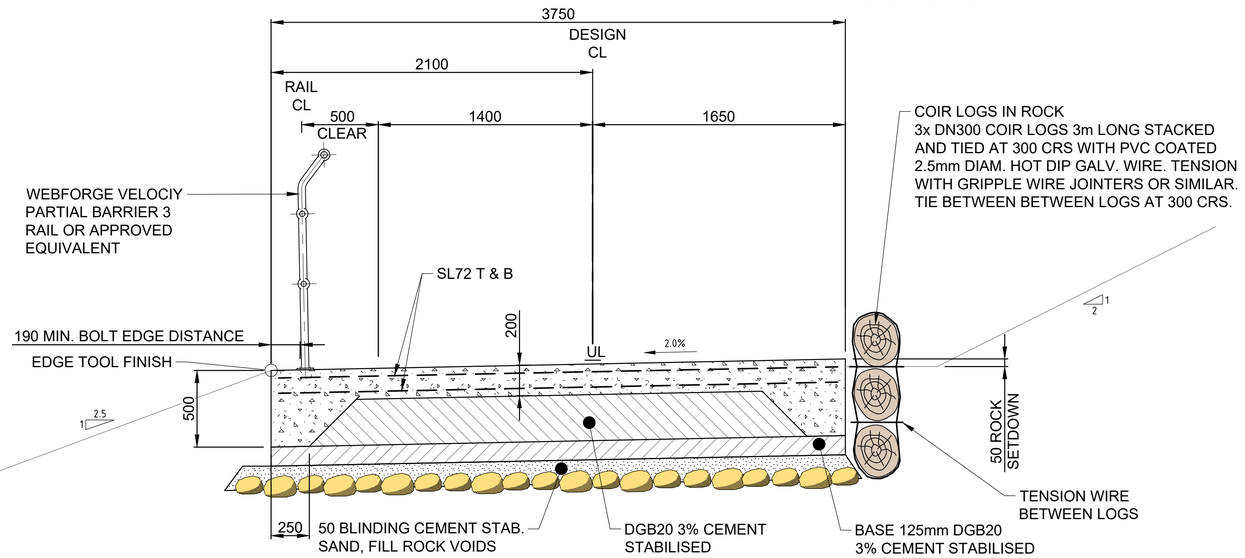
NOTE:
A. FOR SETOUT LOCATION REFER TO C-021
B. 32MPa CONCRETE, REFER TO SPECIFICATION
C. USE DOWEL JOINT AT THE END OF A POUR
D. 50 CLEAR CONCRETE COVER U.N.O

TYPICAL EDGE BEAM JOINT ELEVATION DETAIL
NOT TO SCALE



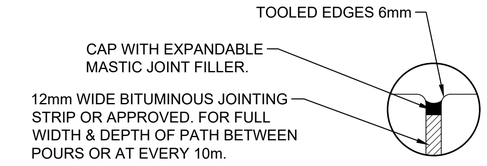
COIR LOGS IN NATURAL GROUND. DN300 COIR LOGS 3m LONG. 50SQ. HARDWOOD STAKES AT 300mm FROM EACH END AND ONE CENTRAL.. 30x0.8mm GALV. STRAPPING WITH 4xGALV. CLOUT NAILS PER STAKE

TYPE B SHARED PATH SECTION
SCALE: 1:20 (B -)

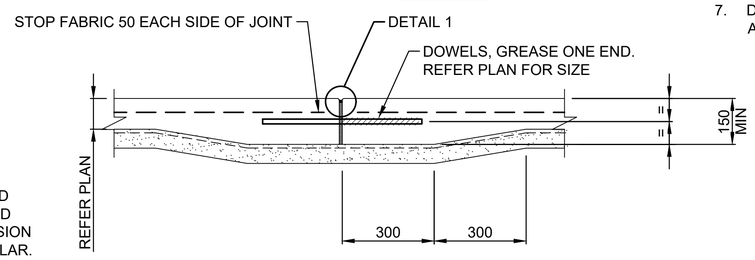


COIR LOGS IN ROCK
3x DN300 COIR LOGS 3m LONG STACKED AND TIED AT 300 CRS WITH PVC COATED 2.5mm DIAM. HOT DIP GALV. WIRE. TENSION WITH GRIPPLE WIRE JOINTERS OR SIMILAR. TIE BETWEEN BETWEEN LOGS AT 300 CRS.

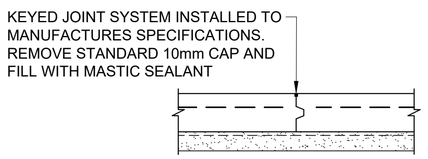
TYPE A SHARED PATH SECTION
SCALE: 1:20 (A -)



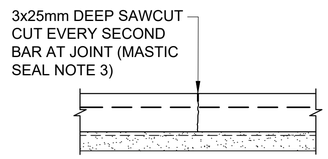
DETAIL 1



DOWELLED EXPANSION JOINT (DEJ) DETAIL
NOT TO SCALE
NOTE: WHERE SLAB THICKNESS IS GREATER THAN 150 NO THICKENING REQUIRED.



KEYED CONTROL JOINT DETAIL
NOT TO SCALE



CONTROL JOINT DETAIL
NOT TO SCALE

NOTES:

1. SHARED PATH SURFACE FINISHED TO BE BROOM FINISHED WITH TOWELED EDGES, UNLESS NOTED OTHERWISE.
2. PROVIDE PROPOSED LOCATIONS AND DETAILS OF CONSTRUCTION JOINTS FOR SUPERINTENDENT'S APPROVAL PRIOR TO CONSTRUCTION.
3. SAW CUT CRACK CONTROL JOINTS AS SOON AFTER CASTING AS PRACTICABLE TO AVOID SPALLING OR RAVELLING OF JOINT EDGES, AND WITHIN 16 HOURS OF CASTING TO PREVENT THERMAL AND/OR SHRINKAGE CRACKING OF SLAB. IMMEDIATELY AFTER SAW CUTTING FLUSH OUT JOINTS TO REMOVE SAWING RESIDUE AND INSERT A TEMPORARY FOAMED PLASTIC BEAD TO KEEP JOINT CLEAN PRIOR TO FILLING OR SEALING. PROTECT SAW CUTS FROM WHEEL LOADS FOR AT LEAST ONE WEEK AFTER CUTTING.
4. CONTROL JOINTS TO CONCRETE AT 2m CRS.
5. EXPANSION JOINTS TO CONCRETE AT 6m CRS.
6. EXPANSION JOINTS LOCATED OVER CONDUITS / DRAIN CROSSINGS
7. DOWELED EXPANSION JOINT AT THE END OF CURED POURS AND TO EXISTING CONCRETE

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
SECTIONS AND DETAILS SHEET 1

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 85545000
Fax +61 2 99293900
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-006	A4	C03

400 0 400 800 1200 1600 2000mm
1:40 (A3) 1:20 (A1)

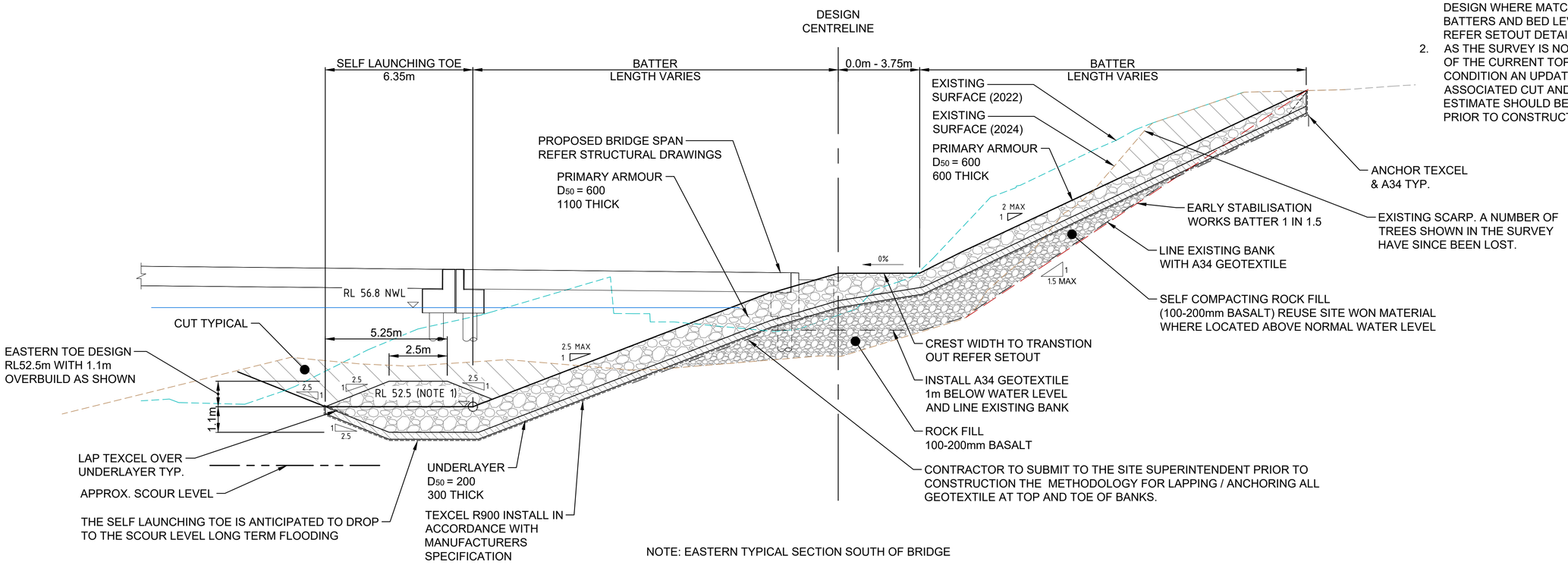
NOT FOR CONSTRUCTION **A4 FOR TENDER**

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-007

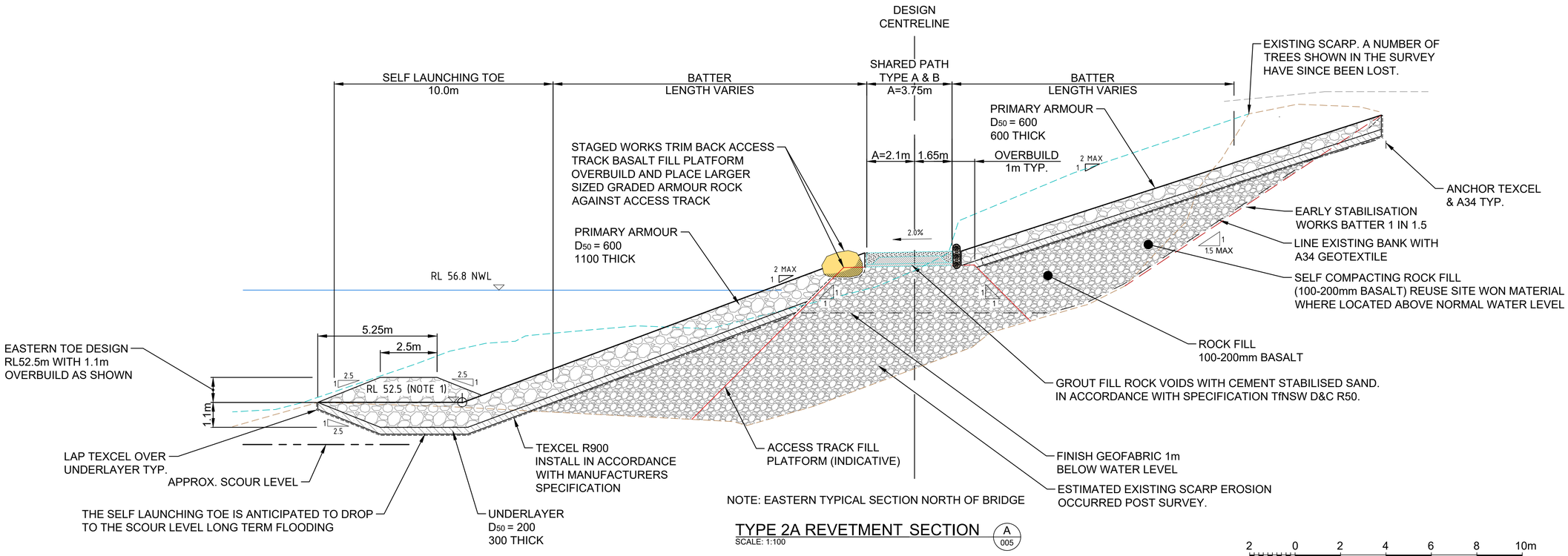
DO NOT SCALE

NOTE:
1. TOE LEVEL VARIES AT EACH END OF THE DESIGN WHERE MATCHING INTO EXISTING BATTERS AND BED LEVELS IS EXPECTED. REFER SETOUT DETAILS.
2. AS THE SURVEY IS NOT REPRESENTATIVE OF THE CURRENT TOPOGRAHIC CONDITION AN UPDATED SURVEY AND ASSOCIATED CUT AND FILL QUANTITY ESTIMATE SHOULD BE UNDERTAKEN PRIOR TO CONSTRUCTION COMMENCING.



NOTE: EASTERN TYPICAL SECTION SOUTH OF BRIDGE

TYPE 1 REVETMENT SECTION
SCALE: 1:100 — C 005



NOTE: EASTERN TYPICAL SECTION NORTH OF BRIDGE

TYPE 2A REVETMENT SECTION
SCALE: 1:100 — A 005

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION | **A4** | **FOR TENDER**

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
SECTIONS AND DETAILS SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE: AS SHOWN	REF: PA3130-RHD-00-M3-C-001_044		

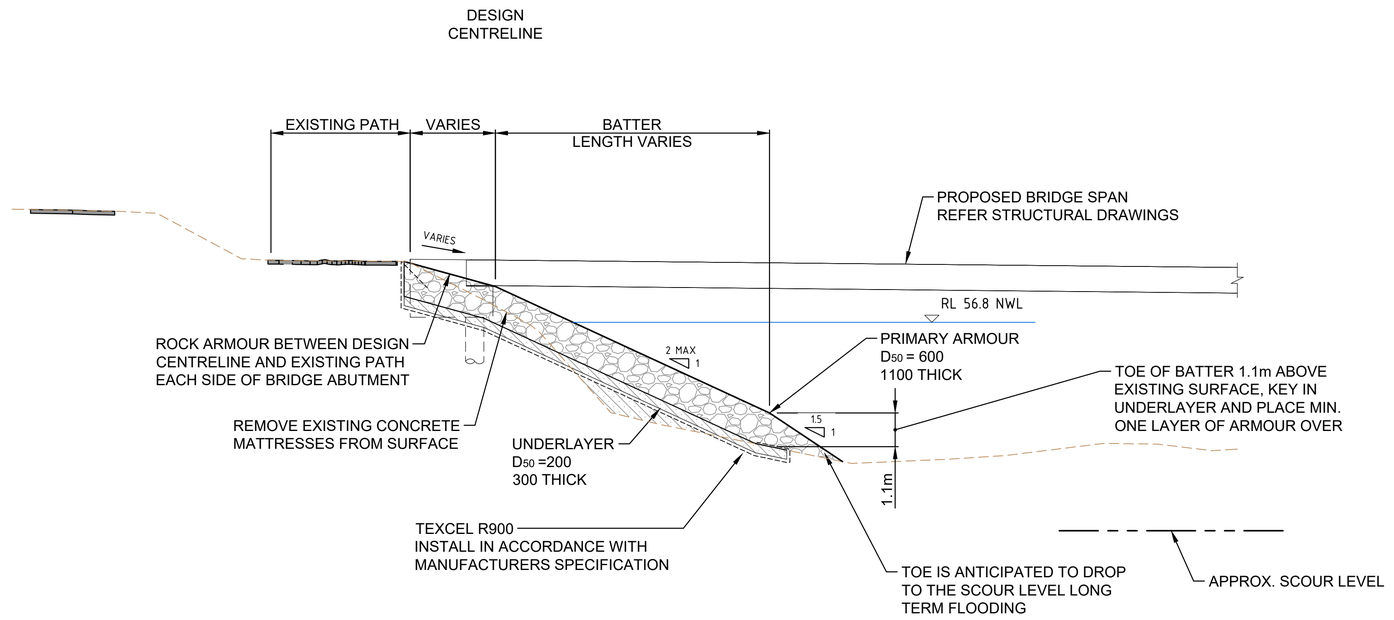
DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-007	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-008

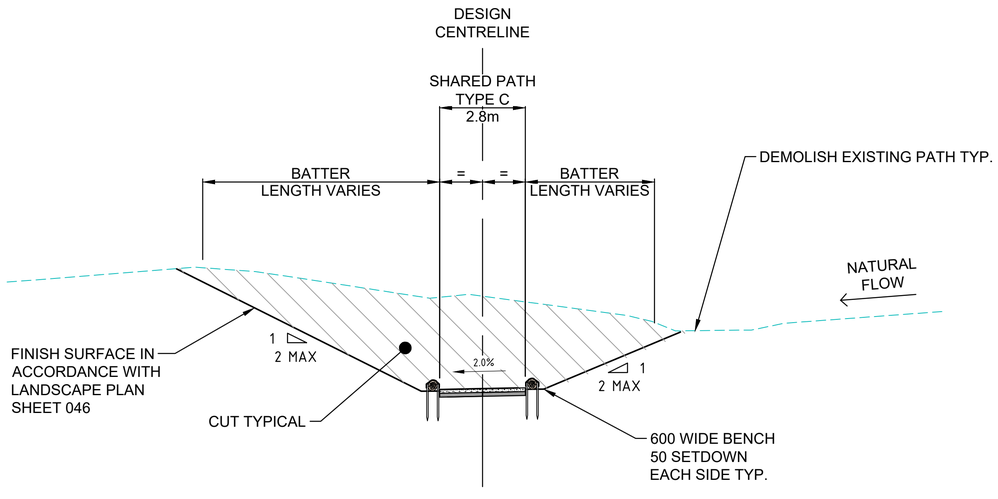
DO NOT SCALE

NOTE:
1. TOE LEVEL VARIES AT EACH END OF THE DESIGN WHERE MATCHING INTO EXISTING BATTERS AND BED LEVELS IS EXPECTED. REFER SETOUT DETAILS
2. THE WESTERN REVETMENT HAS A NATURAL HOLE AT THE TOE LEVEL BETWEEN CHAINAGE 10 AND CH 20. TOP UP OVER DESIGN WITH ADDITIONAL ROCK TO RL 52.5m. REFER TO CROSS SECTIONS



NOTE: WESTERN TYPICAL SECTION

TYPE 3 REVETMENT SECTION (D / 005)
SCALE: 1:100



NOTE: EASTERN TYPICAL SECTION NORTH OF BRIDGE

TYPE 2C REVETMENT SECTION (B / -)
SCALE: 1:100

NOT FOR CONSTRUCTION | **A4** | **FOR TENDER**

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
SECTIONS AND DETAILS
SHEET 3

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

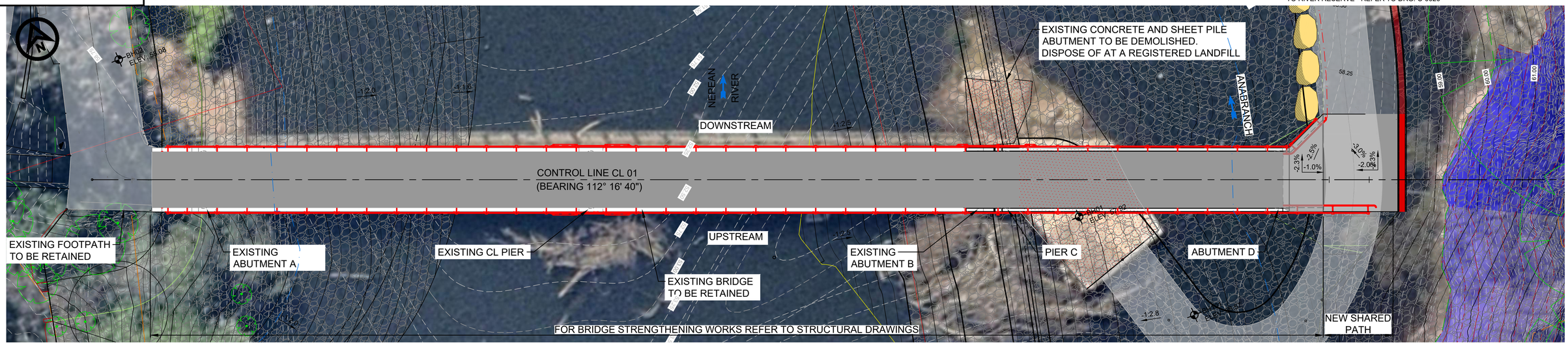
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-008	A4	C03

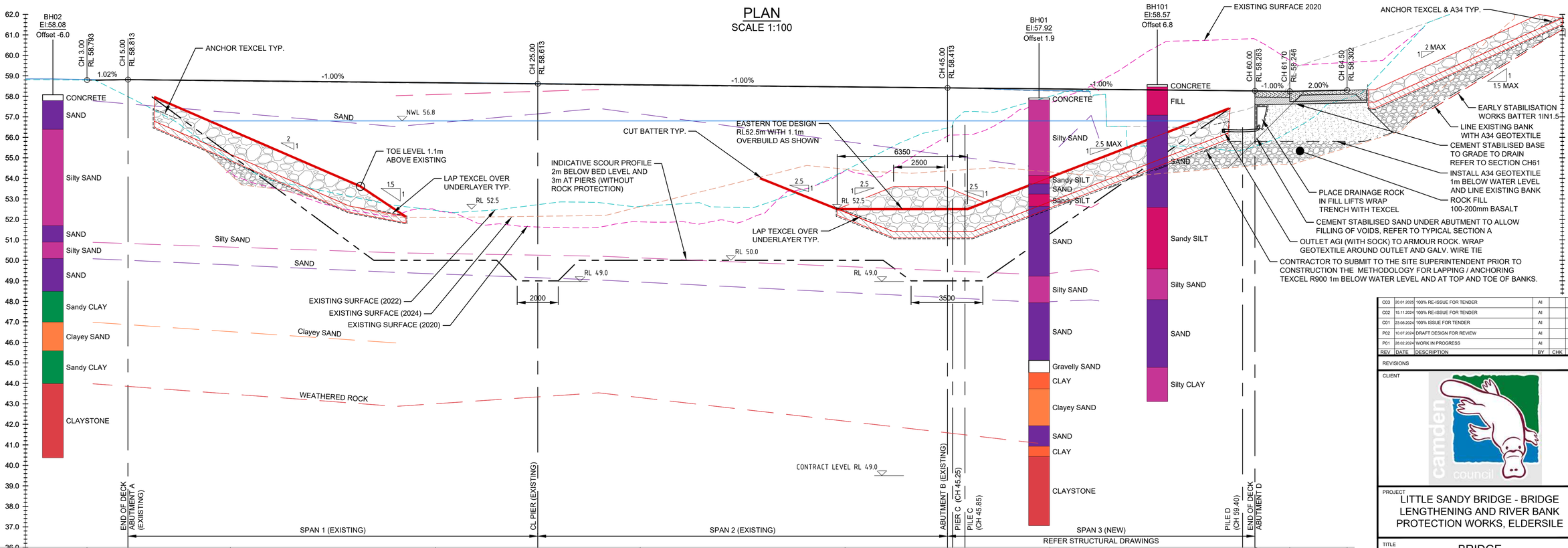
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-009

DO NOT SCALE



PLAN
SCALE 1:100



EXISTING LIDAR LEVELS				58.737	58.643	58.588	58.531	58.442	58.418	58.257	57.520	57.520	58.702	60.260
EXISTING LEVELS (OCT 2024)	58.811	58.793	57.986	54.921	52.439	52.715	52.632	54.382	56.460	58.002	55.557	55.557	56.288	57.914
WEATHERED ROCK LEVELS			43.853	43.480	43.006	43.339	43.304	42.158	41.585					
BRIDGE DECK LEVELS		58.793	58.813	58.763	58.663	58.613	58.563	58.463	58.413	58.363	58.263	58.263	58.246	58.302
CHAINAGE	0.000	3.000	5.000	10.000	20.000	25.000	30.000	40.000	45.000	50.000	60.000	60.000	61.702	64.500

CL01 - BRIDGE ELEVATION LONGSECTION
SCALE 1:100

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSLIE

TITLE
BRIDGE
CIVIL WORKS
PLAN AND LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025

SCALE
AS SHOWN

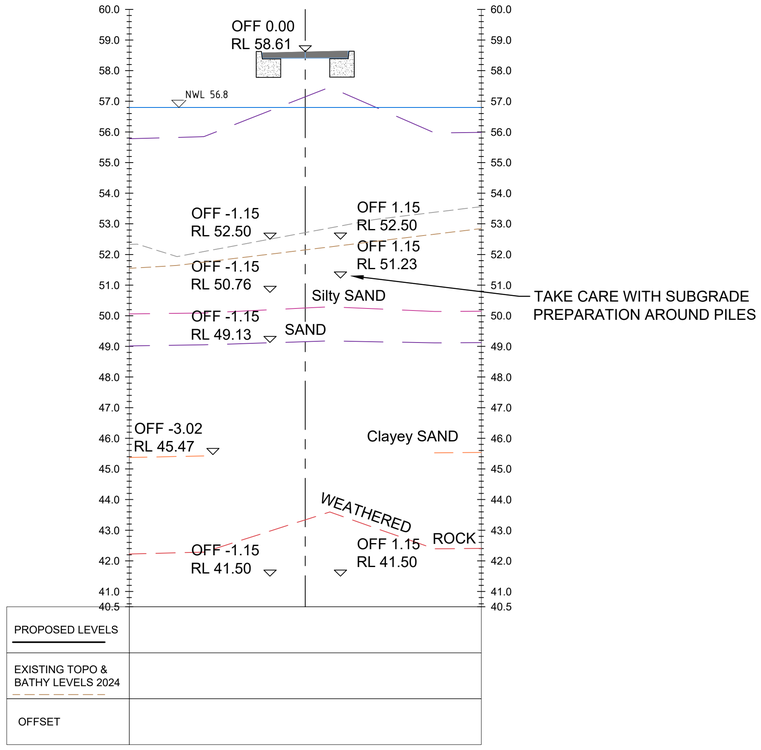
REF.
PA3130-RHD-00-M3-C-001_044

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-009	A4	C03

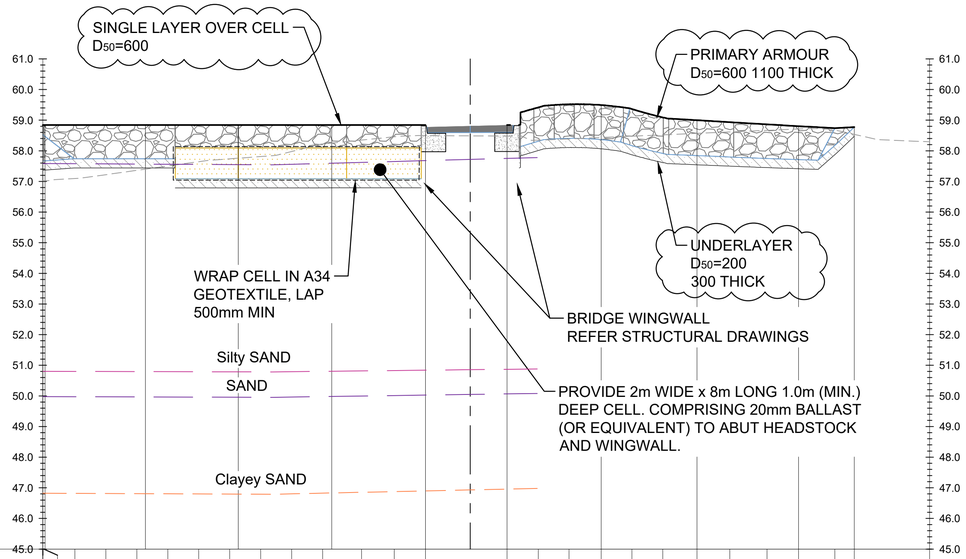
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-010

DO NOT SCALE



CH 25.00



OFFSET	-13.95	-13.92	-12.91	-11.90	-10.88	-9.87	-8.86	-7.85	-6.84	-5.83	-4.82	-3.55	-2.48	-1.46
PROPOSED LEVELS	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84	58.84
EXISTING TOPO & BATHY LEVELS 2024	57.02	57.02	57.10	57.22	57.36	57.50	57.65	57.74	57.81	57.98	58.22	58.35	58.46	58.44

OFFSET	1.20	2.22	3.22	4.27	5.28	6.28	7.40	8.47	9.69	10.72	11.90	12.54
PROPOSED LEVELS	58.84	59.42	59.52	59.49	59.36	59.09	59.00	58.94	58.86	58.80	58.74	58.77
EXISTING TOPO & BATHY LEVELS 2024	58.39	58.17	58.18	58.23	58.28	58.33	58.38	58.43	58.49	58.53	58.49	58.43

CH 4.00

SECTION A
AS SHOWN
C-009, C-040

NOT FOR CONSTRUCTION

A4 FOR TENDER

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE
LENGTHENING AND RIVER BANK
PROTECTION WORKS, ELDERSILE

TITLE
BRIDGE
CIVIL WORKS
CROSS SECTIONS
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

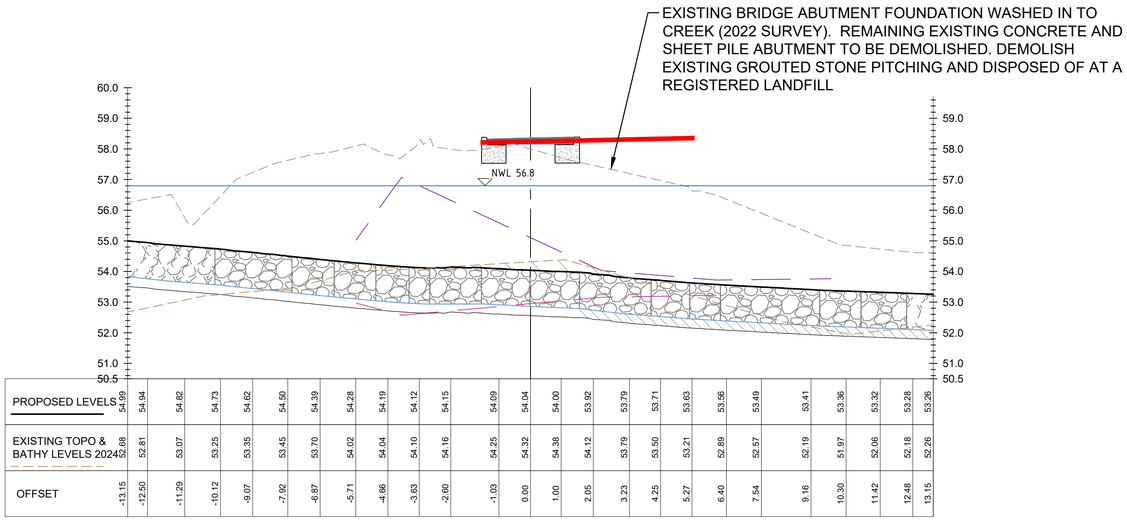
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025

SCALE: AS SHOWN
REF.: PA3130-RHD-00-M3-C-001_044

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-010	A4	C03

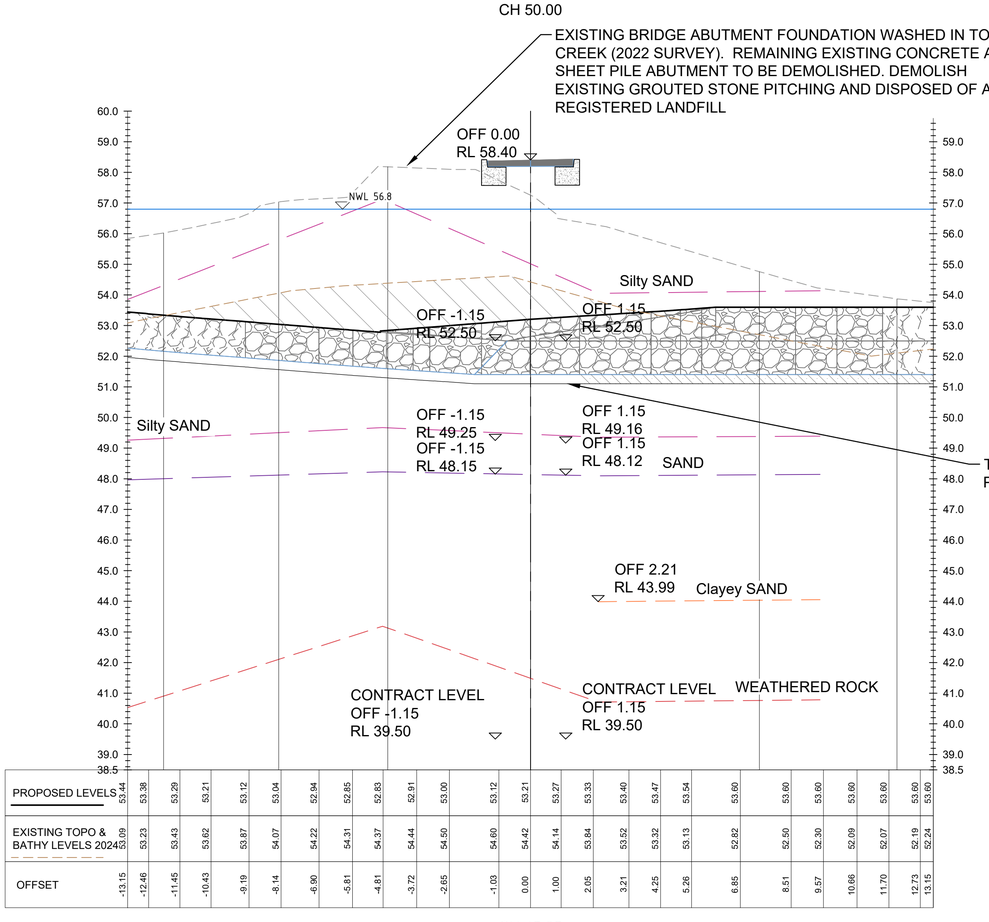
DRAWING No.
PA3130-RHD-00-XX-DR-C-011

DO NOT SCALE



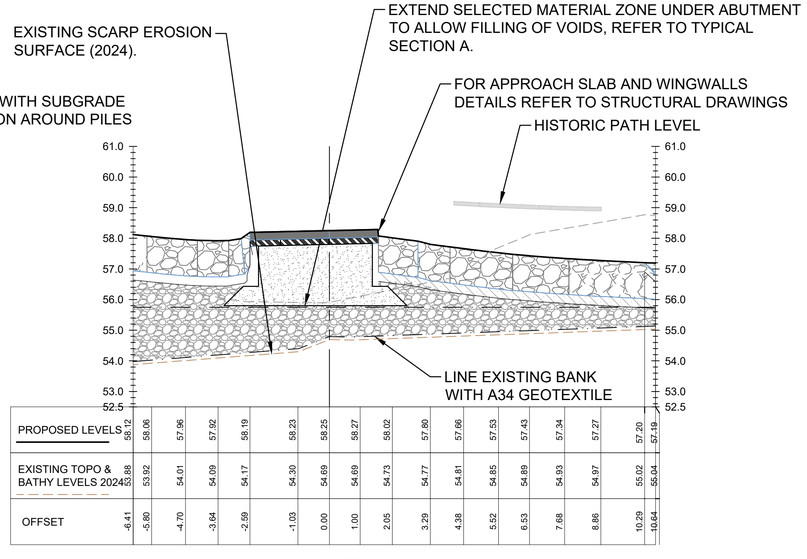
PROPOSED LEVELS	54.99	54.94	54.82	54.73	54.62	54.50	54.39	54.28	54.19	54.12	54.15		54.09	54.04	54.00	53.92	53.79	53.71	53.63	53.56	53.49		53.41	53.36	53.32	53.28	53.26
EXISTING TOPO & BATHY LEVELS 2024	52.68	52.81	53.07	53.25	53.35	53.45	53.70	54.02	54.04	54.10	54.16		54.25	54.32	54.38	54.12	53.79	53.50	53.21	52.89	52.57		52.19	51.97	52.06	52.18	52.26
OFFSET	-13.15	-12.50	-11.29	-10.12	-9.07	-7.92	-6.87	-5.71	-4.66	-3.63	-2.60		-1.03	0.00	1.00	2.05	3.23	4.25	5.27	6.40	7.54		9.16	10.30	11.42	12.48	13.15

CH 50.00



PROPOSED LEVELS	53.44	53.38	53.29	53.21	53.12	53.04	52.94	52.85	52.83	52.91	53.00		53.12	53.21	53.27	53.33	53.40	53.47	53.54	53.60		53.60	53.60	53.60	53.60	53.60	53.60
EXISTING TOPO & BATHY LEVELS 2024	53.09	53.23	53.43	53.62	53.87	54.07	54.22	54.31	54.37	54.44	54.50		54.60	54.42	54.14	53.84	53.52	53.32	53.13	52.82		52.50	52.30	52.09	52.07	52.19	52.24
OFFSET	-13.15	-12.46	-11.45	-10.43	-9.19	-8.14	-6.90	-5.81	-4.81	-3.72	-2.65		-1.03	0.00	1.00	2.05	3.21	4.25	5.26	6.85		8.51	9.57	10.66	11.70	12.73	13.15

CH 45.85



PROPOSED LEVELS	58.12	58.06	57.96	57.92	58.19		58.23	58.25	58.27	58.02		57.80	57.66	57.53	57.43	57.34	57.27		57.20	57.19					
EXISTING TOPO & BATHY LEVELS 2024	53.88	53.92	54.01	54.09	54.17		54.30	54.69	54.69	54.73		54.77	54.81	54.85	54.89	54.93	54.97		55.02	55.04					
OFFSET	-6.41	-5.80	-4.70	-3.64	-2.59		-1.03	0.00	1.00	2.05		3.29	4.38	5.52	6.53	7.68	8.86		10.29	10.64					

CH 61.00

NOT FOR CONSTRUCTION

A4 FOR TENDER

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
BRIDGE
CIVIL WORKS
CROSS SECTIONS
SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

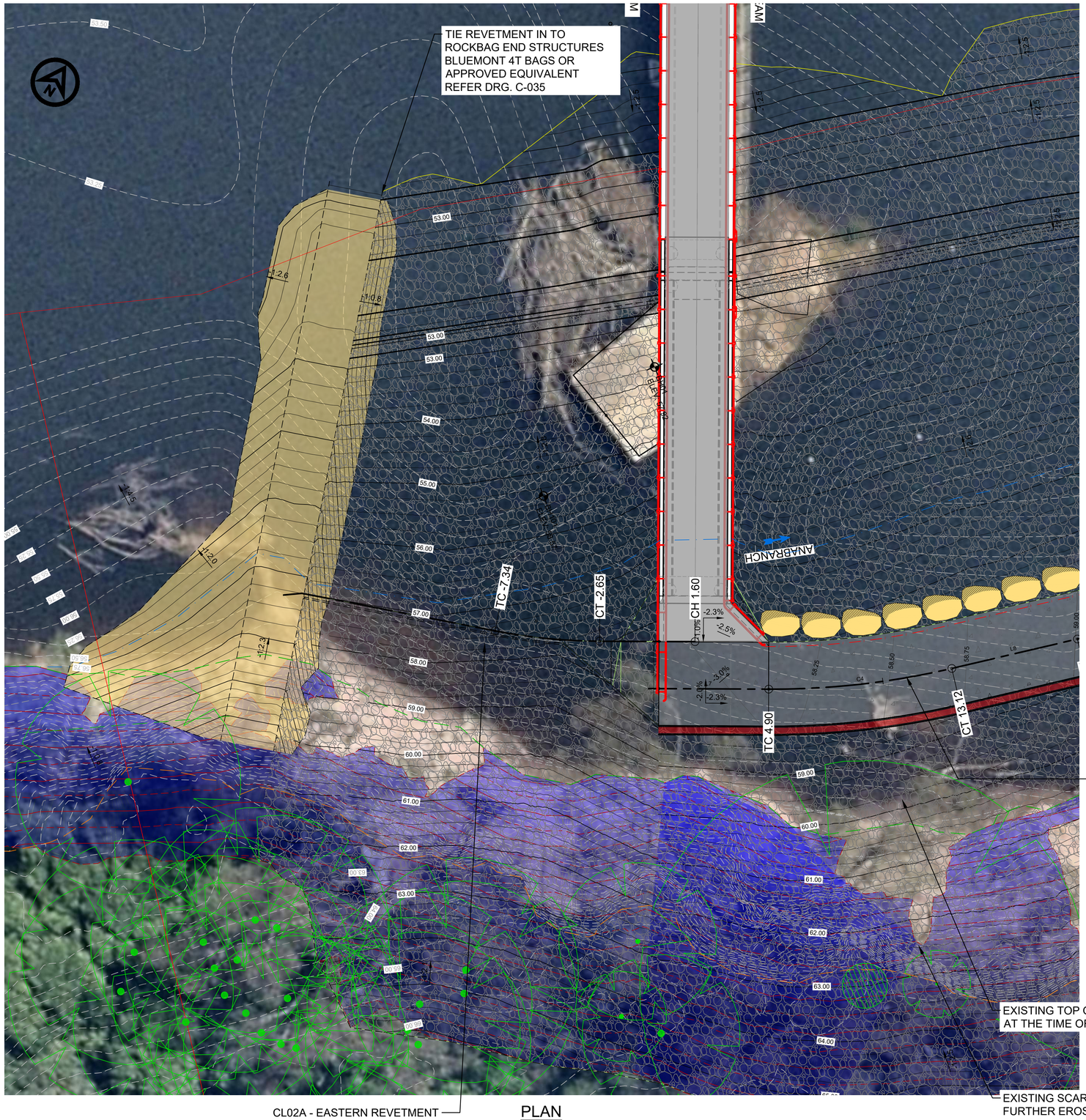
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-011	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

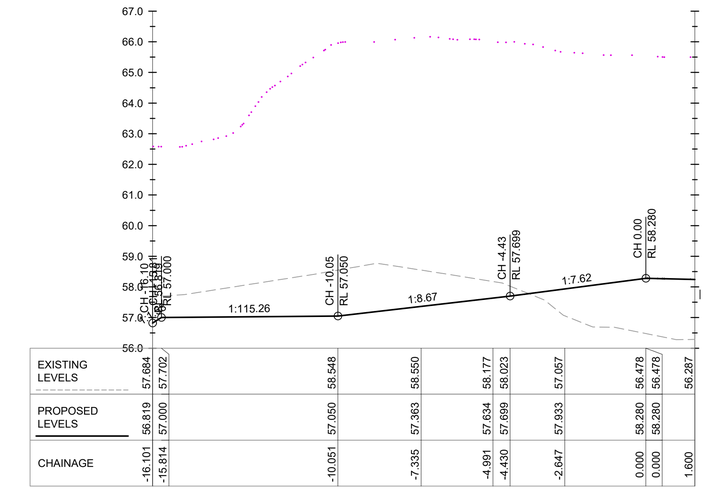
DRAWING No.
PA3130-RHD-00-XX-DR-C-020

DO NOT SCALE



PLAN
SCALE 1:100

CL02A - EASTERN REVETMENT SOUTH OF BRIDGE					
Number	START	END	Length	Line/Chord Direction	Radius



EXISTING LEVELS	57.684	57.702		58.548	58.550	58.177	58.023	57.057	56.478	56.478	56.287
PROPOSED LEVELS	56.819	57.000		57.050	57.363	57.634	57.699	57.933	58.280	58.280	
CHAINAGE	-16.101	-15.814		-10.051	-7.335	-4.991	-4.430	-2.647	0.000	0.000	1.600

CL02A - EASTERN REVETMENT SOUTH OF BRIDGE
SCALE 1:100

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
SOUTH OF BRIDGE
PLAN AND
CL02A - LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-020	A4	C03

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

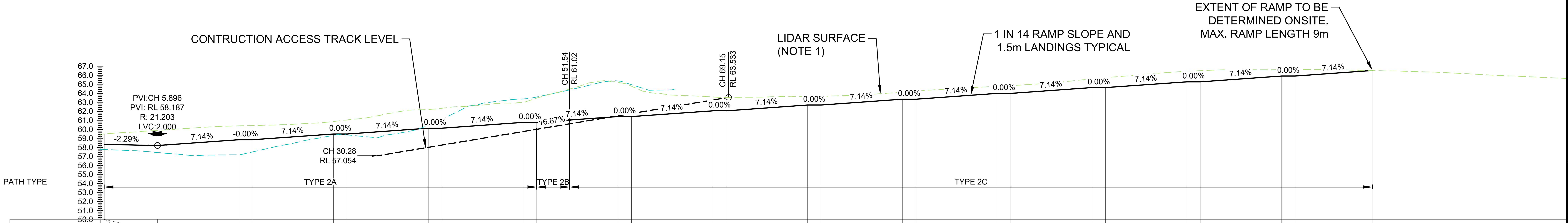
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-021

DO NOT SCALE

CL02B - EASTERN REVETMENT NORTH OF BRIDGE					
Number	START	END	Length	Line/Chord Direction	Radius
L7	CH -0.450, E 287899.864, N 6228648.810	CH 4.895, E 287901.890, N 6228653.756	5.35	N22° 16' 30.22"E	
C4	CH 4.895, E 287901.890, N 6228653.756	CH 13.121, E 287904.089, N 6228661.663	8.23	N15° 32' 31.91"E	35.00
L8	CH 13.121, E 287904.089, N 6228661.663	CH 18.870, E 287904.969, N 6228667.344	5.75	N8° 48' 33.60"E	
C5	CH 18.870, E 287904.969, N 6228667.344	CH 24.974, E 287906.509, N 6228673.240	6.10	N14° 38' 16.90"E	30.00
L9	CH 24.974, E 287906.509, N 6228673.240	CH 29.025, E 287907.926, N 6228677.035	4.05	N20° 28' 00.19"E	
C6	CH 29.025, E 287907.926, N 6228677.035	CH 51.544, E 287924.913, N 6228689.965	22.52	N52° 43' 23.10"E	20.00
L10	CH 51.544, E 287924.913, N 6228689.965	CH 67.534, E 287940.841, N 6228691.364	15.99	N84° 58' 46.00"E	
C7	CH 67.534, E 287940.841, N 6228691.364	CH 84.917, E 287955.438, N 6228699.764	17.38	N60° 04' 46.31"E	20.00
L11	CH 84.917, E 287955.438, N 6228699.764	CH 100.415, E 287964.367, N 6228712.431	15.50	N35° 10' 46.62"E	
C8	CH 100.415, E 287964.367, N 6228712.431	CH 122.044, E 287983.201, N 6228720.753	21.63	N66° 09' 40.97"E	20.00
L12	CH 122.044, E 287983.201, N 6228720.753	CH 137.409, E 287998.446, N 6228718.843	15.36	S82° 51' 24.69"E	
L13	CH 137.409, E 287998.446, N 6228718.843	CH 145.376, E 288006.254, N 6228717.253	7.97	S78° 29' 26.76"E	
C9	CH 145.376, E 288006.254, N 6228717.253	CH 165.491, E 288026.174, N 6228714.571	20.11	S82° 19' 56.66"E	150.00
L14	CH 165.491, E 288026.174, N 6228714.571	CH 177.276, E 288037.932, N 6228713.785	11.78	S86° 10' 26.56"E	

PLAN
SCALE 1:250



EXISTING LIDAR LEVELS	59.451	59.476	59.476	59.870	60.376	60.411	60.852	61.033	62.197	62.325	62.978	63.446	65.208	64.772	63.583	63.527	63.624	63.640	64.104	64.220	64.771	64.853	65.583	65.723	66.422	66.496	66.616	66.625	66.511
EXISTING LEVELS BATHY & TOPO (OCT 2024)		58.811		57.536	53.314	53.007	52.764	52.842	52.695	53.209	57.260	57.401	55.538	55.395	60.485	61.769													
PATH LEVELS		58.322	58.322	58.211	58.830	58.830	59.473	59.473	60.116	60.116	60.758	60.758	61.401	61.401	62.044	62.044	62.687	62.687	63.330	63.330	63.973	63.973	64.616	64.616	65.258	65.258	65.901	65.901	66.511
CHAINAGE	-0.450	0.000	0.000	5.896	14.896	16.396	25.396	26.896	35.896	37.396	46.396	47.896	56.896	58.396	67.396	68.896	77.896	79.396	88.396	89.896	98.896	100.396	109.396	110.896	119.896	121.396	130.396	131.896	140.433

CL02B - EASTERN REVETMENT NORTH OF BRIDGE LONGSECTION

SCALE 1:250

NOT FOR CONSTRUCTION

A4 FOR TENDER

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE
LENGTHENING AND RIVER BANK
PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
NORTH OF BRIDGE
CL02B - LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025

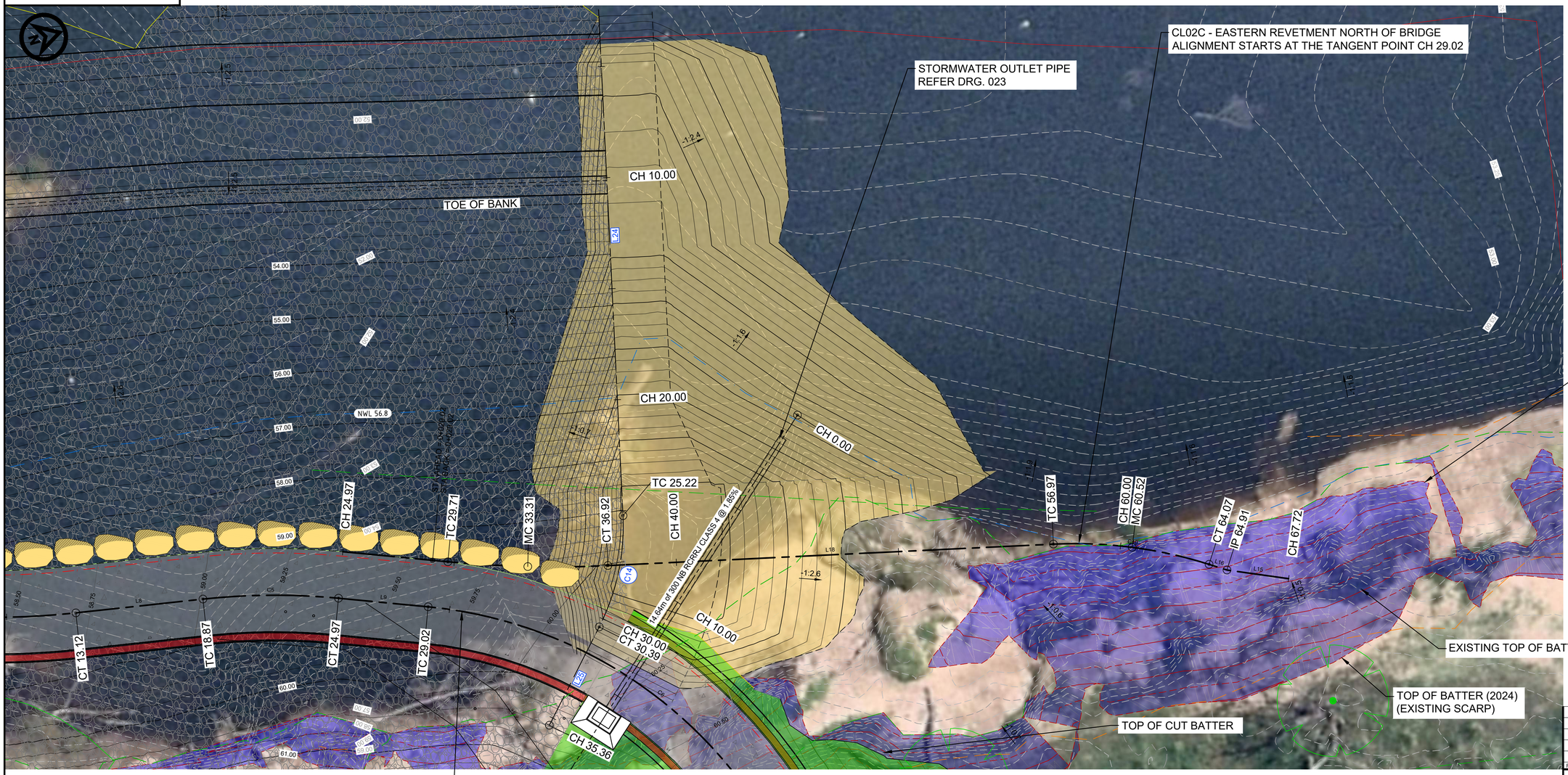
SCALE: AS SHOWN
REF.: PA3130-RHD-00-M3-C-001_044

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-021	A4	C03

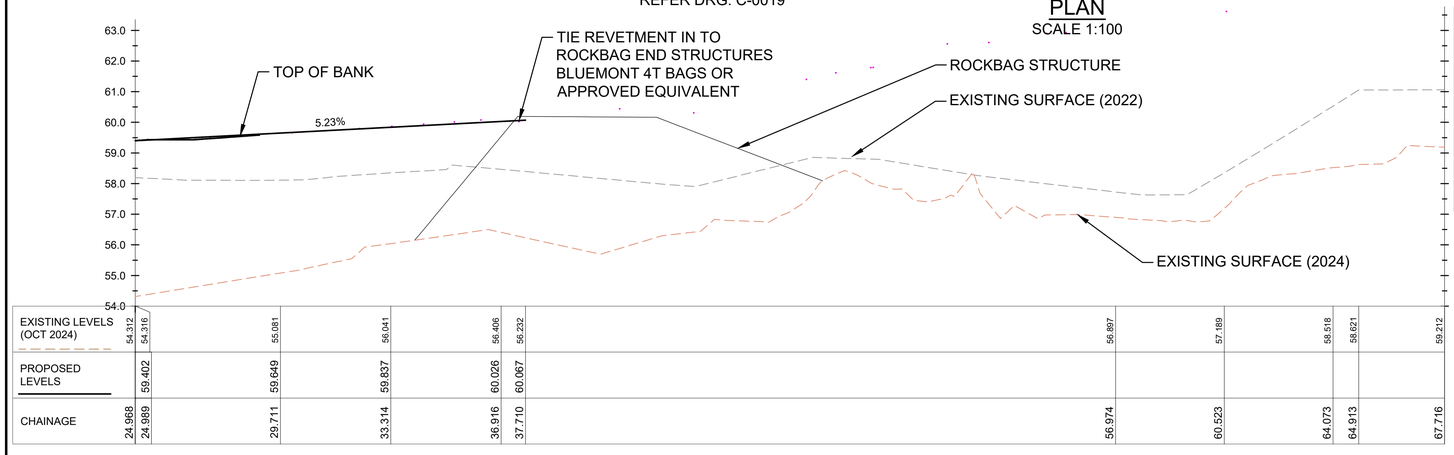
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-022

DO NOT SCALE



PLAN
SCALE 1:100



EXISTING LEVELS (OCT 2024)	54.312	54.316	55.081	56.041	56.406	56.292	56.897	57.189	58.518	58.621	59.212
PROPOSED LEVELS	59.402	59.649	59.837	60.026	60.067						
CHAINAGE	24.968	24.989	29.711	33.314	36.916	37.710	56.974	60.523	64.073	64.913	67.716

CL02C - REVETMENT NORTH EAST
SCALE 1:100

CL02C - REVETMENT NORTH EAST

Number	START	END	Length	Line/Chord Direction	Radius
L17	CH 24.968, E 287904.540, N 6228673.975	CH 29.711, E 287906.201, N 6228678.418	4.74	N20° 29' 42.04"E	
C11	CH 29.711, E 287906.201, N 6228678.418	CH 36.916, E 287908.229, N 6228685.324	7.20	N16° 22' 01.15"E	50.00
L18	CH 36.916, E 287908.229, N 6228685.324	CH 56.974, E 287912.481, N 6228704.926	20.06	N12° 14' 20.25"E	
C10	CH 56.974, E 287912.481, N 6228704.926	CH 64.073, E 287915.173, N 6228711.455	7.10	N22° 24' 26.33"E	20.00
L16	CH 64.073, E 287915.173, N 6228711.455	CH 64.913, E 287915.625, N 6228712.163	0.84	N32° 34' 32.41"E	
L15	CH 64.913, E 287915.625, N 6228712.163	CH 67.716, E 287916.721, N 6228714.743	2.80	N23° 00' 06.51"E	

NOT FOR CONSTRUCTION

A4 FOR TENDER

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
NORTH OF BRIDGE
CL02C - LONGITUDINAL SECTION

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

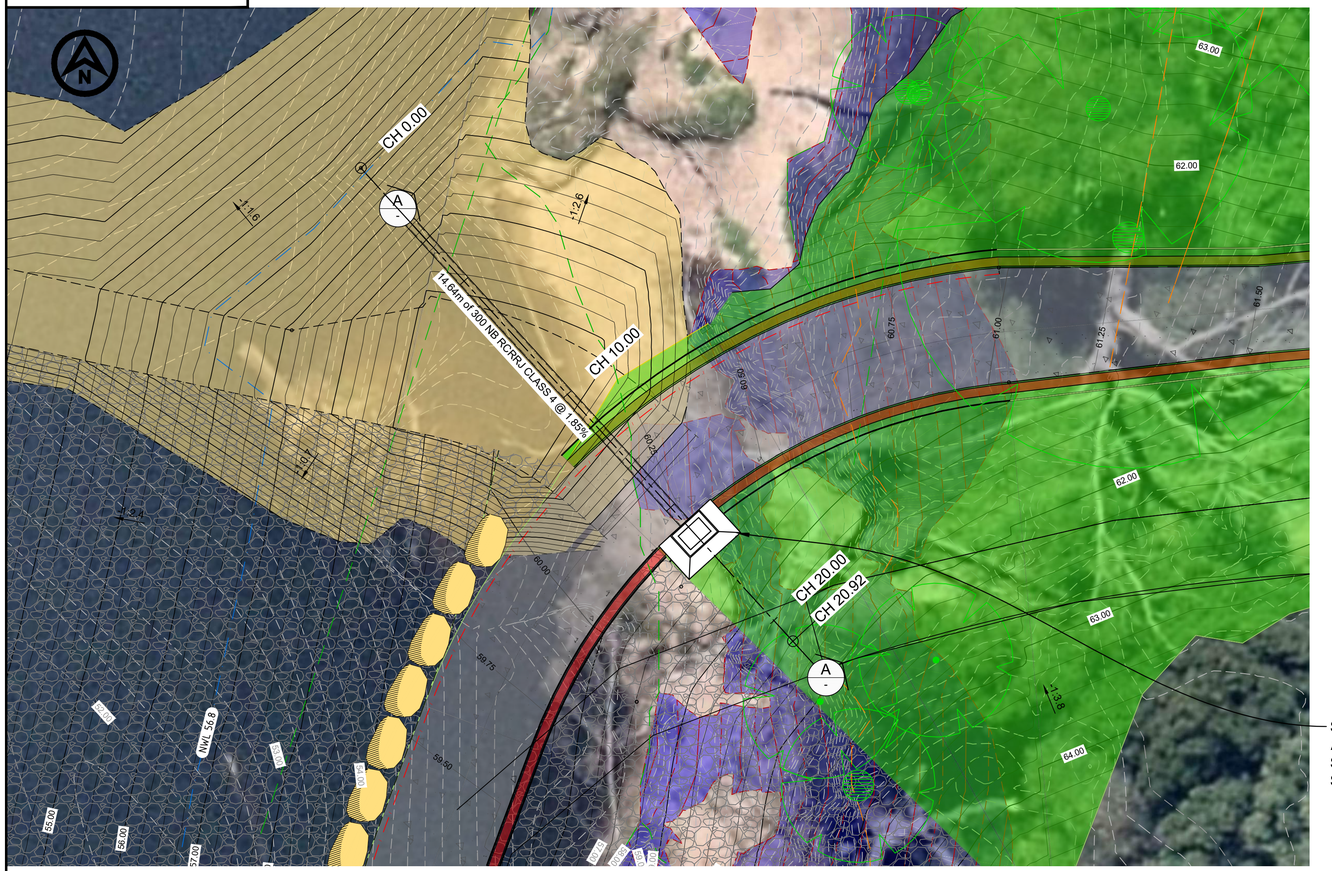
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-022	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-023

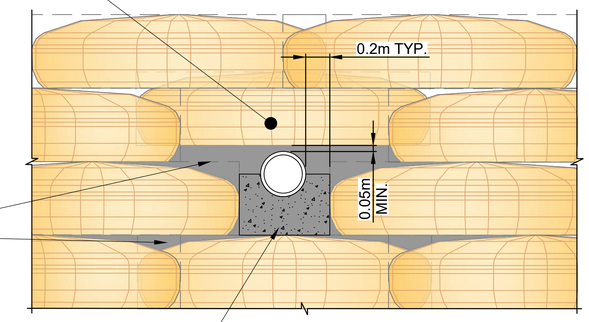
DO NOT SCALE



PLAN
SCALE 1:100

SURFACE INLET PIT - TYPE A GRATE IN ACCORDANCE WITH CAMDEN COUNCIL STD. DRG. SD13. APRON ON THREE SIDES AS SHOWN

SELECTIVELY PLACE BAGS ABOVE OBVERT AND SURROUNDS TO SPAN PIPE AND 'HIDE' CONCRETE PIPE.

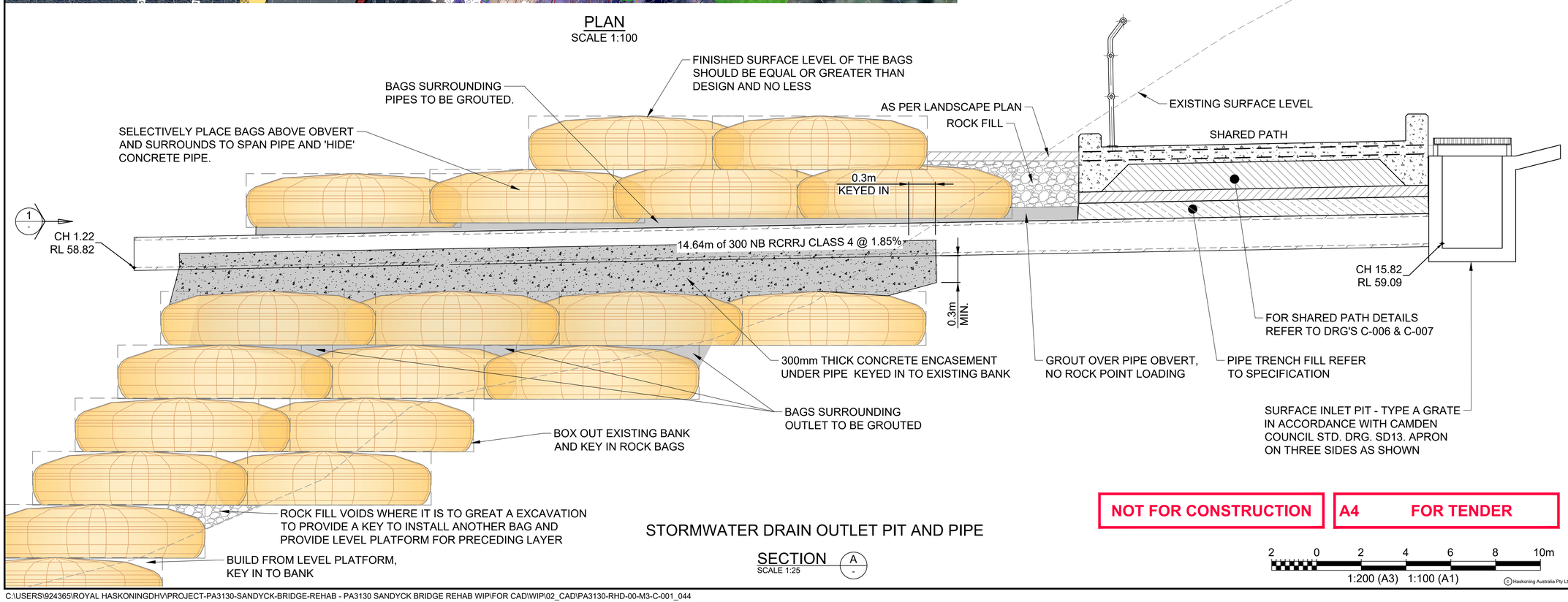


PROVIDE GROUTING IN BAG VOIDS SURROUNDING PIPE WHERE NOT ENCASED

300mm THICK CONCRETE ENCASEMENT UNDER PIPE KEYED IN TO EXISTING BANK

ELEVATION OF STORMWATER PIPE OUTLET AT ROCK REVETMENT

DETAIL A -
AS SHOWN



STORMWATER DRAIN OUTLET PIT AND PIPE

SECTION A -
SCALE 1:25

NOT FOR CONSTRUCTION

A4 FOR TENDER

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT STORMWATER PLAN LONGITUDINAL SECTION & DETAILS

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

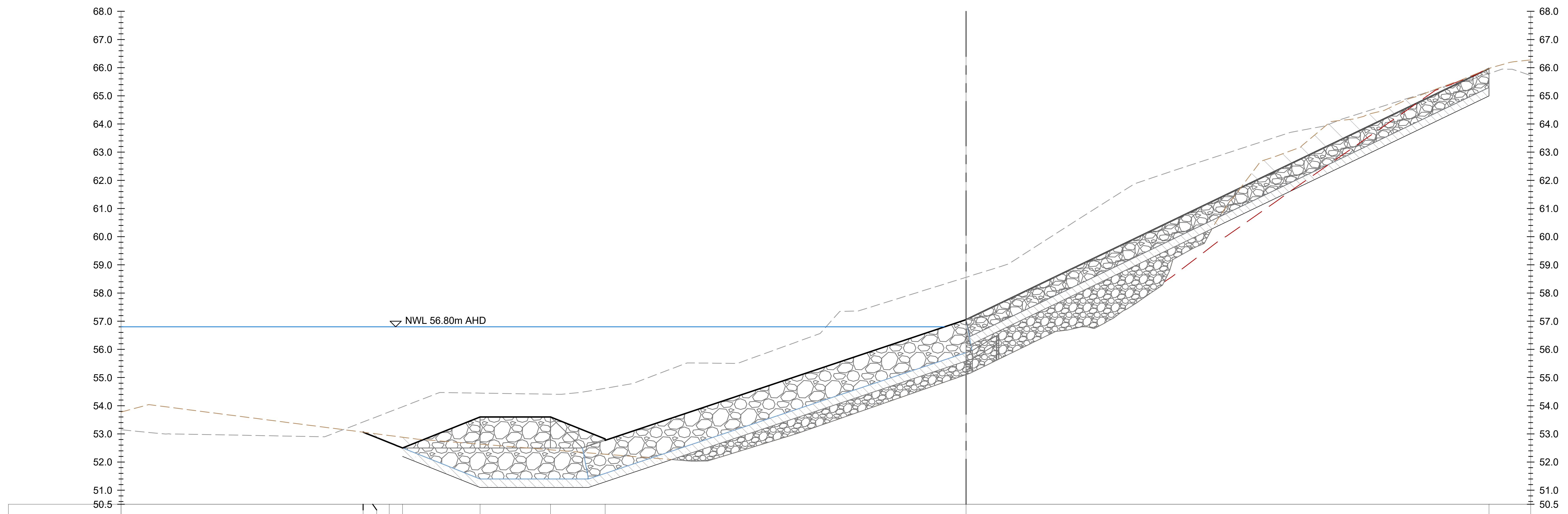
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-023	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

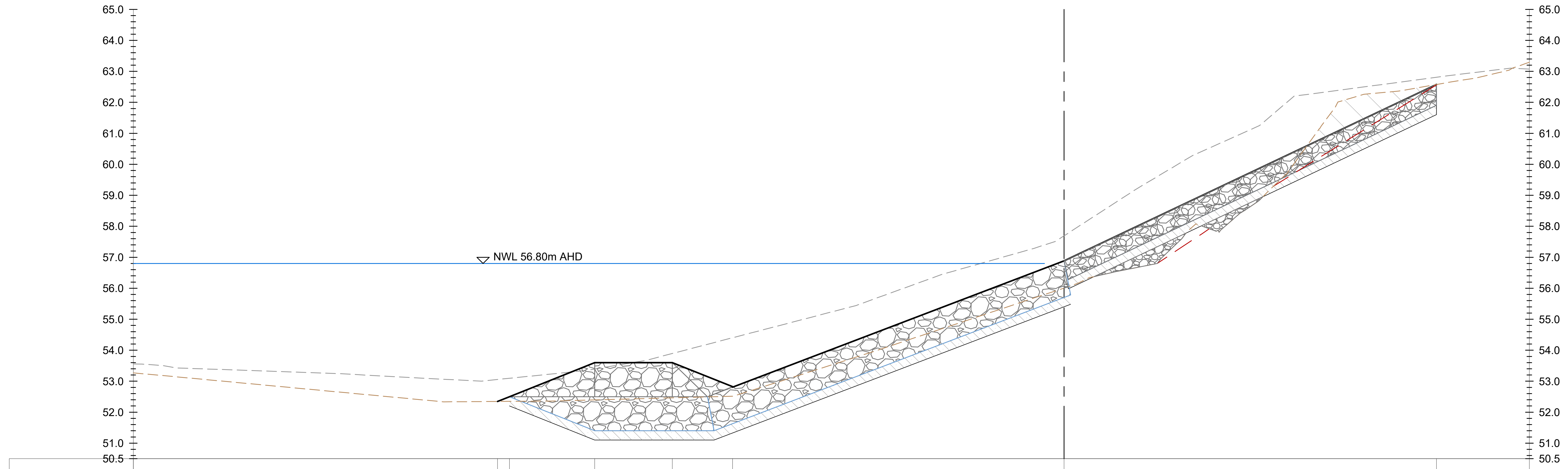
DRAWING No.
PA3130-RHD-00-XX-DR-C-024

DO NOT SCALE



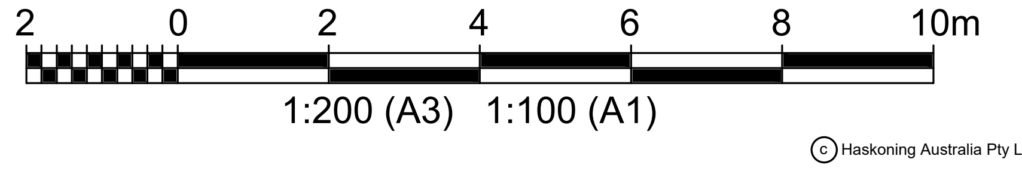
PROPOSED LEVELS	53.06	52.93	52.69	52.50	53.60	53.60	52.77	57.06	65.97
EXISTING TOPO & BATHY LEVELS 2024	53.06	53.02	52.94	52.88	52.63	52.43	52.28	55.10	65.97
OFFSET	-21.40	-21.07	-20.48	-20.00	-17.25	-14.75	-12.81	0.00	18.57

CH -10.00



PROPOSED LEVELS	52.35	52.50	53.60	53.60	52.81	56.88	62.58
EXISTING TOPO & BATHY LEVELS 2024	52.35	52.35	52.40	52.46	52.52	56.00	62.58
OFFSET	-18.26	-17.88	-15.13	-12.63	-10.68	0.00	12.01

CH -16.00



1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02A
SHEET 1

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025

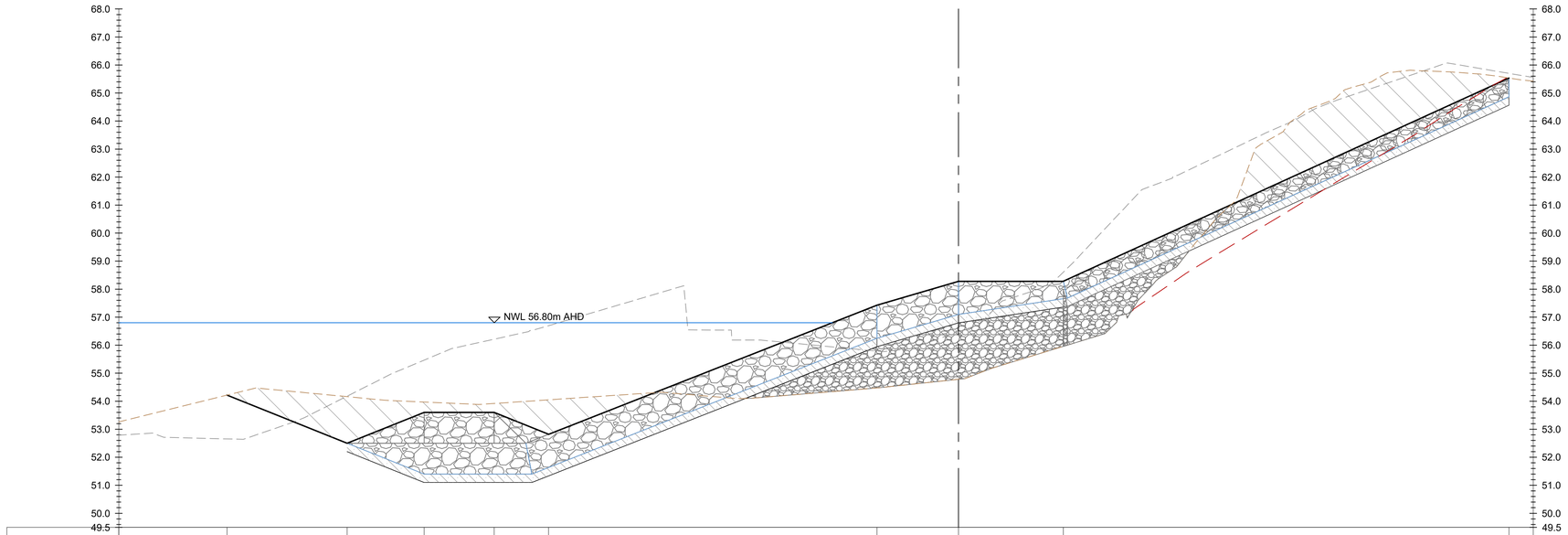
SCALE
AS SHOWN

REF.
PA3130-RHD-00-M3-C-001_044

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-024	A4	C03

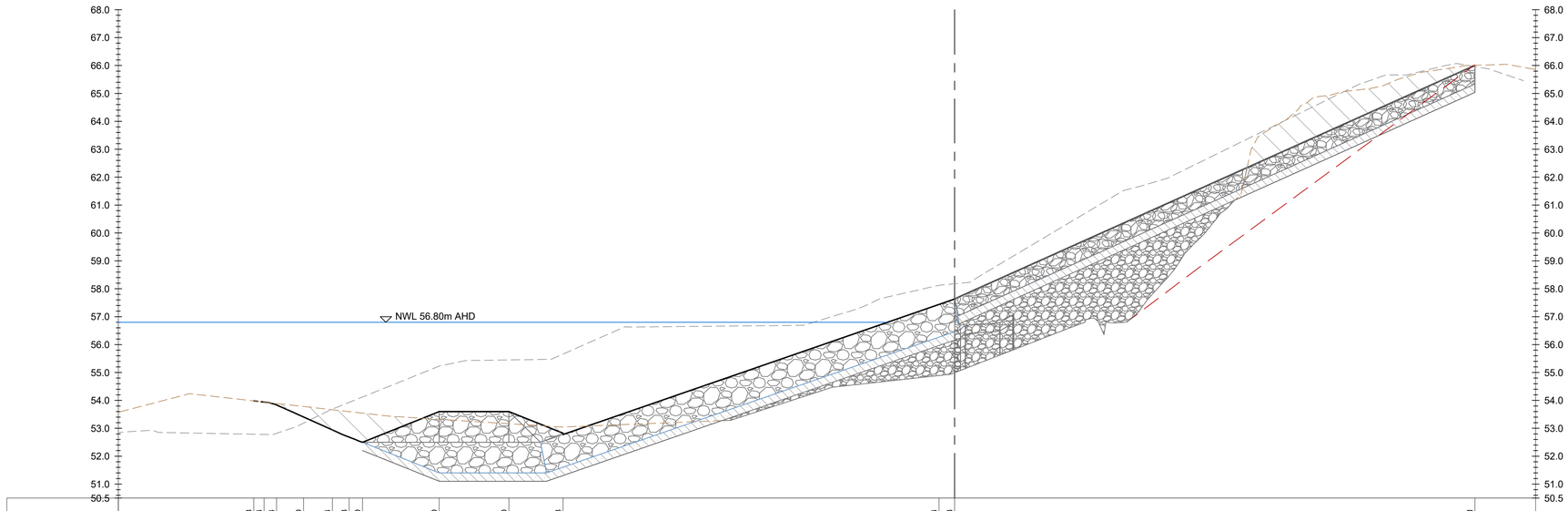
DRAWING No.
PA3130-RHD-00-XX-DR-C-025

DO NOT SCALE



PROPOSED LEVELS	54.22	52.50	53.60	53.60	52.82	57.43	58.28	58.28	65.54
EXISTING TOPO & BATHY LEVELS 2024	54.22	54.16	53.97	53.92	54.05	54.47	54.78	55.96	65.54
OFFSET	-26.13	-21.84	-19.09	-16.59	-14.65	-2.91	0.00	3.75	19.67

CH 0.00



PROPOSED LEVELS	53.98	53.94	53.84	53.40	52.94	52.68	52.50	53.60	53.60	52.78	57.44	57.63	66.01
EXISTING TOPO & BATHY LEVELS 2024	53.98	53.94	53.89	53.78	53.67	53.60	53.54	53.32	53.16	53.05	54.89	54.99	66.01
OFFSET	-25.14	-24.77	-24.32	-23.35	-22.32	-21.72	-21.24	-18.49	-15.99	-14.05	-0.56	0.00	16.67

CH -5.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02A
SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209969
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

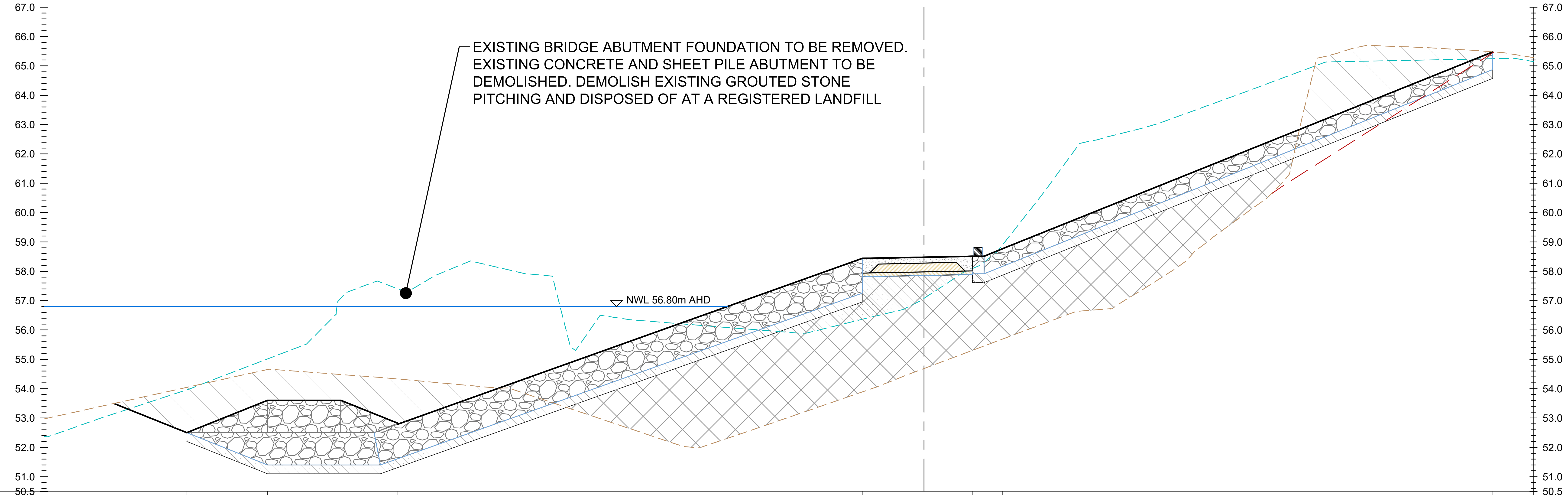
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-025	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

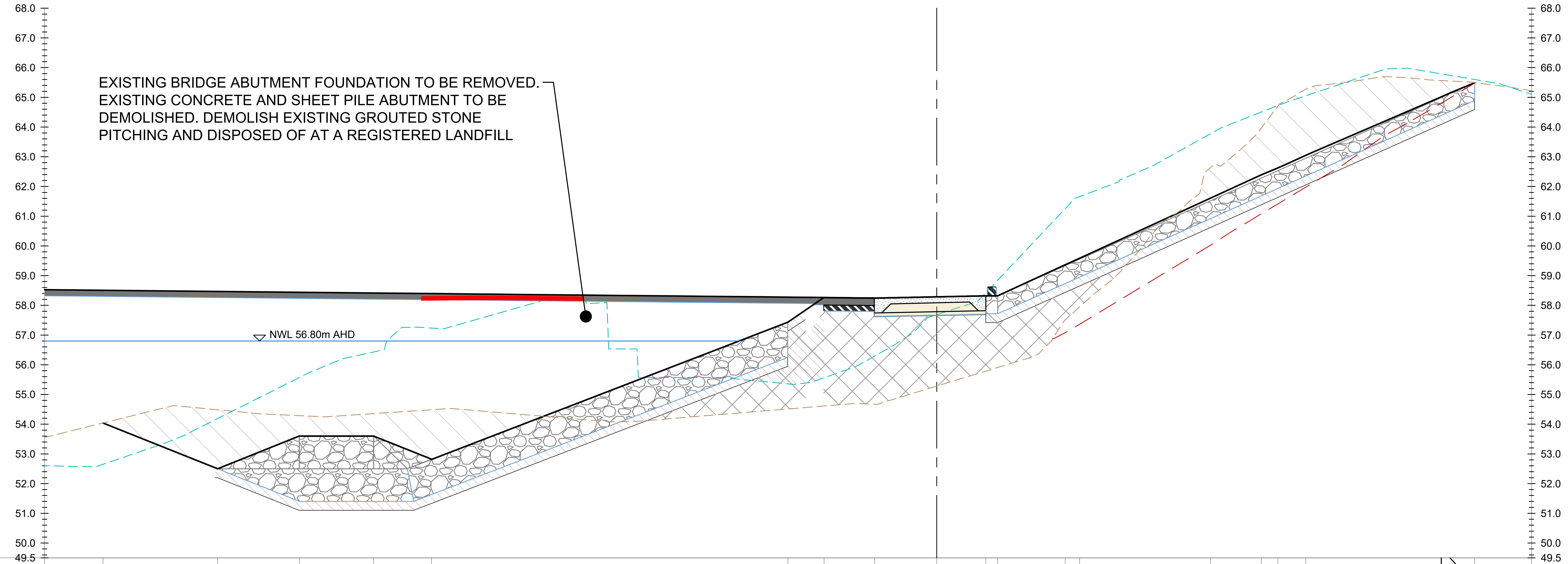
DRAWING No.
PA3130-RHD-00-XX-DR-C-026

DO NOT SCALE



PROPOSED LEVELS	53.49	52.50	53.60	53.60	52.79	58.44	58.48	58.51	58.51	58.77	65.48
EXISTING TOPO & BATHY LEVELS 2024	53.49	54.05	54.65	54.48	54.33	53.89	54.69	55.31	55.46	55.69	65.48
OFFSET	-27.62	-25.13	-22.38	-19.88	-17.94	-2.10	0.00	1.65	2.05	2.68	19.39

CH 10.00



PROPOSED LEVELS	54.04	52.50	53.60	53.60	52.81	57.43	58.26	58.24	58.29	58.32	58.32	59.37	59.58	61.61	62.39	62.63	63.05	65.02	65.15	65.49
EXISTING TOPO & BATHY LEVELS 2024	54.04	54.49	54.29	54.36	54.49	54.51	54.61	54.67	55.28	55.79	55.91	57.51	57.95	62.64	63.96	64.71	65.28	65.56	65.55	65.49
OFFSET	-28.04	-24.18	-21.43	-18.93	-16.99	-5.00	-3.79	-2.09	0.00	1.65	2.05	4.32	4.81	9.21	10.91	11.47	12.41	16.97	17.26	18.09

CH 1.60

NOT FOR CONSTRUCTION

A4 FOR TENDER

500 0 500 1000 1500 2000 2500mm

1:50 (A3) 1:25 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE
LENGTHENING AND RIVER BANK
PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02A
SHEET 3

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025

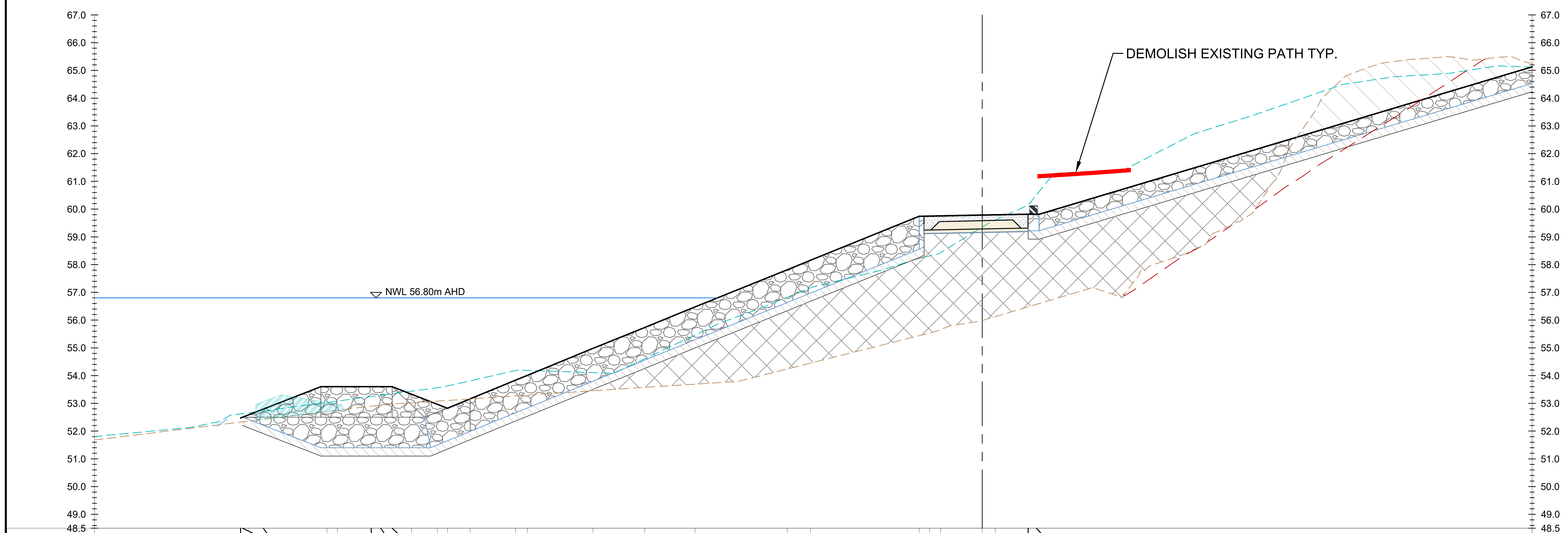
SCALE
AS SHOWN

REF.
PA3130-RHD-00-M3-C-001_044

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-026	A4	C03

DRAWING No.
PA3130-RHD-00-XX-DR-C-027

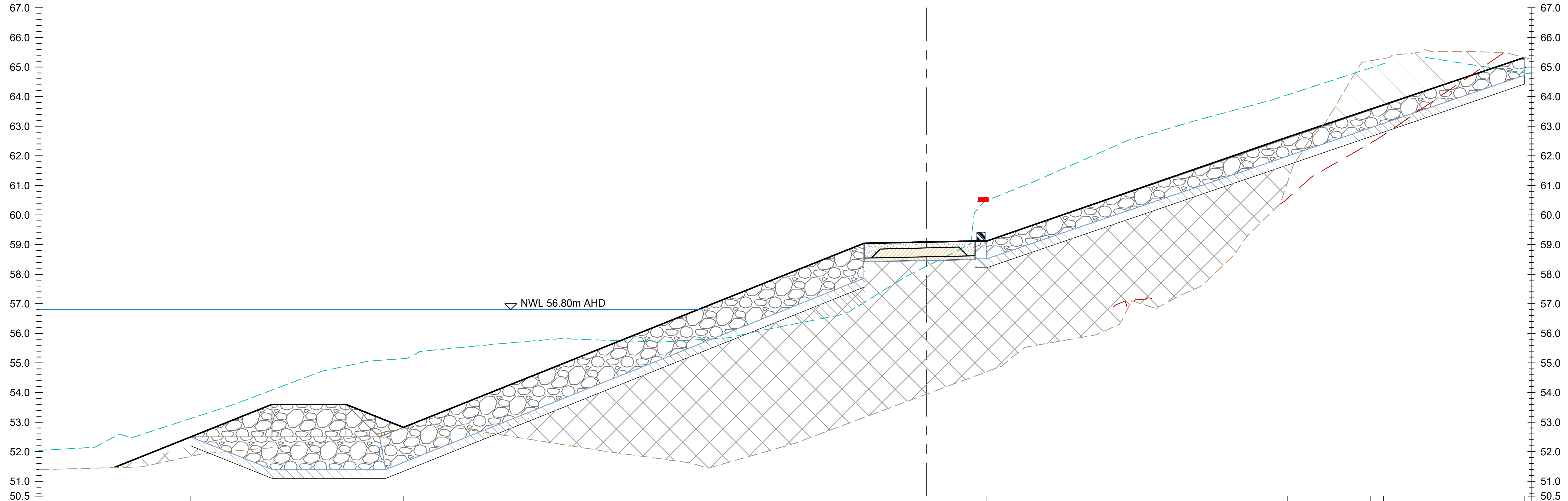
DO NOT SCALE



OPOSED LEVELS	52.47	52.50	52.79	53.60	53.60	53.60	53.60	53.60	53.33	52.97	52.82	53.16	53.83	54.01
STING TOPO & THY LEVELS 2024	52.32	52.33	52.42	52.70	52.75	52.90	52.94	52.97	53.02	53.08	53.11	53.16	53.27	53.30
FSET	-26.74	-26.67	-25.91	-23.62	-23.25	-22.03	-21.69	-21.27	-20.57	-19.65	-19.27	-18.46	-16.83	-16.39

OPOSED LEVELS	54.98	55.73	56.48	57.82	58.16	59.74	59.75	59.76	59.78	59.80	59.82	59.82	65.13
STING TOPO & THY LEVELS 2024	53.45	53.58	53.69	54.24	54.45	55.44	55.53	55.66	55.98	56.12	56.48	56.57	65.24
FSET	-14.03	-12.17	-10.35	-7.03	-6.19	-2.27	-1.90	-1.50	0.00	0.47	1.65	1.95	19.82

CH 31.26



PROPOSED LEVELS	51.46	52.50	53.60	53.60	52.82	59.05	59.09	59.12	59.12	62.63	63.57	63.72	65.32
EXISTING TOPO & BATHY LEVELS 2024	51.46	51.85	52.14	52.43	52.76	53.16	53.94	54.56	54.70	61.13	65.21	65.29	65.32
OFFSET	-27.46	-24.87	-22.12	-19.62	-17.68	-2.10	0.00	1.65	2.05	12.22	15.02	15.46	20.23

CH 20.00

NOT FOR CONSTRUCTION

A4 FOR TENDER

500 0 500 1000 1500 2000 2500mm

1:50 (A3) 1:25 (A1)

C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		
REV	DATE	DESCRIPTION	BY	CHK	APP

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02A
SHEET 4

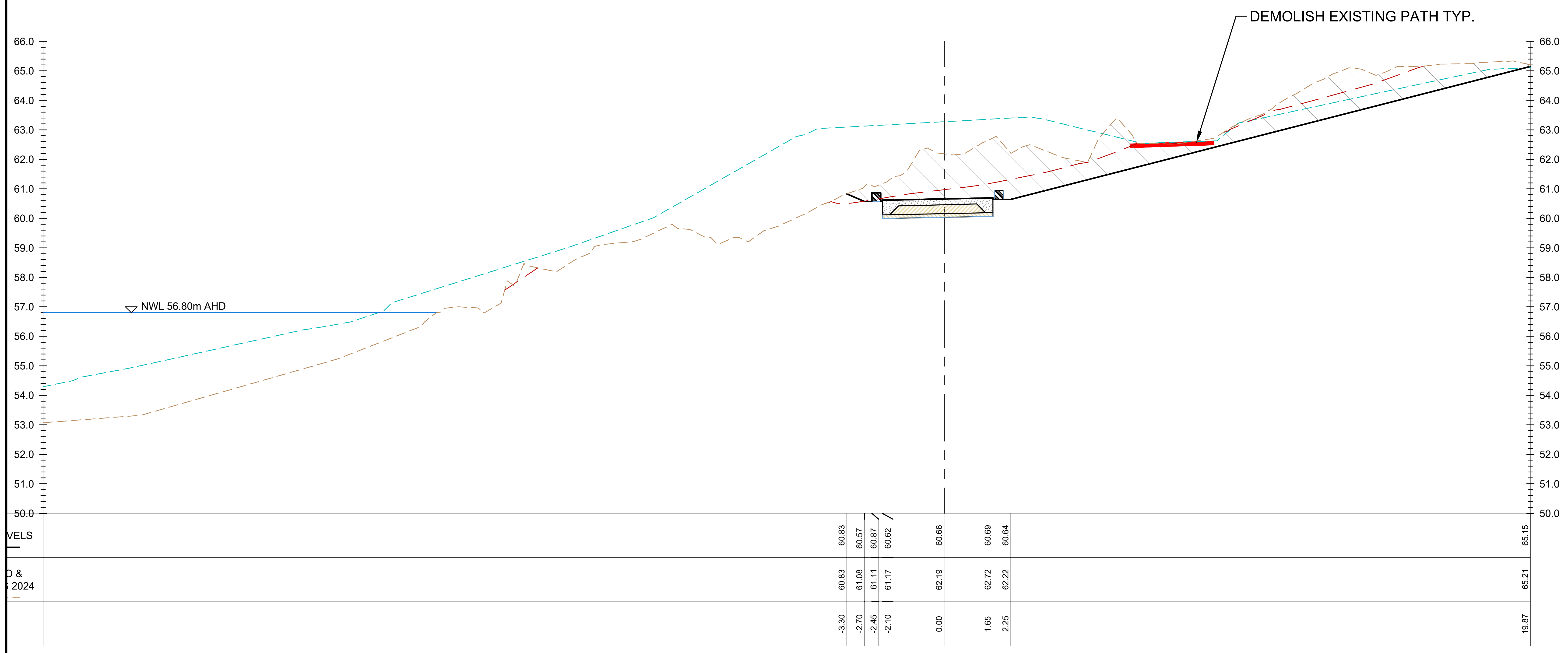
Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

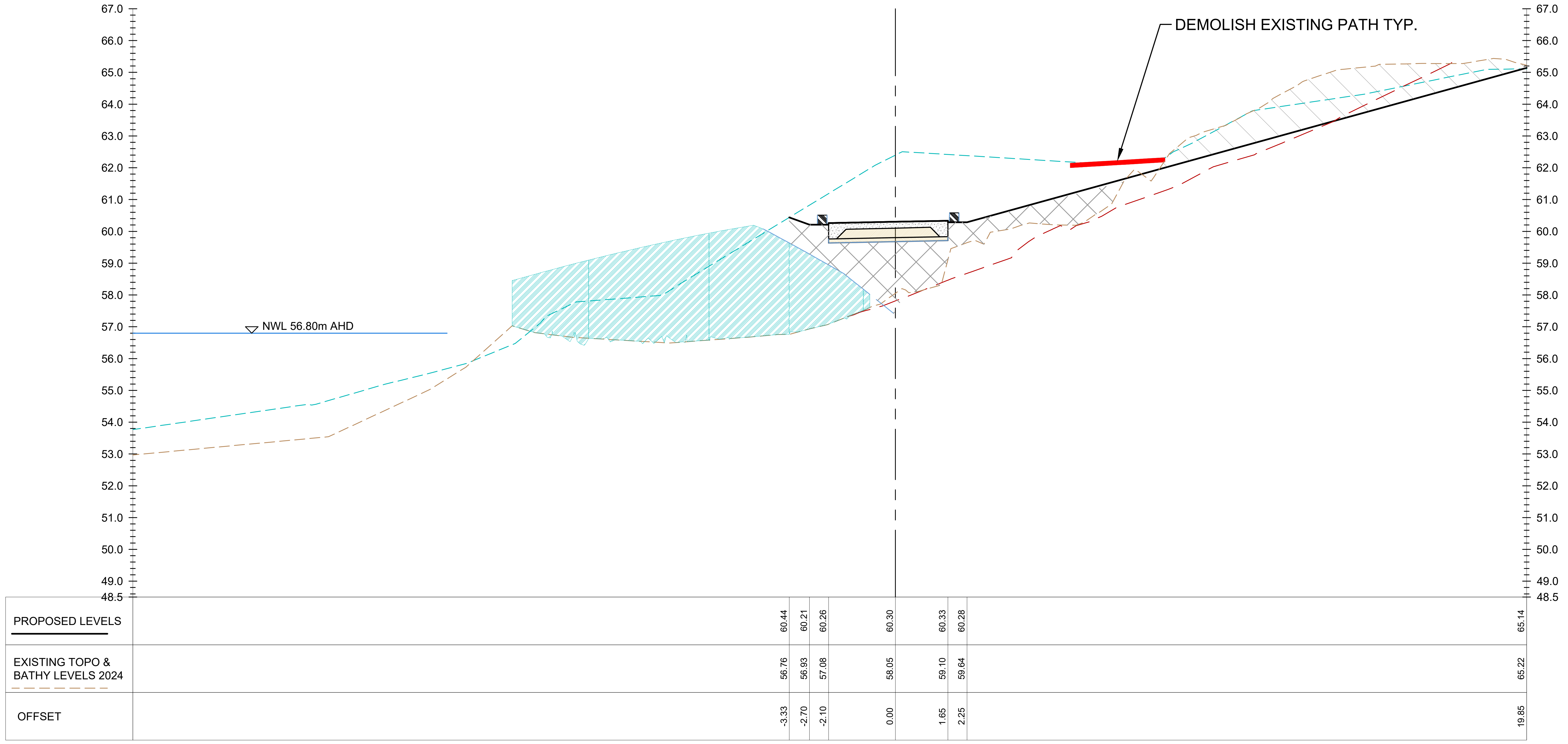
DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-027	A4	C03

DRAWING No.
PA3130-RHD-00-XX-DR-C-028

DO NOT SCALE



CH 45.00



CH 40.00

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE
LENGTHENING AND RIVER BANK
PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02B
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

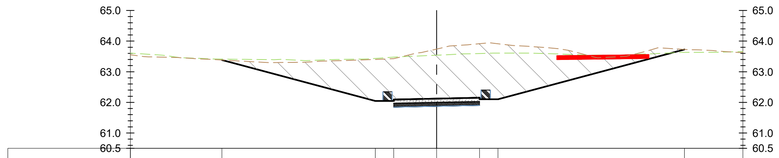
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-028	A4	C03

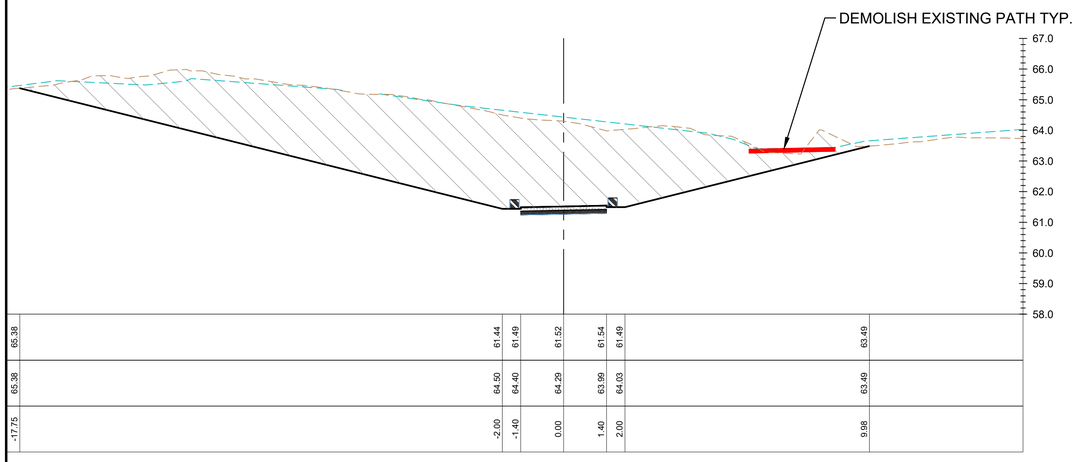
DRAWING No.
PA3130-RHD-00-XX-DR-C-029

DO NOT SCALE



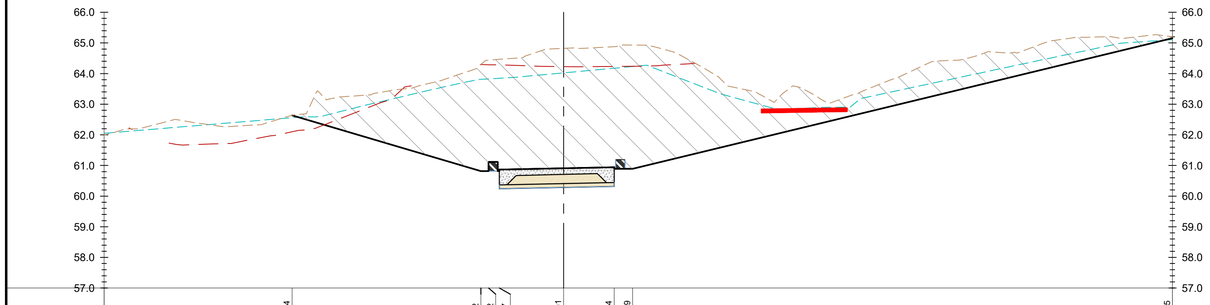
PROPOSED LEVELS	63.38	62.05	62.10	62.12	62.15	62.10	63.73	
EXISTING TOPO & BATHY LEVELS 2024	63.38	63.40	63.43	63.74	63.92	63.91	63.73	
OFFSET	-7.01	-2.00	-1.40	0.00	1.40	2.00	8.09	

CH 70.00



	65.38	61.44	61.49	61.52	61.54	61.49	63.49	
	65.38	64.50	64.40	64.29	63.99	64.03	63.49	
	-17.75	-2.00	-1.40	0.00	1.40	2.00	9.98	

CH 60.00



OPOSED LEVELS	62.64	60.82	61.12	60.87	60.91	60.94	60.89	65.15
STING TOPO & THY LEVELS 2024	62.64	64.30	64.44	64.47	64.82	64.88	64.93	65.20
FSET	-9.86	-2.70	-2.45	-2.10	0.00	1.65	2.25	19.87

CH 50.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02B
SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

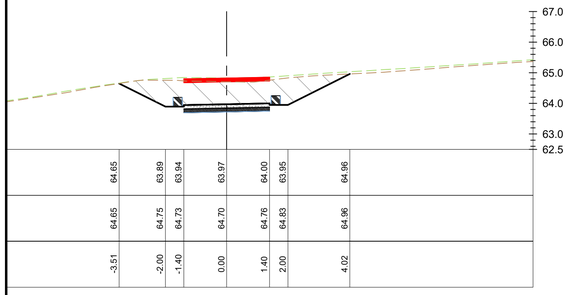
DRAWN AI	COORD. SYSTEM MGA 56 GDA 2020	DATUM AHD	DATE 20.01.2025
SCALE AS SHOWN	REF. PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-029	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

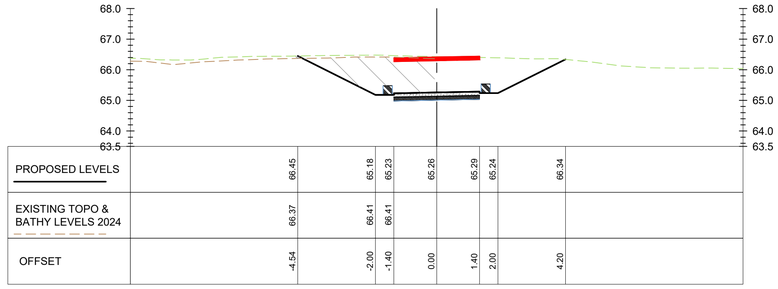
DRAWING No.
PA3130-RHD-00-XX-DR-C-030

DO NOT SCALE



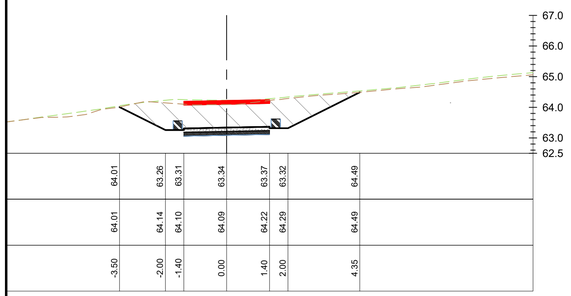
	64.65	63.89	63.94	63.97	64.00	63.95	64.96
	64.65	64.75	64.73	64.70	64.76	64.83	64.96
	-3.51	-2.00	-1.40	0.00	1.40	2.00	4.02

CH 100.00



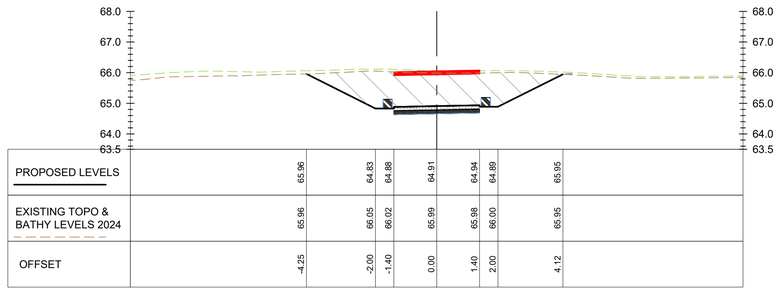
PROPOSED LEVELS		66.45	65.18	65.23	65.26	65.29	65.24	66.34
EXISTING TOPO & BATHY LEVELS 2024		66.37	66.41	66.41				
OFFSET		-4.54	-2.00	-1.40	0.00	1.40	2.00	4.20

CH 120.00



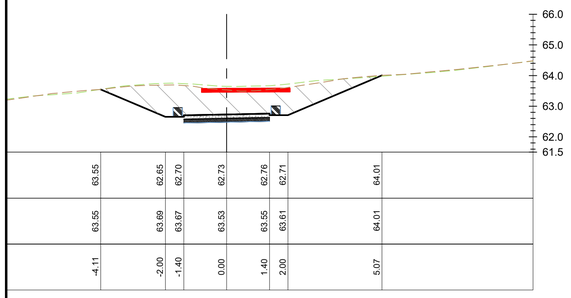
	64.01	63.26	63.31	63.34	63.37	63.32	64.49
	64.01	64.14	64.10	64.09	64.22	64.29	64.49
	-3.50	-2.00	-1.40	0.00	1.40	2.00	4.35

CH 90.00



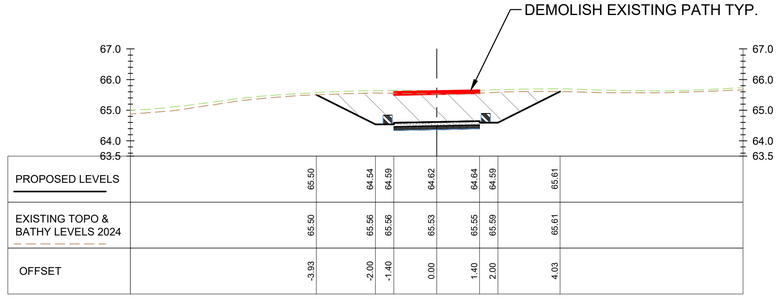
PROPOSED LEVELS		65.96	64.83	64.88	64.91	64.94	64.89	65.95
EXISTING TOPO & BATHY LEVELS 2024		65.96	66.05	66.02	65.99	65.98	66.00	65.95
OFFSET		-4.25	-2.00	-1.40	0.00	1.40	2.00	4.12

CH 115.00



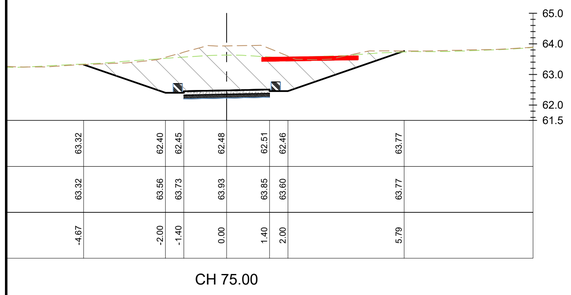
	63.55	62.65	62.70	62.73	62.76	62.71	64.01
	63.55	63.89	63.67	63.53	63.55	63.61	64.01
	-4.11	-2.00	-1.40	0.00	1.40	2.00	5.07

CH 80.00



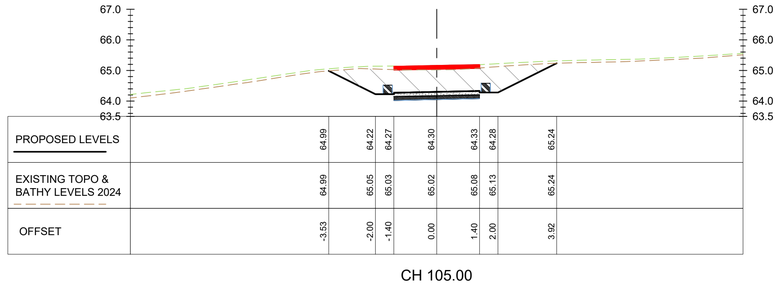
PROPOSED LEVELS		65.50	64.54	64.59	64.62	64.64	64.59	65.61
EXISTING TOPO & BATHY LEVELS 2024		65.50	65.56	65.56	65.53	65.55	65.59	65.61
OFFSET		-3.93	-2.00	-1.40	0.00	1.40	2.00	4.03

CH 110.00



	63.32	62.40	62.45	62.48	62.51	62.46	63.77
	63.32	63.56	63.73	63.93	63.85	63.60	63.77
	-4.67	-2.00	-1.40	0.00	1.40	2.00	5.79

CH 75.00



PROPOSED LEVELS		64.99	64.22	64.27	64.30	64.33	64.28	65.24
EXISTING TOPO & BATHY LEVELS 2024		64.99	65.05	65.03	65.02	65.08	65.13	65.24
OFFSET		-3.53	-2.00	-1.40	0.00	1.40	2.00	3.92

CH 105.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02B
SHEET 3

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209060
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

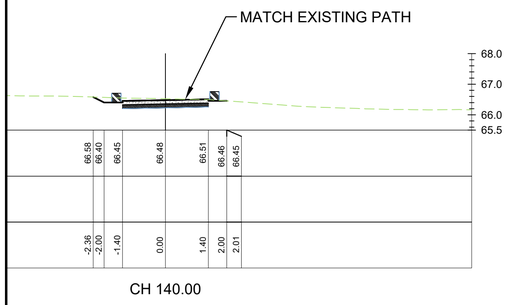
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-030	A4	C03

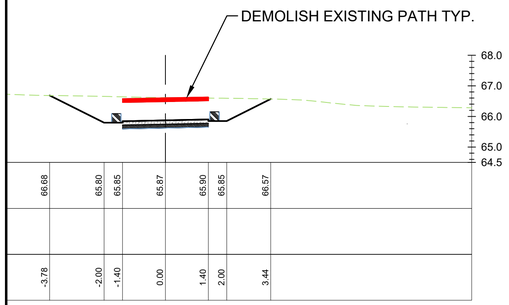
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-031

DO NOT SCALE



CH 140.00



CH 130.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02B
SHEET 4

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209969
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-031	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-032

DO NOT SCALE

SUPERSEDED

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
		SUPERSEDED			
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
CROSS SECTIONS
ALIGNMENT CL02B
SHEET 5

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209969
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-032	A4	C02

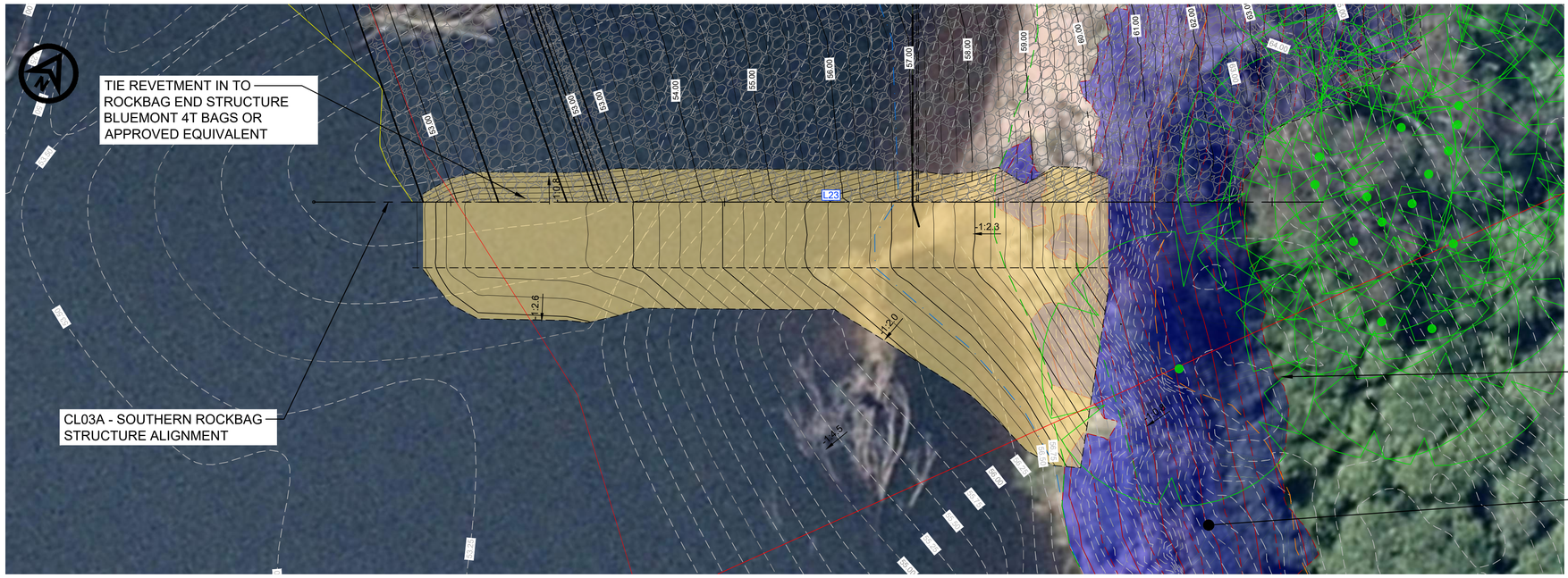
2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-035

DO NOT SCALE



TIE REVETMENT IN TO ROCKBAG END STRUCTURE BLUEMONT 4T BAGS OR APPROVED EQUIVALENT

CL03A - SOUTHERN ROCKBAG STRUCTURE ALIGNMENT

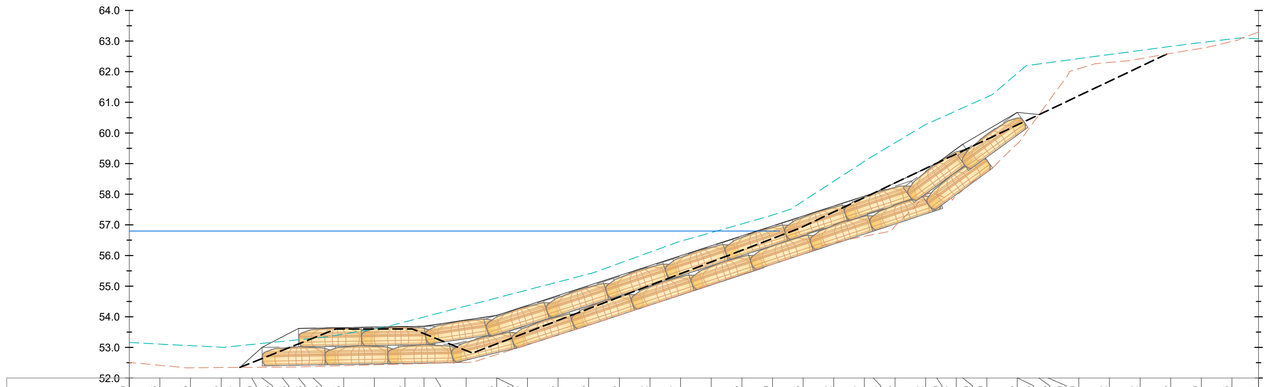
EXISTING SCARP LINE. FURTHER EROSION OCCURRED POST SURVEY. A NUMBER OF TREES SHOWN IN THE SURVEY HAVE SINCE BEEN LOST.

SLOPE ANALYSIS ON EXISTING SCARP LINE, INDICATING BATTERS GREATER THAN 1 IN 1.5 WITH NO BANK PROTECTION

PLAN
SCALE 1:100

CL03A - REVETMENT SOUTH EAST ROCK BAGS

Number	START	END	Length	Line/Chord Direction	Radius
L23	CH 0.000, E 287871.858, N 6228648.078	CH 36.869, E 287902.771, N 6228627.986	36.87	S56° 58' 37.47"E	



EXISTING LEVELS	52.510	52.416	52.335	52.343	52.347	52.350	52.353	52.358	52.366	52.378	52.405	52.431	52.458	52.474	52.484	52.511
GEOBAG TOP LEVEL					52.347	52.699	53.000	53.348	53.620	53.628	53.645	53.662	53.679	53.690	53.747	53.897
CHAINAGE	0.000	1.000	2.000	3.000	3.610	4.000	4.333	5.000	5.523	6.000	7.000	8.000	9.000	9.622	10.000	11.000

EXISTING LEVELS	52.766	52.768	53.087	53.406	53.725	54.048	54.382	54.717	55.051	55.385	55.719	56.046	56.412	56.627	56.684	56.963
GEOBAG TOP LEVEL	54.047	54.049	54.373	54.697	55.021	55.345	55.669	55.994	56.318	56.642	56.966	57.290	57.614	57.938	58.033	58.369
CHAINAGE	11.995	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	20.000	21.000	22.000	23.000	24.000	24.291	25.000

EXISTING LEVELS	57.972	57.990	57.947	58.130	58.719	59.643	59.653	60.598	61.010	62.100	62.302	62.422	62.598	62.760	62.986	63.291
GEOBAG TOP LEVEL	58.843	59.013	59.477	59.629	60.091	60.670	60.668	60.598								
CHAINAGE	26.000	26.358	27.000	27.211	28.000	28.988	29.000	29.702	30.000	31.000	32.000	33.000	34.000	35.000	36.000	36.869

CL03A - REVETMENT SOUTH EAST ROCK BAGS
SCALE 1:100

REV	DATE	DESCRIPTION	BY	CHK	APP
C02	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C01	14.11.2024	100% RE-ISSUE FOR TENDER	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSLIE

TITLE
EASTERN REVETMENT
SOUTHERN ROCKBAG STRUCTURE
PLAN AND LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN AI	COORD. SYSTEM MGA 56 GDA 2020	DATUM AHD	DATE 20.01.2025
SCALE AS SHOWN	REF. PA3130-RHD-00-M3-C-001_044		

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-035	A4	C03

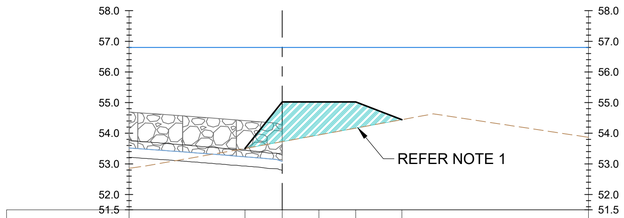
NOT FOR CONSTRUCTION

A4 FOR TENDER

DRAWING No.
PA3130-RHD-00-XX-DR-C-036

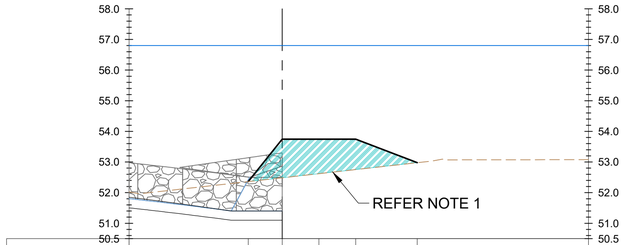
DO NOT SCALE

NOTE:
1. MINOR EARTHWORK PREPARATION MAY BE REQUIRED TO INSTALL GEOBAGS ON A LEVEL PLATFORM TO ENSURE RELATIVE SURFACE FINISH LEVELS, BAG OVERLAP AND INTERLOCK



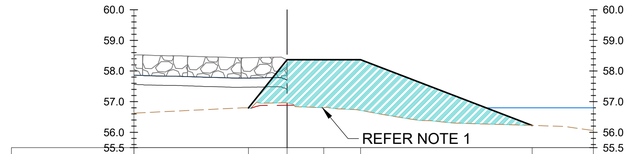
PROPOSED LEVELS	53.50	55.02	55.02	55.02	54.44
EXISTING LEVELS	53.50	53.72	53.95	54.17	54.44
OFFSET	-1.22	0.00	1.20	2.40	3.91

CH 15.00



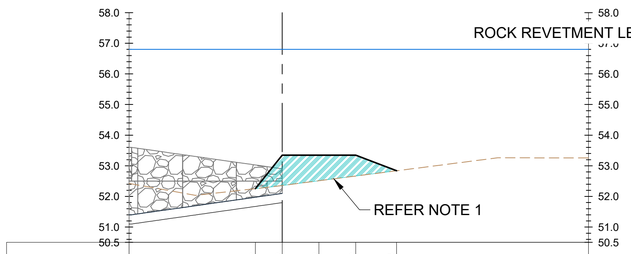
PROPOSED LEVELS	52.36	53.75	53.75	53.75	52.98
EXISTING LEVELS	52.36	52.48	52.62	52.75	52.98
OFFSET	-1.11	0.00	1.20	2.40	4.41

CH 10.00



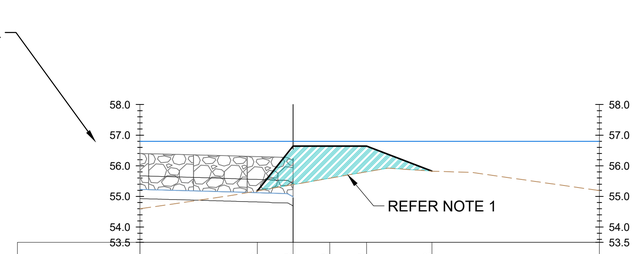
PROPOSED LEVELS	56.79	58.37	58.37	58.37	56.22
EXISTING LEVELS	56.79	56.96	56.81	56.71	56.22
OFFSET	-1.26	0.00	1.20	2.40	8.00

CH 25.00



PROPOSED LEVELS	52.25	53.35	53.35	53.35	52.84
EXISTING LEVELS	52.25	52.36	52.51	52.67	52.84
OFFSET	-0.87	0.00	1.20	2.40	3.73

CH 5.00



PROPOSED LEVELS	55.18	56.64	56.64	56.64	55.82
EXISTING LEVELS	55.18	55.38	55.60	55.80	55.82
OFFSET	-1.17	0.00	1.20	2.40	4.53

CH 20.00

NOT FOR CONSTRUCTION | **A4** | **FOR TENDER**

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C02	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C01	14.11.2024	100% RE-ISSUE FOR TENDER	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
SOUTHERN ROCKBAG STRUCTURE
CROSS SECTIONS

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

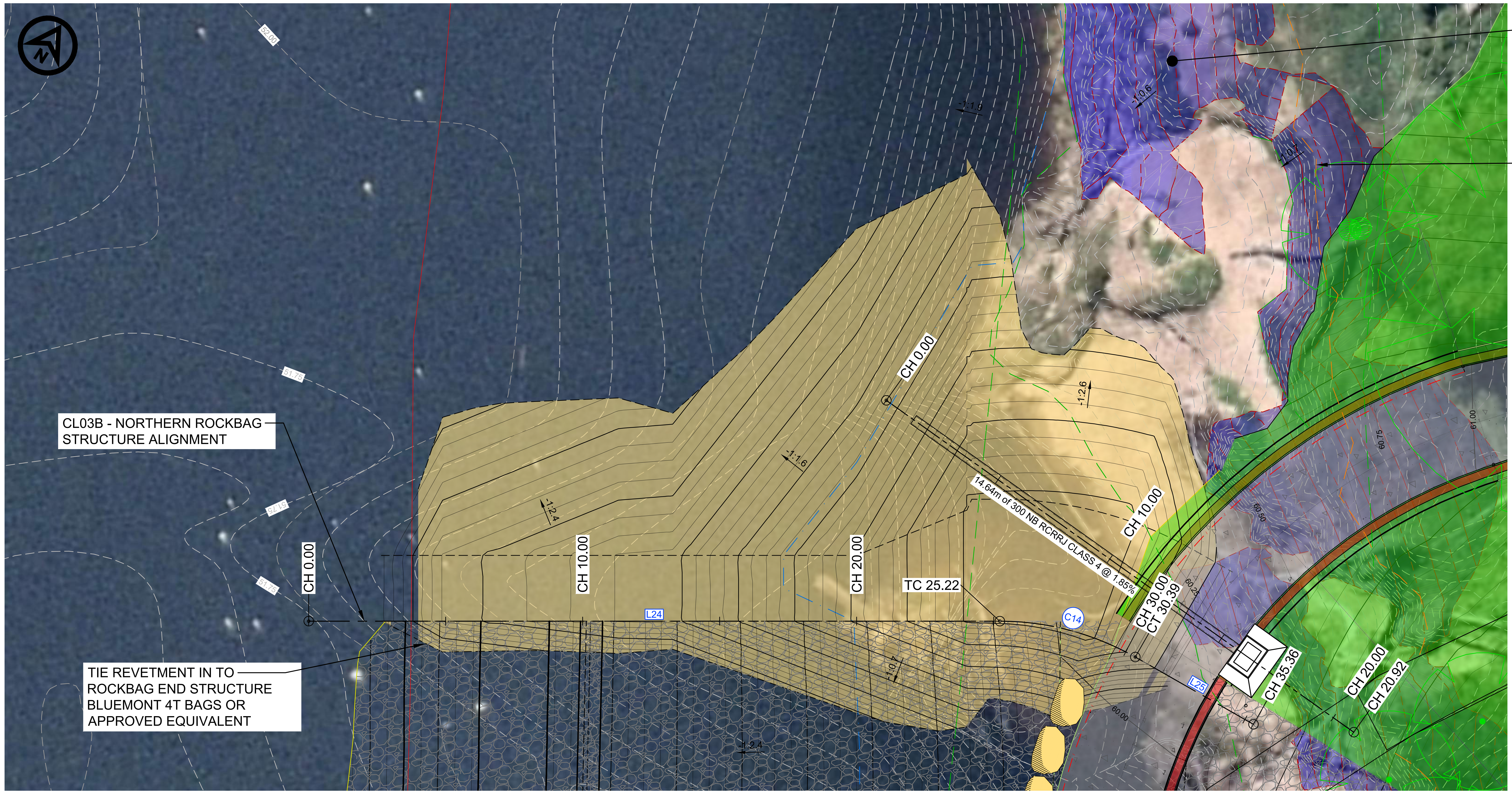
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-036	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-037

DO NOT SCALE

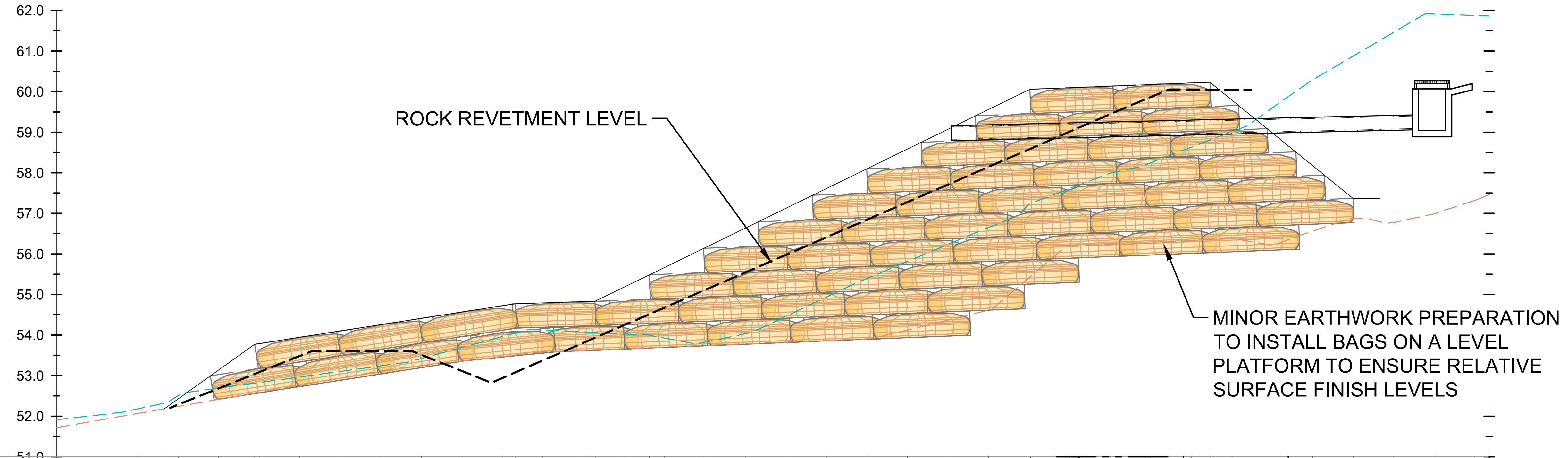


SLOPE ANALYSIS ON EXISTING SCARP LINE, INDICATING BATTERS GREATER THAN 1 IN 1.5 WITH NO BANK PROTECTION

EXISTING SCARP LINE. FURTHER EROSION OCCURRED POST SURVEY. A NUMBER OF TREES SHOWN IN THE SURVEY HAVE SINCE BEEN LOST.

PLAN
SCALE 1:100

CL03B - REVETMENT NORTH EAST ROCK BAGS					
Number	START	END	Length	Line/Chord Direction	Radius
L24	CH 0.000, E 287881.587, N 6228691.909	CH 25.221, E 287906.235, N 6228686.562	25.22	S77° 45' 39.75"E	
C14	CH 25.221, E 287906.235, N 6228686.562	CH 30.394, E 287910.791, N 6228684.235	5.17	S62° 56' 22.86"E	10.00
L25	CH 30.394, E 287910.791, N 6228684.235	CH 35.355, E 287914.484, N 6228680.923	4.96	S48° 07' 05.97"E	



EXISTING LEVELS	51.718	51.893	52.067	52.181	52.241	52.416	52.571	52.590	52.765	52.939	53.113	53.243
GEOBAG TOP LEVEL				52.181	52.427	53.138	53.771	53.788	53.944	54.100	54.256	54.411
CHAINAGE	0.000	1.000	2.000	2.655	3.000	4.000	4.889	5.000	6.000	7.000	8.000	9.000

EXISTING LEVELS	53.357	53.472	53.507	53.583	53.623	53.635	53.663	53.689	53.704	53.744	53.784	53.824
GEOBAG TOP LEVEL	54.567	54.723	54.771	54.793	54.824	54.833	55.179	55.484	55.665	56.152	56.639	57.126
CHAINAGE	10.000	11.000	11.307	12.000	13.000	13.286	14.000	14.628	15.000	16.000	17.000	18.000

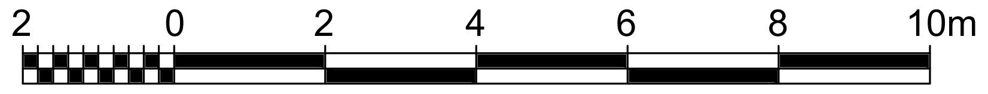
EXISTING LEVELS	53.865	53.905	54.125	54.369	54.614	55.414	55.431	56.212	56.214	56.228	56.265	56.310
GEOBAG TOP LEVEL	57.613	58.100	58.588	59.075	59.562	60.049	60.058	60.097	60.106	60.137	60.176	60.208
CHAINAGE	19.000	20.000	21.000	22.000	23.000	24.000	24.020	25.000	25.221	26.000	27.000	27.808

EXISTING LEVELS	56.324	56.358	56.387	56.210	56.347	56.564	56.876	56.876	56.776	56.988	57.316	57.461
GEOBAG TOP LEVEL	60.216	60.234	59.801	58.991	58.672	58.181	57.371					
CHAINAGE	28.000	28.466	29.000	30.000	30.394	31.000	32.000	32.000	33.000	34.000	35.000	35.355

CL03B - REVETMENT NORTH EAST ROCK BAGS
SCALE 1:100

NOT FOR CONSTRUCTION

A4 FOR TENDER



1:200 (A3) 1:100 (A1)

© Haskoning Australia Pty Ltd

REV	DATE	DESCRIPTION	BY	CHK	APP
C02	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C01	14.11.2024	100% RE-ISSUE FOR TENDER	AI		

REVISIONS

CLIENT

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
NORTHERN ROCKBAG STRUCTURE
PLAN AND LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

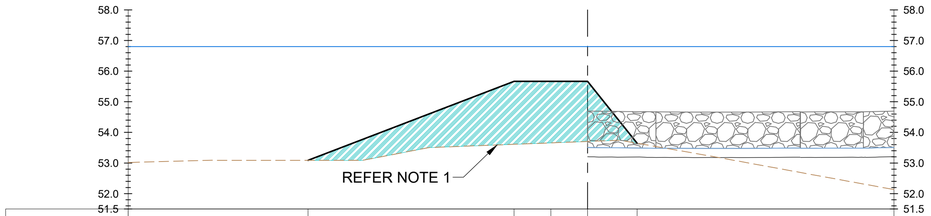
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE AS SHOWN	REF. PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-037	A4	C03

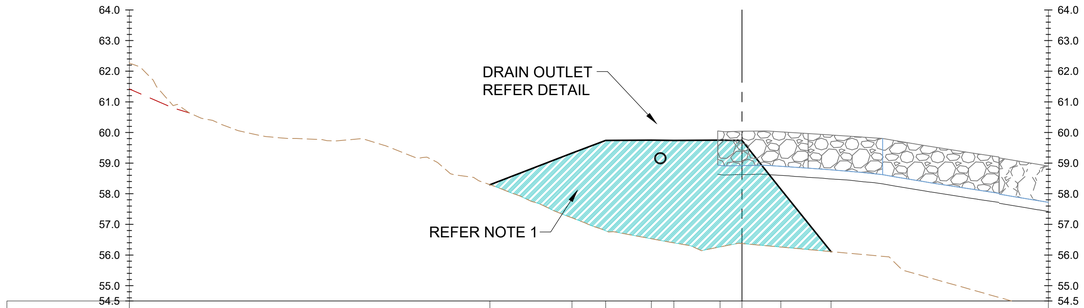
DRAWING No.
PA3130-RHD-00-XX-DR-C-038

DO NOT SCALE



PROPOSED LEVELS	53.09	55.67	55.67	55.67	53.65	
EXISTING TOPO & BATHY LEVELS 2024	53.09	55.67	55.67	55.67	53.65	
OFFSET	-9.13	-2.40	-1.20	0.00	1.62	

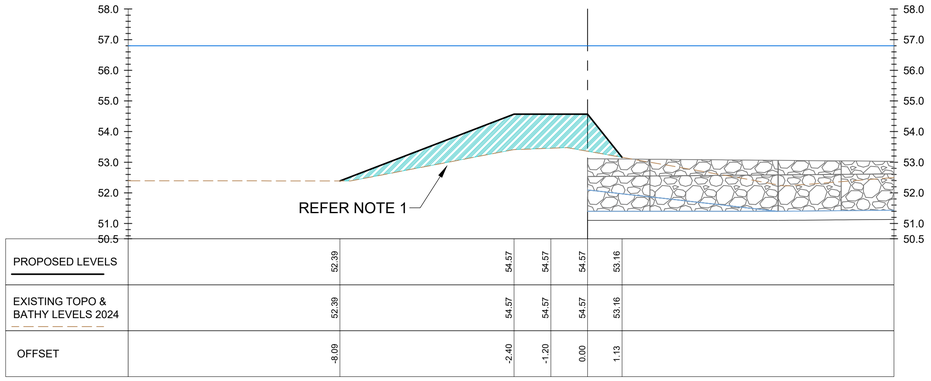
CH 15.00



PROPOSED LEVELS	58.29	59.33	59.74	59.75	59.74	59.75	59.74	58.14	56.11
EXISTING TOPO & BATHY LEVELS 2024	58.29	59.33	59.74	59.75	59.74	59.75	59.74	58.14	56.11
OFFSET	-8.23	-5.55	-4.45	-2.96	-2.22	-0.72	0.00	1.27	2.91

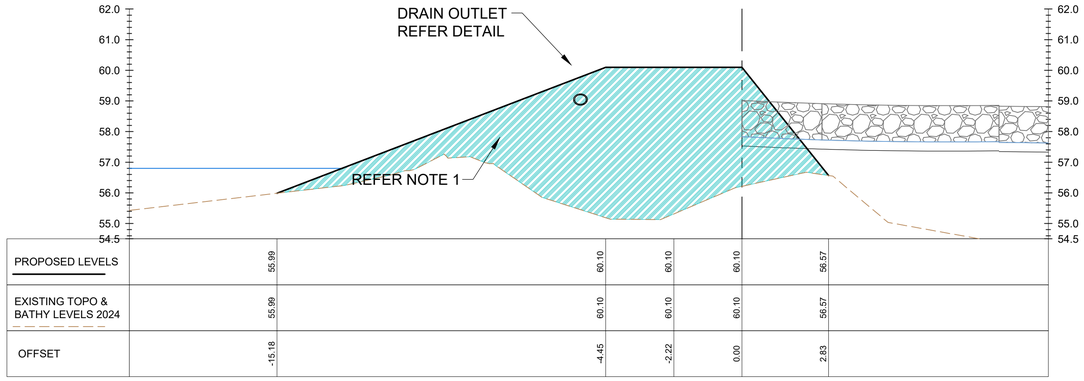
CH 29.07

NOTE:
1. MINOR EARTHWORK PREPARATION MAY BE REQUIRED TO INSTALL GEOBAGS ON A LEVEL PLATFORM TO ENSURE RELATIVE SURFACE FINISH LEVELS, BAG OVERLAP AND INTERLOCK



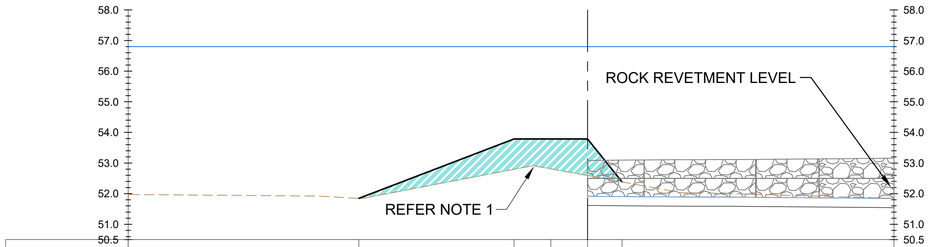
PROPOSED LEVELS	52.39	54.57	54.57	54.57	53.16
EXISTING TOPO & BATHY LEVELS 2024	52.39	54.57	54.57	54.57	53.16
OFFSET	-8.09	-2.40	-1.20	0.00	1.13

CH 10.00



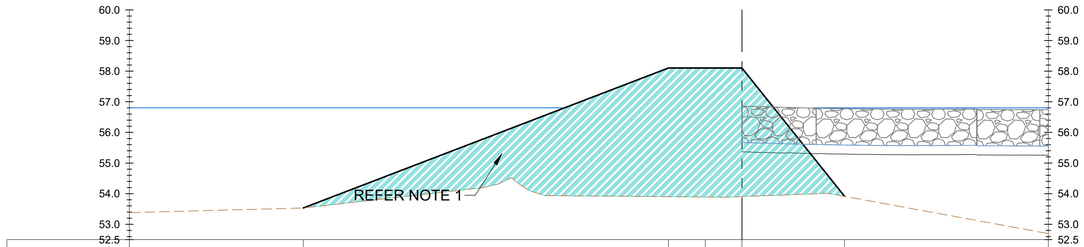
PROPOSED LEVELS	55.99	60.10	60.10	60.10	56.57
EXISTING TOPO & BATHY LEVELS 2024	55.99	60.10	60.10	60.10	56.57
OFFSET	-15.18	-4.45	-2.22	0.00	2.83

CH 25.00



PROPOSED LEVELS	51.85	53.79	53.79	53.79	52.38
EXISTING TOPO & BATHY LEVELS 2024	51.85	53.79	53.79	53.79	52.38
OFFSET	-7.47	-2.40	-1.20	0.00	1.12

CH 5.00



PROPOSED LEVELS	53.53	58.10	58.10	58.10	53.91
EXISTING TOPO & BATHY LEVELS 2024	53.53	58.10	58.10	58.10	53.91
OFFSET	-14.32	-2.40	-1.20	0.00	3.35

CH 20.00

REV	DATE	DESCRIPTION	BY	CHK	APP
C02	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C01	14.11.2024	100% RE-ISSUE FOR TENDER	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EASTERN REVETMENT
NORTHERN ROCKBAG STRUCTURE
CROSS SECTIONS

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-038	A4	C03

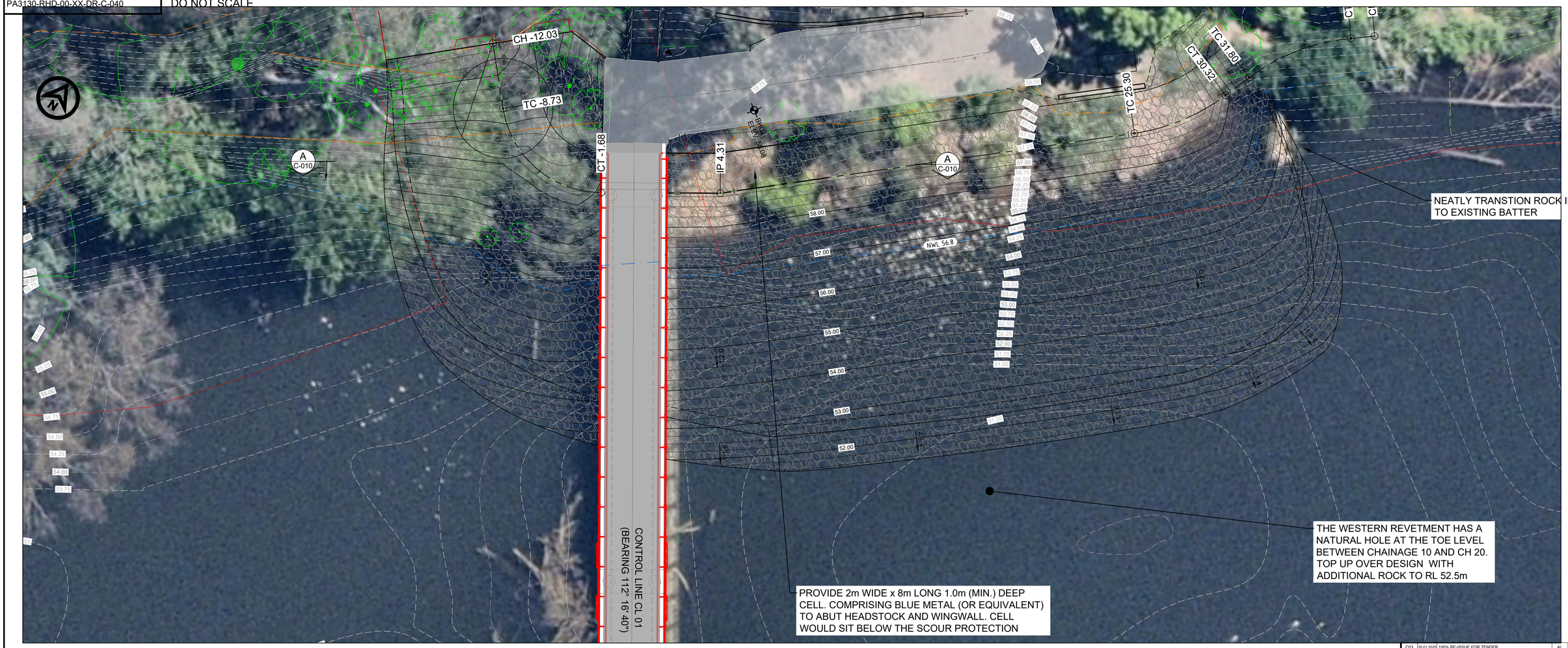
NOT FOR CONSTRUCTION | A4 FOR TENDER

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

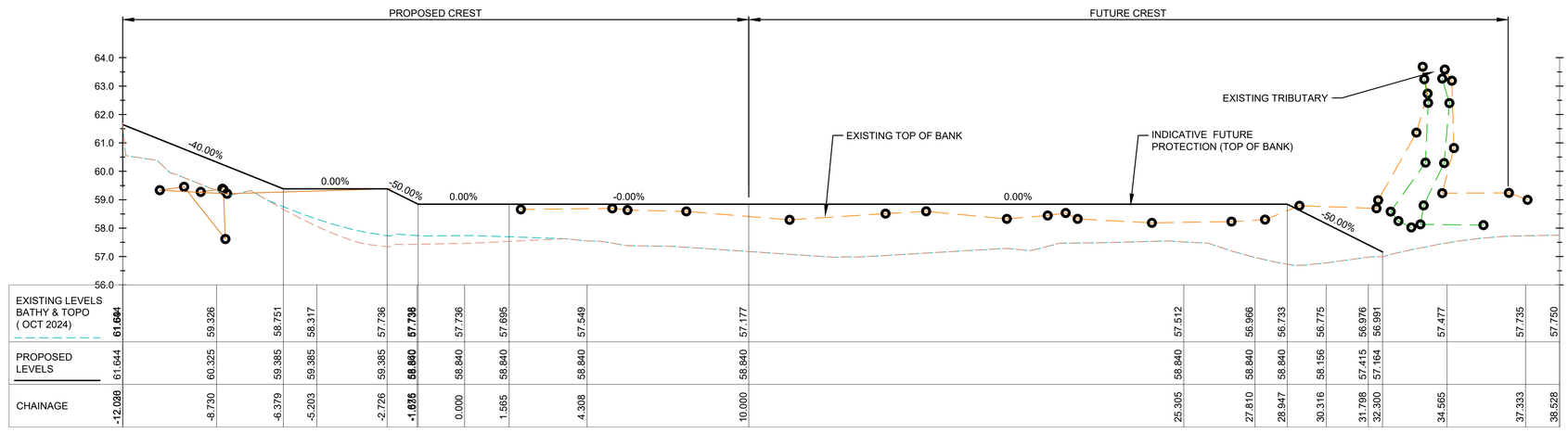
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-040

DO NOT SCALE



PLAN
SCALE 1:250



EXISTING LEVELS BATHY & TOPO (OCT 2024)	**61.644**	59.326	58.751	58.317	57.736	**57.738**	57.736	57.695	57.549	57.177	57.512	56.966	56.733	56.775	56.976	56.991	57.477	57.735	57.750
PROPOSED LEVELS	61.644	60.325	59.385	59.385	59.385	**58.880**	58.840	58.840	58.840	58.840	58.840	58.840	58.840	58.156	57.415	57.164	34.565	37.333	38.528
CHAINAGE	-12.030	-8.730	-6.379	-5.203	-2.726	**-1.636**	0.000	1.565	4.308	10.000	25.305	27.810	28.947	30.316	31.798	32.300			

CL04 - REVETMENT WEST
SCALE 1:100

NOT FOR CONSTRUCTION | **A4** | **FOR TENDER**

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
WESTERN REVETEMENT PLAN AND CL04 - LONGITUDINAL SECTION

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209060
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

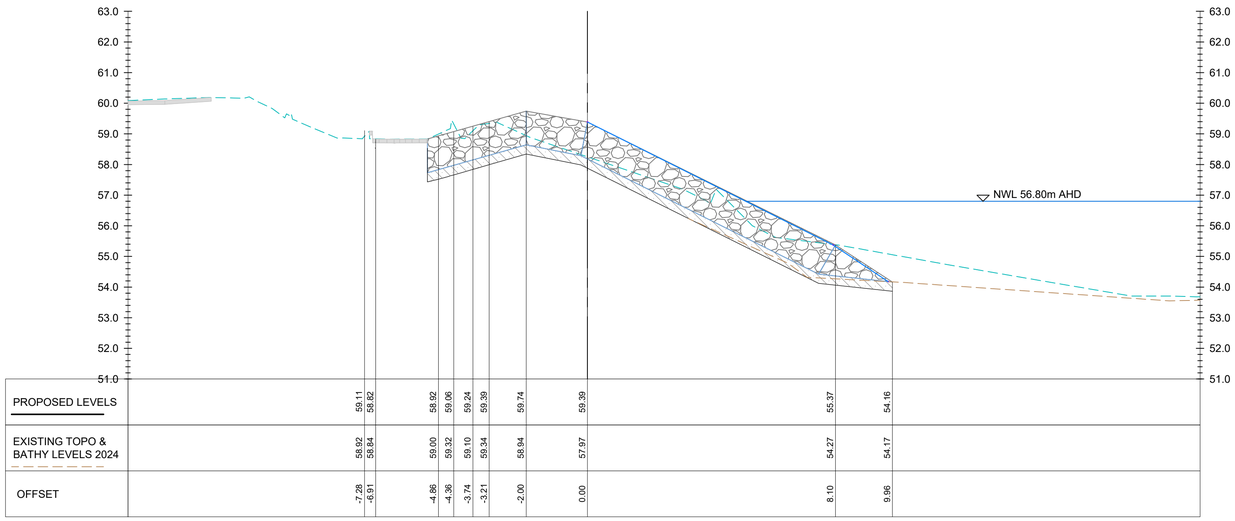
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-040	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

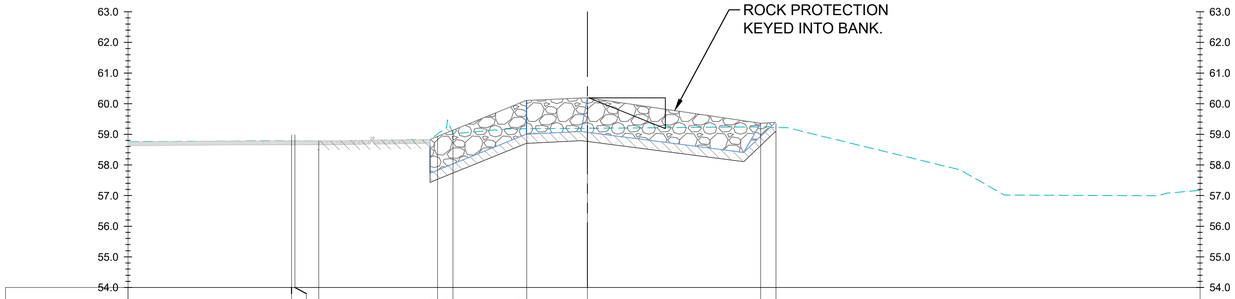
DRAWING No.
PA3130-RHD-00-XX-DR-C-041

DO NOT SCALE



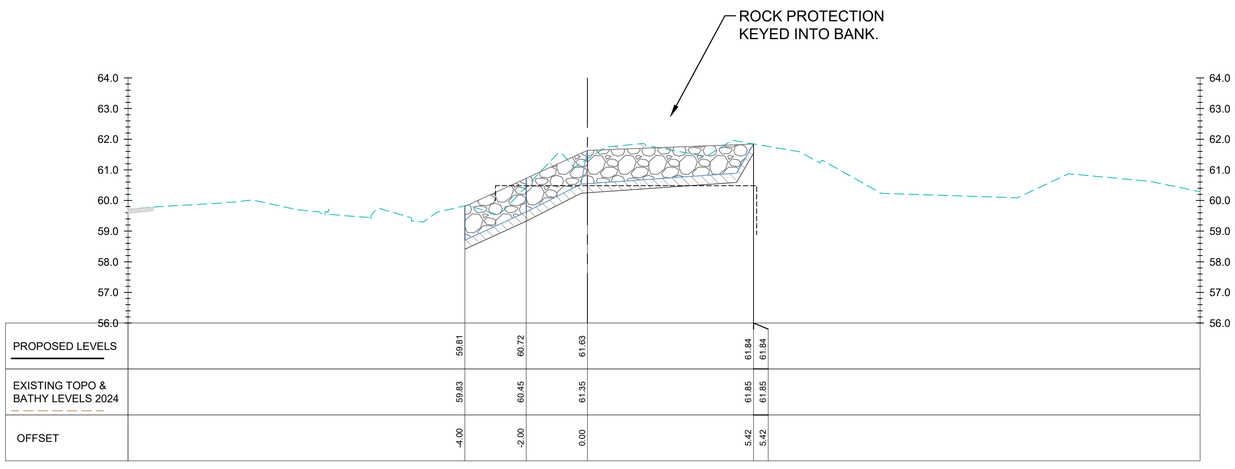
PROPOSED LEVELS	59.11	58.82	58.92	59.06	59.24	59.39	59.74	59.39	55.37	54.16			
EXISTING TOPO & BATHY LEVELS 2024	58.92	58.64	59.00	59.32	59.10	59.34	58.84	57.97	54.27	54.17			
OFFSET	-7.28	-6.91	-4.86	-4.36	-3.74	-3.21	-2.00	0.00	8.10	9.96			

CH -5.00



PROPOSED LEVELS	58.98	58.98	58.79	58.63	59.14	60.11	60.19	59.36	59.37				
EXISTING TOPO & BATHY LEVELS 2024	58.79	58.79	58.79	59.01	59.02	59.18	59.20	59.24	59.22				
OFFSET	-9.66	-9.55	-8.77	-4.89	-4.39	-1.98	0.00	5.65	6.16				

CH -8.40



PROPOSED LEVELS	59.81	60.72	61.63	61.84	61.84	
EXISTING TOPO & BATHY LEVELS 2024	59.83	60.45	61.35	61.85	61.85	
OFFSET	-4.00	-2.00	0.00	5.42	5.42	

CH -12.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
WESTERN REVETEMENT
CROSS SECTIONS
ALIGNMENT CL04
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 85545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

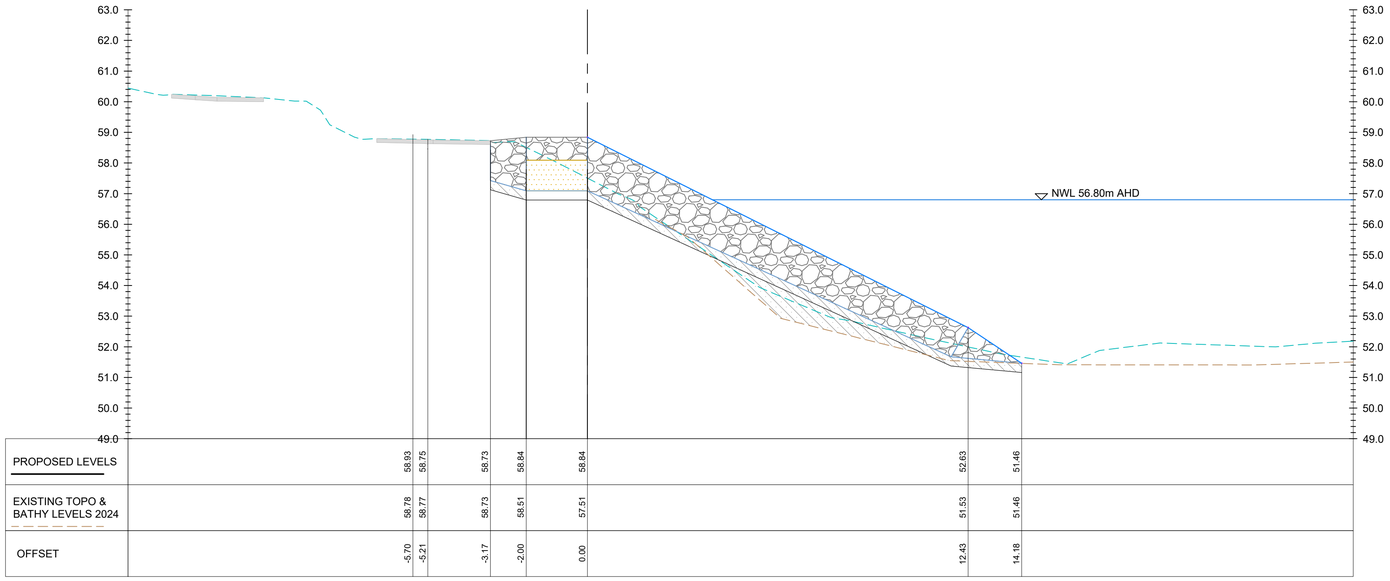
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-041	A4	C03

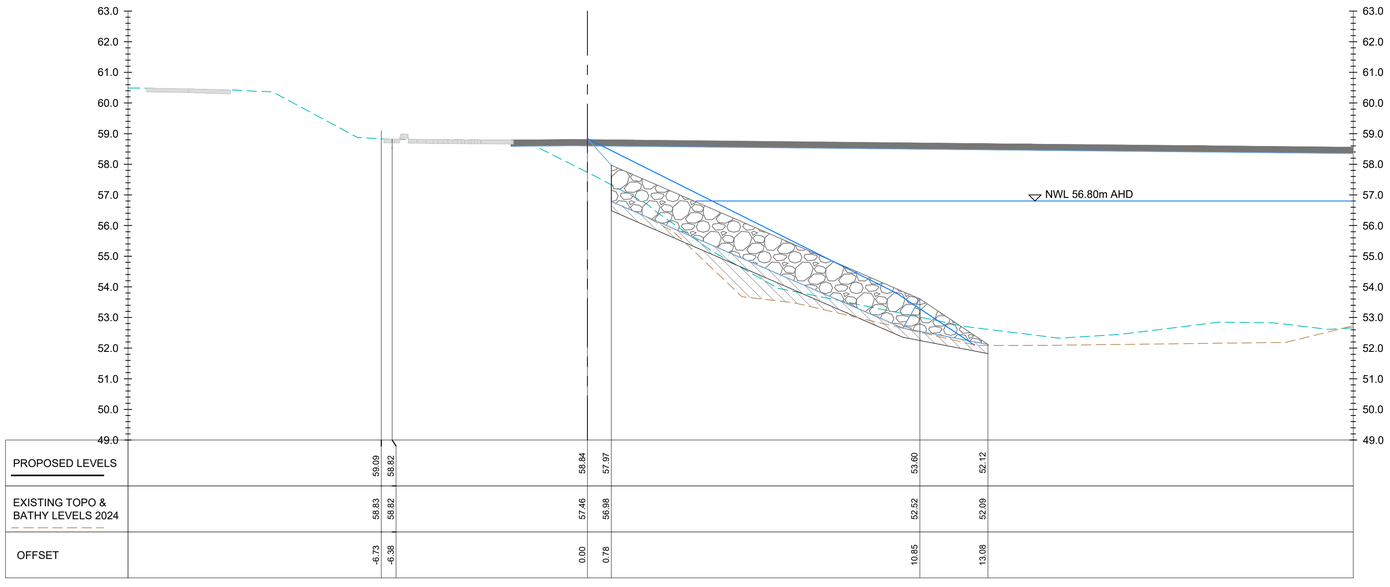
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-042

DO NOT SCALE



CH 5.00



CH 0.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
WESTERN REVETEMENT
CROSS SECTIONS
ALIGNMENT CL04
SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

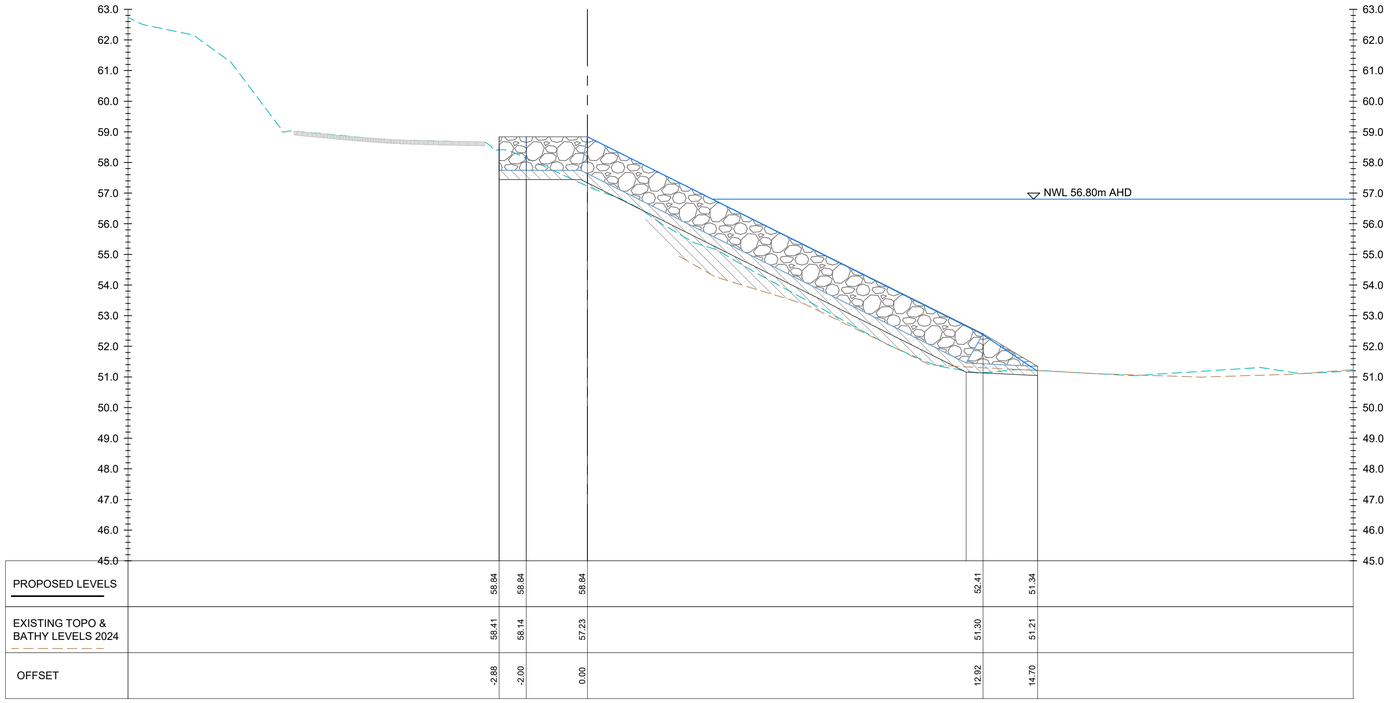
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-042	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

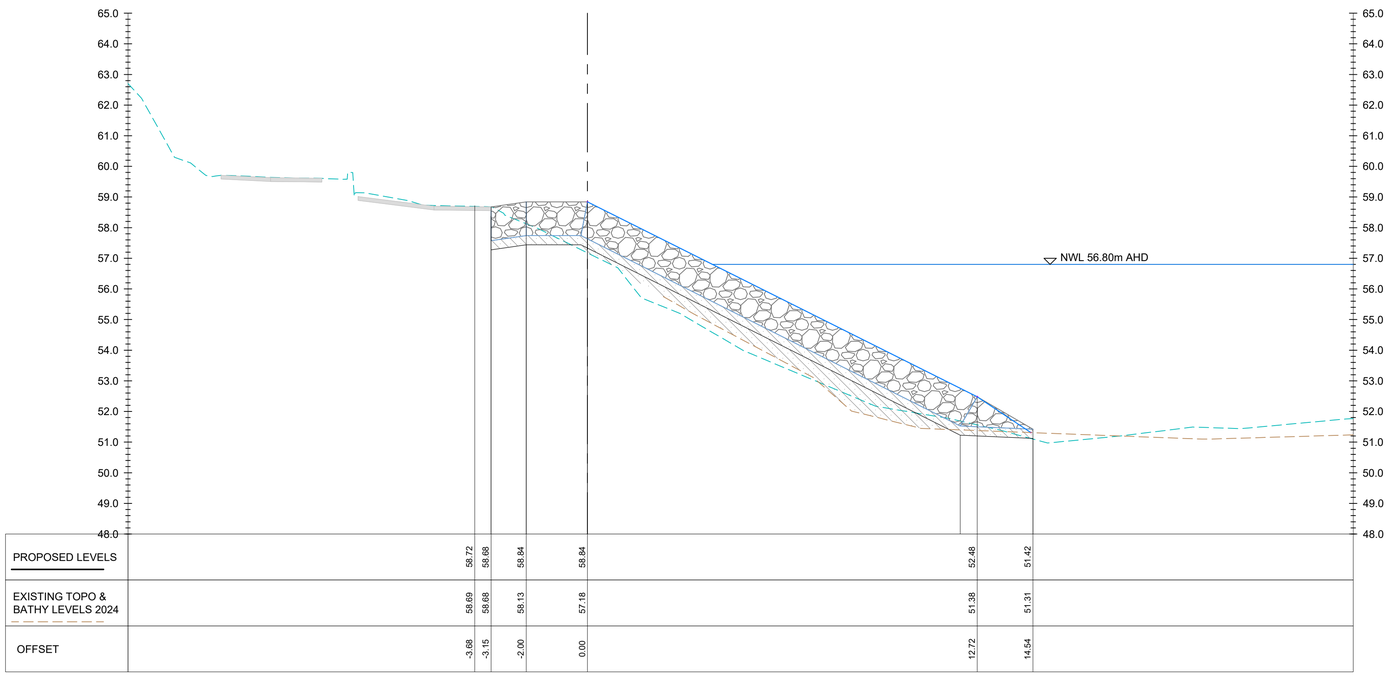
DRAWING No.
PA3130-RHD-00-XX-DR-C-043

DO NOT SCALE



PROPOSED LEVELS	58.84	58.84	58.84		52.41	51.34
EXISTING TOPO & BATHY LEVELS 2024	58.41	58.14	57.23		51.30	51.21
OFFSET	-2.88	-2.00	0.00		12.92	14.70

CH 20.00



PROPOSED LEVELS	58.72	58.68	58.84	58.84	52.48	51.42
EXISTING TOPO & BATHY LEVELS 2024	58.69	58.68	58.13	57.18	51.38	51.31
OFFSET	-3.68	-3.15	-2.00	0.00	12.72	14.54

CH 10.00

2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
WESTERN REVETEMENT
CROSS SECTIONS
ALIGNMENT CL04
SHEET 3

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

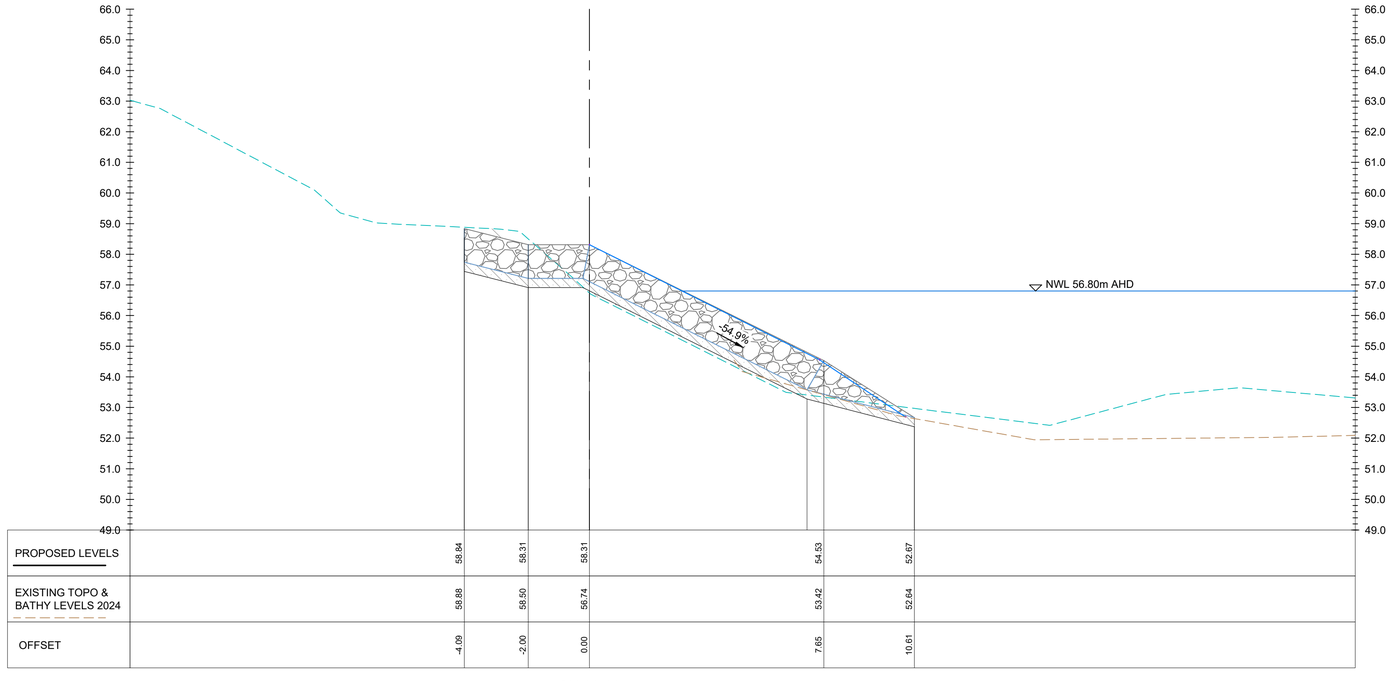
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF:		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-043	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-044

DO NOT SCALE



2 0 2 4 6 8 10m

1:200 (A3) 1:100 (A1)

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
WESTERN REVETEMENT
CROSS SECTIONS
ALIGNMENT CL04
SHEET 4

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-044	A4	C03

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-045

DO NOT SCALE

SOIL EROSION AND SEDIMENT CONTROL

1. THESE PLANS SHALL BE USED AS A GUIDE. ALL EROSION AND SEDIMENT CONTROLS SHALL BE IN ACCORDANCE WITH
a. EROSION AND SEDIMENT CONTROL POLICY
b. THE CONTRACTORS EMP FOR THE WORKS.
c. THE 'BLUE BOOK' LANDCOM 2004, 4th EDITION.

2. ALL SEDIMENT AND EROSION CONTROLS SHALL BE CHECKED WEEKLY AND IMMEDIATELY AFTER RAINFALL. SEDIMENT BUILD UP TO BE REMOVED AND CONTROLS REPAIRED WHERE NECESSARY.

3. THE CONTRACTOR SHALL CONSTRUCT OR INSTALL SOIL AND SEDIMENT CONTROL MEASURES TO THE SATISFACTION OF THE PRINCIPAL PRIOR TO ANY DISTURBANCES TO THE SITE. SOIL AND SEDIMENT CONTROL DEVICES SHALL BE TO THE STANDARD RECOMMENDED BY THE NSW DEPARTMENT OF HOUSINGS 'BLUE BOOK' TITLED "MANAGING URBAN STORMWATER AND CONSTRUCTION – VOLUME 1", 4TH EDITION 2004.

4. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL SEDIMENT AND EROSION CONTROL DEVICES AND REMOVE ACCUMULATED SEDIMENT FROM SUCH DEVICES BEFORE 50% CAPACITY IS USED. ALL THE ACCUMULATED SEDIMENT SHALL BE RE-SPREAD OR REMOVED IN ACCORDANCE WITH THE PRINCIPALS INSTRUCTIONS. THE DEVICES SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL SUCH TIME AS THE DISTURBED AREAS HAVE BEEN REHABILITATED TO A CONDITION SATISFACTORY TO THE PRINCIPAL .

5. THE CONTRACTOR SHALL MAINTAIN ALL RE-VEGETATED AREAS INCLUDING WATERING AND FERTILISING UNTIL SUCH TIME AS THE VEGETATION HAS STABILIZED (MINIMUM TIME IS AT LEAST UNTIL THE END OF THE WORKS, OR AS PER COUNCIL REQUIREMENTS).

6. THE CONTRACTOR SHALL ENSURE TEMPORARY CONTROLS DO NOT DAMAGE EXISTING STRUCTURES, KERBING, PAVEMENT OR SUBGRADES.

7. VEHICULAR ACCESS TO THE SITE SHALL BE CONTROLLED THROUGH THE ACCESS POINTS IDENTIFIED. VEHICLES NOT REQUIRED IN THE PERFORMANCE OF THE WORKS SHALL BE PARKED OFF SITE AWAY FROM DISTURBED AREAS.

8. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO SITE DISTURBANCE TO THE EXTENT THAT THIS CAN BE PRACTICALLY ACHIEVED.

9. PUBLIC ROADS ARE TO BE SWEPT FREE OF DEBRIS RESULTING FROM CONSTRUCTION ACTIVITIES. SWEEPING SHALL BE UNDERTAKEN AT A MINIMUM TWICE MONTHLY.

10. THE CONTRACTOR SHALL TAKE CARE NOT TO DISTURB ANY PORTION OF THE SITE OTHER THAN IN THE IMMEDIATE AREA OF WORKS. NOMINATED UNDISTURBED AREAS SHALL BE BARRICADED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

11. DRAINAGE INLET PROTECTION TO BE PROVIDED FROM THE COMMENCEMENT OF THE EXCAVATION.

12. NO DISTURBED AREA SHALL REMAIN DENUDED FOR A PERIOD LONGER THAN 20 DAYS.

13. THE CONTRACTOR MUST ENSURE THE SUITABILITY AND INTEGRITY OF ALL WORKS AT THE END OF EACH DAYS WORK.

14. ALL REASONABLE AND PRACTICABLE MEASURES MUST BE TAKEN TO ENSURE STORMWATER RUNOFF FROM ACCESS ROADS AND STABILIZED ENTRY/EXIT SYSTEMS, DRAINS TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.

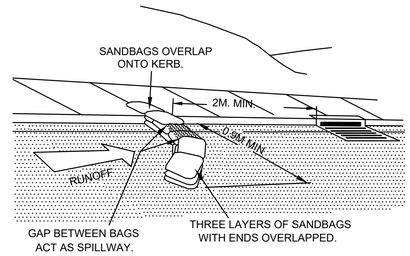
15. SEDIMENT DEPOSITED OFF SITE AS A RESULT OF ON-SITE ACTIVITIES MUST BE COLLECTED AND THE AREA CLEANED/REHABILITATED AS SOON AS REASONABLE AND PRACTICABLE.

16. CONCRETE WASTE AND CHEMICAL PRODUCTS, INCLUDING PETROLEUM AND OIL-BASED PRODUCTS, MUST BE PREVENTED FROM ENTERING ANY INTERNAL OR EXTERNAL WATER BODY, OR ANY EXTERNAL DRAINAGE SYSTEM, EXCLUDING THOSE ON-SITE WATER BODIES SPECIFICALLY DESIGNED TO CONTAIN AND/OR TREAT SUCH MATERIAL. APPROPRIATE MEASURES MUST BE INSTALLED TO TRAP THESE MATERIALS ONSITE.

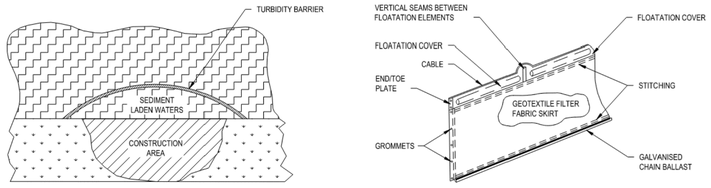
17. STOCKPILES OF ERODIBLE MATERIAL MUST BE PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC) IF THE MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS.

18. MEASURES USED MUST BE APPROPRIATE FOR ALL WORKING HOURS, OUT OF HOURS, WEEKENDS, PUBLIC HOLIDAYS, AND DURING ANY OTHER SHUTDOWN PERIODS.

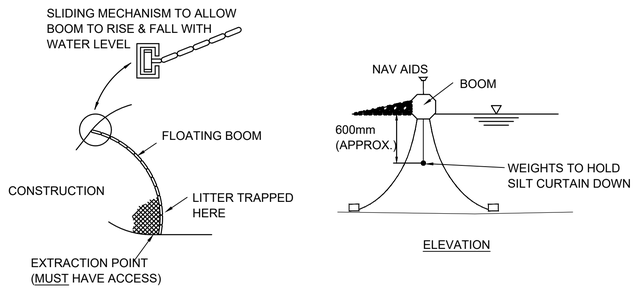
19. ALL MATERIALS REMOVED FROM ESC DEVICES DURING MAINTENANCE, OR DECOMMISSIONING, WHETHER SOLID OR LIQUID, MUST BE DISPOSED OF IN A MANNER THAT DOES NOT CAUSE ANY ONGOING EROSION OR POLLUTION HAZARD.



SANDBAG KERB INLET SEDIMENT TRAP.



TURBIDITY BARRIER
NOT TO SCALE



SILT CURTAIN AND FLOATING LITTER BOOM DETAILS
N.T.S.

NOT FOR CONSTRUCTION

A4 FOR TENDER

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT

camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
EROSION & SEDIMENT CONTROL PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

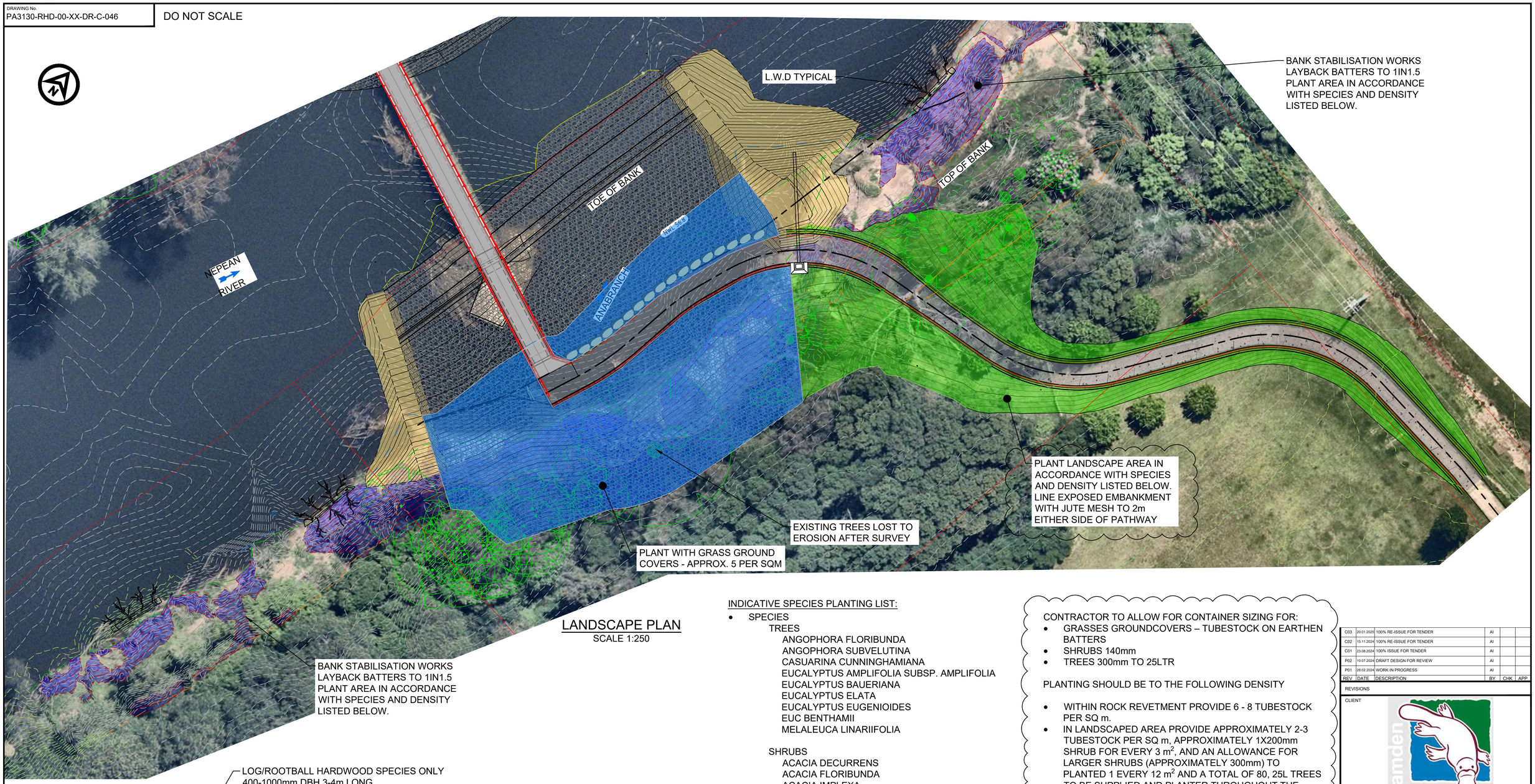
DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-045	A4	C03

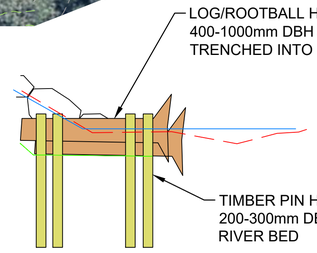
C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

DRAWING No.
PA3130-RHD-00-XX-DR-C-046

DO NOT SCALE



LANDSCAPE PLAN
SCALE 1:250



LARGE WOODY DEBRIS (L.W.D) DETAIL
NOTE: DESIGN BY OTHERS.
LOCATION TO BE CONFIRMED IN ACCORDANCE WITH SUPERINTENDENT

INDICATIVE SPECIES PLANTING LIST:

- SPECIES

TREES
- ANGOPHORA FLORIBUNDA
- ANGOPHORA SUBVELUTINA
- CASUARINA CUNNINGHAMIANA
- EUCALYPTUS AMPLIFOLIA SUBSP. AMPLIFOLIA
- EUCALYPTUS BAUERIANA
- EUCALYPTUS ELATA
- EUCALYPTUS EUGENIOIDES
- EUC BENTHAMII
- MELALEUCA LINARIIFOLIA

SHRUBS
- ACACIA DECURRENS
- ACACIA FLORIBUNDA
- ACACIA IMPLEXA
- ACACIA PARRAMATTENSIS
- BACKHOUSIA MYRTIFOLIA
- CALLISTERMON SALIGNUS
- TREMA ASPERA
- ACACIA BINERVIA
- BURSARIA SPINOSA
- HYMENANTHERA DENATA
- INDIGOFERA AUSTRALIS
- OZOTHAMNUS DIOSMIFOLIUS

GRASSES/GROUNDCOVERS
- CHLORIS VENTRICOSA
- DICHELACHNE MICRANTHA
- POA LABILLARDIERI
- THEMEDA AUSTRALIS
- DIANELLA LONGIFOLIA VAR. LONGIFOLIA
- ISOLEPIS NODOSA
- JUNCUS USITATUS
- LOMANDRA LONGIFOLIA

CONTRACTOR TO ALLOW FOR CONTAINER SIZING FOR:
- GRASSES GROUNDCOVERS – TUBESTOCK ON EARTHEN BATTERS
- SHRUBS 140mm
- TREES 300mm TO 25LTR

PLANTING SHOULD BE TO THE FOLLOWING DENSITY

- WITHIN ROCK REVETMENT PROVIDE 6 - 8 TUBESTOCK PER SQ m.
- IN LANDSCAPED AREA PROVIDE APPROXIMATELY 2-3 TUBESTOCK PER SQ m, APPROXIMATELY 1X200mm SHRUB FOR EVERY 3 m^2, AND AN ALLOWANCE FOR LARGER SHRUBS (APPROXIMATELY 300mm) TO PLANTED 1 EVERY 12 m^2 AND A TOTAL OF 80, 25L TREES TO BE SUPPLIED AND PLANTER THROUGHOUT THE REVEGETATION AREA.

REV	DATE	DESCRIPTION	BY	CHK	APP
C03	20.01.2025	100% RE-ISSUE FOR TENDER	AI		
C02	15.11.2024	100% RE-ISSUE FOR TENDER	AI		
C01	23.08.2024	100% ISSUE FOR TENDER	AI		
P02	10.07.2024	DRAFT DESIGN FOR REVIEW	AI		
P01	28.02.2024	WORK IN PROGRESS	AI		

REVISIONS

CLIENT
camden council

PROJECT
LITTLE SANDY BRIDGE - BRIDGE LENGTHENING AND RIVER BANK PROTECTION WORKS, ELDERSILE

TITLE
LANDSCAPE PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
AI	MGA 56 GDA 2020	AHD	20.01.2025
SCALE	REF.		
AS SHOWN	PA3130-RHD-00-M3-C-001_044		

DRAWING No.	SUITABILITY	REVISION
PA3130-RHD-00-XX-DR-C-046	A4	C03

NOT FOR CONSTRUCTION

A4 FOR TENDER

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

C:\USERS\924365\ROYAL HASKONINGDHV\PROJECT-PA3130-SANDYCK-BRIDGE-REHAB - PA3130 SANDYCK BRIDGE REHAB WIP\FOR CAD\WIP\02_CAD\PA3130-RHD-00-M3-C-001_044

Appendix

Appendix C – Hydraulic Assessment

Royal HaskoningDHV
Enhancing Society Together

Note / Memo

Haskoning Australia PTY Ltd.
Water & Maritime

To:	Paul Fairweather
From:	Monica Laut, Andrew Morris, Josh Terry
Date:	20 October 2023
Copy:	N/A
Our reference:	PA3130-RHD-ZZ-XX-NT-Z-0001
Classification:	Project related
Checked by:	Andrew Morris

Subject: **Little Sandy Bridge – Additional Hydraulic Assessment & Revised Options Investigation**

FINAL

1 Introduction

Camden Council has engaged Royal HaskoningDHV (RHDHV) to undertake an options investigation for the repair of the eastern abutment at the Little Sandy Bridge pedestrian crossing of the Nepean River at Camden. The engagement is focussed towards providing a permanent solution for the stabilisation of the existing embankment and protection of the footpath asset. This followed four flood events that resulted in the progressive erosion and instability of the existing eastern river bank during March, April and July 2022. Four options were developed for the works and were discussed in the *Bank Stabilisation, Little Sandy Bridge, Camden* Memorandum (RHDHV, September 2022).

Following the concept options development, it has been necessary to refine the hydraulic TUFLOW flood model to incorporate the erosion and scour of the river bank in the vicinity of the bridge that has occurred as a consequence of the flooding that occurred in 2022. The TUFLOW model refinement would be used to understand the hydrodynamics and fluvial geomorphology of the river, as well as to inform the selection of a preferred option. A HEC-RAS model has also been developed to undertake a scour assessment to predict the scour depths to assist with the abutment, pier and contraction scour calculations.

As part of the revised hydraulic investigation, the two further options that have been investigated are targeted towards providing long term stability for the river bank. These options have also been designed and costed for implementation on the western river bank. Although the current protection measure (comprising (concrete mattresses) remains in place, it is susceptible to undermining and failure and therefore a replacement measure has been considered.

2 TUFLOW Modelling Updates

2.1 Collection of Additional Survey

Council provided bathymetric survey of the section of the Nepean River approximately 500 metres upstream and 500m downstream of Little Sandy Bridge. The survey file is identified as titled *Plan of Detail and Contours Over Part of Low 1 in DP185957, Little Sandy Bridge and Nepean River Camden* (Beveridge Williams, Ver B, 17/11/22) (2201816(BATH)-DET.dwg) and was surveyed on 3/11/22. The survey is referenced to MGA2020.

The bathymetric data was used to represent the bed and bank profile in the updated TUFLOW and HEC-RAS models.

2.2 Model Updates

A number of updates have been made to the TUFLOW model developed as part of the Nepean River Flood Study. The updates are focussed on refining the representation of flood behaviour in the vicinity of the existing Little Sandy Bridge to understand the localised flood behaviour, including scour potential and to inform the selection of a preferred option.

The following updates were made to the model:

- Update the model to represent the latest topographic and hydrographic survey.
- The representation of the bridge structure, abutments, piers and railing and potential blockage factors (due to accumulated debris), to better represent the potential for increased flow velocity and scour around the bridge abutments.
- Reduce the grid size of the TUFLOW model and/or employ Sub Grid Sampling (SGS) techniques to better represent the river in the section of channel in the vicinity of Little Sandy Bridge.

These changes have been incorporated into the TUFLOW model that has been updated to represent the current conditions and to assess the options investigated.

2.3 Gauges

Three streamflow gauge records have been obtained to assist in quantifying the magnitude of the 2022 Nepean River flood events. The gauges are located at weir structures at Menangle, Camden and Mount Hunter. The locations of the gauging stations relative to the site in question are shown in **Figure 2-1** and summarised below in **Table 2-1**.

Figure 2-1 Location of Gauging Sites Relative to Little Sandy Bridge

Table 2-1 Location of Gauging Station Relative to Little Sandy Bridge

Gauging Station	Location Relative to Little Sandy Bridge
Menangle Weir	Approx. 10.5 kilometres upstream
Camden Weir	Approx. 5.5 kilometres downstream
Mount Hunter Weir	Approx. 11 kilometres downstream

The gauging record is shown in **Figure 2-2**, **Figure 2-3** and **Figure 2-4**.

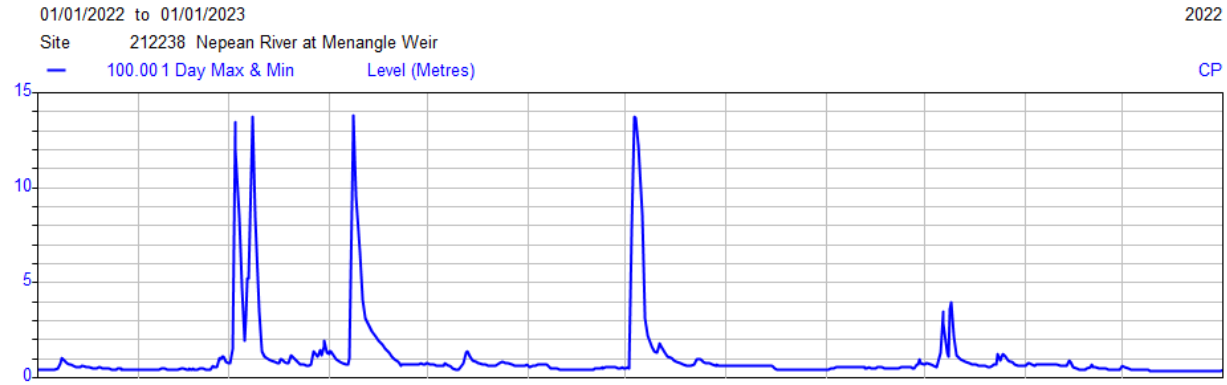


Figure 2-2 Gauging Record at Menangle Weir - 2022

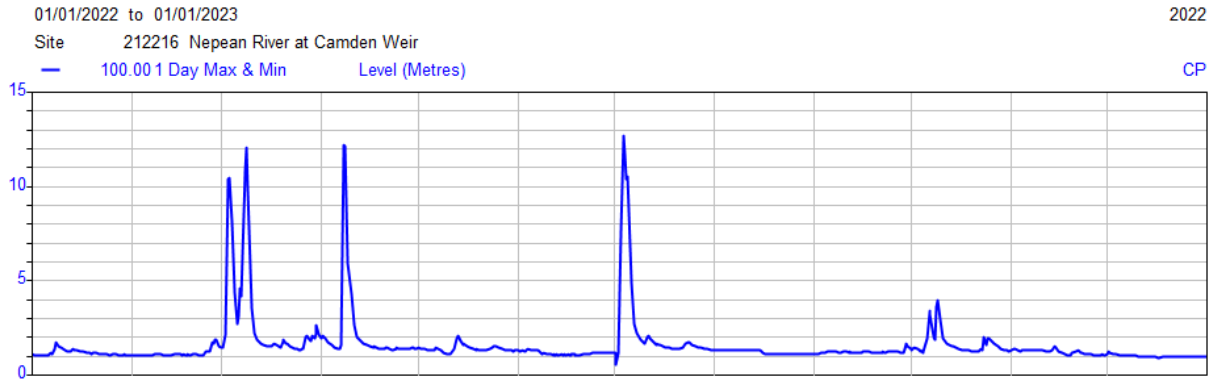


Figure 2-3 Gauging Record at Camden Weir - 2022

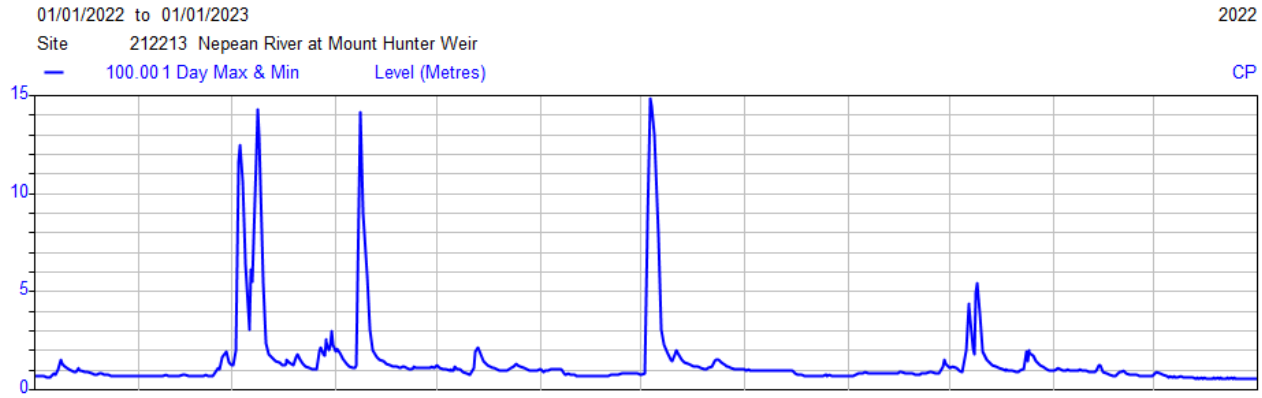


Figure 2-4 Gauging Record at Mount Hunter Weir - 2022

The Camden Weir gauge and Mount Hunter Weir gauge both indicate that the July 2022 event recorded the maximum flood level during 2022, while the maximum recorded at Menangle was very similar for both the April and July events. For this reason, The July 2022 event has been adopted for verifying the TUFLOW model and testing the performance of the proposed design. No other data was sourced for verifying the representation of the July 2022 event in the hydraulic model.

2.4 Updated Modelling Results

The updated Hydraulic Model has been used to assess the hydraulics locally around the existing Little Sandy Bridge structure. This has included evaluating the potential for scour for a baseline scenario and a sensitivity scenario. These scenarios are:

A. **Baseline scenario**: Bridge with damaged eastern abutment, current bathymetry with scoured bank (per the survey dated 17/11/22). Scenario is assessed for the July 2022 event.
B. **Sensitivity assessment**: Bridge in place as per 2014 construction, old bathymetry – conditions at the completion of prior "Stage 1" repair works undertaken in 2020. Scenario is assessed for the flows derived from the July 2022 event.

The model has also been used to simulate the 1% AEP event for each of these scenarios, in addition to the July 2022 event. The updated TUFLOW hydraulic model has also been used to assess the performance of Options 2C and 2D (*refer* **Section 4**). Option 2C and Option 2D have been modelled using the most recent topographic and hydrographic survey data. A summary of the figures prepared to document the hydraulic results (which are included in **Appendix A**) are summarised below.

Figure	Hydrology	Scenario/Option	Hydraulic Parameter
A1	July 2022 flood	Scenario A	Peak Depth
A2	July 2022 flood	Scenario B	Peak Depth
A3	*July 2022 flood*	*Option 2C*	*Peak Depth*
A4	*July 2022 flood*	*Option 2D*	*Peak Depth*
A5	July 2022 flood	Scenario A	Peak Flow Velocity
A6	July 2022 flood	Scenario B	Peak Flow Velocity
A7	*July 2022 flood*	*Option 2C*	*Peak Flow Velocity*
A8	*July 2022 flood*	*Option 2D*	*Peak Flow Velocity*
A9	July 2022 flood	Scenario A	Peak Bed Shear Stress
A10	July 2022 flood	Scenario B	Peak Bed Shear Stress
A11	*July 2022 flood*	*Option 2C*	*Peak Bed Shear Stress*
A12	*July 2022 flood*	*Option 2D*	*Peak Bed Shear Stress*
A13	1% AEP flood	Scenario A	Peak Depth
A14	1% AEP flood	Scenario B	Peak Depth
A15	*1% AEP flood*	*Option 2C*	*Peak Depth*
A16	*1% AEP flood*	*Option 2D*	*Peak Depth*
A17	1% AEP flood	Scenario A	Peak Flow Velocity
A18	1% AEP flood	Scenario B	Peak Flow Velocity
A19	*1% AEP flood*	*Option 2C*	*Peak Flow Velocity*
A20	*1% AEP flood*	*Option 2D*	*Peak Flow Velocity*
A21	1% AEP flood	Scenario A	Peak Bed Shear Stress
A22	1% AEP flood	Scenario B	Peak Bed Shear Stress
A23	*1% AEP flood*	*Option 2C*	*Peak Bed Shear Stress*
A24	*1% AEP flood*	*Option 2D*	*Peak Bed Shear Stress*

The following observations can be made from the comparison of the modelling results for Scenario A and Scenario B:

- The level of regression experienced by the river bank is notable when comparing the difference in peak depths between Figures A1 and A2. This comparison provides a good reference for the potential variation in the riverine environment over time, and the differences that need to be considered for design of the works.
- Similarly, there is a notable reduction in flow velocity corresponding to the widening of the river. Under Scenario B, the constriction associated with the bridge structure and channel is predicted to generate a peak flow velocity of 2.5 m/s (refer Figure A5 and A6), and an instream velocity downstream of 1.75 m/s. Whereas, for Scenario A, the velocity in channel is reduced to below 1.5 m/s.
- Similarly, the difference in peak bed shear stress is observed (refer Figure A9 and A10). Shear stresses in the order of 150 N/m^2 are predicted to occur upstream of the bridge, while shear stress is reduced to a peak of around 100 N/m^2 (and is much more localised) in Scenario A.

While the results of the modelling indicate that the post flooding conditions (post July 2022) are generally more favourable for the design of hydraulic structures in the riverine environment, it is observed that the sensitivity results indicate the potential for velocities and scour potential to increase following a period over which a regime of deposition occurs in the river, which may correspond to periods of lower flow and once the vegetation is re-established. Therefore, velocities and scour potential will need to be considered in the design of any permanent works.

The results of modelling of the two options will be discussed in **Section 4**.

3 HEC-RAS Modelling – Baseline Conditions

A HEC-RAS hydraulic model was developed to analyse the scour potential of the river bed and banks in the vicinity of the existing bridge structure, which is intended to inform the design of the concept design options. The HEC-RAS model incorporated the river bed, river banks and Little Sandy Creek bridge. The HEC-RAS model was used to model the following scenarios:

A. **Baseline scenario**: Bridge with damaged eastern abutment, current bathymetry with scoured bank (per the survey dated 17/11/22). Scenario is assessed for the July 2022 event.
B. **Sensitivity assessment**: Bridge in place, old bathymetry – conditions at the completion of Stage 1 works. Scenario is assessed for the July 2022 event.

3.1 Model Development

A HEC-RAS model was developed to represent the Nepean River 100m upstream to 100m downstream of the bridge. The following assumptions were incorporated into the HECRAS model:

- Mannings 'n' roughness
  - Creek bed: 0.04 (this matches the calibrated TUFLOW model)
  - Creek bank: 0.1 (this matches the calibrated TUFLOW model)
  - Concept design options scour protection: 0.05
- Creek overbank areas were defined based on roughness layers used in the original TUFLOW modelling.
- Bridge design:
  - Scenario A: on the western bank, per the SMEC bridge design documented in *Shared Path Bridge Over Nepean River (Little Sandy Bridge)* (SMEC, Rev A, 2013). On the eastern bank, per the survey dated 17th November 2022.
  - Scenario B: per the SMEC bridge design documented in *Shared Path Bridge Over Nepean River (Little Sandy Bridge)* (SMEC, Rev A, 2013).
- Channel slope:
  - Scenario A: per the survey dated 17th November 2022
  - Scenario B: per the survey dated June 2020
- Channel bed width:
  - Scenario A: per the survey dated 17th November 2022
  - Scenario B: per the survey dated June 2020

3.2 Hydraulic Inputs

As the HEC-RAS model is designed to be applied only for the scour assessment, the model inputs used for validation of the hydraulic outputs of the HEC-RAS model (i.e. peak flow rate and boundary water levels) were the same as used for the scour assessment. Peak flow rates and water levels were extracted from the TUFLOW model at the timestep when the highest shear stresses were measured by TUFLOW, in the channel banks (shear stresses were higher in the banks than in the channel bed). Following interrogation of the TUFLOW modelling results, this was determined to correspond to the time at which or near which water levels exceed the top of bank.

The steady flow data upstream flowrate was based on flowrates derived from TUFLOW modelling. Boundary condition water levels (100m upstream and downstream of the bridge) were based on water levels derived from TUFLOW modelling. A summary of the input flow rates and stream levels for the baseline scenarios and proposed options is provided in **Table 3-1**. This has been derived from the July 2022 Flood event scenario.

Table 3-1 Steady Flow Data at Peak Shear Stress- Flowrate and Boundary Level Inputs to HECRAS

Scenario	100m Upstream Peak Flowrate (m^3/s)	100m Upstream Boundary Water Level (m)	100m Downstream Boundary Water Level (m)
Scenario A	599	63.72	63.54
Scenario B	599	63.8	63.52
Option 2C	599	63.74	63.54
Option 2D	599	63.72	63.54

3.3 Results and Validation

Scenarios A and B at the bridge were modelled to assess the extent of scour resulting from the respective bridge and bathymetric conditions described above. The average channel velocity and the water level at the bridge are provided in **Table 3-2**.

Refer to **Figure 3-1** for a long-section and water surface profile of the main channel reach (Scenario A). Refer to **Figure 3-2** and **Figure 3-3** for the velocity and shear stress profiles of Scenario A. The cross-section averaged velocity in the channel is approximately 1.25 – 1.8 m/s and the shear stress ranges from 11 – 17 kN/m^2 in the vicinity of the bridge (in the centre of the channel).

Refer to **Figure 3-4** for a long-section and water surface profile of the main channel reach (Scenario B). Refer to **Figure 3-5** and **Figure 3-6** for the velocity and shear stress profiles of Scenario A. The cross-section averaged velocity in the channel is approximately 1.3 – 1.5 m/s and the shear stress ranges from 13 – 31 kN/m^2 in the vicinity of the bridge. Both the velocity and shear stress increase downstream of the bridge as a result of the channel constriction.

For reference, the results of Options 2C and 2D (*refer* **Section 4**) are also provided in **Table 3-2**. For Option 2C this includes the water level (*refer* **Figure 3-7**), the velocity (*refer* **Figure 3-8**) and bed shear stress (*refer* **Figure 3-9**).

In relation to Option 2D, the long section and water surface profile is shown in **Figure 3-10,** the flow velocity is presented in **Figure 3-11** and bed shear stress is shown in **Figure 3-12**.

Table 3-2 HEC-RAS Results (Peak Flow 599 m^3/s)

Scenario	Peak Flow (m^3/s)	At the Bridge		
		Average Maximum Channel Velocity (m/s)	Water Level (m)	Average Maximum Channel Shear Stress (N/m^2)
Scenario A – current bathy, damaged bridge	599	1.5	63.64	17
Scenario B – old bathy, bridge in place	599	1.5	63.60	31
Proposed Option 2C	599	1.6	63.65	19
Proposed Option 2D	599	1.4	63.66	17

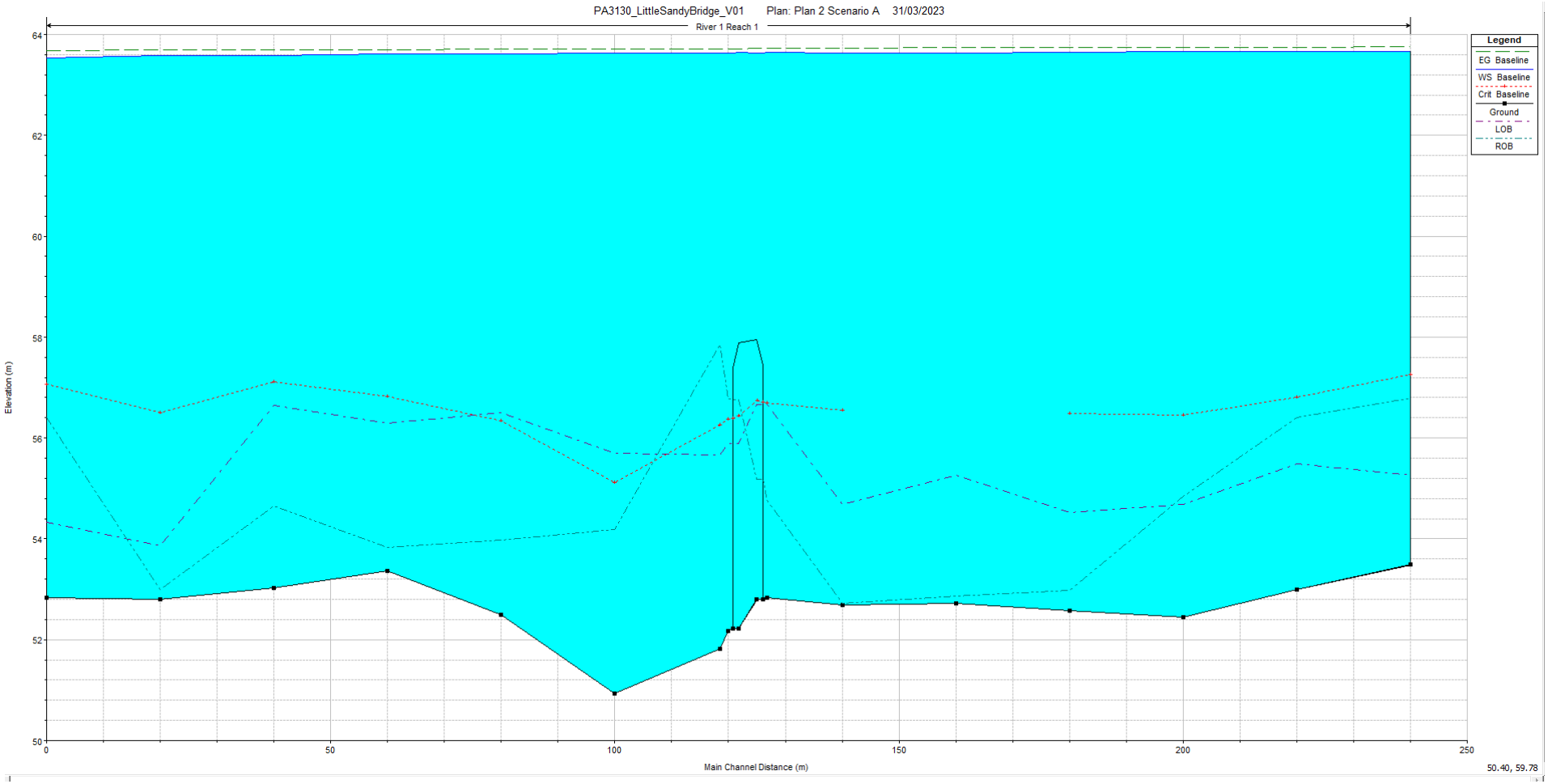


Figure 3-1 Scenario A Surface Water Level, Flow rate - 599.1m³/s

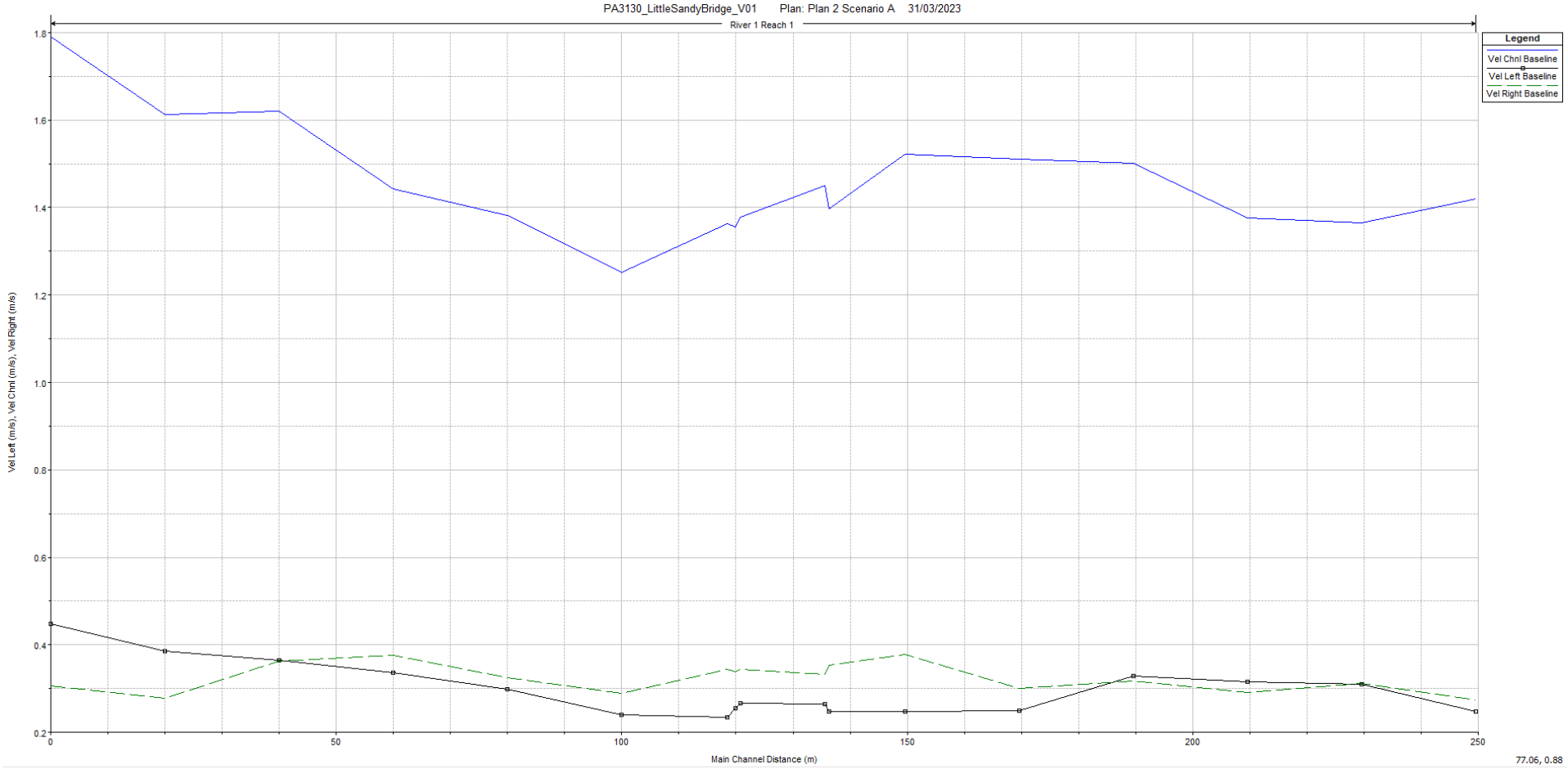


Figure 3-2 Scenario A Velocity Profile, Flow rate - 599.1m^3/s

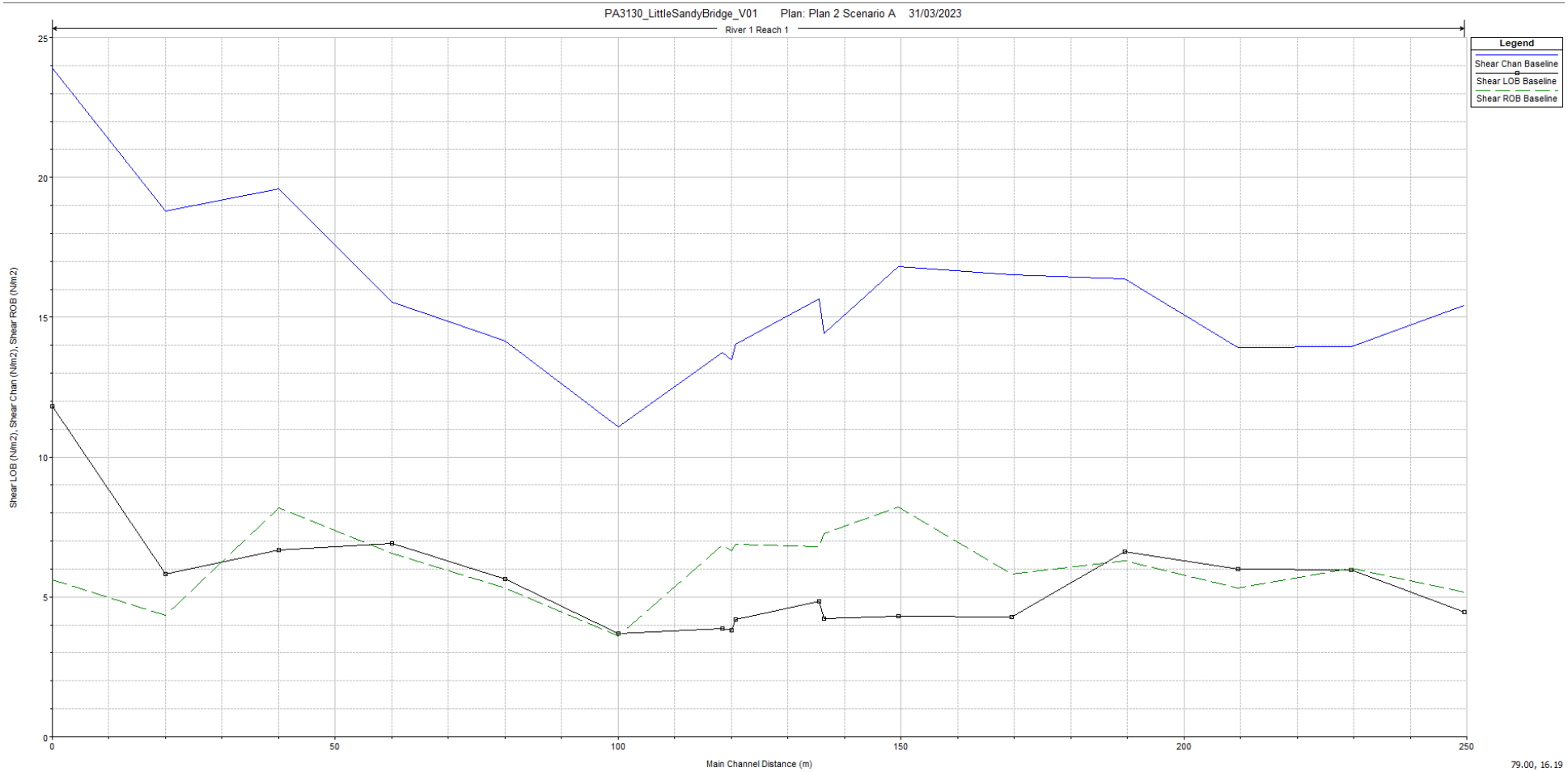


Figure 3-3 Scenario A Shear Stress Profile, Flow rate - 599.1m³/s

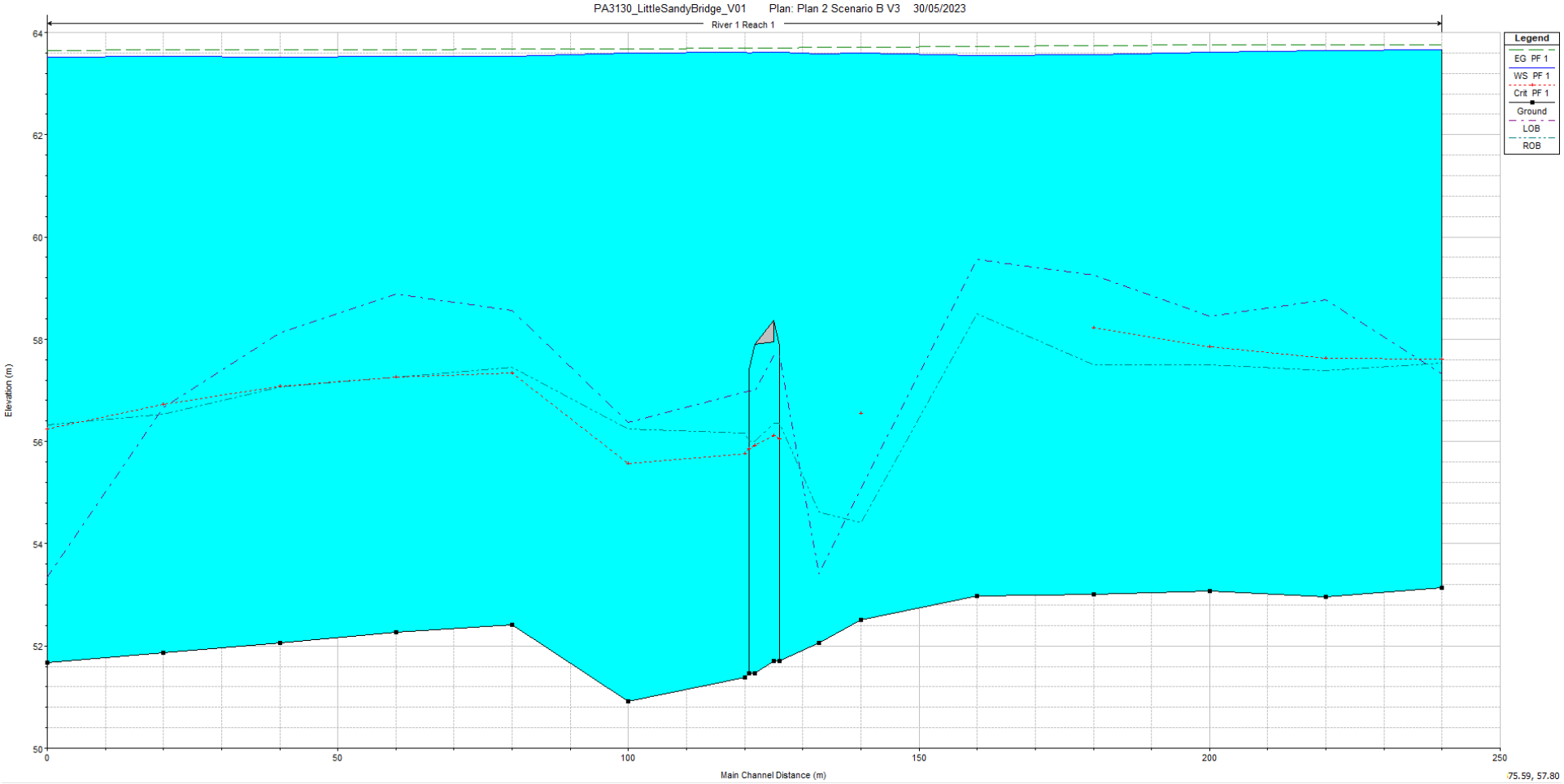


Figure 3-4 Scenario B Surface Water Level, Flow rate - 599.1m^3/s

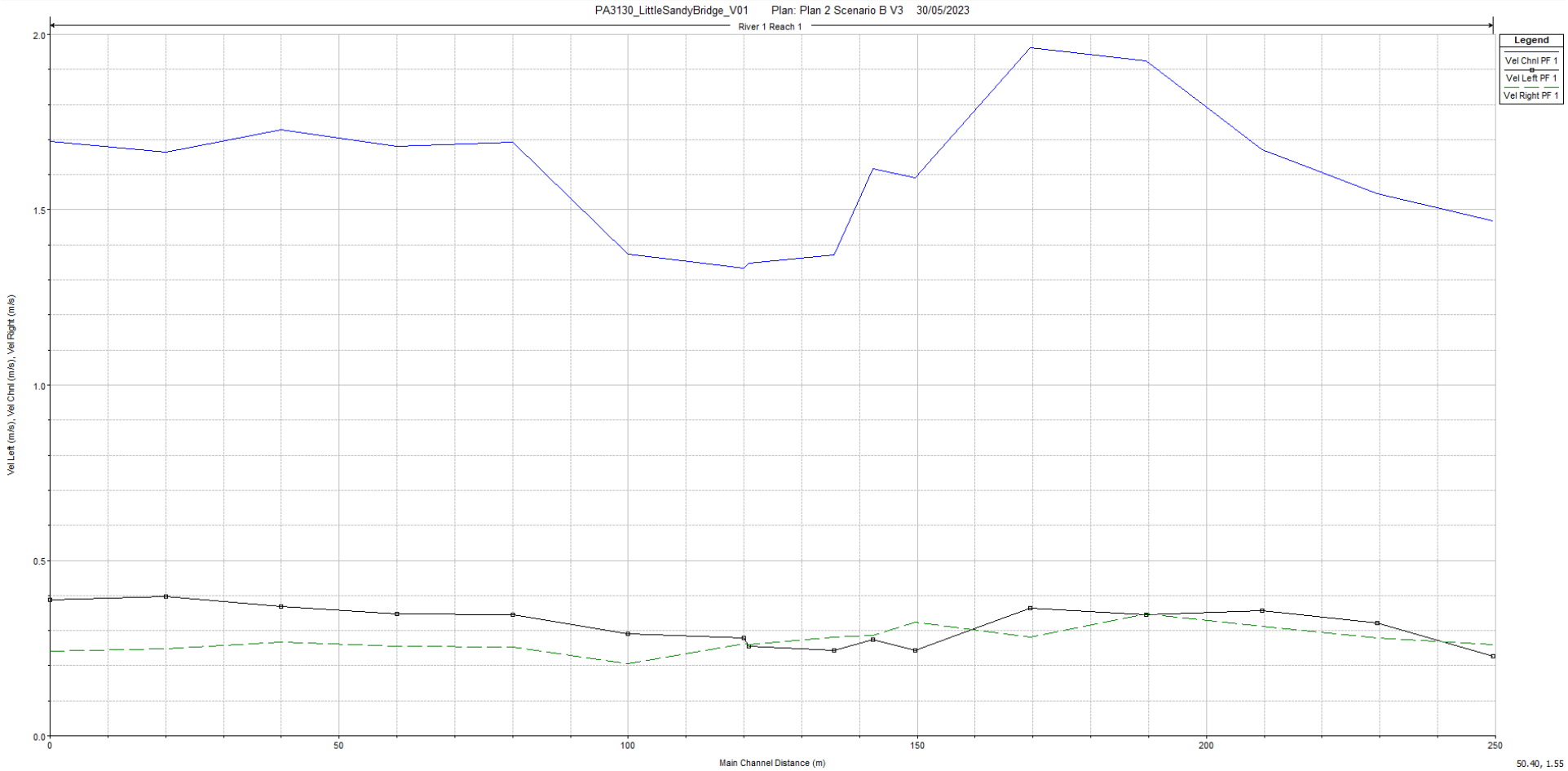


Figure 3-5 Scenario B Velocity Profile, Flow rate - 599.1m^3/s

Figure 3-6 Scenario B Shear Stress Profile, Flow rate - 599.1m^3/s

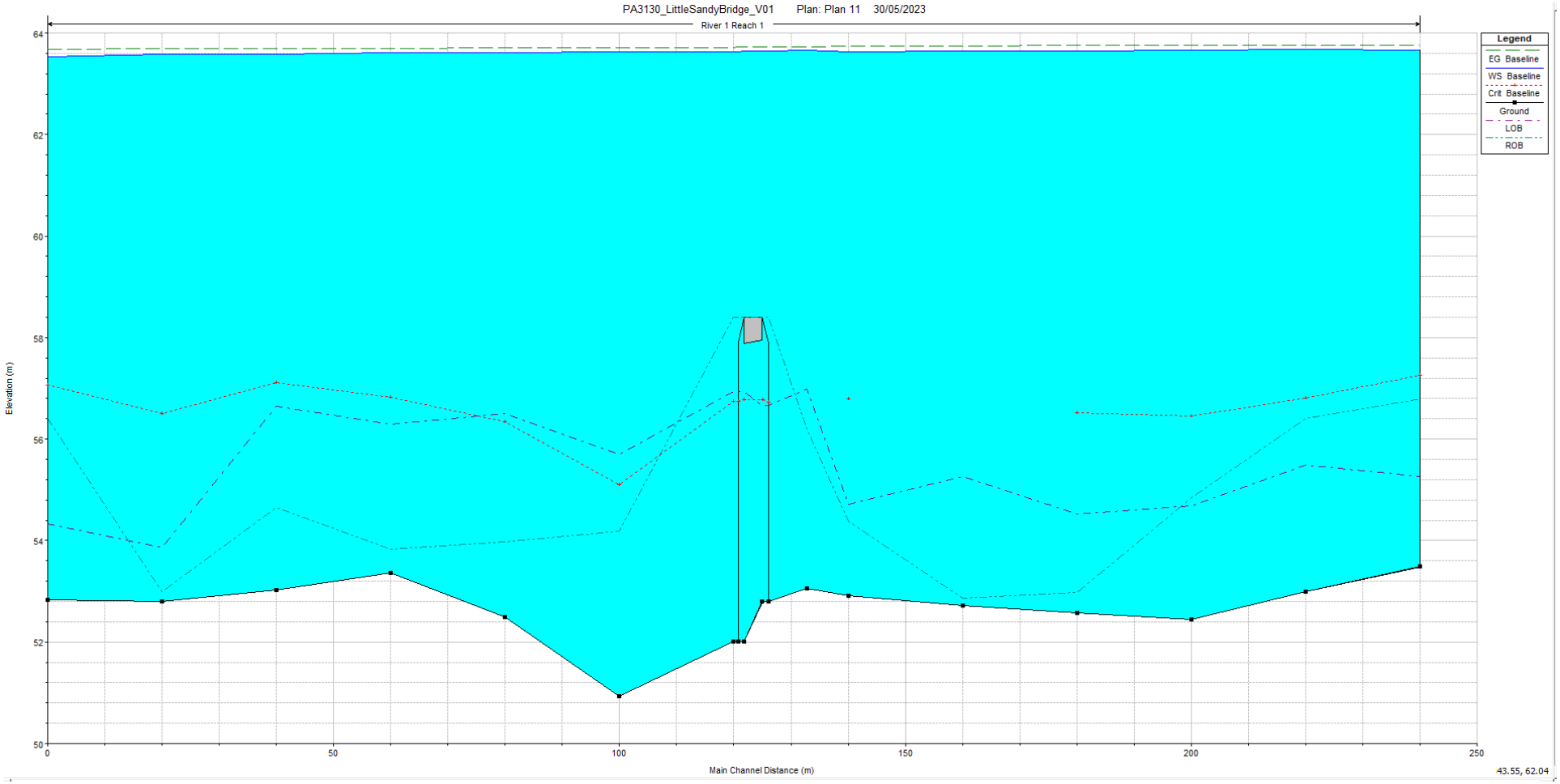


Figure 3-7 Option 2C Surface Water Level, Flow rate - 599.1m^3/s

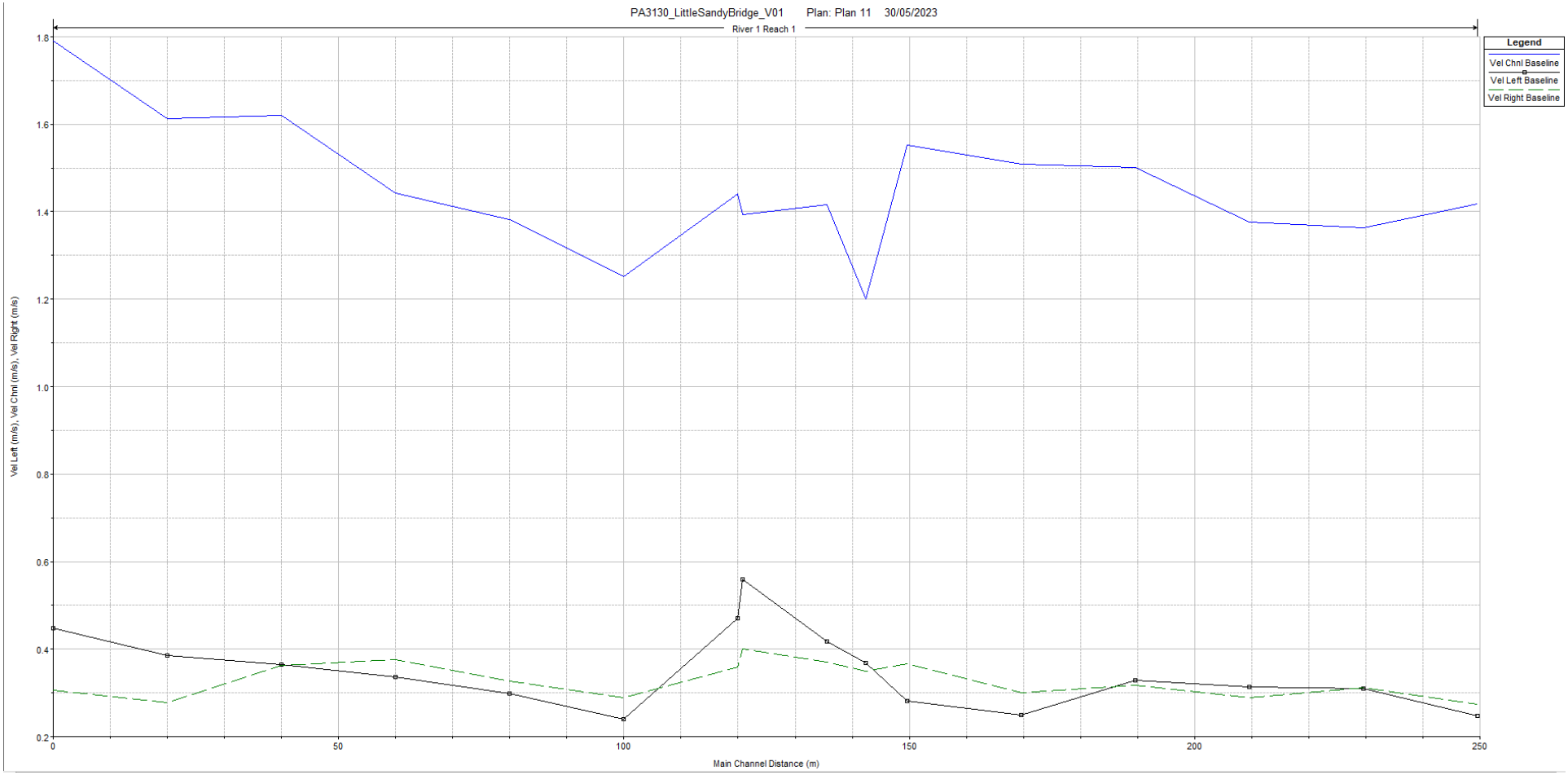


Figure 3-8 Option 2C Velocity Profile, Flow rate - 599.1m^3/s

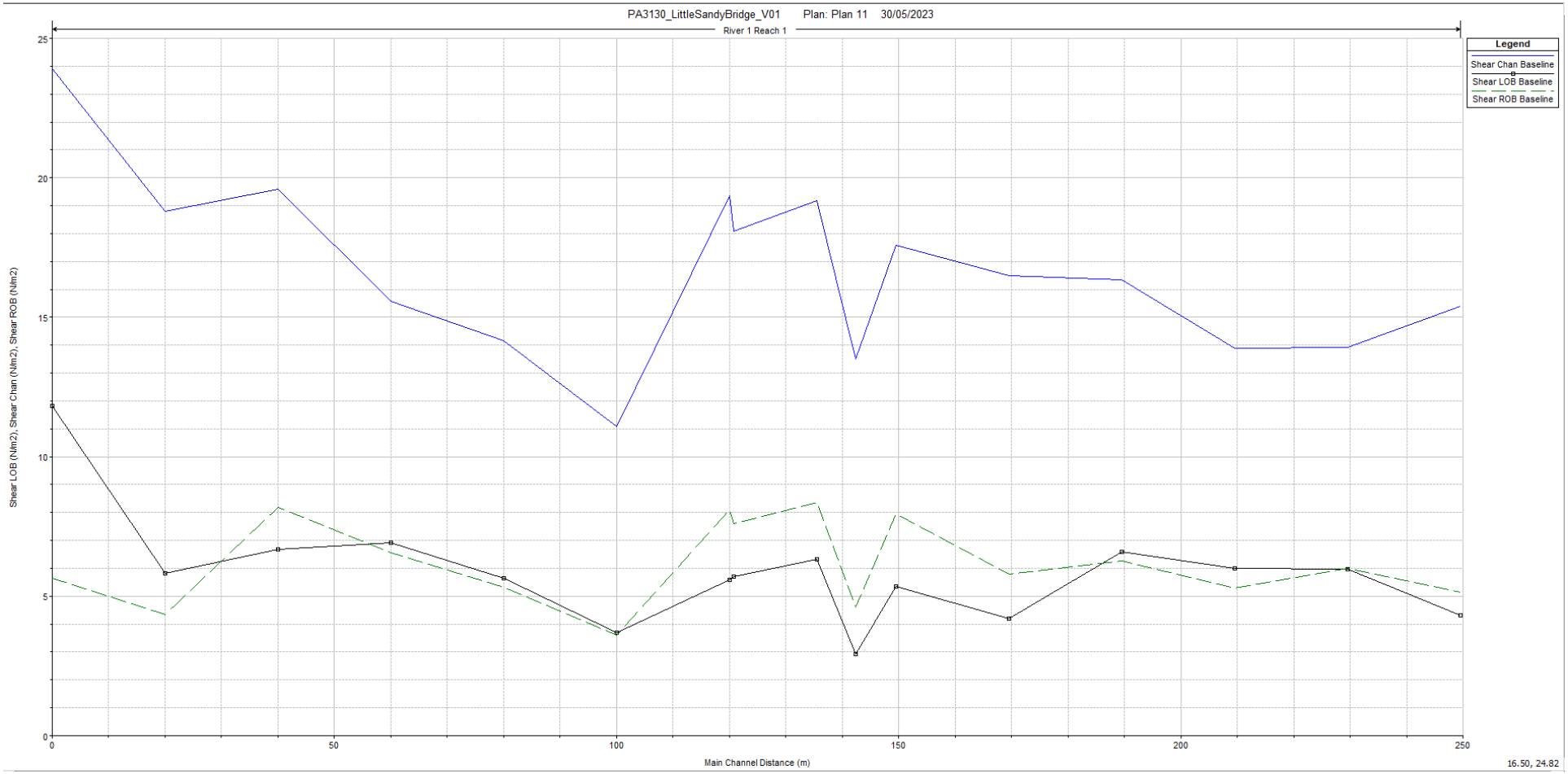


Figure 3-9 Option 2C Shear Stress Profile, Flow rate - 599.1m^3/s

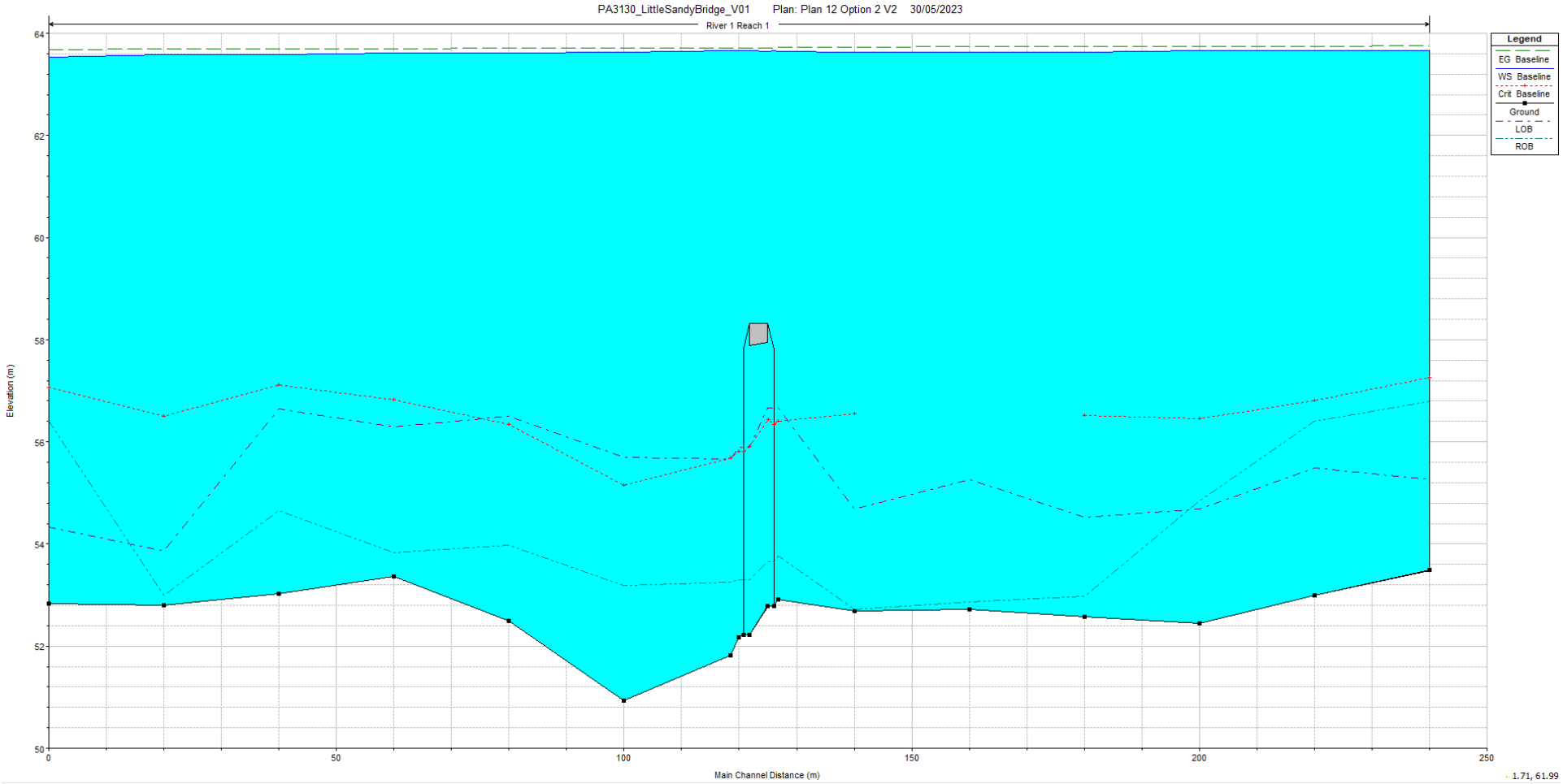


Figure 3-10 Option 2D Surface Water Level, Flow rate - 599.1m^3/s

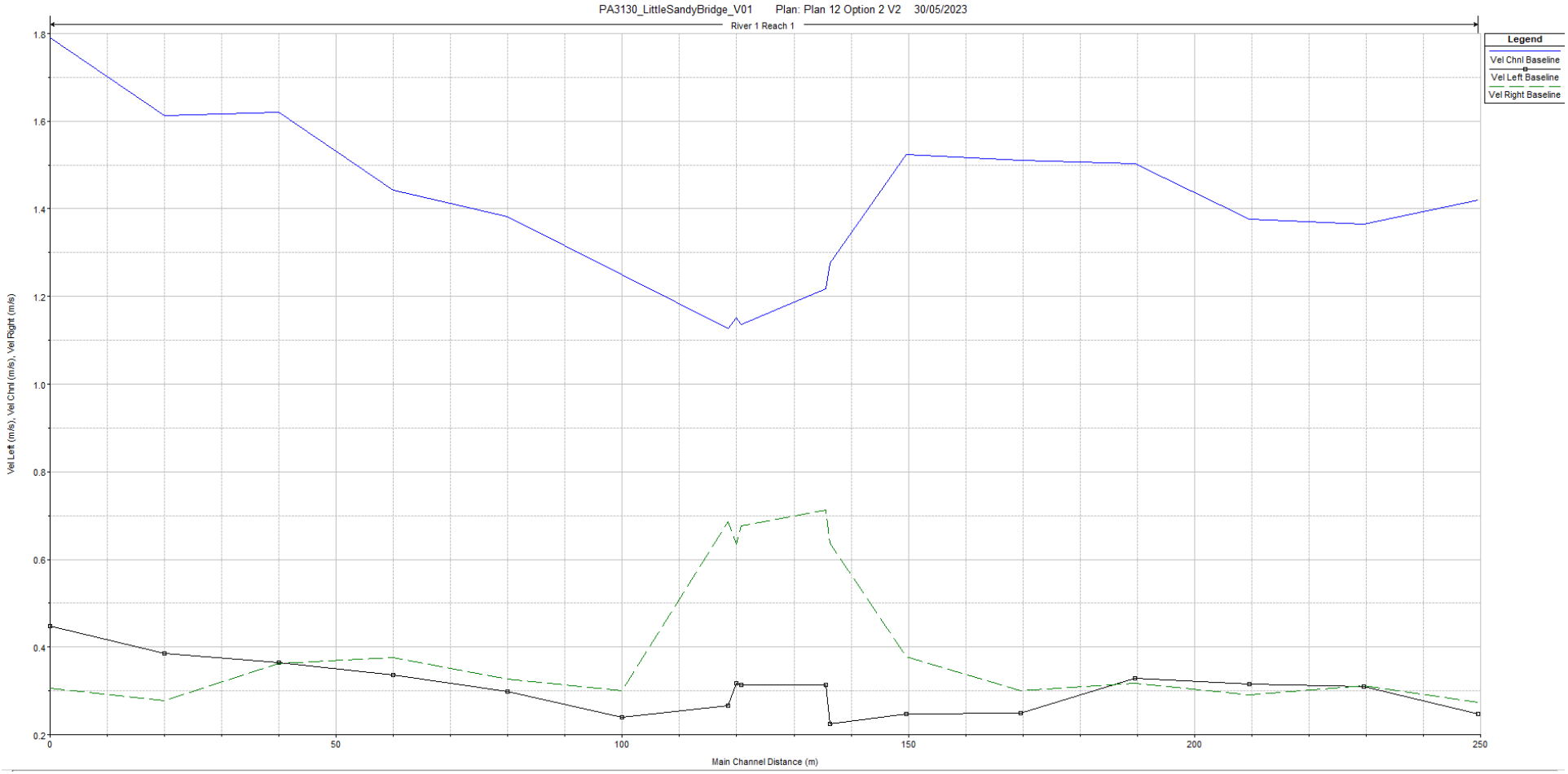


Figure 3-11 Option 2D Velocity Profile, Flow rate - 599.1m^3/s

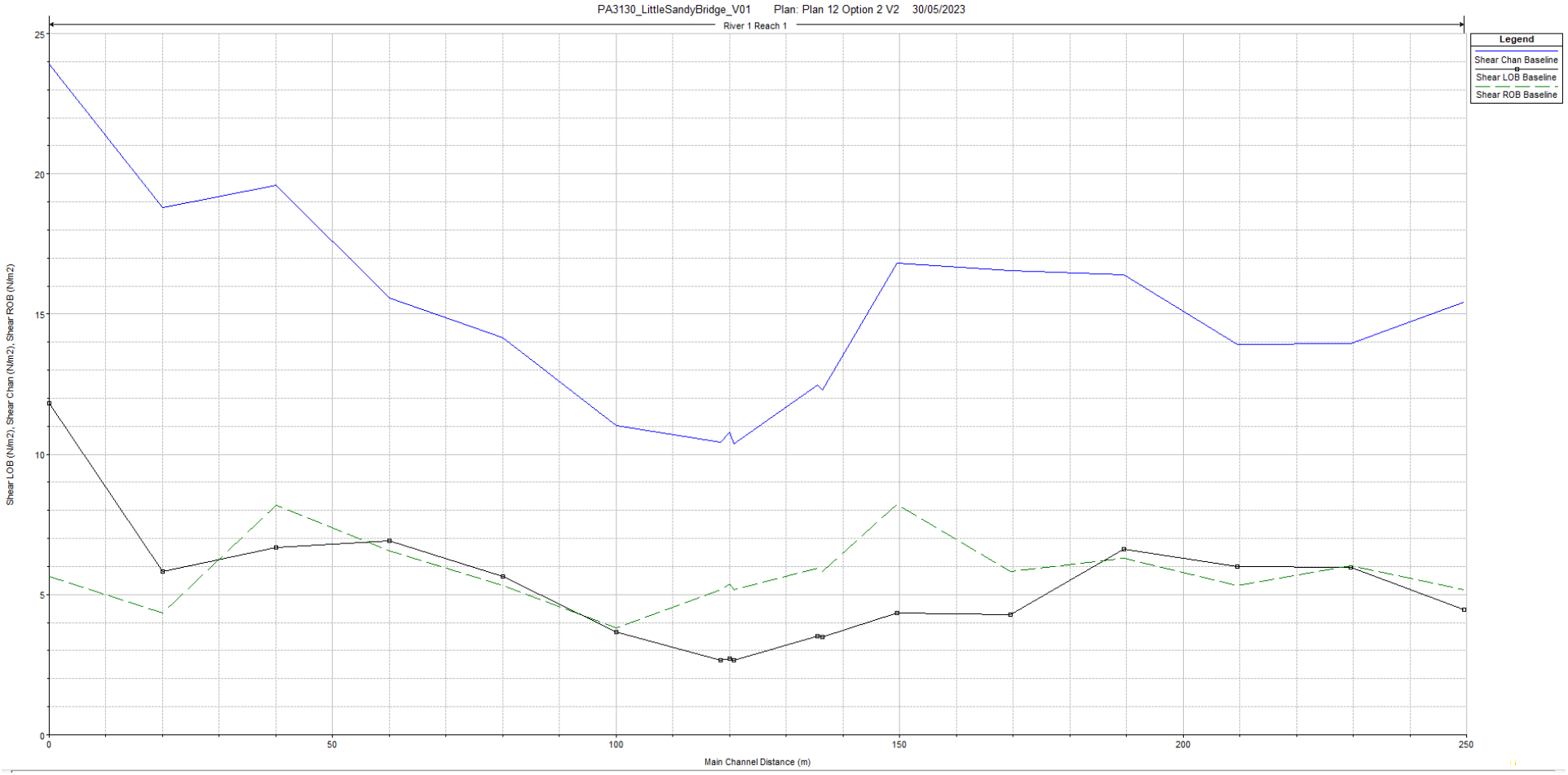


Figure 3-12 Option 2D Shear Stress Profile, Flow rate - 599.1m^3/s

3.4 Scour Assessment

3.4.1 HEC-RAS – Hydraulic Design Function Bridge Scour

The HEC-RAS model was used to assess the potential depth of scour for the Scenario A condition (2022 bridge, 2022 survey). The scour assessment was completed using the built-in Hydraulic Design Function for bridge scour. The variables which were adopted for the scour assessment in HECRAS are provided in **Table 3-3**.

Table 3-3 Variables Adopted for HECRAC Scour Assessment (Scenario A)

Variable	Value	Basis of Assumption
Sediment D_{50} (mm)	0.2	BH101 Particle Size Distribution in 'Geotechnical Investigation for Proposed Riverbank Stabilisation Works at Little Sandy Bridge' (JK Geotechnics, September 2022)
Water temperature degrees	18	Average water temperature at Camden Weir gauge (WaterNSW data)
Pier width a (m)	0.6	Based on Little Sandy Bridge design (SMEC, 2013)
Pier Nose Shape	Group of cylinders	Based on Little Sandy Bridge design (SMEC, 2013)
Correction factor for pier nose shape K1	0.55	Spill-through abutment
Angle of attack for flow hitting the piers	0	Flow direction is perpendicular to the pier
Correction factor for abutment skew K2	1	Based on angle of attack
Condition of the Bed K3	1.1 (Clear Water Scour)	
Sediment D_{95} (mm)	0.4	BH101 Particle Size Distribution in 'Geotechnical Investigation for Proposed Riverbank Stabilisation Works at Little Sandy Bridge' (JK Geotechnics, September 2022)
Length of abutment and road embankment (left and right) (m)	40	Channel cross-section geometry
L' – length of abutment and embankment projected normal to the flow (left and right) (m)	5	Nominal 5 metres applied since this value does not apply to the current scenario (there is no road embankment blocking the channel flow)

The results of the scour assessment are presented in **Figure 3-13**. The results show that the model predicts total scour depth below the peak water level of 10.2 m on the left bank and 14.3 m on the right bank. The default hydraulic parameters provided by HEC-RAS have been adopted from the software for Scenario A.

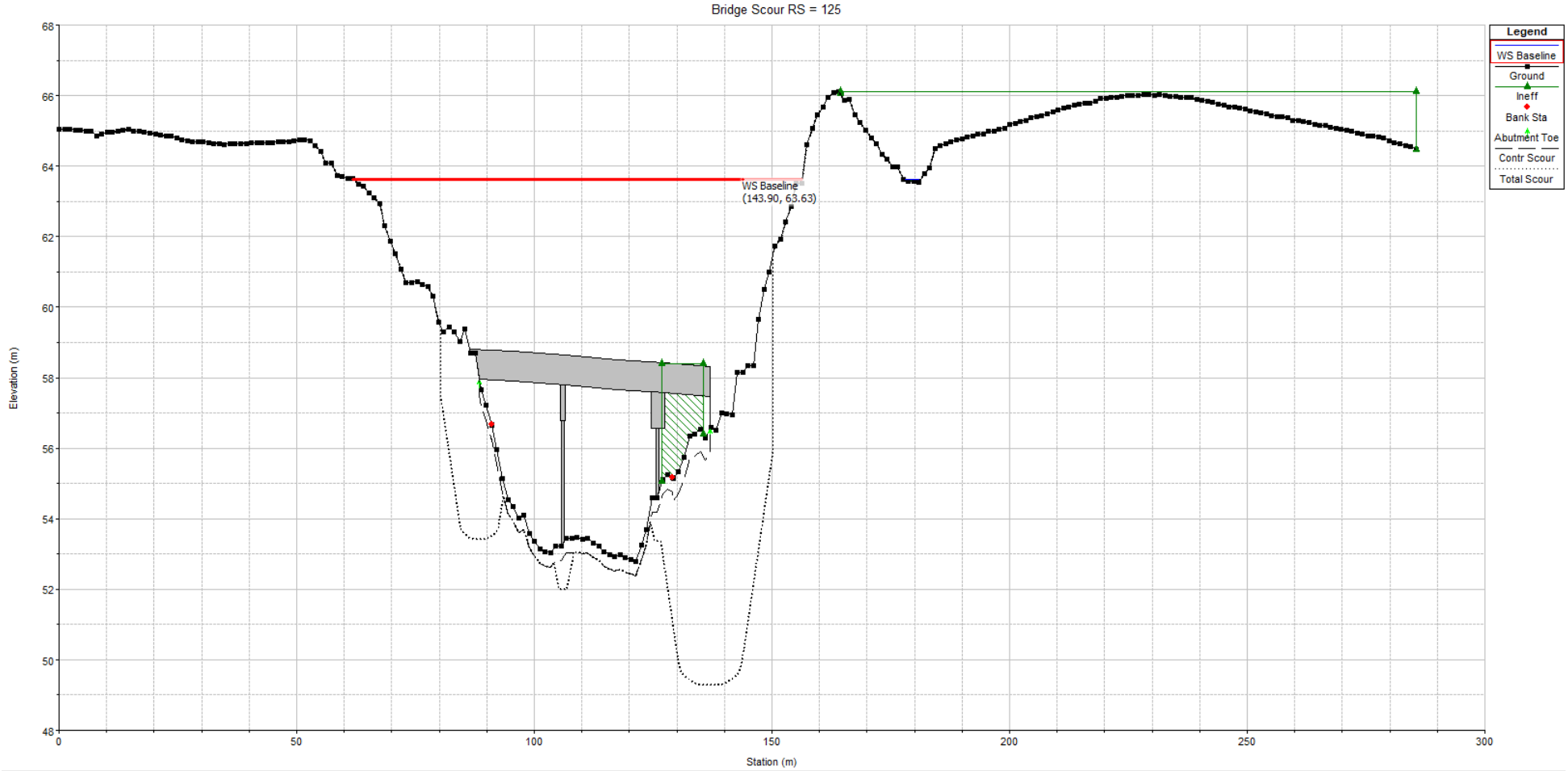


Figure 3-13 HECRAS Scour Assessment Result – Scenario A, Flow Rate – 599 m^3/s

3.4.2 HEC-18 Methodology – Validation

The scour assessment was validated using a direct application of the HEC-18 methodology which adopts as documented in “Evaluating Scour at Bridges - Fifth Edition - Hydraulic Engineering Circular No. 18”, April 2012 Publication No FHWA-HIF012-003.

Abutment Scour

Froehlich’s Abutment Scour Equation is presented in **Figure 3-14**.

8.6.1 Froehlich's Abutment Scour Equation

Froehlich (TRB 1989) analyzed 170 live-bed scour measurements in laboratory flumes by regression analysis to obtain the following equation:

$$\frac{y_s}{y_a} = 2.27\,K_1\,K_2\left(\frac{L'}{y_a}\right)^{0.43} Fr^{0.61} + 1 \qquad (8.1)$$

where:

K_1	=	Coefficient for abutment shape (Table 8.1)
K_2	=	Coefficient for angle of embankment to flow
K_2	=	$(\theta/90)^{0.13}$ (see Figure 8.5 for definition of θ) $\theta<90°$ if embankment points downstream $\theta>90°$ if embankment points upstream
L'	=	Length of active flow obstructed by the embankment, ft (m)
A_e	=	Flow area of the approach cross section obstructed by the embankment, ft^2 (m^2)
Fr	=	Froude Number of approach flow upstream of the abutment = $V_e/(gy_a)^{1/2}$
V_e	=	Q_e/A_e, ft/s (m/s)
Q_e	=	Flow obstructed by the abutment and approach embankment, ft^3/s (m^3/s)
y_a	=	Average depth of flow on the floodplain (A_e/L), ft (m)
L	=	Length of embankment projected normal to the flow, ft (m)
y_s	=	Scour depth, ft (m)

It should be noted that Equation 8.1 is not consistent with the fact that as L′ tends to 0, y_s also tends to 0. The 1 was added to the equation so as to envelope 98 percent of the data. See Section 8.2.2 and Figure 8.4 for guidance on estimating L′.

Figure 3-14 Froehlich's Abutment Scour Equation

The approach velocity adopted for each abutment was 1.6 m/s, derived from the velocity cross-sectional profile at the bridge calculated by HECRAS. All other variables adopted in the equation are provided in **Table 3-3**. The abutment scour depths calculated using this methodology are 9.8m on the left bank and 11.3m on the right bank. The abutment scour on the left bank closely matches the results of the HECRAS scour assessment. On the right bank, there is a difference of approximately 4 metres in the depth of abutment scour compared to the HECRAS results.

Contraction Scour

The channel cross-section is considered to be best represented by Case 2b, as documented in HEC-18. This case is shown in **Figure 3-15**. For Case 2b, either the live-bed or the clear-water scour equations are used to calculate the contraction scour. Based on the channel and hydraulic characteristics, it was determined that the channel contraction scour would be governed by the live-bed equation.

The scour depth is considered to be conservative as it has been assumed that the flow upstream of the bridge is conveyed through the main channel bed and does not include the bank cross-sectional area capacity. It is assumed that the contraction through the main channel is resulting from the flow area contraction caused by the bridge deck and clogged handrails (1.75m depth).

Based on the live-bed equation, the contraction scour depth in the channel is 1.74m, which is deeper than the value calculated by HECRAS. The HECRAS outputs are assumed to govern the scour assessment.

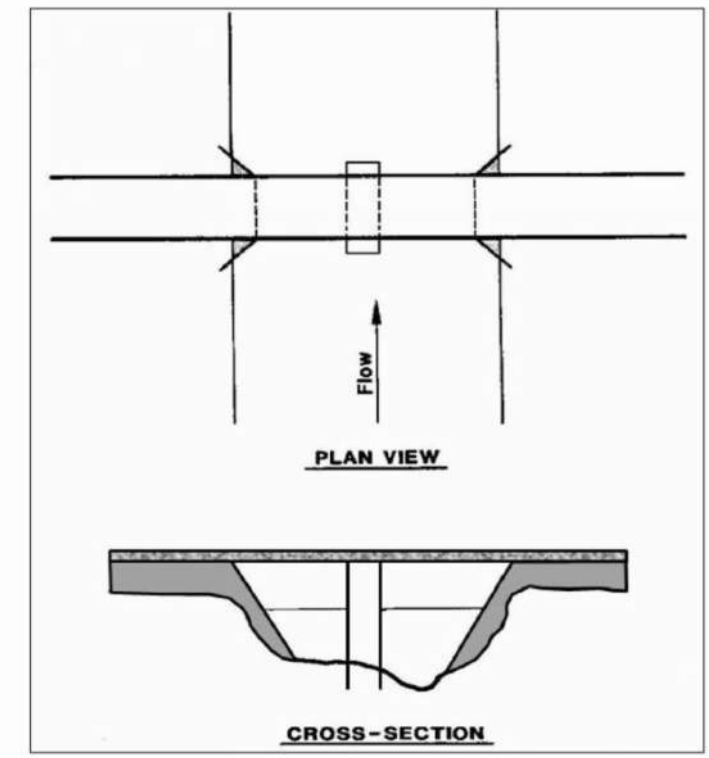


Figure 6.5. Case 2b: Bridge abutments and/or piers constrict flow.

Figure 3-15 Case 2b Channel Configuration (HEC-18)

Pier Scour

The pier scour equation for HEC-18 was used to calculate the predicted pier scour.

$$\frac{y_s}{y_1} = 2.0\, K_1\, K_2\, K_3 \left(\frac{a}{y_1}\right)^{0.65} Fr_1^{0.43}$$

Adopting parameters in accordance with the requirements of HEC-18 yields a predicted scour depth of around 0.3m. The results of the HEC-RAS modelling predicted a pier scour of 0.83 metres for this scenario.

3.4.3 Design Scour Level

Based on the scour assessment, a scour level of RL 49.3 m AHD was adopted for the concept design development (based on the critical scour depth calculated by HEC-RAS).

3.4.4 Sensitivity Assessment – Scenario A

A sensitivity assessment of Scenario A was undertaken to determine the sensitivity of scour levels to flowrates and water levels within the river. The hydraulic model identified a number of flowrates and corresponding water levels which resulted in elevated shear stresses in the channel bed at the bridge. Flowrates both higher and lower than the flowrate used in the baseline assessment (as presented in

Section 3.2) were used in the sensitivity assessment. In addition, the hydraulic model indicated that at a peak flow rate of 10,260 m^3/s (representative of the 500yr ARI design event, the channel bed also experiences a peak shear stress.

For two flow rate scenarios in the TUFLOW hydraulic modelling, the channel experienced overtopping of the bank and inundation of the wider floodplain. The floodplain was not included in the cross-sections representing the river in HECRAS, therefore, in these cases, the flow within the extents of the HECRAS model cross-sections was extracted from the TUFLOW hydraulic model for use in the sensitivity assessment in HECRAS.

The flow rates which have been assessed and the resultant scour level at the bridge as determined via the HECRAS model *Hydraulic Design – Bridge Scour* function are presented in **Table 3-4**.

The 10,260 m^3/s flowrate results in a significantly deeper scour level than the predicted scour levels resulting from the other flowrates, which are all at approximately RL 49mAHD and similar to the design scour level. The results for the 500 year event are provided for reference only. They are not considered to be reflective of the actual scour potential in this event as the influence of the bridge structure on scour will be limited by the width of the floodplain which occupies flow. It also reflects the results of the steady state solution and ability to provide a single uniform grain size, when the scour depth will be limited by the presence of cohesive soils that exist below the very fine sand material.

Table 3-4 Steady State Flow Data Adopted for Sensitivity Assessment and Resultant Scour Levels (Scenario A)

100m Upstream Peak Flowrate [Corresponding Flow Rate in HECRAS Cross-Section Extents] (m^3/s)	100m Upstream Boundary Water Level (m)	100m Downstream Boundary Water Level (m)	Scour Level at Bridge (mAHD)
450 [450]	62.26	62.08	50.5
1200 [970]	66.54	66.42	49.7
10,260 [4100]	73.83	73.68	32.6

4 Proposed Concept Design

Two concept design options were developed to stabilise the existing embankment. The options were developed based on the design scour level (refer to **Section 3.4.3**). Sketches of the proposed concept options, showing the plan layout and typical section are provided in **Appendix B**.

4.1 Option 2C – Sheet Pile Protection

Option 2C proposes to install sheet piling on both banks from the top of the existing bridge deck (RL 58.8 mAHD on the left bank and RL 58.4 mAHD on the right bank) to protect the abutment to the design scour level – resulting in a retained height of approximately 9 m. The sheet piling will be embedded into the riverbed a further 6m, resulting in a total depth of 15m. The sheet piling is installed behind the existing piers on the left and right banks and extends at 45 degrees from the deck of the bridge, upstream and downstream of the bridge deck, and is embedded approximately 5 meters into the bank to protect against outflanking of the structure. The layout of the proposed Option 2C is shown in **Figure 4-1**.

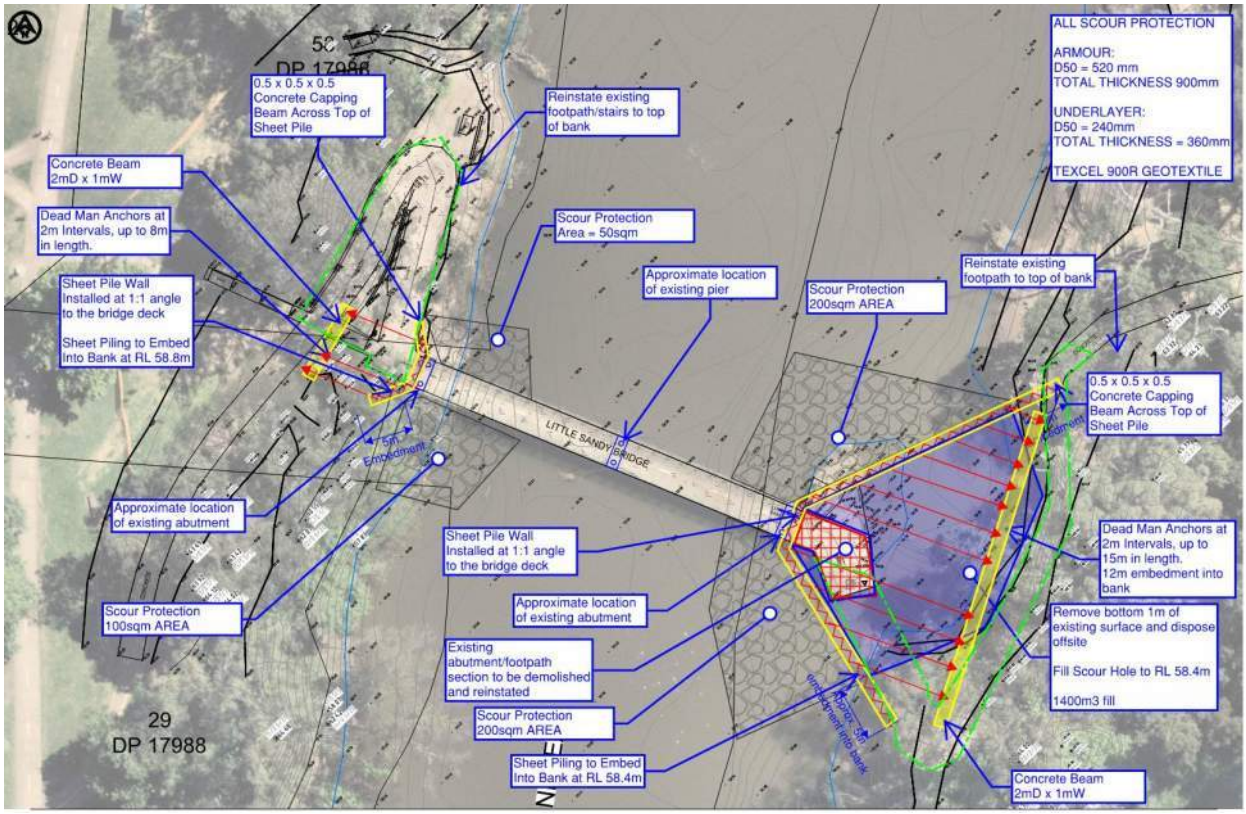


Figure 4-1 Layout of Option 2C

Dead man anchors extend into the bank of the river at 2 metre intervals, up to 15 metres in length and 12 metres embedment into the bank. It is noted that without the inclusion of dead man anchors, the length of the sheet pile embedment would need to be approximately double the retained height of the sheet pile wall. The sheet piling design, including required embedment depth would be detailed further as part of detail design, should this option be progressed.

The surface level behind the sheet pile wall on the right bank is reinstated to a minimum level of RL 58.4 mAHD. The design incorporates riprap protection in front of the sheet piles extended to the bottom of the bank. The size of the proposed scour protection is derived from the Isbach equation as documented in “Guidelines for the Design and Construction of Flexible Revetments Incorporating Geotextiles for Inland Waterways” (PIANC, 1987).

Assuming igneous rock protection, the proposed scour protection has been sized as follows:

- Armour D_{50} = 520mm diameter, 2 layers, 900mm total thickness.
- Underlayer D_{50} = 240mm diameter, 2 layers, 360mm total thickness.
- Texcel 900R Geotextile Underlay.
- D_{90} = 800mm diameter (1.5*D_{50})

The above scour protection has been based on an average velocity in the bank of 3.0 m/s. We note that modelling indicated an average velocity of 1.6 m/s, which would require an armour rock size D_{50} of approximately 200mm diameter. However, existing rock protection sized at 300mm diameter rock was washed away during July 2022 storm events – as such a more conservative rock sizing has been adopted to reflect the localised instability that are associated with contraction of flows through and over the abutment. This also reflects the application of a factor of safety to the rock size of approximately 2, given the turbulent zone that is likely to occur in the vicinity of the bridge structure.

4.2 Option 2D – Widening of Eastern River Bank

Option 2D proposes widening of the eastern river bank through the bridge structure, so that it has an increased area relative to the upstream section, thereby reducing the potential for the abutment to project into the flow and generate scour. The layout of Option 2D is shown in **Figure 4-2**.

.

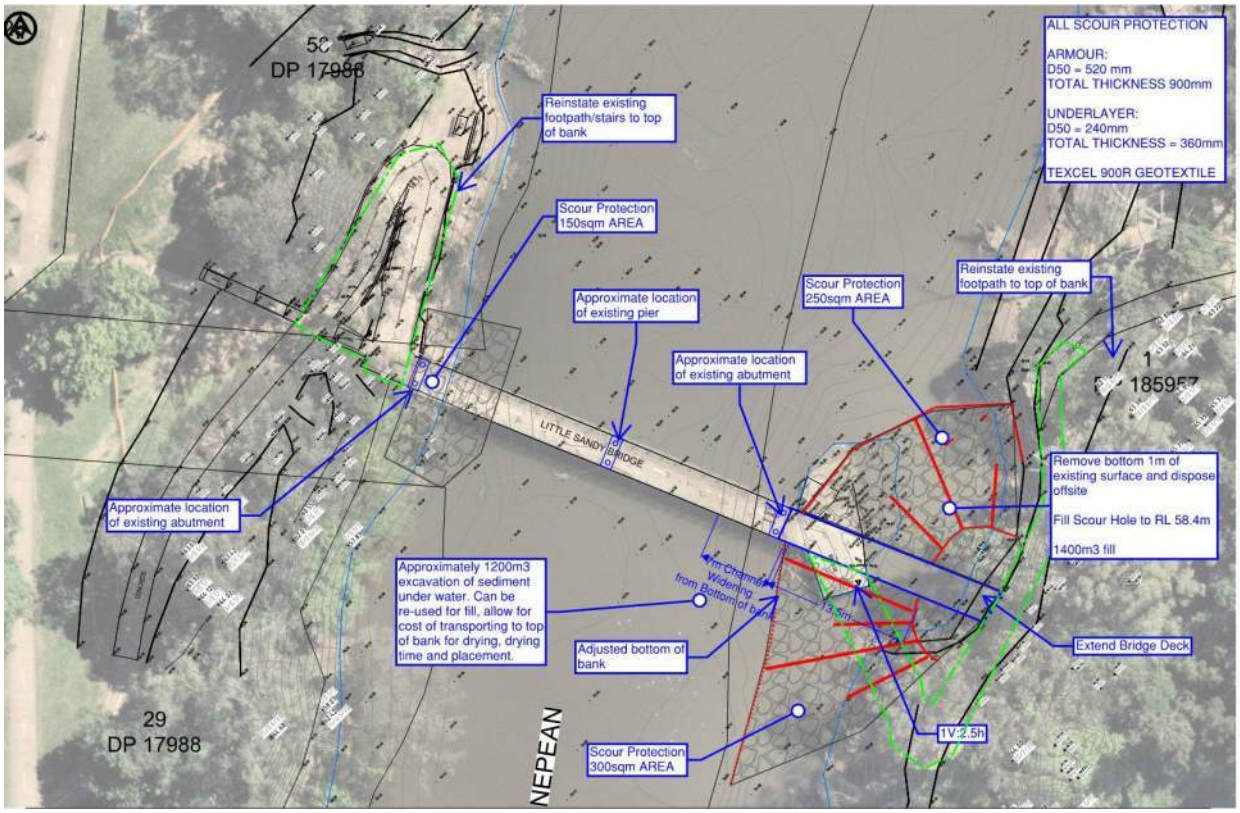


Figure 4-2 Layout of Option 2D

By grading the slope on the widened bank by 1V:2.5H, a channel widening of approximately 7 metres on average is achieved This also reflects the scour and regression that has occurred during the 2022 storm event. The channel cross-sectional area is increased by approximately 50m^2 under the bridge, representing a cross-sectional area increase of approximately 35% in relation to the flow area under the bridge.

The bridge deck is extended by approximately 20 metres from the right-most pier, at a level of RL 58.4 mAHD. Two additional sets of piers are provided to support the additional bridge span. This has been adopted to match the 2014 bridge design which uses a level of RL 43.1 mAHD. The additional bridge section would be subject to detail design.

The surface level behind the bridge structure on the right bank is reinstated to a minimum level of RL 58.4 mAHD. The design incorporates riprap protection on the bank, extended to the bottom of the bank. The size of the proposed scour protection is derived from the Isbach equation as documented in "Guidelines for the Design and Construction of Flexible Revetments Incorporating Geotextiles for Inland Waterways" (PIANC, 1987).

Assuming igneous rock protection, the proposed scour protection has been sized as follows:

- Armour D_{50} = 520mm diameter, 2 layers, 900mm total thickness.
- Underlayer D_{50} = 240mm diameter, 2 layers, 360mm total thickness.
- Texcel 900R Geotextile Underlay.
- D_{90} = 800mm diameter (1.5*D_{50})

The above scour protection has been based on an average velocity in the bank of 3.0 m/s. We note that modelling indicated an average velocity of 1.6 m/s, which would require an armour rock size D_{50} of approximately 200mm diameter. However, existing rock protection sized at 300mm diameter rock was washed away during July 2022 storm events – as such a larger rock has been adopted to account for the localised scour and eddying effects in the vicinity of the abutment. This also reflects the factor of safety that should be applied to the potential turbulence through the bridge structure and eddying effects.

On the left abutment, only scour protection is proposed to protect the existing bank. The scour protection would replace the existing embankment.

4.3 Scour Assessment

A scour assessment was undertaken to determine the predicted scour level of the two options. The findings of the scour assessment indicate that the adopted scour depth for the concept design is not changed materially from the present day conditions, although Option 2D does generally result in less contraction scour through the abutment. Due to the introduction of the new set of piers, the pier scour in Option 2D is deepened to approximately 1 metres below the bed level. Figures showing the predicted scour depth are presented in **Figure 4-3** and **Figure 4-4**.

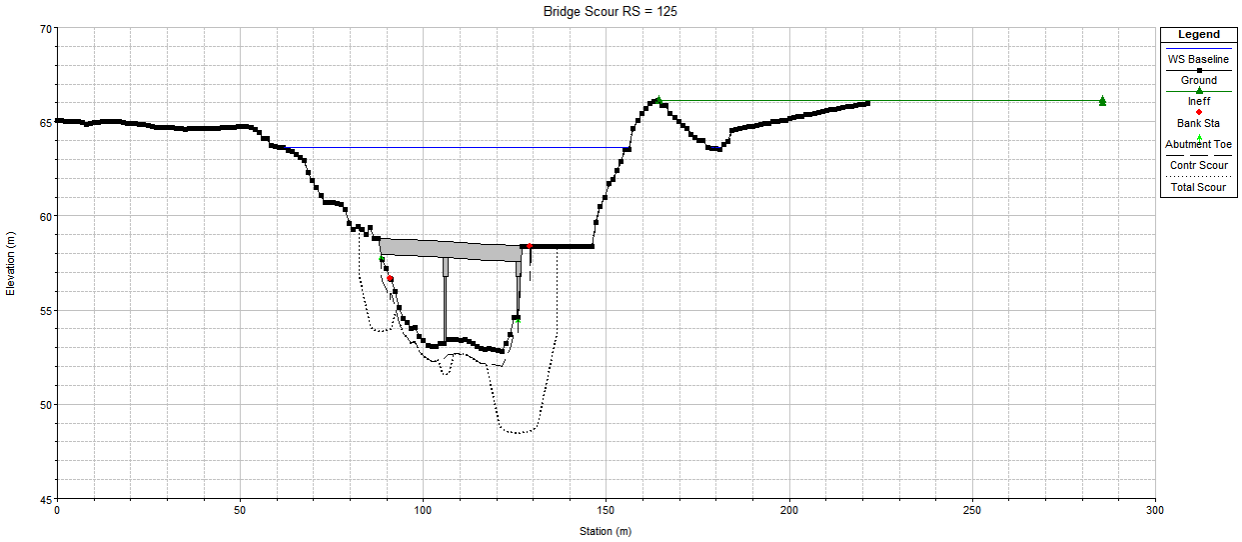


Figure 4-3 Option 2C Scour Assessment – HECRAS

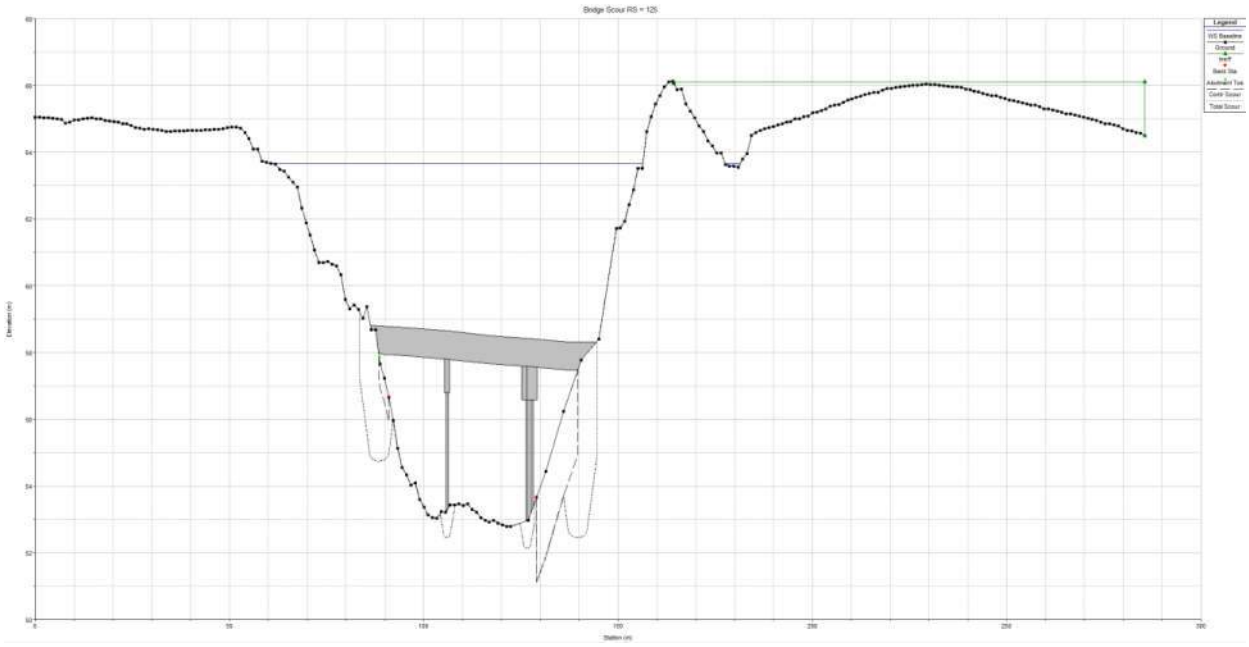


Figure 4-4 Option 2D Scour Assessment – HECRAS

In the case of Option 2D, additional rock protection should be placed at the toe of the revetment to protect against potential scour. Similarly, rock is proposed in front of Option 2C to reduce the potential of scour in front of the sheet pile structure.

5 Cost Estimate

Cost estimates of Option 2C and Option 2D have been undertaken by Vasey Quantity Surveyors. A copy of the Cost Estimates is provided in **Appendix D**. A summary of the breakdown of costs is provided in **Table 5-1**.

Table 5-1 Breakdown of Costs for Options 2C and 2D

Item	Option 2C (ex GST)	Option 2D (ex GST)
Preliminaries	$325,489.80	$266,098.19
Temporary Works	$119,888.40	$122,831.1
Clearing	$17,127.24	$15,177.00
Demolition	$34,072.49	$34,072.49
Earthworks	$218,514.95	$306,603.48
Piling	$591,665.65	$313,853.97
Pedestrian Bridge	N/A	$180,453.82
Scour Protection	$257,766.90	$257,766.90
Anchor System	$234,221.28	N/A
Concrete	$119,549.55	$73,274.17
Site Furniture	$15,400.00	$12,250.00
Signage and Linemarking	$2,500.00	$5,500.00
Landscaping	$16,742.50	$8,708.00
Contractor Overhead and Margin	$292,940.81	$239,488.37
Sub-Total	**$2,245,879.57**	**$1,836,077.49**
Contingency (20%)	$449,175.92	$367,215.50
Total ex GST	**$2,695,055.49**	**$2,203,292.98**

6 Option 3 – Preliminary Evaluation of New Raised Bridge

As part of the options investigation, preliminary consideration has been given to the potential to replace the existing bridge structure with an alternative bridge with a higher deck level. This chapter summarises a number of considerations for this approach.

6.1 Bridge Levels for Flood Immunity

The predicted peak flood level across a range of flood events, including the 2022 flood events is provided in **Figure 6-1**. It is observed that even in the case of the July 2022 flood event, in order to provide flood immunity, a structure would be required that encroaches into the urban environment on the western bank and would be close to 800 metres in length.

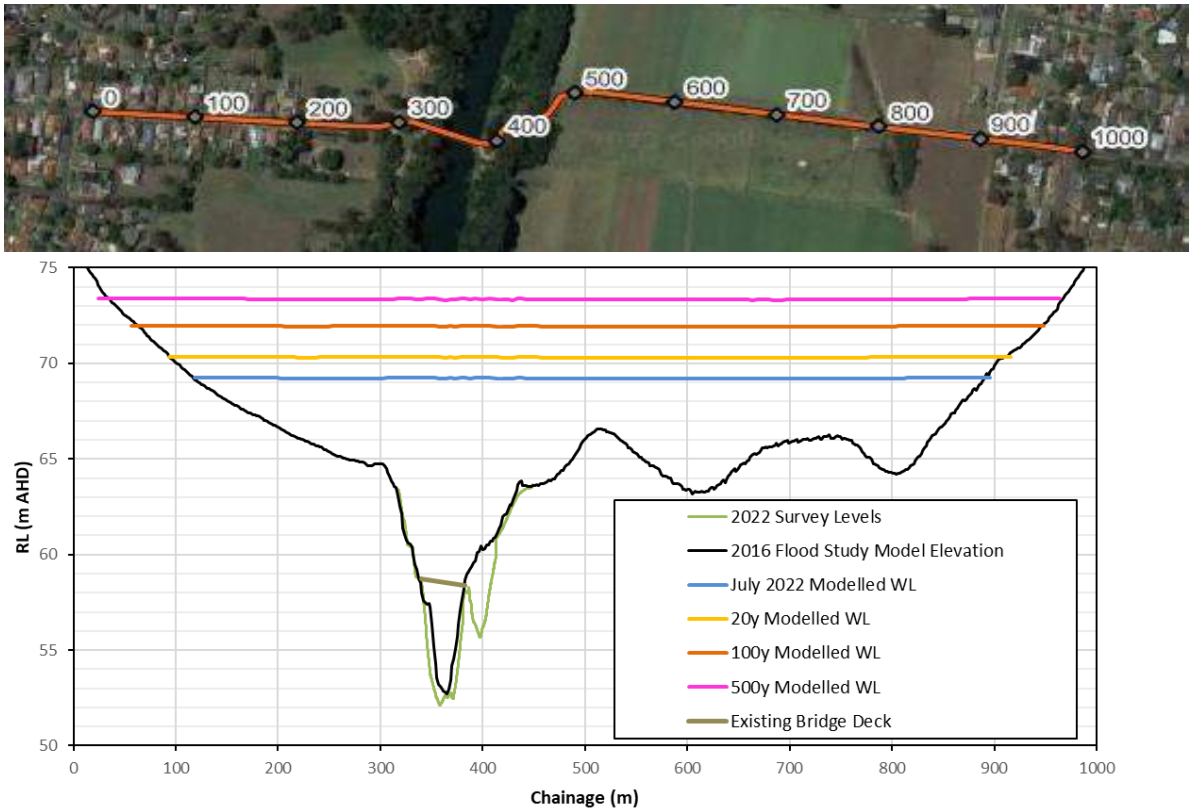


Figure 6-1 Predicted Peak Flood Levels Relative to Bridge Structure Along Alignment Shown

6.2 Preliminary Consultation with Bridge Manufacturers

Royal HaskoningDHV undertook preliminary discussions with a number of pre-fabricated bridge manufacturers regarding a proposed “high level” pedestrian bridge. The discussions assumed that this option would comprise the construction of a new pedestrian bridge, 90 metres in length, at the top of bank. A sketch of the proposed bridge alignment is provided in **Figure 6-2**, showing its position and length relative to the existing low level bridge.

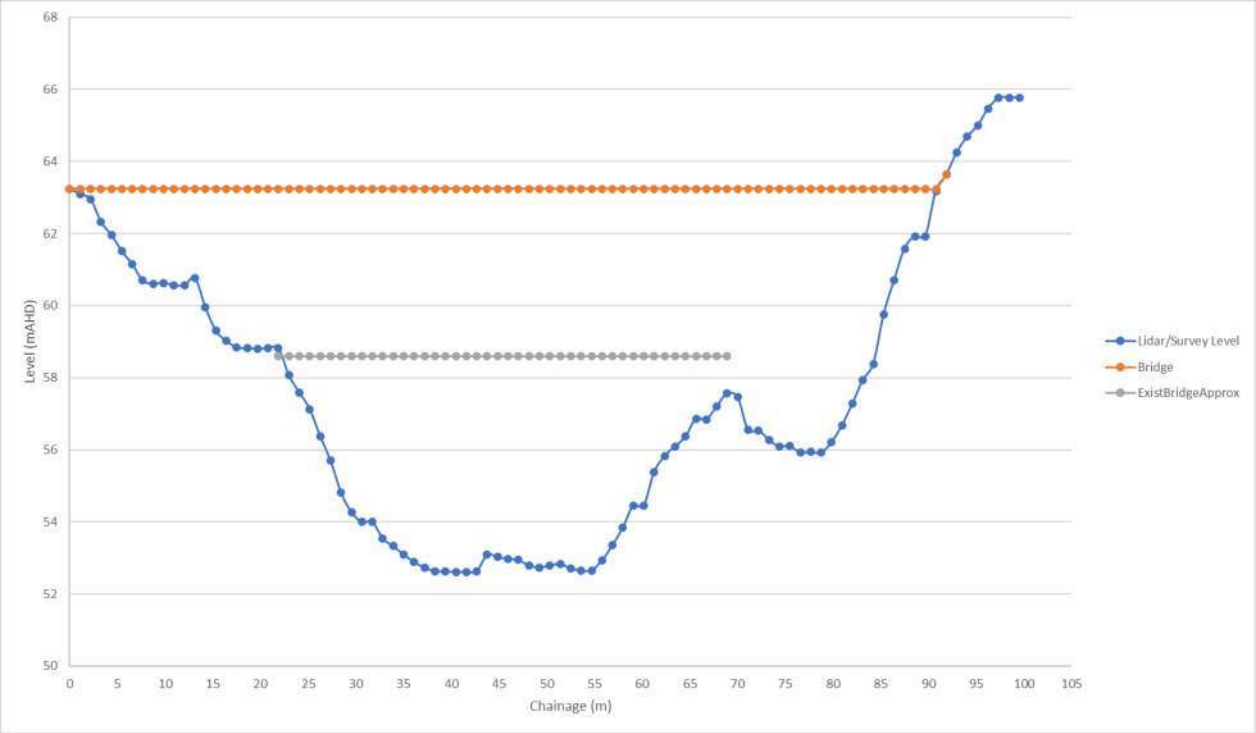


Figure 6-2 Option 3 Bridge Sketch

Three bridge manufacturers were approached to provide a general estimate of the works. One manufacturer, Landmark, advised that the 90 metre long span was beyond what they could readily provide a quote for and were unable to provide pricing.

Two other costs were provided by suppliers, and the following limitations are observed in relation to quotes. In our opinion, they do not consider:

1. The hydraulic environment, particularly the potential for the bridge to be submerged by several metres of floodwaters even in an event equivalent to the 10 year ARI event.
2. The geotechnical constraints at the site, including the depth of embedment required for the piles and the constructability associated with these works.
3. The risk of working in the river for an extended period of time during the construction of the bridge.

A comparison of the quotes received, which are considered to be primarily reflective of the cost of the deck and delivery to site, is provided below. Preliminary indicative costs have been applied to the estimates from the manufacturers, to incorporate additional considerations and works that are likely to be incurred to construct the higher level bridge structure. The comparison of costs is provided in **Figure 6-3**.

Comparison of Bridge Costs received from suppliers @ Little Sandy Bridge			
SIS		**Wagner Quote**	
90m overall length multi-span pedestrian bridge, consisting of 3 x 20m spans and 2 x 15m spans		90m overall length multi-span pedestrian bridge, consisting of 3 x 20m spans and 2 x 15m spans	
Constructed from Fibreglass Reinforced Thermoset Composite			
Inclusions		**Inclusions**	
• Detailed Design		• Detailed Design and Certification of WCFT Superstructure	
• Bridge Deck & Balustrade		• WCFT Bridge Structural Members	
• Installation of piers		• Prefabrication and Pre-Assembly of Bridge Segments	
• Prefabricated Bridge Deliveries to Camden, NSW		• Prefabricated Bridge Deliveries to Camden, NSW	
Initial Cost (from Manufacturer)		**Cost**	
Bridge decking	**$ 1,145,000.00**	AS5100 design - bridge decking	**$ 1,303,905.00**
RH note -have priced piers, abutments and installation separately			
RHDHV Elements Costing		**RHDHV Elements Costing**	
Preliminaries	$ 433,110.00	Preliminaries	$ 446,203.00
Temporary access track	$ 120,000.00	Temporary access track	$ 120,000.00
Clearing	$ 15,000.00	Clearing	$ 15,000.00
Demolition	$ 200,000.00	Demolition	$ 200,000.00
Earthworks	$ 140,000.00	Earthworks	$ 140,000.00
Piling - barge installation and hire	$ 600,000.00	Piling - barge installation	$ 600,000.00
Piling - piling rig mobilisation and demobilisation	$ 100,000.00	Piling - piling rig mobilisation and demobilisation	$ 72,000.00
Piles (10 n.o) - 900mm diameter @25m	$ 1,225,100.00	Piles (10 n.o) - 900mm diameter @25m	$ 1,225,125.00
Bridge deck installation/crane hire	$ 250,000.00	Bridge deck installation/crane hire	$ 250,000.00
Abutments	$ 200,000.00	Abutments	$ 200,000.00
reconstruct pathway both sides	$ 50,000.00	reconstruct pathway both sides	$ 50,000.00
Scour Protection/Rock Armour at abutments	$ 250,000.00	Scour Protection/Rock Armour	$ 250,000.00
Site Furniture	$ 15,000.00	Site Furniture	$ 15,000.00
Landscaping	$ 16,000.00	Landscaping	$ 16,000.00
Signing and linemarking	$ 5,000.00	Signing and linemarking	$ 5,000.00
Contractor overhead/margin	$ 714,631.50	Contractor overhead/margin	$ 736,234.95
Contingency (50%)	$ 2,739,420.75	Contingency (50%)	$ 2,822,233.98
Updated Total	**$ 8,218,262.25**	Updated Total	**$ 8,466,701.93**

Figure 6-3 Preliminary Comparison of Cost – "High Level" Pedestrian Bridge Deck

6.3 Summary of Raised Bridge Alternative

The above is intended to be a preliminary summary of the "raised" bridge alternative. The following is observed:

- To provide a bridge that has immunity during the flooding that was experienced in 2022, would require a combined deck and abutment length of around 800 metres. This would encroach into the urban area to the west of the bridge and is not considered to be feasible in terms of scope of works and cost.
- If a bridge alternative is pursued at the top of bank, we would recommend that in the first instance a concept design be prepared that reflects the hydraulic, geotechnical and environmental conditions that would influence the bridge, and the bridge should be costed by a quantity surveyor experienced in bridge structures.

7 Conclusions & Recommendations

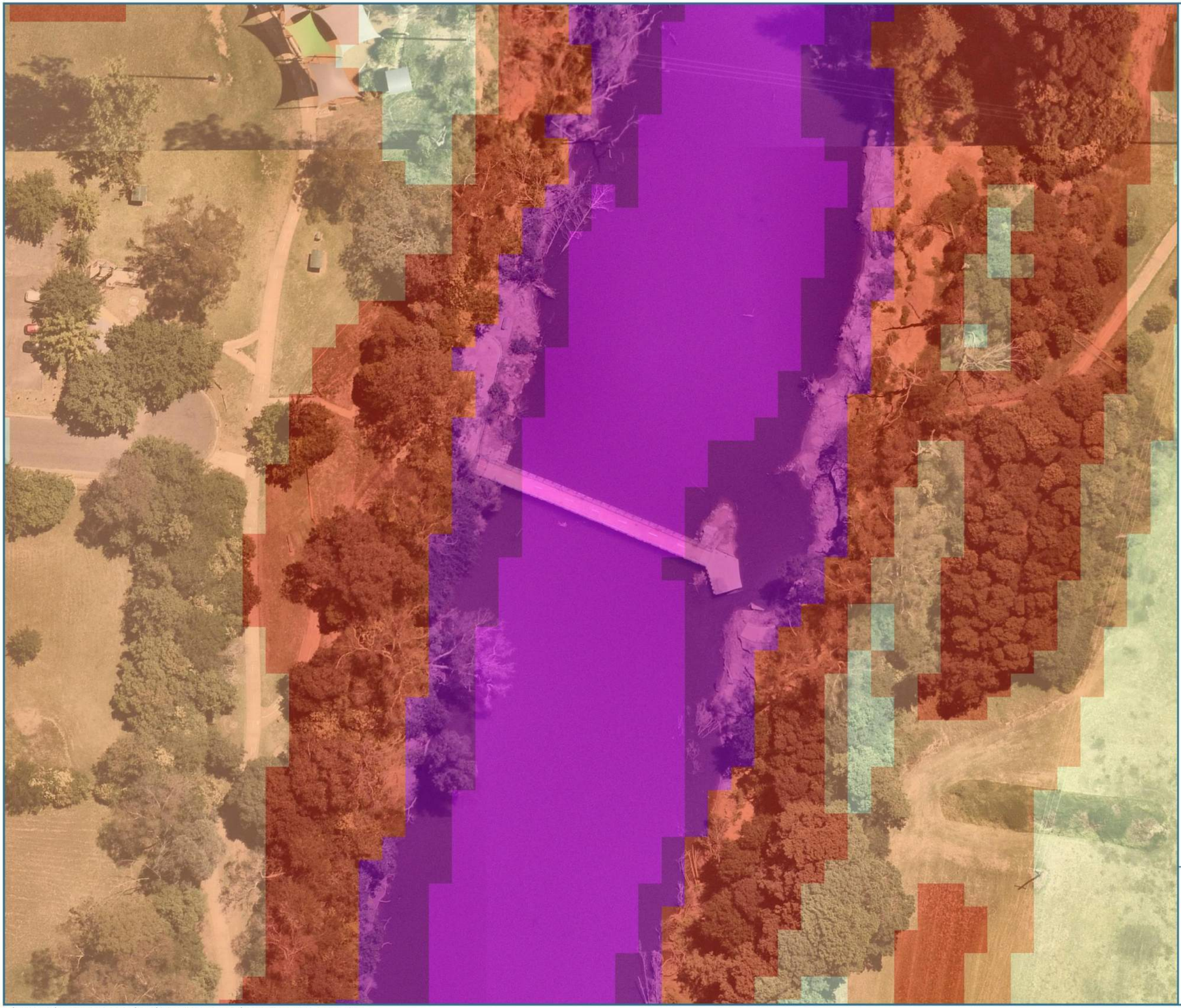
From the further options investigated, we would recommend that Option 2D as the preferred option. This is for the following reasons:

- Option 2D has the lowest cost of construction, including contingencies.
- Option 2D provides a greater waterway area beneath the bridge than Option 2C, thereby reducing the likelihood of ongoing scour issues due to narrowing of the river channel. That is, Option 2D provides a better overall hydraulic outcome compared with Option 2C.
- While there will be challenges to construct any option, in our opinion the challenges associated with Option 2D are less than in Option 2C. This is because:
    - Installation of the sheetpile in Option 2C will require either a barge or placement of an incremental piling works platform. The piling works platform would need to be constructed of materials that are sufficient to support the piling rig, while not of a material that sheetpile will be unable to penetrate. For example, armour rock would be preferred, however this would create challenges in terms of sheetpile installation.
    - Installation of the dead man anchors over the waters edge in Option 2C will not be straight forward.

We would also recommend that a condition assessment be undertaken of the existing bridge structure to evaluate any damage that may have occurred to the bridge structure as part of the 2022 flood event.

Regarding raised bridge alternative, as noted above, it is Royal HaskoningDHV's opinion that the construction of a higher level pedestrian bridge would be notably more expensive than the cost of the proposed Option 2C. If there is further interest in pursuing this option, we'd recommend preparing a concept design and costing by an experienced quantity surveyor.

Appendix A – Hydraulic Modelling Results



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 001
July 2022 Peak Depth
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

Depth

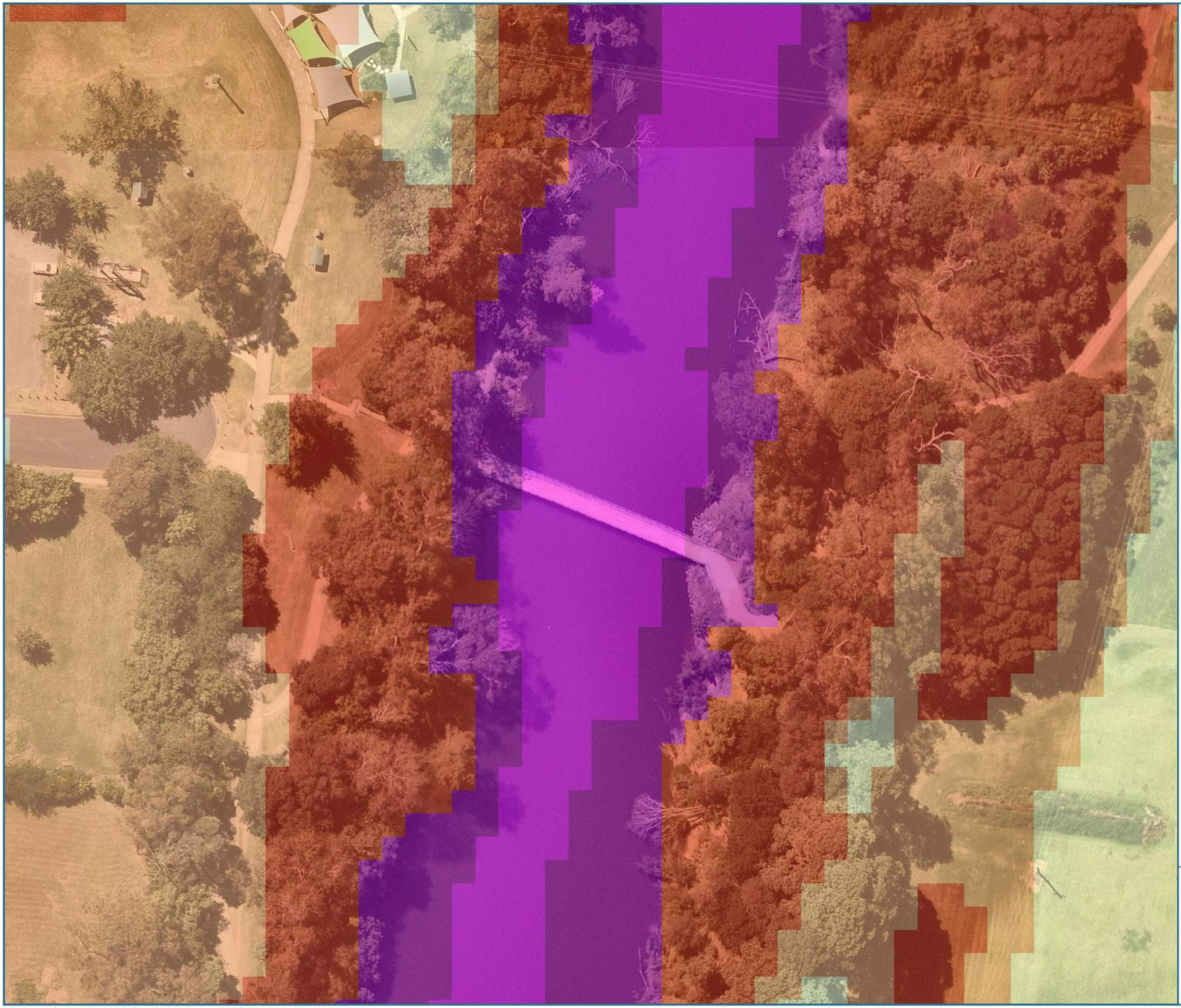
- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 002
July 2022 Peak Depth
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 003
July 2022 Peak Depth
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

I:\PA3130\Technical_Data\GIS\01-QGIS-project\Camden_218_Atlas.qgz

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 004
July 2022 Peak Depth
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 005
July 2022 Peak Velocity
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 006
July 2022 Peak Velocity
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

Velocity

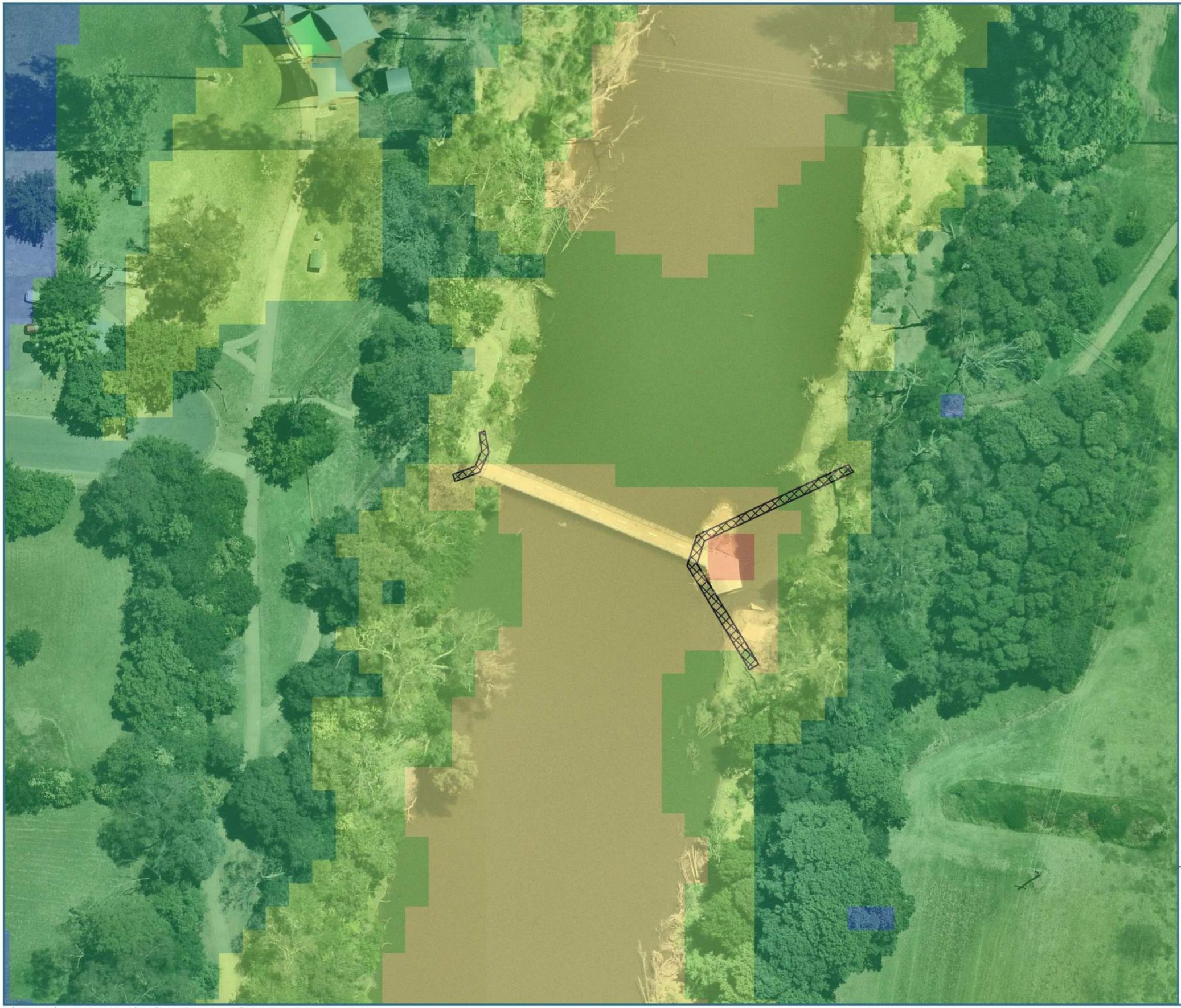
- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 007
July 2022 Peak Velocity
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 008
July 2022 Peak Velocity
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

Velocity

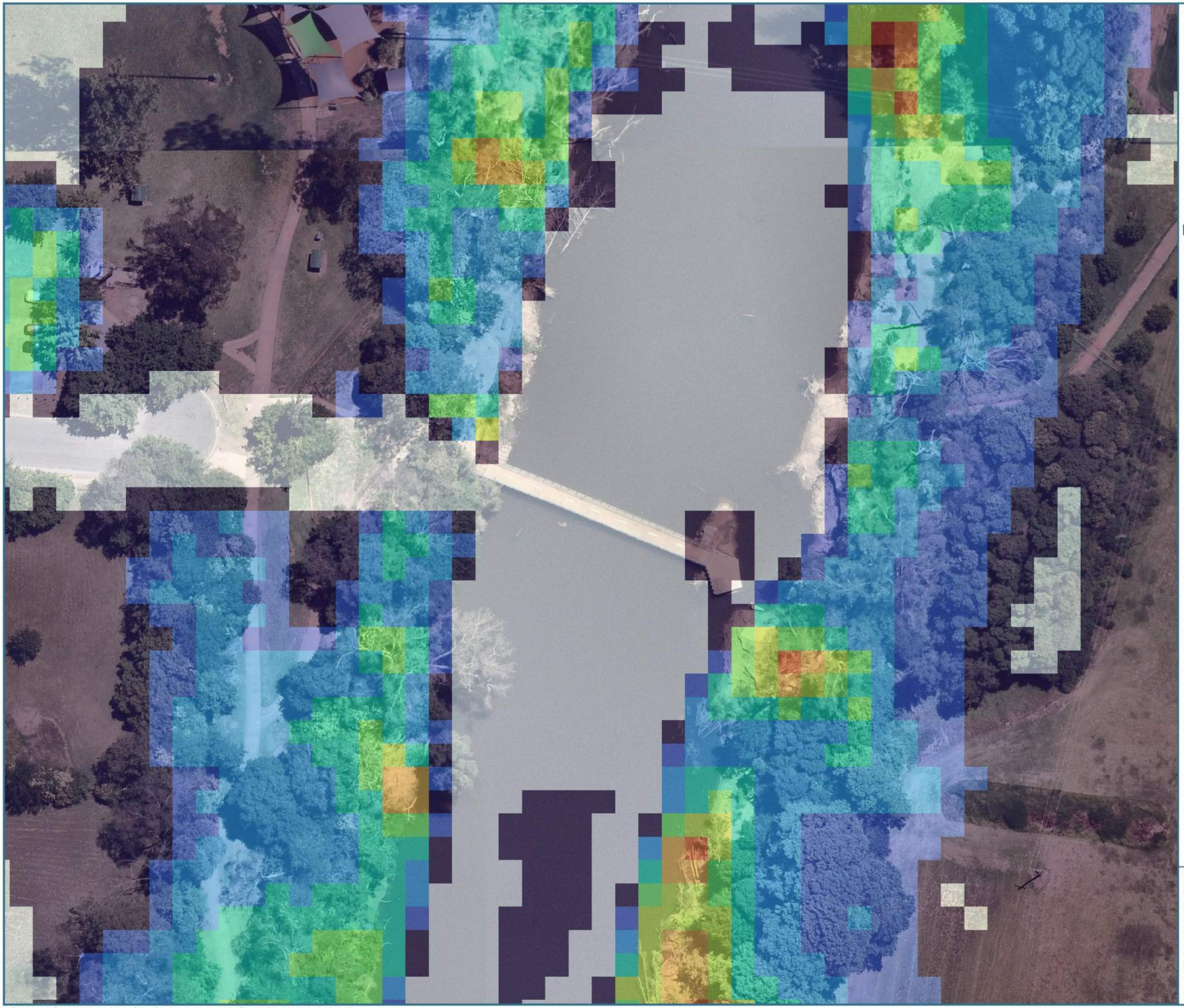
- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 009
July 2022 Peak Bed Shear Stress
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 010
July 2022 Peak Bed Shear Stress
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 011
July 2022 Peak Bed Shear Stress
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

BSS

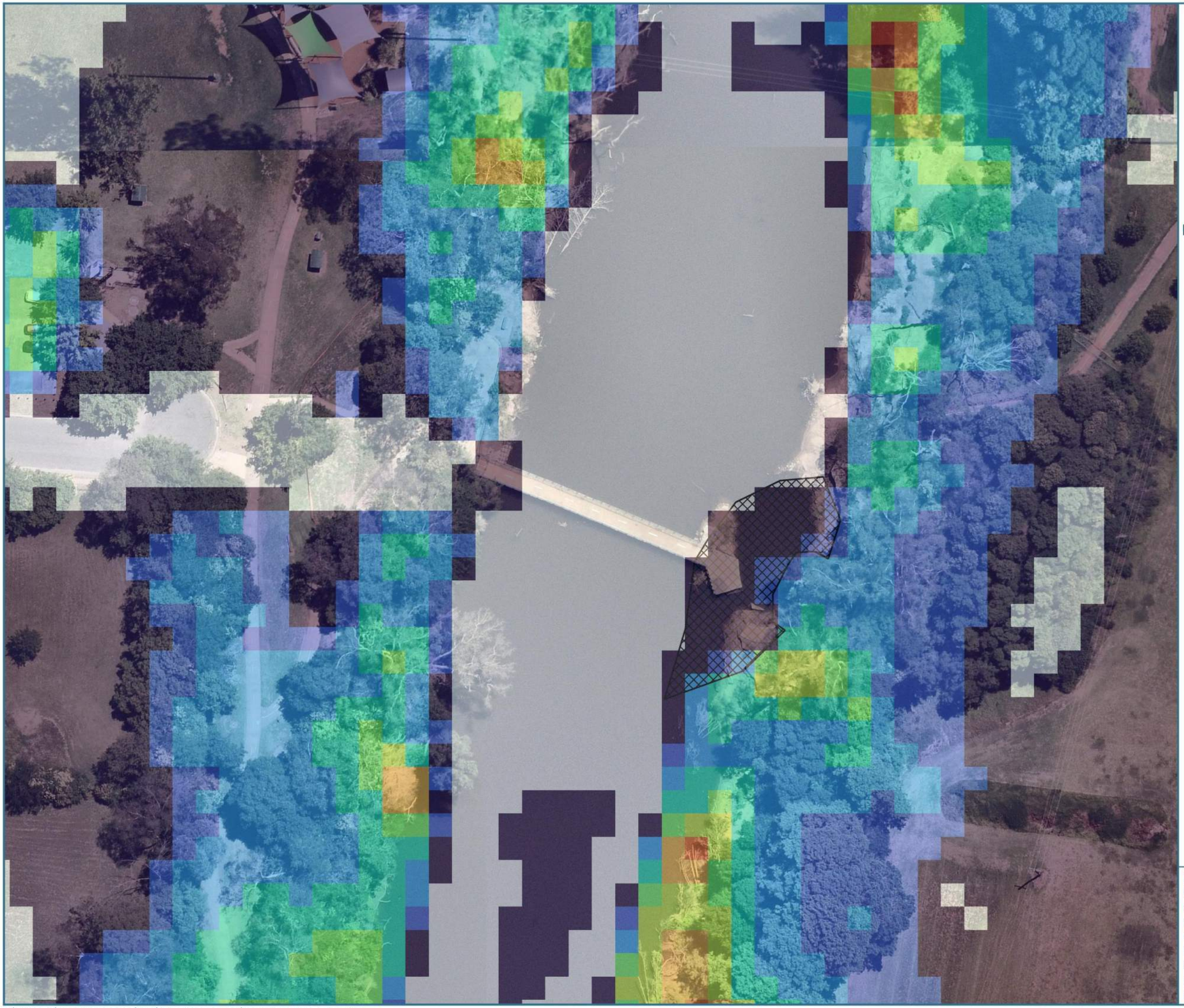
- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 012
July 2022 Peak Bed Shear Stress
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

BSS

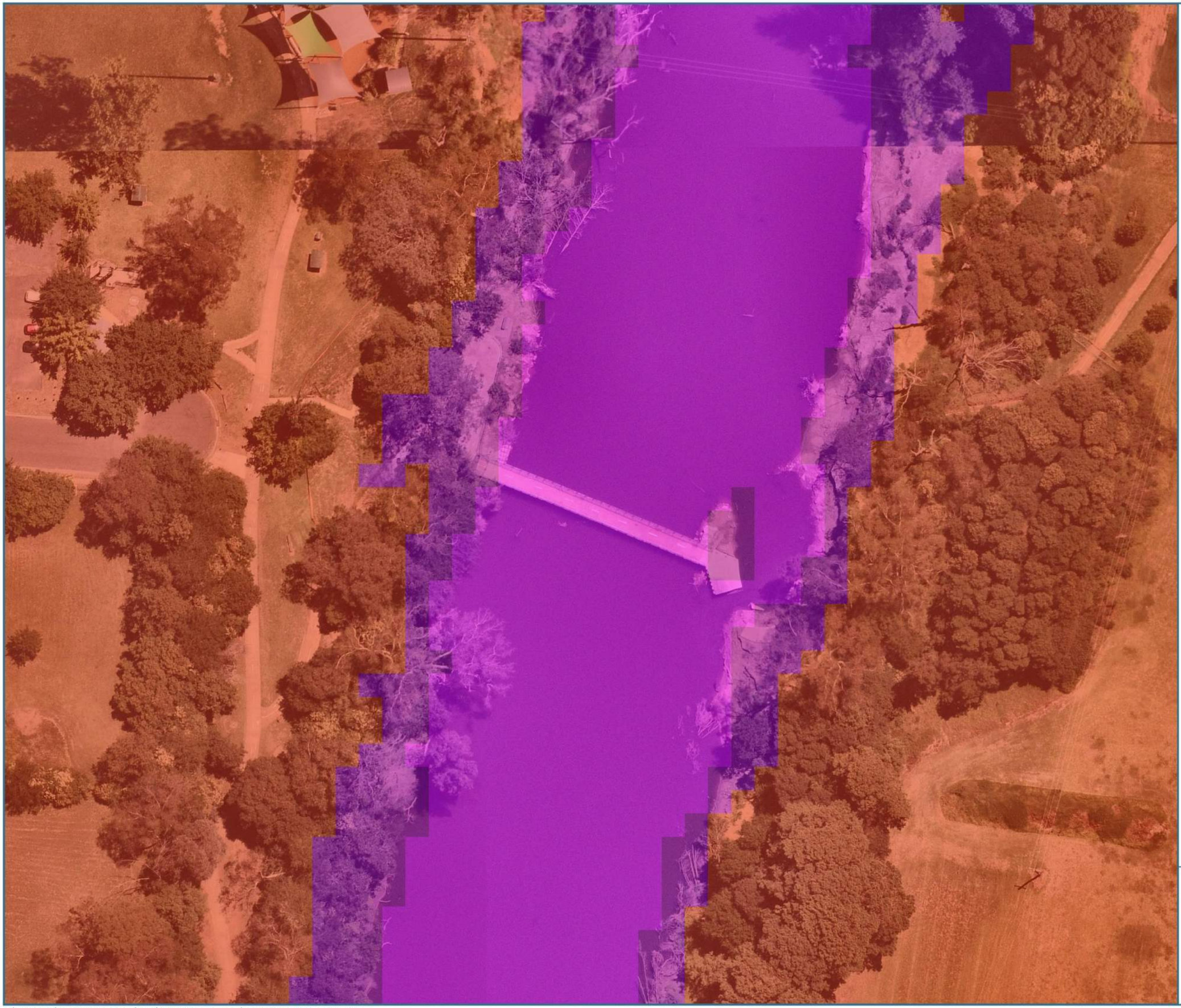
- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 013
1% AEP Peak Depth
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

Depth

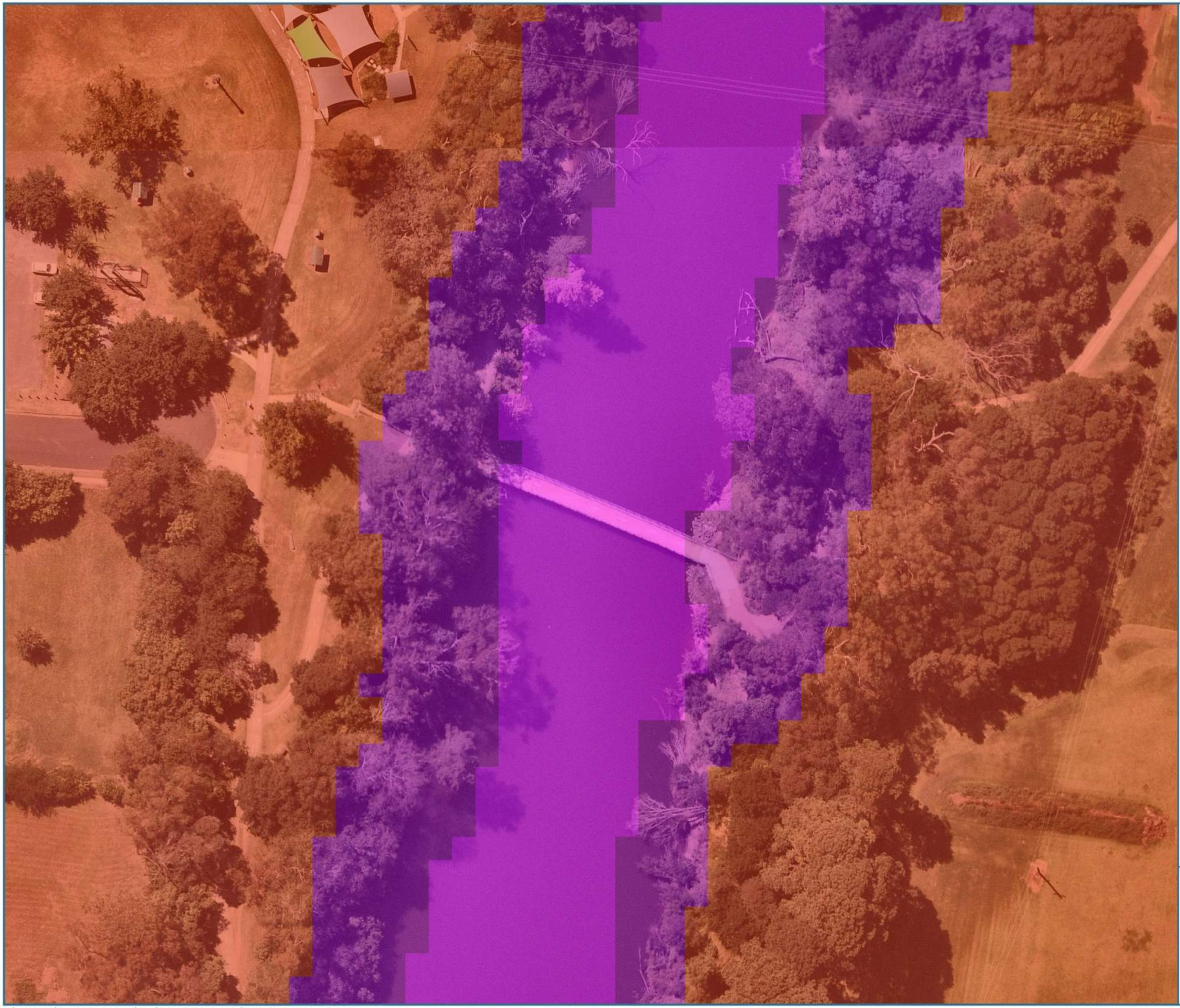
- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together



Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 014
1% AEP Peak Depth
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 015
1% AEP Peak Depth
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 016
1% AEP Peak Depth
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

Depth

- ≤ 0.5 m
- 0.5 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- 5.0 - 10.0 m
- 10.0 - 15.0 m
- > 15.0 m

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 017
1% AEP Peak Velocity
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 018
1% AEP Peak Velocity
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 019
1% AEP Peak Velocity
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 020
1% AEP Peak Velocity
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

Velocity

- ≤ 0.25
- 0.25 - 0.50 m/s
- 0.50 - 0.75 m/s
- 0.75 - 1.00 m/s
- 1.00 - 1.25 m/s
- 1.25 - 1.50 m/s
- 1.50 - 1.75 m/s
- 1.75 - 2.00 m/s
- 2.00 - 2.50 m/s
- > 2.50 m/s

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 021
1% AEP Peak Bed Shear Stress
Scenario A - Present Day Conditions
Location: Little Sandy Bridge, Camden

Legend

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 022
1% AEP Peak Bed Shear Stress
Scenario B - Previous Survey and SMEC Bridge Design
Location: Little Sandy Bridge, Camden

Legend

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 023
1% AEP Peak Bed Shear Stress
Option 2C - Sheet Pile Protection
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Sheet Pile Protection

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Royal HaskoningDHV
Enhancing Society Together

Little Sandy Bridge

Figure 024
1% AEP Peak Bed Shear Stress
Option 2D - Right Bank Widening
Location: Little Sandy Bridge, Camden

Legend

Indicative Location of Channel Widening

BSS

- ≤ 15 N/m²
- 15 - 30 N/m²
- 30 - 45 N/m²
- 45 - 60 N/m²
- 60 - 75 N/m²
- 75 - 90 N/m²
- 90 - 105 N/m²
- 105 - 120 N/m²
- 120 - 135 N/m²
- 135 - 150 N/m²
- > 150 N/m²

PA3130 / 2023-03-03
GDA94 / MGA zone 56
Scale at A3 1:600

N

0 10 20 30 m

Royal HaskoningDHV
Enhancing Society Together

Appendix

Appendix D – Threatened Species Search

Royal HaskoningDHV
Enhancing Society Together

EPBC Act Protected Matters Report

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

Report created: 09-Oct-2023

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	45
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	3
Commonwealth Heritage Places:	1
Listed Marine Species:	22
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	6
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	Endangered	Community may occur within area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area
Cooks River/Castlereagh Ironbark Forest of the Sydney Basin Bioregion	Critically Endangered	Community may occur within area
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
Elderslie Banksia Scrub Forest in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Melanodryas cucullata cucullata		
South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area
Pycnoptilus floccosus		
Pilotbird [525]	Vulnerable	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stagonopleura guttata		
Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
FROG		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
Litoria aurea		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
INSECT		
Austrocordulia leonardi		
Sydney Hawk Dragonfly [84741]	Endangered	Species or species habitat may occur within area
MAMMAL		

Scientific Name	Threatened Category	Presence Text
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area
Petauroides volans		
Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area
Petaurus australis australis		
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
PLANT		
Acacia bynoeana		
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Allocasuarina glareicola		
[21932]	Endangered	Species or species habitat may occur within area
Cynanchum elegans		
White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Eucalyptus benthamii Camden White Gum, Nepean River Gum [2821]	Vulnerable	Species or species habitat known to occur within area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat may occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Pimelea spicata Spiked Rice-flower [20834]	Endangered	Species or species habitat likely to occur within area
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat known to occur within area
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat likely to occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Thelymitra kangaloonica Kangaloon Sun Orchid [81861]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Delma impar		
Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State
Communications, Information Technology and the Arts - Australian Postal Corporation	
Commonwealth Land - Australian Postal Commission [12112]	NSW
Communications, Information Technology and the Arts - Telstra Corporation Limited	
Commonwealth Land - Telstra Corporation Limited [12115]	NSW
Commonwealth Land - Telstra Corporation Limited [12114]	NSW

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Camden Post Office	NSW	Listed place

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
[Lathamus discolor](#) Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area
[Neophema chrysostoma](#) Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area overfly marine area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area
[Pterodroma cervicalis](#) White-necked Petrel [59642]		Species or species habitat may occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
[Rostratula australis as Rostratula benghalensis (sensu lato)](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Sterna striata White-fronted Tern [799]		Migration route may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area overfly marine area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Warragamba Dam Raising Project	2017/7940	Controlled Action	Assessment Approach
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Realignment of Link Road and residential development adjacent to Camden Bypass	2005/2181	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval
Referral decision			
Northern Expansion of the Camden Gas Project	2012/6638	Referral Decision	Completed

Bioregional Assessments		
SubRegion	BioRegion	Website
Sydney	Sydney Basin	BA website

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Aves	Anatidae	0216	*Oxyura australis*		Blue-billed Duck	V,P		1	
Animalia	Aves	Anatidae	0214	*Stictonetta naevosa*		Freckled Duck	V,P		2	
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P		14	
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*		Little Eagle	V,P		9	
Animalia	Aves	Scolopacidae	0164	*Calidris canutus*		Red Knot	P	E,C,J,K	8	
Animalia	Aves	Cacatuidae	0268	*^^Callocephalon fimbriatum*		Gang-gang Cockatoo	V,P,3	E	2	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*		Little Lorikeet	V,P		2	
Animalia	Aves	Psittacidae	0309	*Lathamus discolor*		Swift Parrot	E1,P	CE	7	
Animalia	Aves	Psittacidae	0302	*^^Neophema pulchella*		Turquoise Parrot	V,P,3		1	
Animalia	Aves	Strigidae	0248	*^^Ninox strenua*		Powerful Owl	V,P,3		6	
Animalia	Aves	Climacteridae	8127	*Climacteris picumnus victoriae*		Brown Treecreeper (eastern subspecies)	V,P		1	
Animalia	Aves	Acanthizidae	0504	*Chthonicola sagittata*		Speckled Warbler	V,P		11	
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*		Varied Sittella	V,P		6	
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*		Dusky Woodswallow	V,P		16	
Animalia	Aves	Petroicidae	8367	*Melanodryas cucullata cucullata*		Hooded Robin (south-eastern form)	V,P		2	
Animalia	Aves	Petroicidae	0380	*Petroica boodang*		Scarlet Robin	V,P		2	
Animalia	Aves	Petroicidae	0382	*Petroica phoenicea*		Flame Robin	V,P		1	
Animalia	Aves	Estrildidae	0652	*Stagonopleura guttata*		Diamond Firetail	V,P		1	
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	E1,P	E	2	
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	57	

Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		2	
Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat	V,P		25	
Animalia	Mammalia	Vespertilionidae	1353	*Chalinolobus dwyeri*	Large-eared Pied Bat	V,P	V	5	
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V,P		8	
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*	Southern Myotis	V,P		11	
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V,P		10	
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*	Little Bent-winged Bat	V,P		9	
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		23	
Animalia	Gastropoda	Camaenidae	1006	*Meridolum corneovirens*	Cumberland Plain Land Snail	E1		44	
Plantae	Flora	Apocynaceae	10896	*Marsdenia viridiflora subsp. viridiflora*	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2		7	
Plantae	Flora	Fabaceae (Faboideae)	3008	*Pultenaea pedunculata*	Matted Bush-pea	E1		4	
Plantae	Flora	Myrtaceae	4007	^^*Callistemon linearifolius*	Netted Bottle Brush	V,3		1	
Plantae	Flora	Myrtaceae	4055	*Eucalyptus benthamii*	Camden White Gum	E4A	V	252	
Plantae	Flora	Rhamnaceae	5573	*Pomaderris brunnea*	Brown Pomaderris	E1	V	50	
Plantae	Flora	Santalaceae	5871	*Thesium australe*	Austral Toadflax	V	V	1	
Plantae	Flora	Thymelaeaceae	6190	*Pimelea spicata*	Spiked Rice-flower	E1	E	809	

Appendix

Appendix E – AHIMS Search

Royal HaskoningDHV
Enhancing Society Together

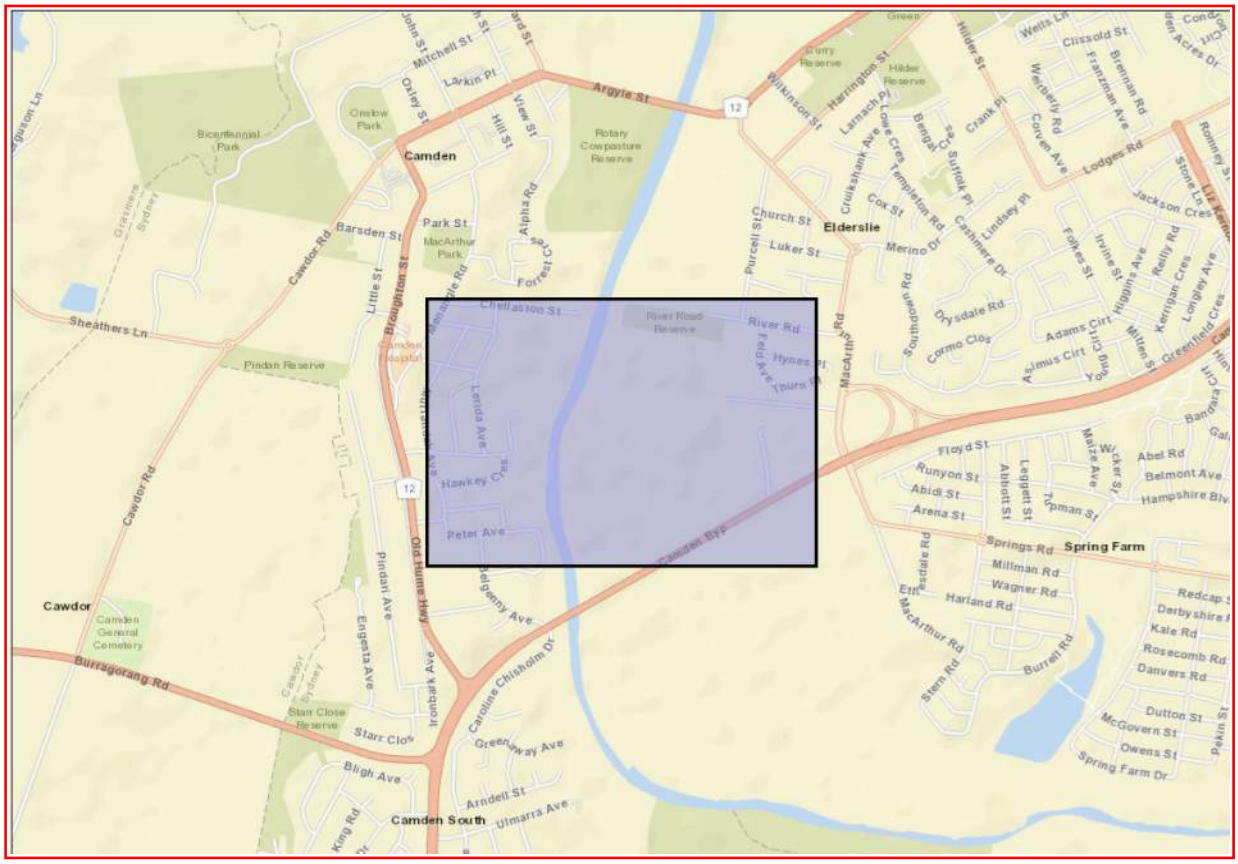
AHIMS Web Services (AWS)
Search Result

Date: 26 October 2023

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -34.0696, 150.6946 - Lat, Long To : -34.0607, 150.71,

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

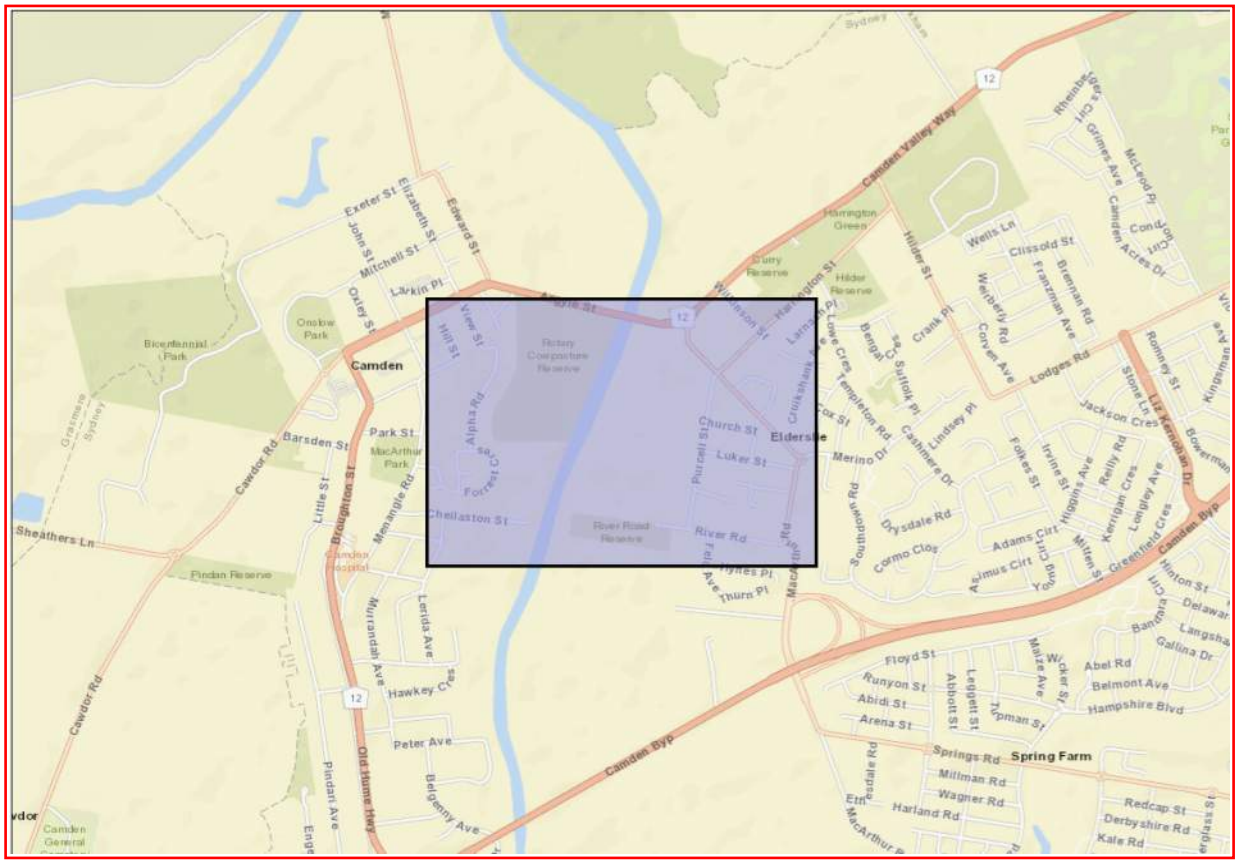
ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

AHIMS Web Services (AWS)
Search Result

Date: 26 October 2023

AHIMS Web Service search for the following area at Lat, Long From : -34.0626, 150.6967 - Lat, Long To : -34.0537, 150.7121,

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
Tel: (02) 9585 6345

ABN 34 945 244 274
Email: ahims@environment.nsw.gov.au
Web: www.heritage.nsw.gov.au

CERTIFICATION OF REVIEW OF ENVIRONMENTAL FACTORS

Project Name:	Rectification of Little Sandy Bridge Elderslie	**Proposal ID#:**	EDM: 25/36811 Final/P.01 - September 2024
Project Manager:	Paul Fairweather	**Project Budget:**	$4.5m

Does the activity have a capital investment value of more than $5million?		No
Does the activity require an approval or permit in relation to:		
- Fisheries Management Act 1994 (sections 144, 200, 205, or 219)?	Yes	
- Heritage Act 1977 (section 57)?		No
- National Parks and Wildlife Act 1974 (section 90)?		No
- Protection of the Environment Operations Act 1997 (sections 47-49 or 122)?		No
Is it in the public interest to publish the REF?	Yes	

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

Signature: _____ Date: 04/02/2025

Name: Paul Fairweather Position: Senior Project Manager

The proposed activity is not likely to have a significant impact on the environment and therefore an EIS is not required.

The proposed activity will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats or impact biodiversity values, meaning a SIS and/or BDAR is not required.

The proposed activity may proceed.

I am satisfied that subject to the inclusion of the mitigation measures identified in this REF the project will not have a significant impact on the environment during the construction and operation phases.

The REF is required to be published on the Council website.

Signature: _____R Corby_____ Date: 5 February 2025_____

Name: ____Robert Corby_____ Position: Natural Resource Officer