



29 June 2023

Mareeba Shire Council
65 Rankine Street
Mareeba QLD 4880

Attention: Brian Millard

Dear Brian,

**APPLICATION FOR DEVELOPMENT PERMIT FOR OPERATIONAL WORKS FOR
KURANDA CEMETERY STAGE 1**

Application No: MCU/22/0009
Street Address: 70 Kuranda Heights Road, Kuranda
Real Property Address: Lot 2 on RP730337

On behalf of our Client, Mareeba Shire Council, we submit this application for a Development Permit for Operational Works approval for the new Kuranda Cemetery – Stage 1.

This correspondence seeks to address conditions included in the Decision Notice from Mareeba Shire Council (Ref: MCU/22/0009) in relation to the proposed development at 70 Kuranda Heights Road, Kuranda. For clarity, the conditions have been reproduced below with the responses following in *blue italicised text*.

Reconfiguring a Lot aspect

1. Development must be carried out generally in accordance with the approved plans and the facts and circumstances of the use as submitted with the application, and subject to any alterations:
 - found necessary by the Council's delegated officer at the time of examination of the engineering plans or during construction of the development because of particular engineering requirements; and
 - to ensure compliance with the following conditions of approval.

Noted.

2. Timing of Effect

- 2.1 The conditions of the development permit must be complied with to the satisfaction of Council's delegated officer prior to the endorsement of the plan of survey for the development, except where specified otherwise in these conditions of approval.

Noted.

3. General

- 3.1 The development approval would not have been issued if not for the conditions requiring the construction of infrastructure or the payment of infrastructure charges/contributions within the conditions of approval.
- 3.2 The applicant/developer is responsible for the cost of necessary alterations to existing public utility mains, services or installations required by works in relation to the proposed development or any works required by condition(s) of this approval.
- 3.3 All payments or bonds required to be made to the Council pursuant to any condition of this approval must be made prior to the endorsement of the plan of survey and at the rate applicable at the time of payment.

- 3.4 The developer must relocate (in accordance with FNQROC standards) any services such as water, sewer, drainage, telecommunications and electricity that are not wholly located within the lots that are being created/serviced where required by the relevant authority, unless approved by Council's delegated officer.
- 3.5 Where utilities (such as sewers on non-standard alignments) traverse lots to service another lot, easements must be created in favour of Council for access and maintenance purposes. The developer is to pay all costs (including Council's legal expenses) to prepare and register the easement documents.
- 3.6 Where approved existing buildings and structures are to be retained, setbacks to any new property boundaries are to be in accordance with Planning Scheme requirements for the relevant structure and/or Queensland Development Code.
- 3.7 All works must be designed, constructed and carried out in accordance with FNQROC Development Manual requirements (as amended) and to the satisfaction of Council's delegated officer.
- 3.8 Charges

All outstanding rates, charges, and expenses pertaining to the land are to be paid in full.

- 3.9 Building Envelope - Proposed Lot 1 only
 - (a) Prior to the endorsement of the survey plan the approved building envelope area for proposed Lot 1 must be defined by markers set at each corner, to the satisfaction of Council's delegated officer.
 - (b) All future buildings including associated on-site effluent disposal systems must be located within the approved building envelope.
 - (c) No native vegetation shall be cleared outside the approved building envelope.

Noted.

4. Infrastructure Services and Standards

4.1 Access

- 4.1.1 An access crossover must be constructed (from the edge of the road pavement of Kuranda Heights Road to the property boundary of each allotment) in accordance with the FNQROC Development Manual, to the satisfaction of Council's delegated officer.

4.2 Stormwater Drainage

- (a) The applicant/developer must take all necessary steps to ensure a non-worsening effect on surrounding land as a consequence of the development.
- (b) All stormwater drainage collected from the site must be discharged to an approved legal point of discharge.

4.3 Water Supply

- (a) Where the existing reticulated water supply does not currently service the site or is not at an adequate capacity, the developer is required to extend or upgrade the reticulated water supply infrastructure to connect the site to Council's existing infrastructure at a point that has sufficient capacity to service the development in accordance with FNQROC Development Manual standards (as amended).
- (b) A water service connection must be provided to each proposed lot in accordance with FNQROC Development Manual standards (as amended) to the satisfaction of Council's delegated officer.

4.4 Wastewater Disposal

At the time of construction of a future dwelling or outbuilding on proposed Lot 1, any associated on-site effluent disposal system must be constructed in compliance with the latest version On-Site Domestic Wastewater Management Standard (AS/NZS1547) to the satisfaction of the Council's delegated officer.

4.5 Electricity provision / supply

The applicant/developer must ensure that an appropriate level of electricity supply is provided to each allotment in accordance with FNQROC Development Manual standards (as amended) to the satisfaction of Council's delegated officer.

Written advice from an Electricity Service Provider is to be provided to Council indicating that an agreement has been made for the provision of power reticulation.

4.6 Telecommunications

The applicant/developer must demonstrate that a connection to the national broadband network is available for each allotment, or alternatively, enter into an agreement with a telecommunication carrier to provide telecommunication services to each lot and arrange provision of necessary conduits and enveloping pipes.

Noted. Please refer to Supporting Information Report and project drawings ARO0231 – C01 to ARO0231-C15 attached in Attachment A.

Material Change of Use aspect

1. Development must be carried out generally in accordance with the approved plans and the facts and circumstances of the use as submitted with the application, subject to any alterations:
 - found necessary by Council's delegated officer at the time of examination of the engineering plans or during construction of the development because of particular engineering requirements; and
 - to ensure compliance with the following conditions of approval.

Noted.

2. Timing of Effect

- 2.1 The conditions of the development permit must be complied with to the satisfaction of Council's delegated officer prior to the commencement of the use except where specified otherwise in these conditions of approval.
- 2.2 Prior to the commencement of use, the applicant must notify Council that all the conditions of the development permit have been complied with, except where specified otherwise in these conditions of approval.

Noted.

3. General

- 3.1 The applicant/developer is responsible for the cost of necessary alterations to existing public utility mains, services or installations required by works in relation to the proposed development or any works required by condition(s) of this approval.
- 3.2 All payments or bonds required to be made to the Council pursuant to any condition of this approval must be made prior to commencement of the use and at the rate applicable at the time of payment.
- 3.3 All works must be designed, constructed and carried out in accordance with FNQROC Development Manual requirements (as amended) and to the satisfaction of Council's delegated officer.
- 3.4 Waste Management

On site refuse storage area must be provided and be screened from view from adjoining properties and road reserve by 1-metre-wide landscaped screening buffer, 1.8m high solid fence or building.

Noted. Please refer to Supporting Information Report and project drawings ARO0231 – C01 to ARO0231-C15 attached in Attachment A.

4. Infrastructure Services and Standards

4.1 Access

A commercial access crossover must be constructed (from the edge of Kuranda Heights Road to the property boundary of the subject lot) in accordance with the FNQ.ROC Development Manual, to the satisfaction of Council's delegated officer.

4.2 Stormwater Drainage

- (a) The applicant/developer must take all necessary steps to ensure a non-worsening effect on surrounding land as a consequence of the development.
- (b) As part of a subsequent application for operational works, the applicant must submit a Stormwater Management Plan and Report prepared and certified by a suitably qualified design engineer (RPEQ) that meets or exceeds the standards of design and construction set out in the Queensland Urban Drainage Manual (QUDM) and the FNQROC Development Manual, to the satisfaction of Council's delegated officer.
- (c) Prior to works commencing the applicant must submit a Stormwater Quality Management Plan and Report prepared and certified by a suitably qualified design engineer (RPEQ) that meets or exceeds the standards of design and construction set out in the Urban Stormwater Quality Planning Guideline and the Queensland Water Quality Guideline to the satisfaction of Council's delegated officer.
- (d) The Stormwater Quality Management Plan must include an Erosion and Sediment Control Plan that meets or exceeds the Soil Erosion and Sedimentation Control Guidelines (Institute of Engineers Australia) to the satisfaction of Council's delegated officer.
- (e) The applicant/developer must construct the stormwater drainage infrastructure in accordance with the approved Stormwater Management Plan and/or Stormwater Quality Management Plan and Report.
- (f) Temporary drainage is to be provided and maintained during the construction phase of the development, discharged to a lawful point and not onto the construction site.
- (g) All stormwater drainage collected from the site must be discharged to an approved legal point of discharge.
- (h) For any underground stormwater infrastructure installed, the applicant (at their cost) must video these stormwater lines and submit the video for inspection by Council's delegated officer prior to the development being taken "off maintenance" to ensure that no defects have occurred during the 12 month maintenance period.

Noted. Please refer to Supporting Information Report and project drawings ARO0231 – C01 to ARO0231-C15 attached in Attachment A.

4.3 Car Parking / Internal Driveways

The applicant/developer must ensure the development is provided with on-site car parking spaces, which are available solely for the parking of vehicles associated with the use of the premises. All car parking spaces and internal driveways must be concrete, bitumen or asphalt sealed and appropriately drained prior to the commencement of the use and to the satisfaction of Council's delegated officer.

All car parking spaces and internal driveways must be constructed in compliance with the following standards, to the satisfaction of Council's delegated officer:

- Australian Standard AS2890: Off Street Parking - Car Parking Facilities;
- Australian Standard AS1428:2001 - Design for Access and Mobility.

Noted. Please refer to Supporting Information Report and project drawings ARO0231 – C01 to ARO0231-C15 attached in Attachment A.

4.4 Landscaping

Prior to the commencement of the use of the site, a landscape plan must be prepared and submitted to Council's delegated officer for consideration and approval.

The landscape plan must use plant species selected from the Plant Schedule in Planning Scheme Policy 6 - Landscaping and preferred plant species.

The landscaping of the site must be carried out in accordance with the endorsed landscape plan prior to the commencement of the use, and mulched, irrigated and maintained to the satisfaction of Council's delegated officer.

4.5 Water Supply

- (a) Where the existing reticulated water supply does not currently service the site or is not at an adequate capacity, the developer is required to extend or upgrade the reticulated water supply infrastructure to connect the site to Council's existing infrastructure at a point that has sufficient capacity to service the development in accordance with FNQROC Development Manual standards (as amended).
- (b) A water service connection must be provided to each proposed lot in accordance with FNQROC Development Manual standards (as amended) to the satisfaction of Council's delegated officer.

4.6 On-Site Wastewater Management

All on site effluent disposal associated with the approved use must be in compliance with the latest version of On-Site Domestic Wastewater Management Standard (ASNZ1547) to the satisfaction of the Council's delegated officer.

4.7 Lighting

Where outdoor lighting is required, the developer shall locate, design and install lighting to operate from dusk to dawn within all areas where the public will be given access, which prevents the potential for light spillage to cause nuisance to neighbours and must be provided in accordance with Australian Standard 1158.1 - Lighting for Roads and Public Spaces.

Illumination resulting from direct, reflected or other incidental light emanating from the subject land does not exceed 8 lux when measured at any point 1.5m outside the property boundary of the subject site. The lighting fixtures installed on site must meet appropriate lux levels as documented within Australian Standard 4282 -Control of the Obtrusive Effects of Outdoor Lighting.

Noted. Please refer to Supporting Information Report and project drawings ARO0231 – C01 to ARO0231-C15 attached in Attachment A.

We confirm that SPA Consulting has been engaged to undertake the assessment and design of the proposed flaglight lighting on Kuranda Heights Road and subsequent negotiations with Ergon Energy.

Yours sincerely
ARO INDUSTRIES

Rudd Rankine
Principal Civil Engineer
RPEQ 8452

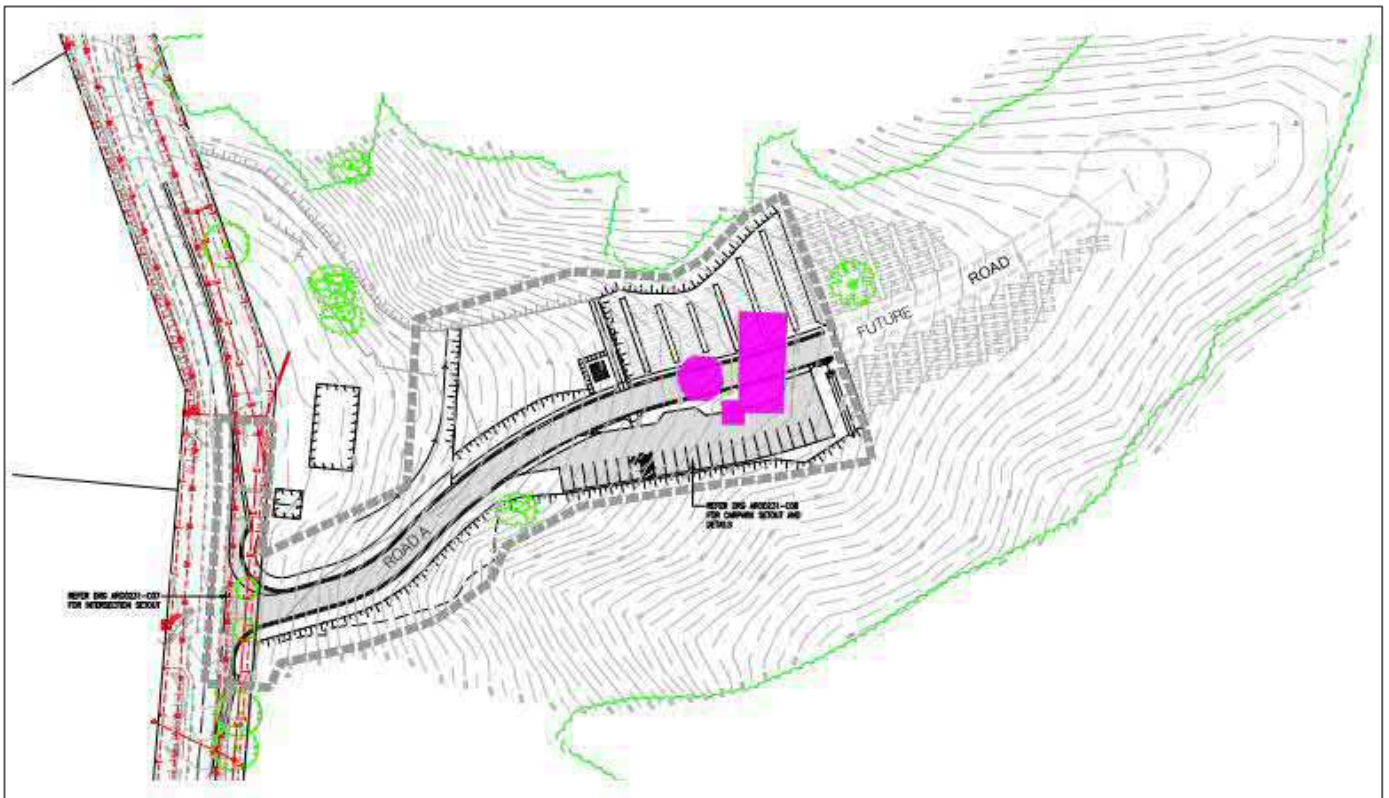
Encl: Attachment A – Supporting Information Report and DA Form 1

ATTACHMENT A
Supporting Information Report
DA Form 1



MAREEBA SHIRE COUNCIL KURANDA CEMETERY OPERATIONAL WORKS

SUPPORTING INFORMATION REPORT



CIVIL ENGINEERING, MANAGEMENT AND BUSINESS ADVISORY

CAIRNS OFFICE

51 Sheridan Street | PO Box 5358
Cairns City QLD 4870
(07) 4281 6897

ATHERTON OFFICE

57b Mabel Street | PO Box 5358
Atherton QLD 4883
0488 388 895



ARO

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INTRODUCTION

ARO Industries has been commissioned by Mareeba Shire Council (MSC) to undertake the detailed design and documentation of civil works, for the expansion of the Kuranda Cemetery on 70 Kuranda Heights Road, Kuranda.

A material change of use to Cemetery and reconfiguration of a lot (1 into 2 Lots) was approved subject to conditions by Mareeba Shire Council on 4 January 2023. For Council's reference, a copy of the Decision Notice for the Development Application MCU/22/0009 – Material Change of Use – Cemetery and Reconfiguring a Lot – Subdivision (1 into 2 lots) is included in **Appendix A**. This document is to address the Material Change of Use aspect only. The development hereby submitted has been prepared in compliance with the conditions of that Decision Notice.

ENGINEERING DOCUMENTATION

In accordance with Council's requirements, we have provided a copy of the engineering design drawings in **Appendix D**. These include the following drawings:

ARO0231 - C00	Cover Sheet, Locality Plan and Drawing Schedule
ARO0231 - C01	General Arrangement Plan
ARO0231 - C02	Roadworks and Stormwater Drainage Plan
ARO0231 - C03	Type Cross Sections and Road Setout Details
ARO0231 - C04	Road A Longitudinal Section
ARO0231 - C05	Road A Annotated Cross Sections – Sheet 1 of 3
ARO0231 - C06	Road A Annotated Cross Sections – Sheet 2 of 3
ARO0231 - C07	Intersection Setout
ARO0231 - C08	Carpark Setout and Details
ARO0231 - C09	Earthworks Grading Plan
ARO0231 – C10	Earthworks Sections
ARO0231 – C11	Concrete Beam Details – Sheet 1 of 2
ARO0231 – C12	Concrete Beam Details – Sheet 2 of 2
ARO0231 – C13	Pedestrian Pathway and Ablution Block Pad Details
ARO0231 – C14	Water Reticulation Plan
ARO0231 – C15	Erosion and Sediment Control Plan

SUPPORTING INFORMATION

ROADWORKS

Access to the site will be from Kuranda Heights Road. Internal circulation of the site will be via a new road (Road A). Road A will service future stages to the development.

The intersection of Kuranda Heights Road and Road A will be a give-way unsignalised intersection. The intersection works will include acceleration and deceleration lanes on Kuranda Heights Road.

Road A will be a 2-way 6.0m wide asphaltic concrete road running in the east west direction to meet the conditions of the Development Approval.

CARPARKS

Car parking spaces have been designed in accordance with the following standards are per the Development Approval:

- Australian Standard AS2890:1 Off Street Parking – Car Parking Facilities; and
- Australian Standards AS1428:2001 – Design for Access and Mobility

A total of 25 on-site car parks are provided (including 1 accessibility park) solely for the parking of vehicles associated with the use of the premises.

All car parking spaces are asphaltic concrete roads BEAM in accordance with the Development Application.

STORMWATER DRAINAGE

The stormwater drainage infrastructure has been designed in accordance with FNQROC Design Guidelines and the Queensland Urban Drainage Manual.

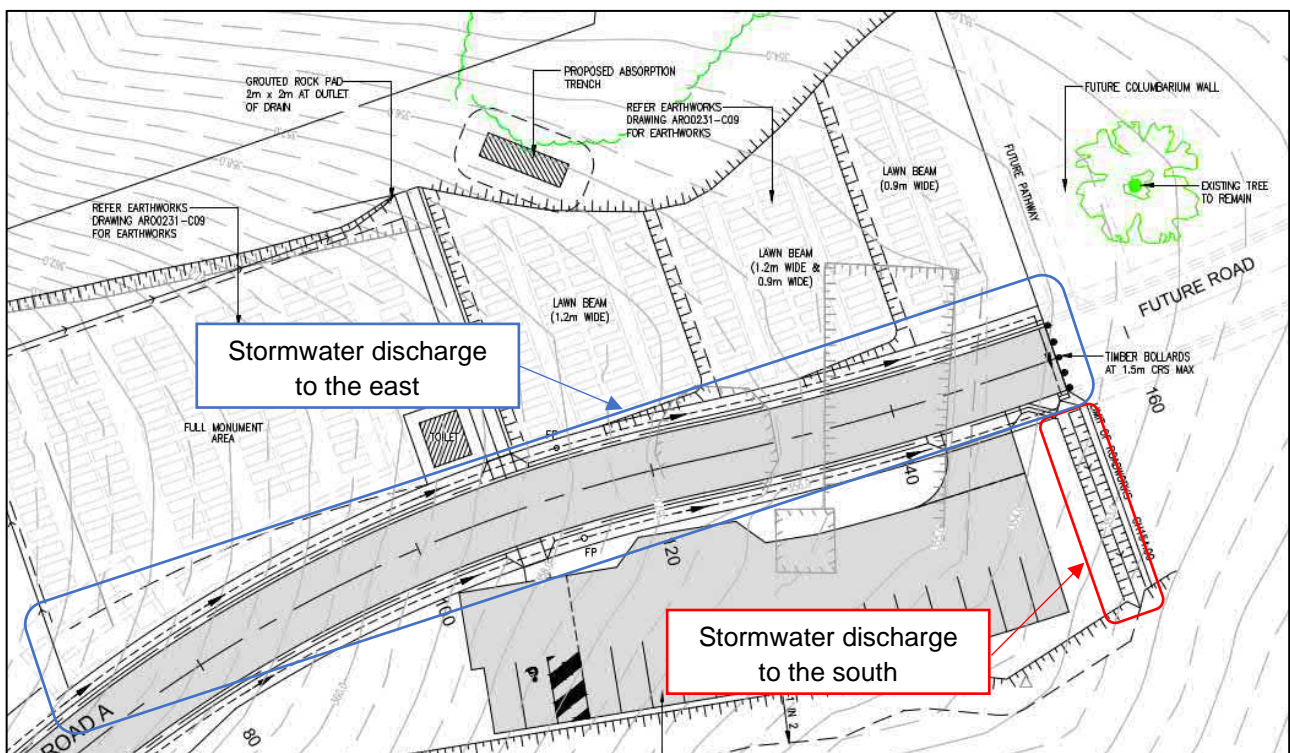
1.1 Pre-Development Stormwater Drainage Conditions

The site currently discharges to the south and the east of the property. Both flows discharge into a creek located on the subject lot which ultimately discharges into the Barron River. These points of discharge are to be maintained post-development.

The roadway is constructed along the existing ridgeline, and it is not envisaged that the natural flow paths on site will be impacted.

1.2 Post-Development Stormwater Drainage Conditions

Stormwater runoff will be discharged from the site to the east by the roadway concrete kerb to the south by a grass lined open channel drain. These locations are depicted in the figure below.



1.2.1 Southern Stormwater Outlet

It was determined that in a Q20 event 92L/s will be discharged from the site via the southern stormwater outlet. These flows are captured by the kerb and subsoil drainage along Road A and discharges through to a triangular open channel drain. One way crossfall from Chainage 110 will discharge flows to the southern outlet with the remainder being shed to the east of the property. The open channel drain has a longitudinal grade of 1% and outlets to a creek on the property (outlets to the Barron River downstream).

The capacity of the drain was determined using proprietary software 'Hydraulic Toolbox'. The output of this analysis is displayed in the figure below.

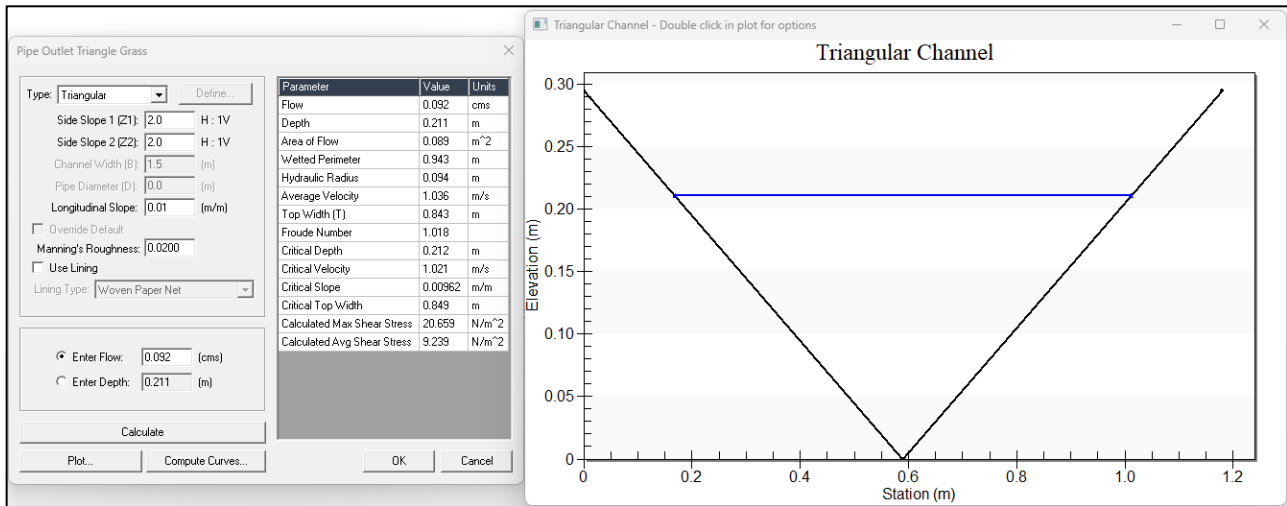


Figure 1 – Southern stormwater outlet model outputs

It is noted that the velocity and depth of flow conforms with the requirements of FNQROC and QUDM.

1.2.2 Northern Stormwater Outlet

Given the open nature of the cemetery it is not anticipated that open flows will be present.

SEWERAGE

There is no reticulated sewerage infrastructure along Kuranda Heights at the site access. The onsite toilet block will utilise onsite effluent disposal. An on-site effluent disposal report that complies with the latest version of On-Site Domestic Wastewater Management Standard (ASNZ1547) is provided in **APPENDIX B**.

WATER RETICULATION

The proposed development will be serviced by existing water reticulation infrastructure on Kuranda Heights Road. Council records that an existing 200dia water main is located within the Kuranda Heights Road reserve on the opposite side of the roadway.

Connection to the existing network will be made using 100mm DICL underneath Kuranda Heights Road as per FNQROC. The development will then be serviced by a single 50mm HDPE pipe. It is noted that the connection will service the toilet block and a garden tap only. No hydrants have been provided onsite.

No water reticulation modelling has been completed to date.

GEOTECHNICAL INVESTIGATIONS

Geotechnical Investigations of the site were undertaken. A copy of the geotechnical report has been included as in **APPENDIX C**

UTILITY SERVICES

In accordance with Council's requirements, SPA Consulting Pty Ltd has been engaged to carry out the electrical design, including assessment of the streetlighting and negotiations with Ergon Energy. Final documentation will be forwarded to Council upon receipt.

Due to the nature of the development, no NBN connection is proposed nor is it considered necessary. .

EROSION & SEDIMENT CONTROL STRATEGY

An Erosion and Sediment Control Strategy (ARO231 – C18) has been produced to minimise erosion and the movement of sediment from the site. The strategy is to be used as a guide by the Contractor in producing their Erosion and Sediment Control Plan for construction works.

It is noted that the final Erosion and Sediment Control measures are subject to the Contractor's construction methodology. It is envisaged that the final Erosion Sedimentation Control infrastructure will generally follow those provided in the strategy.

The Contractor is required to produce an erosion and sediment control plan in line with this strategy and their construction methodology.

RECOMMENDATIONS

Following consideration of this Design Submission Report and the accompanying design documentation it is recommended that:

- Council approves the design and documentation for the development of the Kuranda Cemetery.
- Council acknowledge negotiation for supply of electricity has been commenced with Ergon, and the installation of underground conduits will be included in the project construction drawings upon receipt of detailed information from both authorities and forwarded to Council for approval.
- Council issues an Operational Works Permit to construct the works.

Rudd Rankine (RPEQ 8452)

Director

APPENDIX A
MSC Decision Notice MCU/22/0009



25 January 2023

Mareeba Shire Council
C/- Kelly Reaston
51 Sheridan Street
CAIRNS QLD 4870

Senior Planner: Brian Millard
Direct Phone: 4086 4657
Our Reference: MCU/22/0009

Dear Applicants,

Decision Notice

Planning Act 2016

I refer to your application and advise that on 25 January 2023, Council decided to approve the application in full subject to conditions.

Details of the decision are as follows:

APPLICATION DETAILS

Application No:	MCU/22/0009
Street Address:	70 Kuranda Heights Road, Kuranda
Real Property Description:	Lot 2 on RP730337
Planning Scheme:	Mareeba Shire Council Planning Scheme 2016

DECISION DETAILS

Type of Decision:	Approval
Type of Approval:	Development Permit for Material Change of Use - Cemetery and Reconfiguring a Lot - Subdivision (1 into 2 lots)
Date of Decision:	25 January 2023

CURRENCY PERIOD OF APPROVAL

The currency period for this development approval is listed below. (Refer to Section 85 "Lapsing of approval at end of currency period" of the *Planning Act 2016*.):

- Material Change of Use aspect – six (6) years (starting the day the approval takes effect).
- Reconfiguring a Lot aspect – four (4) years (starting the day the approval takes effect).

INFRASTRUCTURE

Where conditions relate to the provision of infrastructure, these are non-trunk infrastructure conditions unless specifically nominated as a “*necessary infrastructure condition*” for the provision of trunk infrastructure as defined under Chapter 4 of the *Planning Act 2016*.

ASSESSMENT MANAGER CONDITIONS

(A) ASSESSMENT MANAGER’S CONDITIONS (COUNCIL)

(a) Development assessable against the Planning Scheme

Reconfiguring a Lot aspect

1. Development must be carried out generally in accordance with the approved plans and the facts and circumstances of the use as submitted with the application, and subject to any alterations:
 - found necessary by the Council’s delegated officer at the time of examination of the engineering plans or during construction of the development because of particular engineering requirements; and
 - to ensure compliance with the following conditions of approval.
2. Timing of Effect
 - 2.1 The conditions of the development permit must be complied with to the satisfaction of Council’s delegated officer prior to the endorsement of the plan of survey for the development, except where specified otherwise in these conditions of approval.
3. General
 - 3.1 The development approval would not have been issued if not for the conditions requiring the construction of infrastructure or the payment of infrastructure charges/contributions within the conditions of approval.
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3.8 Charges

All outstanding rates, charges, and expenses pertaining to the land are to be paid in full.

3.9 Building Envelope - Proposed Lot 1 only

- (a) Prior to the endorsement of the survey plan the approved building envelope area for proposed Lot 1 must be defined by markers set at each corner, to the satisfaction of Council's delegated officer.
- (b) All future buildings including associated on-site effluent disposal systems must be located within the approved building envelope.
- (c) No native vegetation shall be cleared outside the approved building envelope.

4. Infrastructure Services and Standards

4.1 Access

- 4.1.1 An access crossover must be constructed (from the edge of the road pavement of Kuranda Heights Road to the property boundary of each allotment) in accordance with the FNQROC Development Manual, to the satisfaction of Council's delegated officer.

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- (a) The applicant/developer must take all necessary steps to ensure a non-worsening effect on surrounding land as a consequence of the development.
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The landscape plan must use plant species selected from the Plant Schedule in Planning Scheme Policy 6 - Landscaping and preferred plant species.

The landscaping of the site must be carried out in accordance with the endorsed landscape plan prior to the commencement of the use, and mulched, irrigated and maintained to the satisfaction of Council's delegated officer.

4.6 Water Supply

- (a) Where the existing reticulated water supply does not currently service the site or is not at an adequate capacity, the developer is required to extend or upgrade the reticulated water supply infrastructure to connect the site to Council's existing infrastructure at a point that has sufficient capacity to service the development in accordance with FNQROC Development Manual standards (as amended).
- (b) A water service connection must be provided to each proposed lot in accordance with FNQROC Development Manual standards (as amended) to the satisfaction of Council's delegated officer.

4.7 On-Site Wastewater Management

All on site effluent disposal associated with the approved use must be in compliance with the latest version of On-Site Domestic Wastewater Management Standard (ASNZ1547) to the satisfaction of the Council's delegated officer.

4.8 Lighting

Where outdoor lighting is required the developer shall locate, design and install lighting to operate from dusk to dawn within all areas where the public will be given access, which prevents the potential for light spillage to cause nuisance to neighbours and must be provided in accordance with Australian Standard 1158.1 – Lighting for Roads and Public Spaces.

Illumination resulting from direct, reflected or other incidental light emanating from the subject land does not exceed 8 lux when measured at any point 1.5m outside the property boundary of the subject site. The lighting fixtures installed on site must meet appropriate lux levels as documented within Australian Standard 4282 – Control of the Obtrusive Effects of Outdoor Lighting.

REFERRAL AGENCIES

Not Applicable.

APPROVED PLANS

The following plans are Approved plans for the development:

Plan/Document Number	Plan/Document Title	Prepared by	Dated
2106 SKA-05 A	Staging Plan - Stage 1 - Alternative	Mareeba Shire Council	10/02/2022
ARO0071-SK01	Kuranda Cemetery Residential Land Development Lot 2 on RP730337 Proposed Lot Layout	ARO Industries Pty Ltd	25 October 2022

ADVISORY NOTES

The following notes are included for guidance and information purposes only and do not form part of the assessment manager conditions:

(A) ASSESSMENT MANAGER'S ADVICE

(a) An Adopted Infrastructure Charges Notice has been issued with respect to the approved development. The Adopted Infrastructure Charges Notice details the type of infrastructure charge/s, the amount of the charge/s and when the charge/s are payable.

(b) The Adopted Infrastructure Charges Notice does not include all charges or payments that are payable with respect to the approved development. A number of other charges or payments may be payable as conditions of approval. The applicable fee is set out in Council's Fees & Charges Schedule for each respective financial year.

(c) Easement Documents

Council has developed standard easement documentation to assist in the drafting of formal easement documents for Council easements. Please contact the Planning Section for more information regarding the drafting of easement documents for Council easements.

(d) Endorsement Fees

Council charges a fee for the endorsement of a Survey Plan, Community Management Statements, easement documents, and covenants. The fee is set out in Council's Fees & Charges Schedule applicable for each respective financial year.

(e) Compliance with applicable codes/policies

The development must be carried out to ensure compliance with the provisions of Council's Local Laws, Planning Scheme Policies, Planning Scheme and Planning Scheme Codes to the extent they have not been varied by a condition of this approval.

(f) Environmental Protection and Biodiversity Conservation Act 1999

The applicant is advised that referral may be required under the *Environmental Protection and Biodiversity Conservation Act 1999* if the proposed activities are likely to have a significant impact on a matter of national environmental significance. Further information on these matters can be obtained from www.dcceew.gov.au.

(g) Cultural Heritage

In carrying out the activity the applicant must take all reasonable and practicable measures to ensure that no harm is done to Aboriginal cultural heritage (the "cultural heritage duty of care"). The applicant will comply with the cultural heritage duty of care if the applicant acts in accordance with gazetted cultural heritage duty of care guidelines. An assessment of the proposed activity against the duty of care guidelines will determine whether or to what extent Aboriginal cultural heritage may be harmed by the activity. Further information on cultural heritage, together with a copy of the duty of care guidelines and cultural heritage search forms, may be obtained from www.dsdsatsip.qld.gov.au.

FURTHER DEVELOPMENT PERMITS REQUIRED

- Development Permit for Operational Work
- Development Permit for Building Work
- Compliance Permit for Plumbing and Drainage Work

SUBMISSIONS

There were no properly made submissions about the application.

RIGHTS OF APPEAL

You are entitled to appeal against this decision. A copy of the relevant appeal provisions from the *Planning Act 2016* is attached.

During the appeal period, you as the applicant may suspend your appeal period and make written representations to council about the conditions contained within the development approval. If council agrees or agrees in part with the representations, a "negotiated decision notice" will be issued. Only one "negotiated decision notice" may be given. Taking this step will defer your appeal period, which will commence again from the start the day after you receive a "negotiated decision notice".

OTHER DETAILS

If you wish to obtain more information about Council's decision, electronic copies are available on line at www.msc.qld.gov.au, or at Council Offices.

Yours faithfully



BRIAN MILLARD
SENIOR PLANNER

Enc: Approved Plans/Documents
Appeal Rights
Adopted Infrastructure Charge Notice

Approved Plans/Documents

INTERMENT TYPES

- ⓐ Interment Type A
- ⓑ FULL MONUMENTAL
- ⓒ Interment Type B
- ⓓ LAWN BEAM - PLAQUE
- ⓔ Interment Type C
- ⓕ ASH INTERMENTS
- ⓖ FUTURE COLUMBARIUM (W/ALL)

STAGE 1

- Cut and fill to the extent of Stage 1
- Entrance road up to first roundabout
- Interment Types:
 - Full Monumental (approx. 100)
 - Lawn Beam - Plaque (approx. 250)
 - Ash Interments - Future Columbarium Wall
 - Lawns to the extent of Stage 1
- Water reticulation for taps to the extent of Stage 1
- Ablution Facility
- Two stormwater overland flow path swales

Feature Legend:

- Gabion Walls
- Columbarium Wall
- Swale Drain
- Toilet
- Full Monumental
- Lawn Graves

TECHNICAL DRAWING BLOCK:

CLIENT: MAREEBA SHIRE COUNCIL
 PROJECT NAME: NEW WILKIN ROAD CENTRE 1
 DRAWING NO: S3A-05
 DATE: 16/04/2022
 PROJECT FILE: 2018

25/1/2023
B. Mill

AR000071-SK01
KURANDA CEMETERY
RESIDENTIAL LAND DEVELOPMENT
LOT 2 ON RP720837

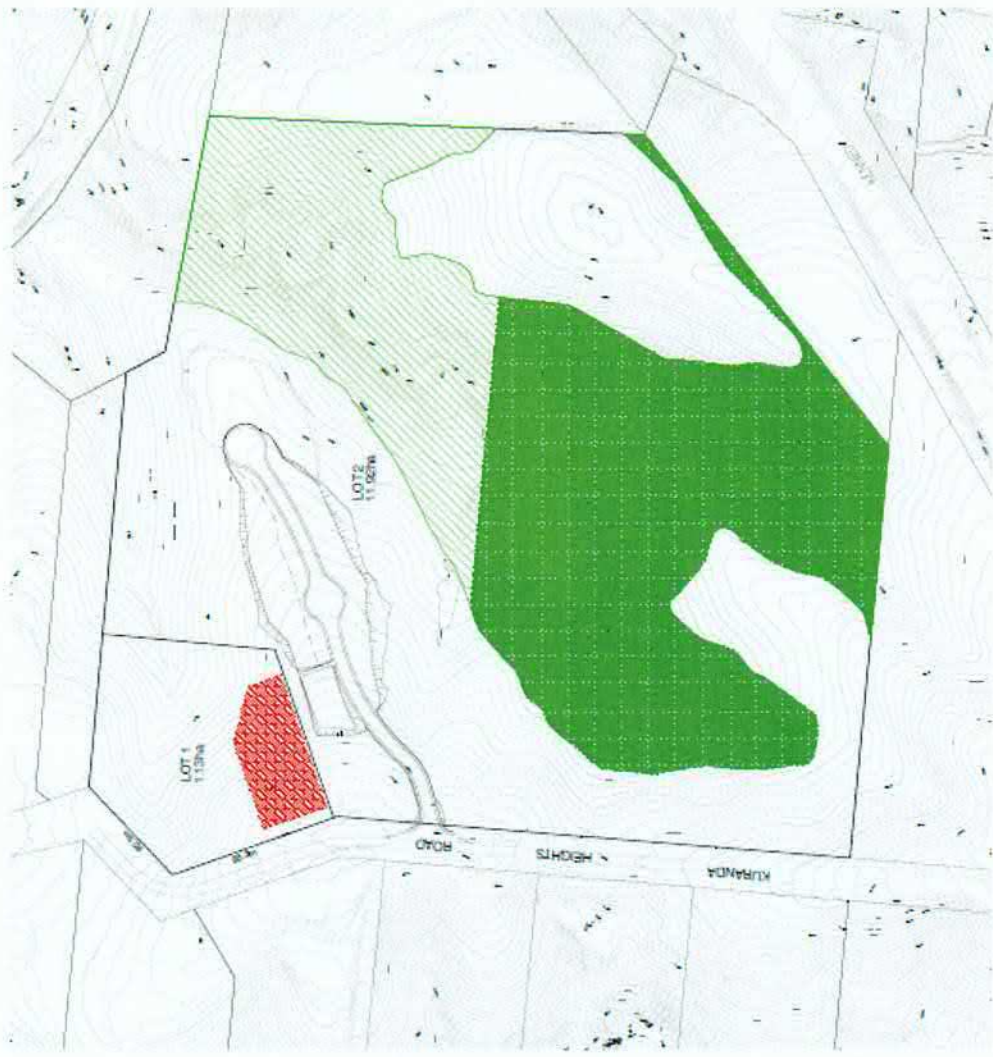
LEGEND

	ASBESTOS
	EROSION CONTROL
	PROPOSED LOT LAYOUT



AR000071-SK01
KURANDA CEMETERY
RESIDENTIAL LAND DEVELOPMENT
LOT 2 ON RP720837

PROPOSED LOT LAYOUT
AR000071-SK01
1:1000
23/06/2023



25/1/2023
B. n. [Signature]

Appeal Rights

PLANNING ACT 2016 & THE PLANNING REGULATION 2017

Chapter 6 Dispute resolution

Part 1 Appeal rights

229 Appeals to tribunal or P&E Court

(1) Schedule 1 of the *Planning Act 2016* states –

- (a) Matters that may be appealed to –
 - (i) either a tribunal or the P&E Court; or
 - (ii) only a tribunal; or
 - (iii) only the P&E Court; and
- (b) The person-
 - (i) who may appeal a matter (**the appellant**); and
 - (ii) who is a respondent in an appeal of the matter; and
 - (iii) who is a co-respondent in an appeal of the matter; and
 - (iv) who may elect to be a co-respondent in an appeal of the matter.

(Refer to Schedule 1 of the Planning Act 2016)

(2) An appellant may start an appeal within the appeal period.

(3) The **appeal period** is –

- (a) for an appeal by a building advisory agency – 10 business days after a decision notice for the decision is given to the agency; or
- (b) for an appeal against a deemed refusal – at any time after the deemed refusal happens; or
- (c) for an appeal against a decision of the Minister, under chapter 7, part 4, to register premises or to renew the registration of premises – 20 business days after a notice us published under section 269(3)(a) or (4); or
- (d) for an appeal against an infrastructure charges notice – 20 business days after the infrastructure charges notice is given to the person; or
- (e) for an appeal about a deemed approval of a development application for which a decision notice has not been given – 30 business days after the applicant gives the deemed approval notice to the assessment manager; or
- (f) for any other appeal – 20 business days after a notice of the decision for the matter, including an enforcement notice, is given to the person.

Note –

See the P&E Court Act for the court's power to extend the appeal period.

(4) Each respondent and co-respondent for an appeal may be heard in the appeal.

(5) If an appeal is only about a referral agency's response, the assessment manager may apply to the tribunal or P&E Court to withdraw from the appeal.

(6) To remove any doubt. It is declared that an appeal against an infrastructure charges notice must not be about-

- (a) the adopted charge itself; or
- (b) for a decision about an offset or refund-
 - (i) the establishment cost of trunk infrastructure identified in a LGIP; or
 - (ii) the cost of infrastructure decided using the method included in the local government's charges resolution.

230 Notice of appeal

- (1) An appellant starts an appeal by lodging, with the registrar of the tribunal or P&E Court, a notice of appeal that-
 - (a) is in the approved form; and
 - (b) succinctly states the grounds of the appeal.
- (2) The notice of appeal must be accompanied by the required fee.
- (3) The appellant or, for an appeal to a tribunal, the registrar must, within the service period, give a copy of the notice of appeal to –
 - (a) the respondent for the appeal ; and
 - (b) each co-respondent for the appeal; and
 - (c) for an appeal about a development application under schedule 1, table 1, item 1 – each principal submitter for the development application; and
 - (d) for an appeal about a change application under schedule 1, table 1, item 2 – each principal submitter for the change application; and
 - (e) each person who may elect to become a co-respondent for the appeal, other than an eligible submitter who is not a principal submitter in an appeal under paragraph (c) or (d); and
 - (f) for an appeal to the P&E Court – the chief executive; and
 - (g) for an appeal to a tribunal under another Act – any other person who the registrar considers appropriate.
- (4) The *service period* is –
 - (a) if a submitter or advice agency started the appeal in the P&E Court – 2 business days after the appeal has started; or
 - (b) otherwise – 10 business days after the appeal is started.
- (5) A notice of appeal given to a person who may elect to be a co-respondent must state the effect of subsection (6).
- (6) A person elects to be a co-respondent by filing a notice of election, in the approved form, within 10 business days after the notice of appeal is given to the person.

231 Other appeals

- (1) Subject to this chapter, schedule 1 and the P&E Court Act, unless the Supreme Court decides a decision or other matter under this Act is affected by jurisdictional error, the decision or matter is non-appealable.
- (2) The *Judicial Review Act 1991*, part 5 applies to the decision or matter to the extent it is affected by jurisdictional error.
- (3) A person who, but for subsection (1) could have made an application under the *Judicial Review Act 1991* in relation to the decision or matter, may apply under part 4 of that Act for a statement of reasons in relation to the decision or matter.
- (4) In this section –
 - decision* includes-
 - (a) conduct engaged in for the purpose of making a decision; and
 - (b) other conduct that relates to the making of a decision; and

- (c) the making of a decision or failure to make a decision; and
- (d) a purported decision ; and
- (e) a deemed refusal.

non-appealable, for a decision or matter, means the decision or matter-

- (a) is final and conclusive; and
- (b) may not be challenged, appealed against, reviewed, quashed, set aside or called into question in any other way under the Judicial Review Act 1991 or otherwise, whether by the Supreme Court, another court, a tribunal or another entity; and
- (c) is not subject to any declaratory, injunctive or other order of the Supreme Court, another court, a tribunal or another entity on any ground.

232 Rules of the P&E Court

- (1) A person who is appealing to the P&E Court must comply with the rules of the court that apply to the appeal.
- (2) However, the P&E Court may hear and decide an appeal even if the person has not complied with the rules of the P&E Court.

APPENDIX B

H2O Consults - On-site effluent disposal report

ON SITE SEWERAGE FACILITY SITE AND SOIL EVALUATION REPORT

A: SITE EVALUATOR

Name: Shane Barnes

Signature:



Date: 19.11.2022

B: SITE INFORMATION (desk-top evaluation)

Location Details,

Locality: New Kuranda Cemetery, Kuranda Heights Road.

Owner: Mareeba Shire Council

Phone No:

Survey Plan Details: RP730337

Lot No: 2

Local Government: Parish:

County:

Site Plan Details Attached, Ref. No. or Description: Proposed Cemetery with Ablutions

Refer to Site Plan

Soil Type from Soil Maps etc: N/A

Climate

Annual Rainfall: 2028 mm

Annual Potential Evapotranspiration: 2239 mm

Existing Water Supply Source:

Town Water Supply

Rainwater (Roof Collection)

Dam

Bore/Well

Other

SITE AND SOIL EVALUATION REPORT

C: SITE ASSESSMENT

Topography

Slope: **Varies across the site.**
Shape: **Varies Across the Site**
Ground Cover: **Grassed areas and large vegetation to South/East Boundaries.**
Exposure: **Great**
Drainage Patterns: **Refer Site Plan**

Available Clearances: (Site Plan details attached)

Boundaries: **4 Meters minimum from All Boundaries**

Wells, Bores: **Nil accounted during inspection**

Watercourse: **50 Meters Available**

Stands of Trees, Shrubs: **50 Meters Available**

Buildings: **2-4 Meters from All Buildings**

Other: _____

Site History (Land Use): **Pasture**

Environmental Concerns: **Barron River Catchment
and Intermittent Drainage Paths.**

Site Stability:

Is expert Evaluation Necessary? **Yes / No**

If Yes, attach stability report and give details here of:

Author: _____ Designation: _____

Company: _____ Date: _____

Drainage Controls

Depth of Seasonal water table:

WINTER: **N/A** SUMMER: **N/A**

Need for groundwater cut-off drains? **Yes / No**

Need for surface water collection / cut-off drains? **Yes / No**

Availability of Reserve / Setback Areas

Reserve Area available for disposal: **100%** of design area:

Evaluator's Photographs attached **Yes / No (Available if required)**

SITE AND SOIL EVALUATION REPORT

D: SUBSOIL INVESTIGATION

Soil Profile Determination

Soil classification has been determined from site investigations carried out by H2O Consultants on site Permeameter test.

Soil Description:	Clay Loam
Soil Category:	4
Structure:	Moderate
Coarse Fragments:	Nil
Measured Permeability	P1 = 0.84
Average K sat:	0.5 to 1.5 m/day
Design Irrigation Rate:	3.5m/day
Design Loading Rate:	15mm/day
Design Mound Loading Rate:	16mm/day

Estimated Soil Category:

Soil Category	Description	Tick One
1.	Gravels and Sand	
2.	Loamy Sand	
3.	Sandy Loams	
4.	Loams	
5.	Clay Loams	<input checked="" type="checkbox"/> 0.2m – 2.4m
6.	Light Clays	
7.	Medium to Heavy Clays	

Reasons for placing in Stated Soil Category: **On Site Test/Assessment**

Reasons for Design Loading Rate (DLR) recommendation:

Based on Test and have assumed DLR of 15 to AS 1547:2012 - Table L1

General Comments

Need for Groundwater Quality Protection: **Yes / No**

Type of Land Application Facility considered best suited to site:

Primary Waste Water Treatment (Septic Tank) with Absorption Trench as disposal

Evaluator's preliminary assessment of minimum Land Application Area for the site:

70m² of 600mm Deep Absorption Bed

Estimated Daily Flow: **Maximum Demand is 200 litres per day**

Planning Guidelines for Water Supply and Sewerage 2010

PRIMARY TREATMENT AND DISPOSAL SEPTIC TANK AND ABSORPTION BED DISPOSAL

1. ABSORPTION AREA OR TRENCH

$$Aw = Q / DLR$$

Aw = wetted area in square meters

Q = daily flow in litres

DLR = Design Loading Rate in mm per day

$$Aw = 200 / 15$$

Aw = 13m² of wetted area required

2. LENGTH OF TRENCH

$$L = Aw / B$$

L = trench length in meters

Aw = wetted area in square meters

B = trench width in meters

$$L = 13 / 0.6$$

L = 22 meters (2 x 11m Long) of 600mm wide x 600mm deep absorption trench.

or

7 meters long x 2.0m wide x 600mm deep Absorption Bed.

3. CONCLUSION

Areas are available on-site for this amount of absorption trenches plus 100% replacement

**THIS METHOD OF TREATMENT IS VIABLE
SETBACK DISTANCES MUST BE MAINTAINED,
REFER TO OVERALL SITE PLAN**

Minimum Setback Distances

Available Clearances:	Boundaries	2m	<input checked="" type="checkbox"/>
	Building Footings	2m	<input checked="" type="checkbox"/>
	Recreation Areas	4m	<input checked="" type="checkbox"/>
	Inground Swimming Pools	6m	<input checked="" type="checkbox"/>
	Inground Water Tank	6m	n/a

Setback distances for subsurface land application area			
Feature	Horizontal separation distance (meters)		
	Up Slope	Down Slope	Level
Distance from the edge of trench / bed excavation or subsurface irrigation distribution pipework to the nearest point of the feature			
Property boundaries, pedestrian paths, footings of buildings, walkways, recreation areas, retaining wall footings.	2	4	2
In ground swimming pools	6	6	6
In ground potable water tank	6	6	6

Setback distances for onsite sewerage facilities			
Feature	Primary Effluent	Secondary Effluent	Advanced Secondary Effluent
Top of bank of permanent water course. Top of bank of intermittent water course. Top of bank of a lake. Top water level of a surface water source used for agriculture, aquaculture or stock purposes. Easement boundary of unlined open stormwater drainage channel or drain. Bore or dam used or likely to be used for human and or domestic consumption.	50m	30m	10m
Unsaturated soil depth to a permanent water table (vertically)	0.3m	0.6m	1.2m

NOTICE TO LAND OWNER

OPERATION AND MAINTENANCE: GENERALLY

On-site sewerage treatment plants and the associated land application facilities are complex systems that are prone to failure if operated and maintained incorrectly. All on-site sewerage facilities require a high degree of user dedication in terms of operation and maintenance to ensure that the design performance of the facility is achieved for the expected life of the facility.

All on-site sewerage facilities or components of the facility have a finite life. For instance, septic tanks may have an expected life of 25 years, whilst the associated land application facility may have an expected life of 5 to 15 years depending on the nature of the specific site.

OPERATION & MAINTENANCE PROCEDURES

Operation and maintenance procedures are undertaken to a regular schedule appropriate to the nature and type of treatment and land application facility and in accordance with any manufacturer's instructions; and

Continuity of operation and maintenance is achieved throughout changes of ownership and/or changes in use or development of the site.

OPERATION

- Practice water conservation and avoid exceeding the hydraulic capacity of the facility.
- Minimise the input of cleaning agents, detergents, disinfectants, bleaches, alkalis, oil, petrol, acids, degreasers, photography chemicals, cosmetics, lotions, pesticides and herbicides into the facility.
- Not place materials such as disposal nappies, female napkins, paper towels, cigarette butts, bones and coffee grounds into the facility.
- Be observant regarding signs of unsatisfactory performance, including unusual odours, leaks from the facility or choking.
- Contact the service agent following observation of unsatisfactory performance or breakdown.
- Protect facility components from structural damage, such as from vehicles.
- Be familiar with safety procedures.
- Establish a time pattern of desludging.
- Keep the area in the vicinity of the on-site sewerage facility tidy to facilitate ease of operation and maintenance.
- Where appropriate, or required by a condition of approval, enter into an annual service contract with a service agent
- Retain copies of all service reports.

LAND APPLICATION SYSTEMS

Regular visual checking of correct system operation by households, and an annual inspection by service contractors should be undertaken. Signs of system failure include:

- Surface ponding and run-off of treated effluent;
- Degrading of soil structure (Sheet or Rill erosion, surface crusts, hard surface)
- Poor Vegetation growth; and
- Unusual odours

PROPOSED ABLUTIONS BUILDING
OPTION B

PROPOSED ABLUTIONS BUILDING
OPTION A



GENERAL NOTES:

1. ALL WORK TO BE CONSTRUCTED IN ACCORDANCE WITH THE NATIONAL PLUMBING AND DRAINAGE CODE AS 3500 AND OTHER RELEVANT AUSTRALIAN STANDARDS.
2. CONTRACTOR TO CHECK INTERPRETATION OF BYLAWS WITH COUNCIL.
3. THESE DRAWINGS TO BE READ IN CONJUNCTION WITH THE ARCHITECT AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS.
4. CONTRACTOR TO VERIFY THE ACCURATE LOCATION OF ALL EXISTING SERVICES, SURFACE LEVELS, INVERT LEVELS AND COVER OVER WASTE DRAINAGE LINES ARE CORRECT AND OBTAINABLE BEFORE THE COMMENCEMENT OF WORK ON SITE. THE CONSULTANT IS TO BE ADVISED OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF WORK.
5. CONCEAL ALL PIPEWORK WHERE POSSIBLE.
6. ALL PIPES LAID UNDER SLAB TO BE MINIMUM DEPTH OF 400mm TO INVERT LEVEL AND SHALL BE 100mm DIA. U.N.O.
7. CONTRACTOR TO PROVIDE AS CONSTRUCTED DRAWINGS TO THE ARCHITECT ON COMPLETION OF THE CONTRACT. AS CONSTRUCTED DRAWINGS ARE TO SHOW ALL DIMENSIONS FROM FIXED OBJECTS AND LEVELS FROM FINISHED SURFACE LEVELS.

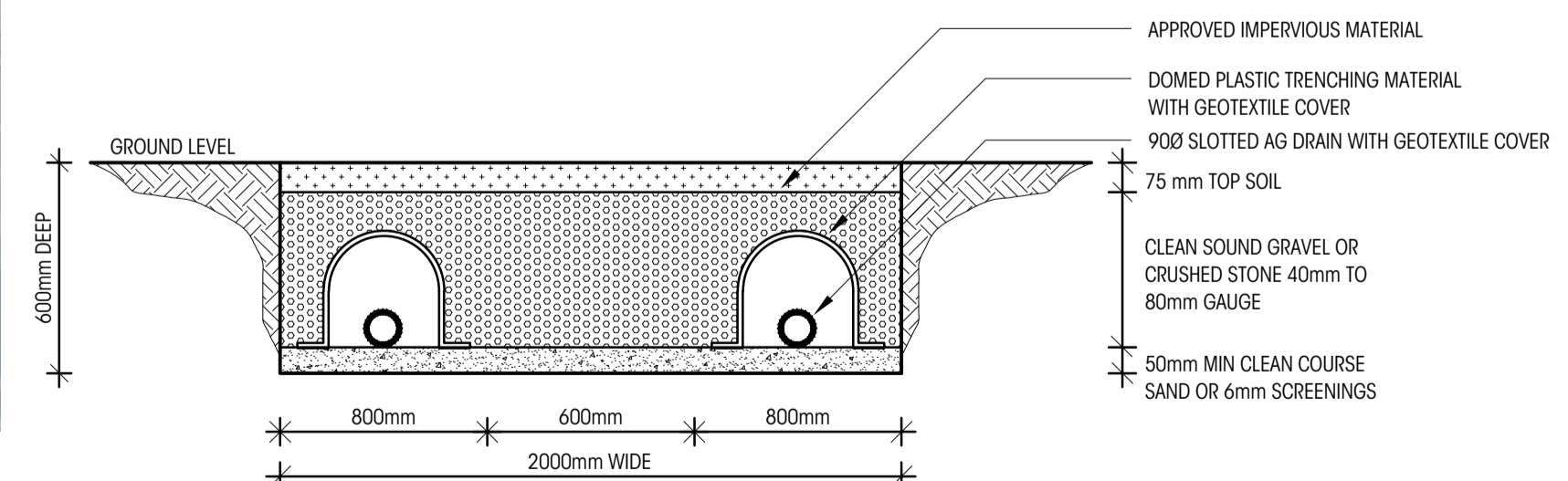
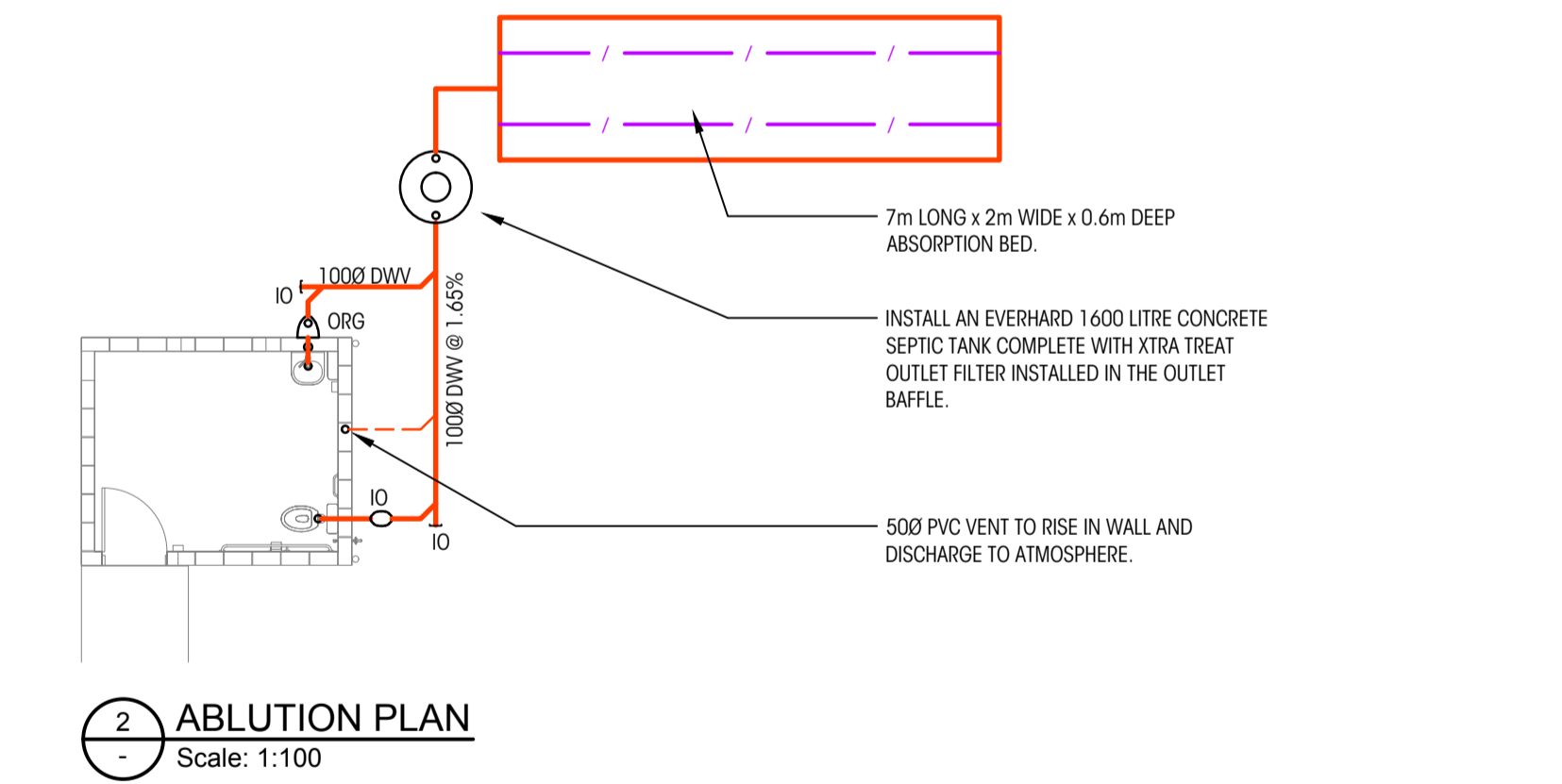
SANITARY PLUMBING AND DRAINAGE:

1. ALL DRAINAGE SHALL BE 100mm DIA. UPVC RUN AT MINIMUM GRADE OF 1.65% (1:60) U.N.O.
2. ALL VENT PIPES TO TERMINATE IN ACCORDANCE WITH AS 3500 2.2 SECTION 6.7.4.
3. ALL IO'S UNDER CONCRETE TO BE TAKEN TO SURFACE LEVEL AND FITTED WITH APPROVED SCREW CAP.
4. ALL FWG'S SHALL HAVE 100mm DIA RISERS AND REMOVABLE SCREW GRATES.
5. WHERE PVC PIPES PENETRATE OR ARE BUILT INTO WALLS OR SLABS THE PIPES SHALL BE LAGGED WITH APPROVED MATERIAL IN ACCORDANCE WITH AUSTRALIAN STANDARDS.
6. MAXIMUM DISTANCE OF UNVENTED BRANCH DRAIN IS 10 METRES TO FIXTURES, ORG'S OR DG'S.
7. MATERIALS: DRAINAGE, SOIL, WASTE & VENT PIPES & FITTINGS: UPVC CLASS 'DWV' TO AS 1260 FITTED WITH FIRESTOP COLLARS WHERE REQUIRED TO AS1530.4 OR COPPER TYPE 'D' TO AS 1432.
8. ALL WC'S TO BE SCREW FIXED TO FLOOR WITH NYLON PLUGS AND NON-CORROSIVE METAL SCREWS.
9. ALL DISCHARGE PIPES RECEIVING CONDENSATE WASTE INCLUDING TRAPS SHALL BE INSULATED.

NOTE:

ALL WORK TO BE CARRIED OUT IN ACCORDANCE WITH THE LOCAL AUTHORITY REQUIREMENTS AND THE FOLLOWING CODES:
 * AS 3500 - NATIONAL PLUMBING & DRAINAGE CODE
 * AS 1546 - SMALL SEPTIC TANKS
 * AS 1547 - DISPOSAL SYSTEMS FROM DOMESTIC PREMISES
 * CODE OF PRACTICE FOR ON-SITE SEWERAGE FACILITIES

Feature	Separation Distance (metres)		
	Advanced Secondary	Secondary	Primary*
For onsite -			
For greywater -	High	Medium	Low
Top of bank of permanent water course; or Top of bank of intermittent water course; or Top of bank of a lake, bay or estuary or; Top water level of a surface water source used for agriculture, aquaculture or stock purposes or; Easement boundary of unlined open stormwater drainage channel or drain.	10	30	50
Bore or a dam used or likely to be used for human and or domestic consumption			
Unsaturated soil depth to a permanent water table (vertically)	0.3	0.6	1.2



3 EVAPOTRANSPIRATION - ABSORPTION AREA DETAIL
NOT TO SCALE

1 SITE PLAN
Scale: 1:500

FOR INFORMATION

DATE	REV	AMENDMENT	CHKD
28.11.2022	P1	PRELIMINARY ISSUE	

REFERENCE COORDINATION DRAWINGS			
DESCRIPTION	DRAWING NO.	REV	CHKD
ARCHITECTURAL DRAWING	X		SB

HYDRAULIC ENGINEER - QBCC 745652

PROJECT
NEW KURANDA CEMETERY
KURANDA HEIGHTS ROAD
KURANDA, QLD
CLIENT
MAREEBA SHIRE COUNCIL

DATE	OCT 2022	DRAWN	SB
SCALE	1:500	CHECKED	SB
SHEET SIZE	A1	APPROVED	SB
CAD FILE	1Drive\Projects\22177 - Kuranda Cemety		

TITLE		
HYDRAULIC SERVICES		
SITE PLAN		
EFFLUENT DISPOSAL		
PROJECT NO.	DRAWING NO.	REVISION
22177	H01	1

APPENDIX C

Geotechnical Report

ARO INDUSTRIES

KURANDA CEMETARY - GEOTECHNICAL INVESTIGATIONS REPORT



February 2023

1. INTRODUCTION

The design of the access road contained within the proposed Kuranda Cemetery and ancillary items are being undertaken on behalf of Mareeba Shire Council.

This Geotechnical Report provides:

- An overview of the Site, location, and proposed works
- Details of the field work undertaken
- Geotechnical design parameters for the construction of footings for the beam structure for headstone plates.
- Advice relating to any gravel, boulders, bedrock, soft ground conditions or the like at the site that may affect design and / or construction works; and,
- The outputs from geotechnical modelling of the road batters and retaining structures.

1.1. Site Location

The site is location on Lot 2 RP730337 and is accessed by Kuranda Heights Road, Kuranda. Figure 1 illustrates the location of the allotment.



Figure 1 – Site Location

2. SITE INVESTIGATIONS

Field investigations were completed on 13 October 2022 in the form of four (4) test pits and five (5) Dynamic Cone Penetrometer tests (DCP). The test pits and DCP locations are illustrated on Figure 2.

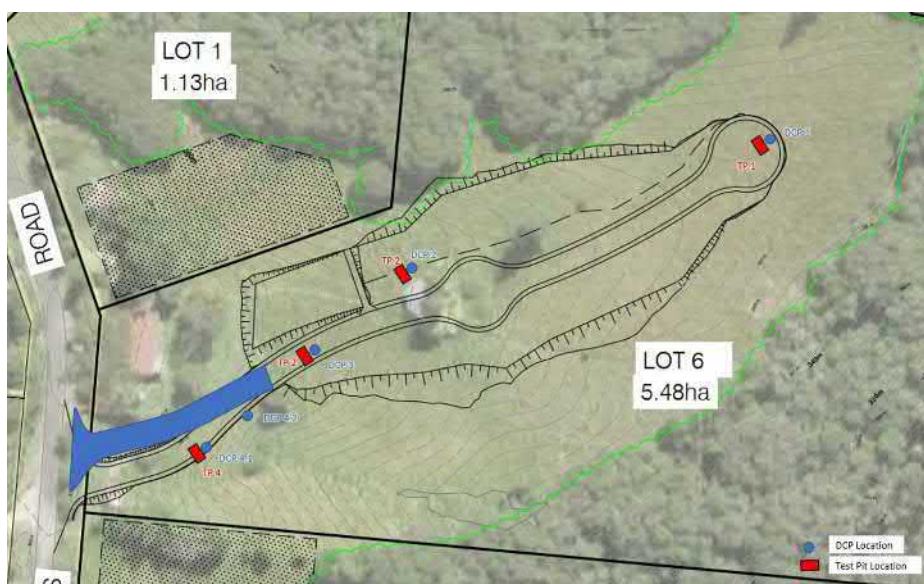


Figure 2 – Test Pit and DCP Test Location

2.1. Dynamic Cone Penetrometer Testing

The DCP testing was undertaken by an ARO Industries Geotechnical Engineer. The DCP logs are included in Appendix A. The DCP's were undertaken at the location of the corresponding test pits prior to the excavation of the test pits.

2.2. Test pits

The test pits were excavated using a backhoe with a 600mm toothed bucket. The test pits were excavated to depth of refusal. This was between 2m and 2.4m across the four test pits. Samples of each soil layer identified in each test pit were collected and tested for their Atterberg Limits. The results are documented in Appendix A.

2.3. Subsurface Conditions

The sub-surface conditions encountered in the test pits can be summarised as:

Loamy Topsoil:	Loose, Dry, Brown loam (0mm-300mm)
Firm Clayey Silt (residual soil):	Firm, Dry, Clayey Silt with traces of sand (300mm-1600mm)
Ex. Low Strength Mudstone:	Mottled Grey/Brown, easily ripped with B/Hoe (1500mm-2400mm)
Very Low Strength Mudstone:	Grey/Brown, able to be ripped with Backhoe (1900mm-2400mm+)

Table 1 – Subsurface conditions

Soil Condition	Depth of Layer			
	Test Pit 1	Test Pit 2	Test Pit 3	Test Pit 4
Loamy Topsoil	GL to 0.3m	GL to 0.3m	GL to 0.3m	GL to 0.3m
Firm Clayey Silt (residual soil)	0.3m - 1.5m	0.3m - 1.4m	0.3m - 1.5m	0.3m - 1.4m
Extremely Weathered Mudstone Extremely Low Strength	1.5m - 1.9m	1.4m - 1.9m	1.5m – 2.4m	1.4m – 2.4m
Distinctly Weathered Mudstone Very Low Strength	1.9m+	1.9m+	2.4m+	2.4m+

Figure 3 below illustrates the soil types encountered in the test pits.

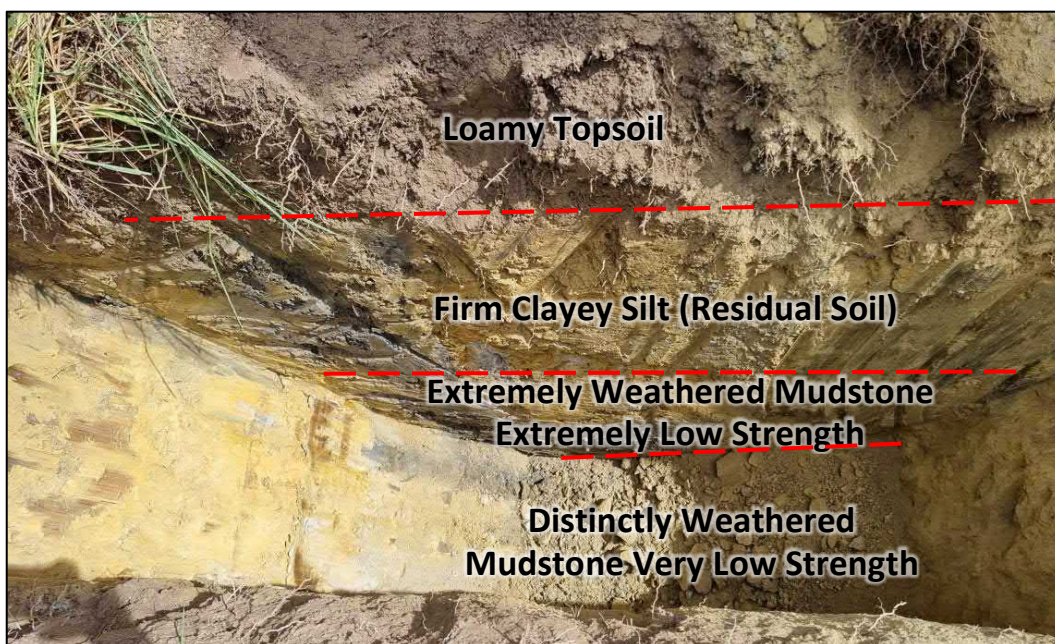


Figure 3 – Soil layers identified.



Figure 4 – Close photo of the distinctly weathered mudstone.

3. LABORATORY TESTING

3.1. Atterberg Testing / Classification

Five (5) Atterberg Limit tests were undertaken by Mareeba Shire Council’s Soil Technicians on the soils identified in the four (4) test pits excavated as part of the geotechnical investigations. The results indicated, the fines components of the soils, were low plasticity silts and clays. CBR testing was also undertaken on the residual soil material identified in each test pit. The results are tabulated in Table 2 below and lab reports are attached in Appendix B.

Table 2: Atterberg and CBR Test Results

	Test Pit 1 - 0.3-1.5	Test Pit 2 - 0.25-1.4	Test Pit 3 - 0.3-1.5	Test Pit 4 - 0.3-1.4	Test Pit 4 - 1.4-2.3
Test Pit:	1	2	3	4	4
Sample Depth:	0.3-1.5	0.25-1.4	0.3-1.5	0.3-1.4	1.4-2.3
Sample Location:	70 Kuranda Heights Road				
Report No.	1-000-100-553				
CBR (%):	6	9	6	8	-
Liquid Limit (LL) (%):	36	38	38	37	42
Plastic Limit (PL) (%):	24	25	25	21	29
Plasticity Index (PI) (%):	12	13	13	16	13
Linear Shrinkage (%):	5.5	7	8	10	6
USCS Classification:	ML	ML	ML	CL	ML

3.2. California Bearing Ratio

A Californian Bearing Ratio (CBR) test was undertaken on the second soil material layer from each test pit (Firm Clayey Silt). The CBR tests returned values of between 6.0% and 9.0%.

A design CBR of 6% has been adopted for design.

3.3. Rock Testing

Samples of the distinctly weathered mudstone were obtained from the test pits, as ripped material, recovered by the backhoe bucket. Samples were generally able to be fractured/broken by hand.

The rock has been categorised as having Very Low (VL) strength.

4. ENGINEERING ADVICE

4.1. Site Preparation and Earthworks

It is anticipated that excavation of existing site material will be able to be completed with traditional earthmoving equipment.

Site investigations indicate that the excavated material will be a clayey silt with extremely weathered mudstone of extremely low strength at depths beyond around 1.5m and distinctly weathered mudstone of low strength at depths beyond around 2.4m.

Where onsite filling is required, the following site preparation measures should be considered:

- Stripping and grubbing of the site to remove all vegetation from the site surface.
- Environmentally significant vegetation should be noted, and advice sought regarding their removal if deemed necessary.
- Depressions in the surface resulting from the removal of vegetation should be filled and compacted in layers with clean, engineered fill.
- Excavate and removal of structurally poor material.
- Compaction of subgrade level will aid in identification of poor material.
- Fill should be placed and compacted in layers not exceeding 200mm in thickness.
- Using the standard compaction method, a density ratio of at least 95% is recommended. Imported clean fill should have a CBR greater than 15% and a plasticity index of less than 10.
- Earthworks are completed in accordance with AS3798-2011 and the works are supervised by a suitably qualified person.

4.2. Footings & Site classification

No details of the footings or the structural loading for the proposed amenity's structure have been provided to ARO at the present time. It is expected that the footings will be a high-level footing. All geotechnical comments provided in this report are provided on this basis. It is understood that the header beams require deep foundations to prevent collapse when excavations occur around the structure.

All footing excavations should be inspected by a geotechnical engineer, to confirm the ground conditions are consistent with those on which these design guidelines are based.

Although not explicitly related to the type of infrastructure proposed, the site under investigation is identified as a "Class S" site, in accordance with AS2870-2011 'Residential slabs and footings'. Footing design should consider the below recommendations.

Shallow Footings

Pad and strip-footings shall be founded minimum of 450mm into the extremely weathered claystone and designed using the parameters as specified in Table 3.

Table 3: Shallow footing design parameters

Material	Unit Weight (kN/m ³)*	Internal Friction Angle ϕ' (°)	Effective Cohesion c' (kPa)	Allowable Vertical Bearing Pressure (kPa)**
Loamy Topsoil	17	28	0	NR
Firm Clayey Silt (Residual soil)	18	28	2	50 [#]
Extremely Low Strength Extremely Weathered Mudstone – Remoulds to Firm Clayey Silt	20	30	3	75 [#]
Very Low Strength – Distinctly Weathered Mudstone	20	30	5	250 ^{##}

* Indicative Unit Weight

** Derived from DCP testing undertaken and consideration of specific literature as indicated

[#] Sivakugan, N. and Das, B., 2010. Geotechnical Engineering. Ft. Lauderdale, FL: J. Ross Pub., p.293.

^{##} Sivakugan, N., Shukla, S. and Das, B., 2013. Rock Mechanics. 1st ed. Boca Raton, FL, USA: Taylor & Francis Group, p.225. With applicable factor of safety.

Shallow Foundations

Footings founded in the firm clayey silts may be designed for an allowable bearing pressure of 50kPa (to be confirmed on inspection by a competent and experienced geotechnical engineer). The base of all pad and strip footings founding in the Firm Clayey Silt should be individually recompacted using a vibrating plate compactor prior to placement of reinforcing steel and concrete as soils may be loosened during the excavation process by machinery action.

Given the properties of the founding materials it is recommended that the footings be poured as soon as possible following excavation, to minimise the potential for desiccation/wetting up of the founding material. Where the footings cannot be poured (within a short period of time) it is recommended that a blinding layer of concrete, at least 50mm thick, be placed immediately following excavation, cleaning and inspection of the footing base.

Deep Foundations

High level pad or strip footings are NOT recommended for the header beam due to the requirement of adjacent excavation for burial sites. It is recommended that the header beams be founded on deep foundations to avoid the potential of differential settlement, and potential collapse following excavation and limited compaction once refilled.

Bored piers are considered suitable for the site. Instability of the bore within the residual soil layer and weathered rock layers is not expected to require casing/ lining.

It is recommended that the deep foundations used on this project be designed in accordance with AS 2159-2009 Piling - Design and installation.

5. PILE DESIGN

5.1. Vertical Loading

A factor of safety of 2.5 has been applied to the ultimate values to reduce them to working stress values.

The overall design average risk rating (ARR) was assessed in accordance with Australian Standard – “AS2159: Piling – Design and Installation”. A geotechnical strength reduction factor (ϕ) of 0.45 has been applied for the site, for the design and installation risk factors anticipated.

Pier footings shall be founded minimum of two times the diameter (2D) of the bored pier into the distinctly weathered mudstone and designed using the parameters as specified in Table 4.

Calculated ultimate skin friction and end bearing pressure for the materials encountered are presented in Table 3. The ultimate skin friction and end bearing pressure for the soils have been derived using the Decourt, L. (1995) method as well as reference to values for the rock type identified documented in relevant literature.

Table 4: Deep footing design parameters

Material	Unit Weight (kN/m ³)*	Internal Friction Angle ϕ' (°)#	Effective Cohesion c' (kPa)	Allowable Shaft Adhesion (kPa)	Allowable Vertical Bearing Pressure (kPa)
Loose Loamy Topsoil	17	26	0	- [†]	Not Recommended
Firm Clayey Silt (Residual soil)	18	28	2	-	Not Recommended
Extremely Low Strength Extremely Weathered Mudstone – Remoulds to Firm Clayey Silt	20	30	3	7.5**	75**
Very Low Strength – Distinctly Weathered Mudstone	20	30	5	7.5**	250##

* Indicative Unit Weight

Sivakugan, N. and Das, B., 2010. *Geotechnical Engineering*. Ft. Lauderdale, FL: J. Ross Pub., p.293 & p.263.

Sivakugan, N., Shukla, S. and Das, B., 2013. *Rock Mechanics*. 1st ed. Boca Raton, FL, USA: Taylor & Francis Group, p.225.

** Adopted from Decourt Method utilising correlation between DCP results and SPT (N_{60}) and applicable strength Reduction Factor.

The above parameters are for single piers/piles. If piers/piles are spaced closer than three diameters a reduction factor (Group Efficiency Ratio) may apply

5.2. Uncontrolled Fill

Uncontrolled fill was not identified on site.

5.3. Ground Conditions

It is noted that no obvious issues were noted on site regarding the ground conditions. It is anticipated that excavation of existing site material will be able to be completed with traditional earthmoving equipment. If deep excavations (beyond 2.0m) deep, are used specialist earthmoving equipment, such as rock breaker attachments, may be required to excavate the foundations.

- The following advice relates to ground conditions within the top 2.0m of material:
- Excavation of existing site material will produce coarse silty mudstone (refer Figure 5).
- Soft ground conditions are not expected.
- Competent (non-rippable) bedrock is not expected.
- Boulders are not expected to be located.
- The water table is not expected to be observed.



Figure 5 – Expected material to be recovered from excavation (test pit 3)

6. CONSTRUCTION INSPECTIONS

Through the construction of the proposed footing, inspections by a suitably qualified and experienced geotechnical engineer are required to be undertaken to confirm design assumptions.

7. SUMMARY

A geotechnical investigation of the site was undertaken to provide design parameters for footings for ancillary structures and gravestone header beams for the Kuranda Cemetery.

The findings can be summarised as:

1. Although not explicitly related to the type of infrastructure proposed. The site is classified as a “Class S” site in accordance with AS2870-2011 ‘Residential slabs and footings’.
2. The subsurface investigation identified distinctly weathered rock between 2.0m and 2.4m below the natural surface.
3. Design parameters for shallow foundations are provided in Table 3 and deep foundations in Table 4 of this report.
4. For road design, a subgrade CBR value of 6% can be adopted on the provision that the 300mm of topsoil identified is stripped.

8. REFERENCES

Australian Standard AS 2159-2009 “*Piling – Design and Installation*”, Standards Australia

Ampadu, Samuel & Ayeh, Felix & Boadu, Fred. (2018). *Deriving SPT N-Values from DCP Test Results: The Case of Foundation Design in a Tropical Environment*. Geotechnical and Geological Engineering. 36. 10.1007/s10706-018-0480-4.

Decourt, L. (1995), Prediction of load settlement relationships for foundations on the basis of the SPT-T, Ciclo de Conferencias Internacionales, “Leonardo Zeevaert”, UNAM, Mexico, 85-104

Gill, S. A. (1980). Design and construction of rock cassettes. In International Conference of Structural Foundations on Rock, Sydney (pp. 241–252). Rotterdam: A. A. Balkem

Hencher, S. (2017), “Practical Rock Mechanics”, CRC Press LLC

Pells, P.J.N., Douglas, D.J., Rodway, B., Thorne, C., and McMahon, B.K., (1978), “Design Loadings on Foundations on Shale and Sandstone in the Sydney Region”, Australian Geomechanics Journal.

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Tomlinson, MJ and Woodward, J, “Piling – Design and Construction Practice”, 5th edition, Taylor, and Francis, 2008

Singh, B., & Goel, R. (2011). Rock mass classification (pp. 270-279). Amsterdam: Elsevier.

Ampadu, Samuel & Ayeh, Felix & Boadu, Fred. (2018). *Deriving SPT N-Values from DCP Test Results: The Case of Foundation Design in a Tropical Environment*. Geotechnical and Geological Engineering. 36. 10.1007/s10706-018-0480-4.

9. LIMITATIONS AND ASSUMPTIONS

- ARO Industries Pty Ltd have prepared this report for the use of the Clients, for design and construction purposes in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made as to the professional advice included in this report.
- This report has not been prepared for use by parties other than the Client or their design consultants, i.e., Architect & Civil/Structural Engineers.
- The report has been based on project details as provided to us at the time of the commission. It therefore applies only to the site investigated, and to a specific set of project requirements, as understood by ARO Industries Pty Ltd.
- If there are changes to the project, you need to advise us. This allows the effect of the changes, so advised, to be adequately assessed against the prior report recommendations.
- It is important to remember that the subsurface conditions described in the report represent the state of the site at the time of investigation, and in the locations tested. Natural processes and the activities of man can result in changes to site conditions. For example, ground water levels can change, or fill can be placed on a site after the investigation is completed. If there is a possibility that conditions may have changed with time, ARO Industries Pty Ltd should be consulted to assess the impact on the recommendations of the report.
- The site investigation only identifies the actual subsurface conditions at the location and time when the samples were taken. Geologists and engineers then extrapolate between the investigation points to provide an assumed three-dimensional picture of the site conditions.
- The report assumes that the site conditions as identified at the investigation locations are representative of the actual conditions throughout an area. This may not be the case and actual conditions may differ from those inferred to exist. This will not be known until construction has commenced. Your geotechnical report and the recommendations contained within it can therefore only be regarded as preliminary. In the event that conditions encountered during construction are different to those described in the report, ARO Industries Pty Ltd, should be consulted immediately. Nothing can be done to change the actual site conditions which exist; however, steps can be taken to reduce the impact of unexpected findings.
- This report should be retained as a complete document and should not be copied in part, divided or altered in any way.
- It is recommended that ARO Industries Pty Ltd is retained during the construction phase to confirm that conditions encountered are consistent with design assumptions. These assumptions and limitations have been listed help all parties involve recognise their individual responsibilities.

APPENDIX A

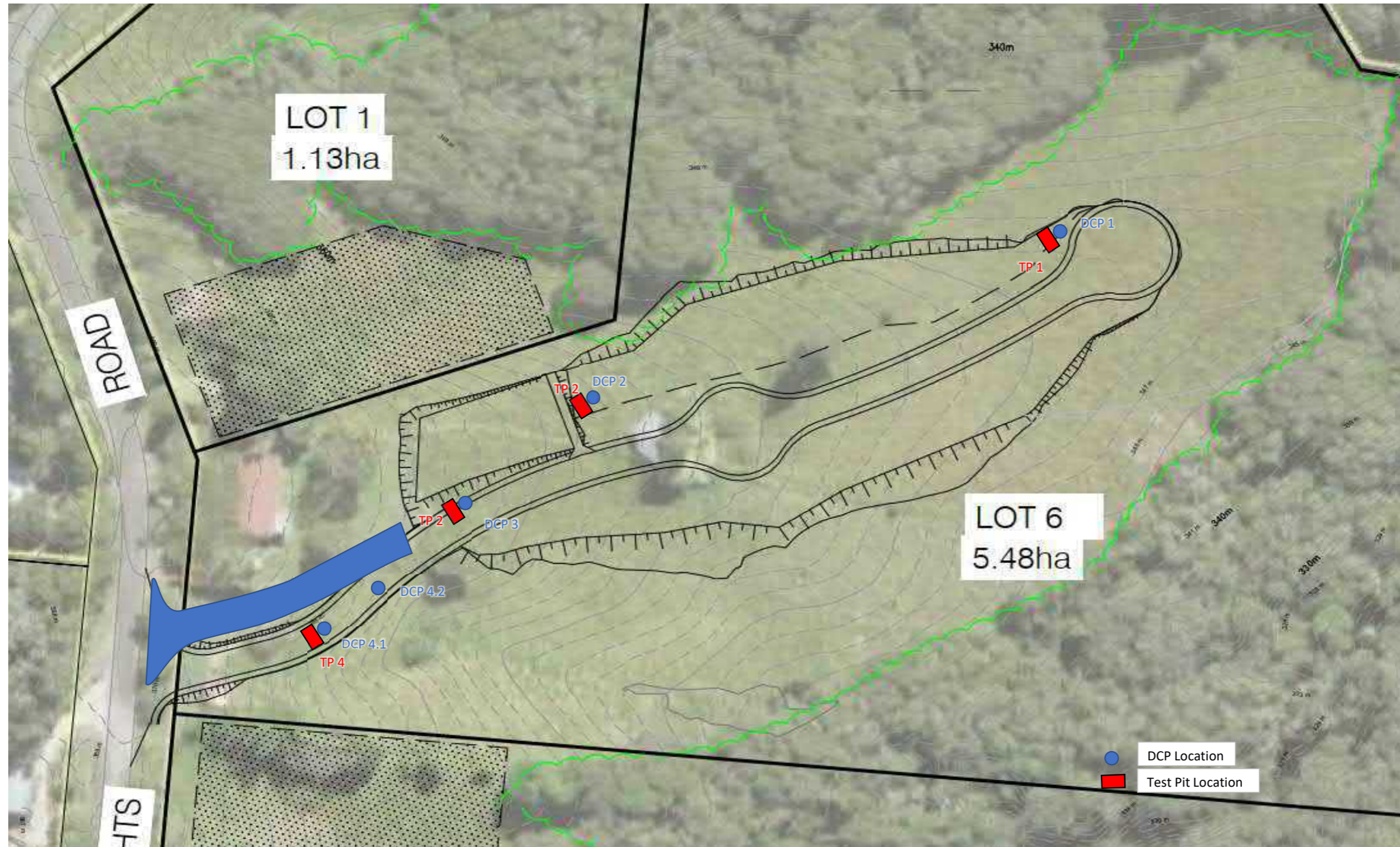
Test Pit Field Investigation Logs and DCP Log

SITE TESTING DATA SHEET - LOCATION AND PHOTOGRAPHIC EVIDENCE



Client Mareeba Shire Council
Project No. ARO0231
Project Kuranda Cemetary
Location 70 Kuranda Heights Road

Date 13/10/2022
TP: TP1
TP2
TP3
TP4



SITE TESTING DATA SHEET

Client: Mareeba Shire Council
 Project No.: AR00231
 Project: Kuranda Cemetary
 Location: 70 Kuranda Heights Road
 Date: 13/10/2022

TP: TP4
 DCP: DCP1
 Pit Depth: 2.4m
 Machine: Case 590 Super N
 Bucket Type: 600mm Toothed

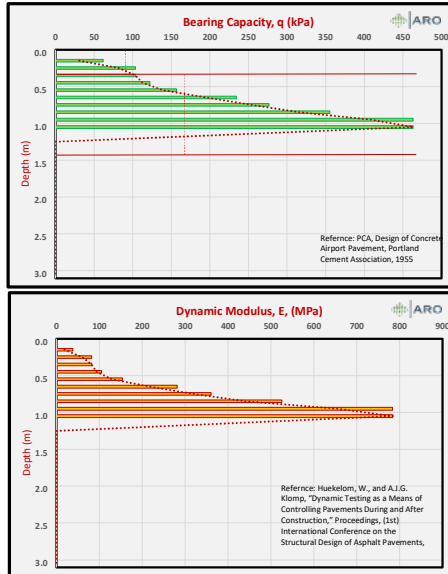
Test Pit 1			Sampling and In-Situ Testing			Dynamic Penetrometer Test (Blows / 300mm)																					
Depth (m)	Water Level	Description of Strata	Graphic Log	Pen	Blow	Blow Data (Blows/300mm)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15						
0.0		Loamy Top soil	[Graphic Log]	D	0.3m	B	2																				
0.1	Dry						4																				
0.2	Dry						4																				
0.3	Dry						4																				
0.4	Firm						5																				
0.5	Firm						7																				
0.6	Firm						12																				
0.7		Clayey Silt with Trace amounts of Sand	[Graphic Log]	D	1.5m	B	15																				
0.8	23																										
0.9	30																										
1.0	30																										
1.1																											
1.2		Residual Soil - Clayey Silt with traces of sand	[Graphic Log]	D	1.5m	B	15																				
1.3	23																										
1.4	30																										
1.5	30																										
1.6		Extremely Weathered Mudstone V. Low Strength	[Graphic Log]	D	1.9m	B	15																				
1.7	23																										
1.8	30																										
1.9																											
2.0																											
2.1																											
2.2																											
2.3																											
2.4																											
2.5																											
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3.6																											
3.7																											
3.8																											
3.9																											
4.0																											

RIG: _____
 LOGGED BY: RR _____
 REMARKS: DCP Test only

A Auger
 B Bulk Sample
 BLK Block Sample
 C Core Drilling
 D Disturbed Sample
 E Environmental Sample
 G Gas Sample
 P Piston Sample
 U_s Tube Sample (xmm dia)
 W Water Sample

Water Seepage
 Water Level
 PID Photo Ionisation detector (ppm)
 PL(A) Point Load Axial test (50 MPa)
 PL(D) Point Load Diametral test (50 MPa)
 pp Pocket Penetrometer (kPa)
 S Standard Penetration Test
 V Shear Vane test (kPa)

DCP ANALYSIS



PHOTOS



SITE TESTING DATA SHEET

DCP ANALYSIS

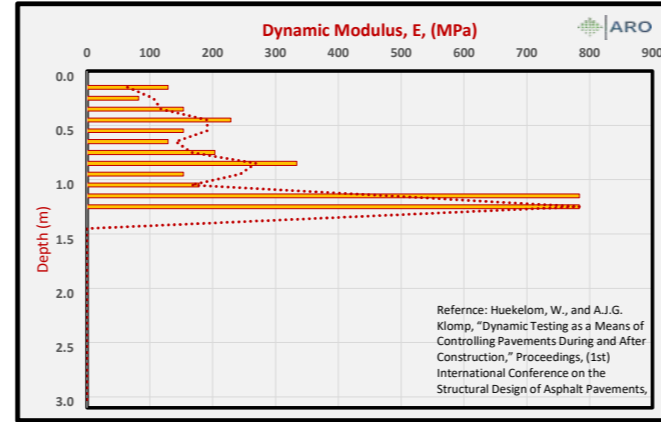
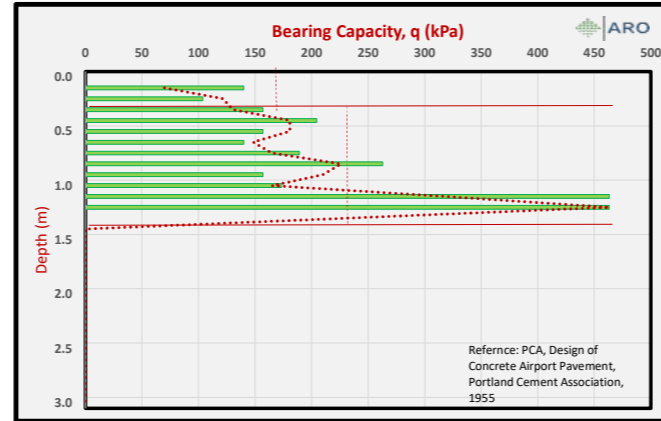
PHOTOS



Client: Mareeba Shire Council
 Project No: AR00231
 Project: Kuranda Cemetery
 Location: 70 Kuranda Heights Road
 Date: 13/10/2022

TP: TP4
 DCP: DCP2
 Pit Depth: 2.4m
 Machine: Case 590 Super N
 Bucket Type: 600mm Toothed

Test Pit 2			Sampling and In-Situ Testing			Dynamic Penetrometer Test (Blows / 100mm)											
RL	Depth (m)	Description of Strata	Graphic Log	Type	Depth (m)	Sample	Results and Comments	RAW Data	Blows/100mm	1	5	10	15	20	25		
	0	Loamy Top soil		D	0.3m	B	Loose and Soft	3									
	0.1						Dry	6									
	0.2							4									
	0.3							7									
	0.4							10									
	0.5	Clayey Silt with Trace amounts of Sand		D	0.3m	B	Firm	7									
	0.6							6									
	0.7							9									
	0.8							14									
	0.9							7									
	1.0	Residual Soil - Clayey Silt with traces of sand		D	1.4m	B		8									
	1.1							30									
	1.2							30									
	1.3																
	1.4																
	1.5	Extremely Weathered Mudstone V. Low Strength		D	1.9m	B	Dry Firm - V. Firm										
	1.6																
	1.7																
	1.8																
	1.9																
	2.0																
	2.1																
	2.2																
	2.3																
	2.4																
	2.5																
	2.6																
	2.7																
	2.8																
	2.9																
	3.0																
	3.1																
	3.2																
	3.3																
	3.4																
	3.5																
	3.6																
	3.7																
	3.8																
	3.9																
	4.0																
	5																



- RIG _____
 - LOGGED BY RR _____
 - REMARKS DCP Test only _____
- A Auger
 - B Bulk Sample
 - BLK Block Sample
 - C Core Drilling
 - D Disturbed Sample
 - E Environmental Sample
 - G Gas Sample
 - P Piston Sample
 - U_s Tube Sample (x.mm dia)
 - W Water Sample
- ▽ Water Seepage
 - ↕ Water Level
 - PID Photo Ionisation detector (ppm)
 - PL(A) Point Load Axial test (MPa)
 - PL(D) Point Load Diametral test (MPa)
 - pp Pocket Penetrometer (kPa)
 - S Standard Penetration Test
 - V Shear Vane test (kPa)

SITE TESTING DATA SHEET

DCP ANALYSIS

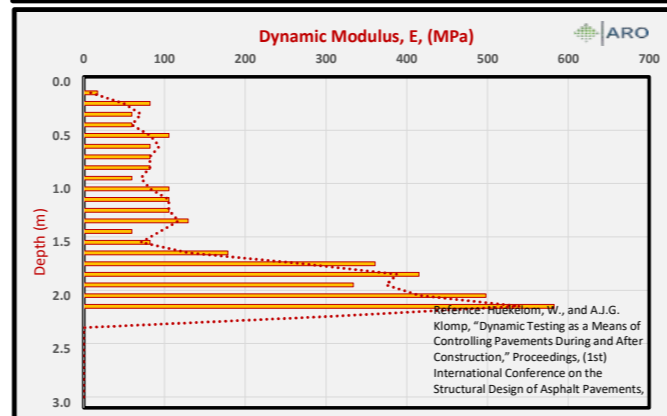
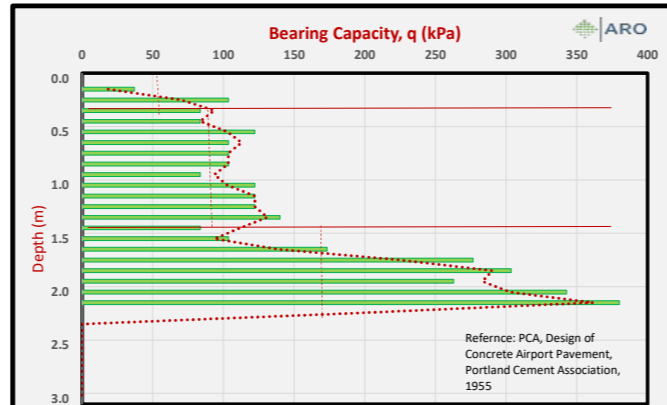
PHOTOS



Client: Mareeba Shire Council
 Project No: AR00231
 Project: Kuranda Cemetery
 Location: 70 Kuranda Heights Road
 Date: 13/10/2022

TP: TP4
 DCP: DCP3
 Pit Depth: 2.4m
 Machine: Case 590 Super N
 Bucket Type: 600mm Toothed

Test Pit 3			Sampling and In-Situ Testing				Dynamic Penetrometer Test (Blows / 100mm)																																	
RL	Depth (m)	Water Level	Description of Strata	Graphic Log	Type	Depth	Sample	Results and Comments	RAW Data	Blows/100mm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23							
	0.0		Loamy Top soil		D	0.3m	B	Loose and Soft Dry, Brown	0	1																														
	0.1								4																															
	0.2								3																															
	0.3								3																															
	0.4		Clayey Silt with Trace amounts of Sand		D	0.3m	B	Dry	4																															
	0.5								Firm	5																														
	0.6								Light Brown/Orange	4																														
	0.7									4																														
	0.8									3																														
	0.9									4																														
	1.0								3																															
	1.1		Residual Soil - Clayey Silt with traces of sand		D	1.4m	B	Dry	5																															
	1.2								Firm - V. Firm	4																														
	1.3								Blue/Grey	5																														
	1.4									6																														
	1.5									3																														
	1.6									4																														
	1.7									8																														
	1.8									15																														
	1.9									17																														
	2.0									14																														
	2.1		Extremely Weathered Mudstone V. Low Strength		D	2.4m	B	Moist	20																															
	2.2								Blue/Grey	23																														
	2.3																																							
	2.4																																							
	2.5																																							
	2.6																																							
	2.7																																							
	2.8																																							
	2.9																																							
	3.0																																							
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	3.8																																							
	3.9																																							
	4.0																																							
	5.0																																							



RIG _____
 LOGGED BY RR _____
 REMARKS DCP Test only _____

A Auger
 B Bulk Sample
 BLK Block Sample
 C Core Drilling
 D Disturbed Sample
 E Environmental Sample
 G Gas Sample
 P Piston Sample
 U_s Tube Sample (x.mm dia)
 W Water Sample

Water Seepage
 Water Level
 PID Photo Ionisation detector (ppm)
 PL(A) Point Load Axial test (MPa)
 PL(D) Point Load Diametral test (MPa)
 pp Pocket Penetrometer (kPa)
 S Standard Penetration Test
 V Shear Vane test (kPa)

SITE TESTING DATA SHEET

DCP ANALYSIS

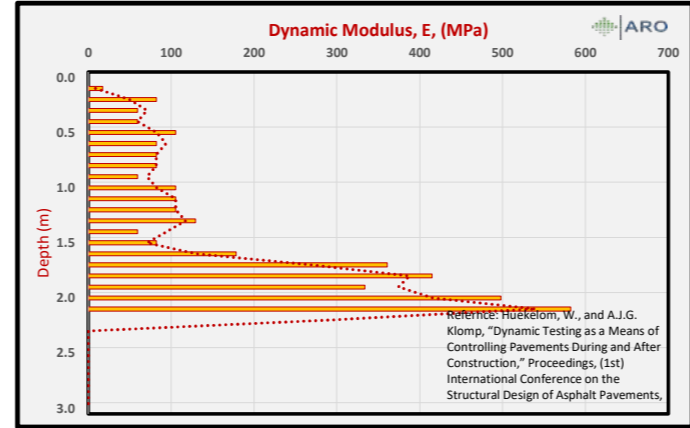
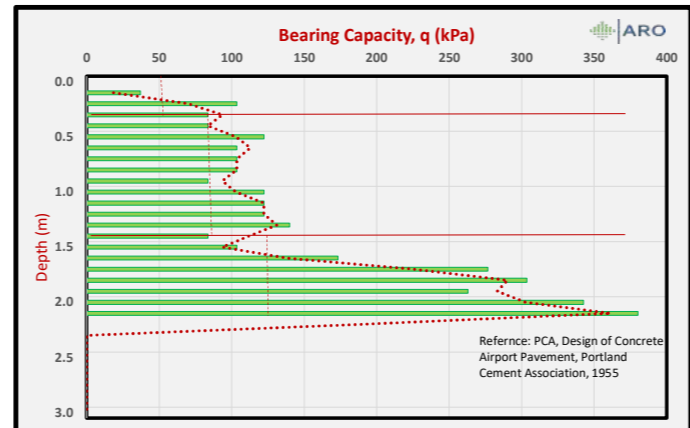
PHOTOS



Client: Mareeba Shire Council
 Project No: ARO0231
 Project: Kuranda Cemetary
 Location: 70 Kuranda Heights Road
 Date: 13/10/2022

TP: TP4
 DCP: DCP4
 Pit Depth: 2.4m
 Machine: Case 590 Super N
 Bucket Type: 600mm Toothed

Test Pit 4				Sampling and In-Situ Testing			Dynamic Penetrometer Test (Blows / 100mm)														
Depth (m)	Water Level	Description of Strata	Graphic Log	Type	Depth	Sample	Results and Comments	RAW Data Blows/100mm	1	2	3	4	5	6	7	8	9	10	11	12	
0		Loamy Top soil					Loose and Soft	0													
0.1							Dry, Brown	1													
0.2								4													
0.3				D	0.2m	B	Dry Firm	3													
0.4							Light Brown/Orange	3													
0.5								5													
0.6								4													
0.7								4													
0.8								4													
0.9								3													
1.0		Clayey Silt with Trace amounts of Sand		D	0.3m 1.4m	B		5													
1.1								5													
1.2								5													
1.3								6													
1.4								3													
1.5							Dry Firm - V. Firm Blue/Grey	4													
1.6								8													
1.7								15													
1.8		Residual Soil - Clayey Silt with traces of sand		D	1.4m 2.4m	B		17													
1.9								14													
2.0								20													
2.1								23													
2.2																					
2.3																					
2.4		Extremely Weathered Mudstone V. Low Strength		D	2.4m	B	Moist Blue/Grey														
2.5																					
2.6																					
2.7																					
2.8																					
2.9																					
3.0																					
3.1																					
3.2																					
3.3																					
3.4																					
3.5																					
3.6																					
3.7																					
3.8																					
3.9																					
4.0																					
5																					



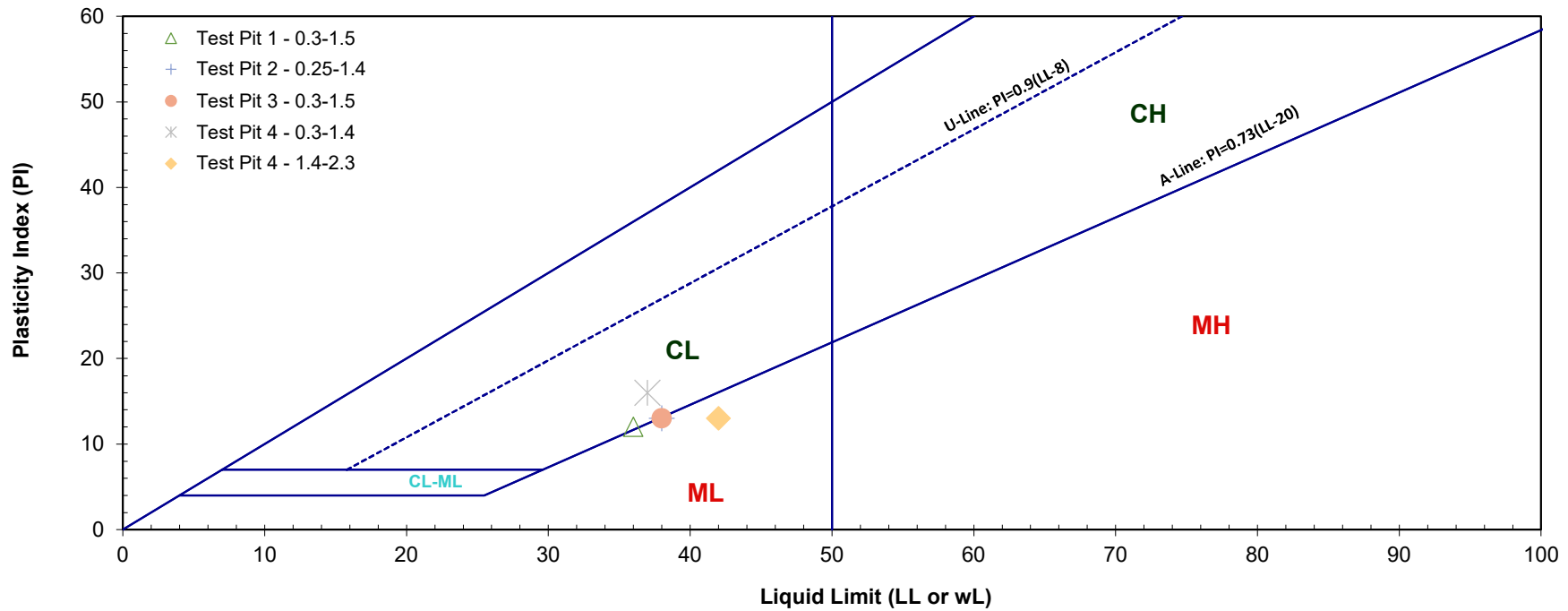
- RIG _____
 LOGGED BY RR _____
 REMARKS DCP Test only _____
- A Auger
 - B Bulk Sample
 - BLK Block Sample
 - C Core Drilling
 - D Disturbed Sample
 - E Environmental Sample
 - G Gas Sample
 - P Piston Sample
 - U_s Tube Sample (x.mm dia)
 - W Water Sample
- Water Seepage
 - Water Level
 - PID Photo Ionisation detector (ppm)
 - PL(A) Point Load Axial test IS50 (MPa)
 - PL(D) Point Load Diametral test IS50 (MPa)
 - pp Pocket Penetrometer (kPa)
 - S Standard Penetration Test
 - V Shear Vane test (kPa)

APPENDIX B
Laboratory Results

Plot of Atterberg limits on Casagrand's PI-LI Chart



	Test Pit 1 - 0.3-1.5	Test Pit 2 - 0.25-1.4	Test Pit 3 - 0.3-1.5	Test Pit 4 - 0.3-1.4	Test Pit 4 - 1.4-2.3
Test Pit:	1	2	3	4	4
Sample Depth:	0.3-1.5	0.25-1.4	0.3-1.5	0.3-1.4	1.4-2.3
Sample Location:	70 Kuranda Heights Road				
Report No.	1-000-100-553	1-000-100-553	1-000-100-553	1-000-100-553	1-000-100-553
CBR (%) :	6	9	6	8	-
Liquid Limit (LL or w_L) (%) :	36	38	38	37	42
Plastic Limit (PL or w_P) (%) :	24	25	25	21	29
Plasticity Index (PI) (%) :	12	13	13	16	13
USCS Classification:					
Linear Shrinkage (%) :	5.5	7	8	10	6



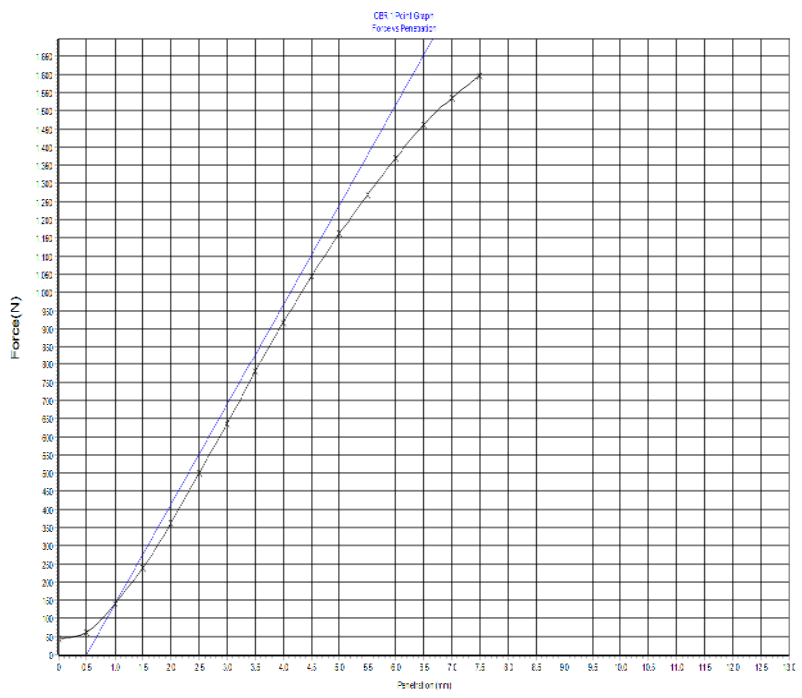


California Bearing Ratio Report (1 Point)

Client :	ARO	Report Number:	1-000-100-553 - 6
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	4/11/2022
Project Number :	1-000-100-553	Order Number :	
Project Name :	Kuranda Cemetery Stage 1	Test Method :	Q113C & Q145A
Location :	ARO0231 Kuranda Heights Road , Kuranda	Page 1 of 1	

Sample Number :	22/531	SAMPLE LOCATION	
Date Sampled :	13/10/2022	Kuranda Cemetery Stage 1	
Date Tested :	31/10/2022	TP1	
Sampled By :	Client	0.3m - 1.5m	
Sampling Method :	Unknown		
Material Source :	Insitu	Lot Number :	TP1
Material Type :	Subgrade	Test Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m ³) :	1.74
Optimum Moisture Content (%) :	17.0
Compactive Effort :	Standard
Nominated Percentage of MDD :	97.0
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	97.1
Achieved Percentage of OMC :	99
Dry Density Before Soak (t/m ³) :	1.69
Dry Density After Soak (t/m ³) :	
Moisture Content Before Soak (%) :	16.9
Moisture Content After Soak (%) :	
Density Ratio After Soak (%) :	
Field Moisture Content (%) :	14.4
Top Moisture Content - After Penetration (%) :	23.1
Total Moisture Content - After Penetration (%) :	20.2
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	2.0



CBR Surcharge (kg) :	4.5	CBR 2.5mm (%) :	5
Oversize (%) :		CBR 5.0mm (%) :	6
Oversize Material Replaced (%) :		CBR Value (%) :	6

Soil Description :	
Site Selection :	
Plasticity Method :	AS1289.3.9.2
Curing Time :	72

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Quality of Materials Report

Client :	ARO	Report Number:	1-000-100-553 - 1
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	1/11/2022
Project Name :	Kuranda Cemetery Stage 1	Order Number :	
Project Number :	1-000-100-553	Test Method :	AS1289.3.6.1
Location:	ARO0231 Kuranda Heights Road , Kuranda		Page 1 of 1

Sample Number :	22/531	SAMPLE LOCATION	
Sampling Method :	Unknown	Kuranda Cemetery Stage 1	
Sampled By :	Client	TP1	
Date Sampled :	13/10/2022	0.3m - 1.5m	
Date Tested :	31/10/2022	Test Number :	
Material Type :	Subgrade	Lot Number :	TP1
Material Source :	Insitu	Specification Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

AS Sieve Size(mm)	Percent Passing	Specification Limits	
100			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0	100		
16.0			
13.2	100		
9.5	99		
6.7	99		
4.75	98		
2.36	96		
1.18	91		
0.600	86		
0.425	83		
0.300	79		
0.150	70		
0.075	62		

	Test Method	Results		
Liquid Limit (%) :	AS1289.3.9.2	36	Shrinkage Comments :	Curling Occurred
Plastic Limit (%) :	AS1289.3.2.1	24	Mould Length (mm) :	150.0
Plasticity Index (%) :	AS1289.3.3.2	12	Sample History	Dry
Linear Shrinkage (%) :	AS1289.3.4.1	5.5		
Soil Description :				

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	 Paul Patane - Technician NATA Accreditation Number 9523

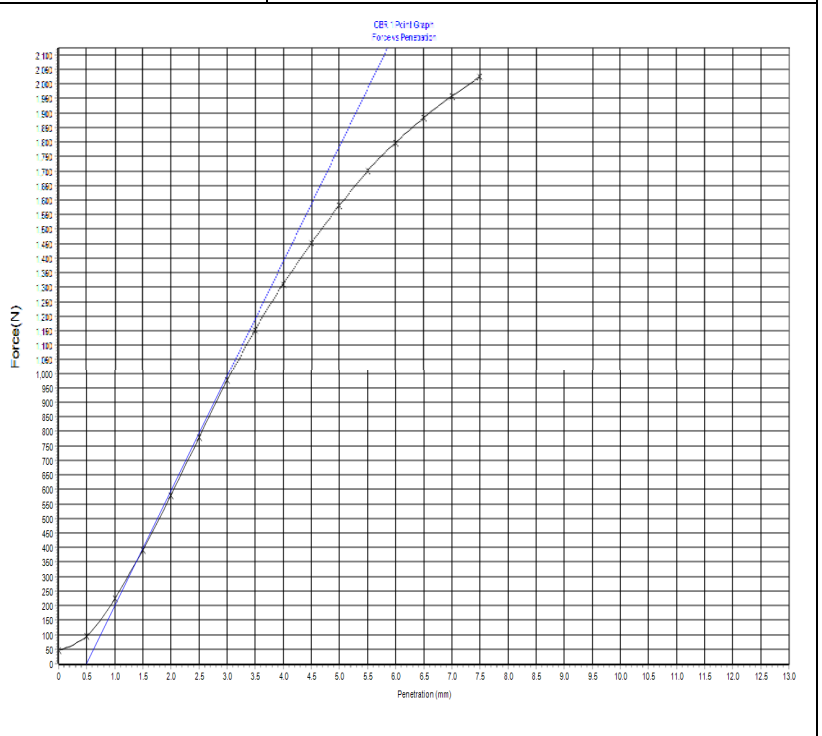


California Bearing Ratio Report (1 Point)

Client :	ARO	Report Number:	1-000-100-553 - 7
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	4/11/2022
Project Number :	1-000-100-553	Order Number :	
Project Name :	Kuranda Cemetery Stage 1	Test Method :	Q113C & Q145A
Location:	ARO0231 Kuranda Heights Road , Kuranda	Page 1 of 1	

Sample Number :	22/532	SAMPLE LOCATION	
Date Sampled :	13/10/2022	Kuranda Cemetery Stage 1	
Date Tested :	31/10/2022	TP2	
Sampled By :	Client	0.25m - 1.4m	
Sampling Method :	Unknown		
Material Source :	Insitu	Lot Number :	TP2
Material Type :	Subgrade	Test Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m ³) :	1.72
Optimum Moisture Content (%) :	17.0
Compactive Effort :	Standard
Nominated Percentage of MDD :	97.0
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	97.1
Achieved Percentage of OMC :	99
Dry Density Before Soak (t/m ³) :	1.67
Dry Density After Soak (t/m ³) :	
Moisture Content Before Soak (%) :	16.8
Moisture Content After Soak (%) :	
Density Ratio After Soak (%) :	
Field Moisture Content (%) :	11.5
Top Moisture Content - After Penetration (%) :	23.1
Total Moisture Content - After Penetration (%) :	20.6
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	1.8



Soil Description :	
Site Selection :	
Plasticity Method :	AS1289.3.9.2
Curing Time :	72

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Quality of Materials Report

Client :	ARO	Report Number:	1-000-100-553 - 2
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	1/11/2022
Project Name :	Kuranda Cemetery Stage 1	Order Number :	
Project Number :	1-000-100-553	Test Method :	AS1289.3.6.1
Location:	ARO0231 Kuranda Heights Road , Kuranda		Page 1 of 1

Sample Number :	22/532	SAMPLE LOCATION	
Sampling Method :	Unknown	Kuranda Cemetery Stage 1	
Sampled By :	Client	TP2	
Date Sampled :	13/10/2022	0.25m - 1.4m	
Date Tested :	28/10/2022	Test Number :	
Material Type :	Subgrade	Lot Number :	TP2
Material Source :	Insitu	Specification Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

AS Sieve Size(mm)	Percent Passing	Specification Limits	
100			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0	100		
16.0			
13.2	100		
9.5	100		
6.7	100		
4.75	100		
2.36	100		
1.18	97		
0.600	92		
0.425	88		
0.300	84		
0.150	74		
0.075	66		

	Test Method	Results		
Liquid Limit (%) :	AS1289.3.9.2	38	Shrinkage Comments :	Curling Occurred
Plastic Limit (%) :	AS1289.3.2.1	25	Mould Length (mm) :	150.0
Plasticity Index (%) :	AS1290.3.3.2	13	Sample History	Dry
Linear Shrinkage (%) :	AS1289.3.4.1	7		
Soil Description :				

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		 Paul Patane - Technician NATA Accreditation Number 9523

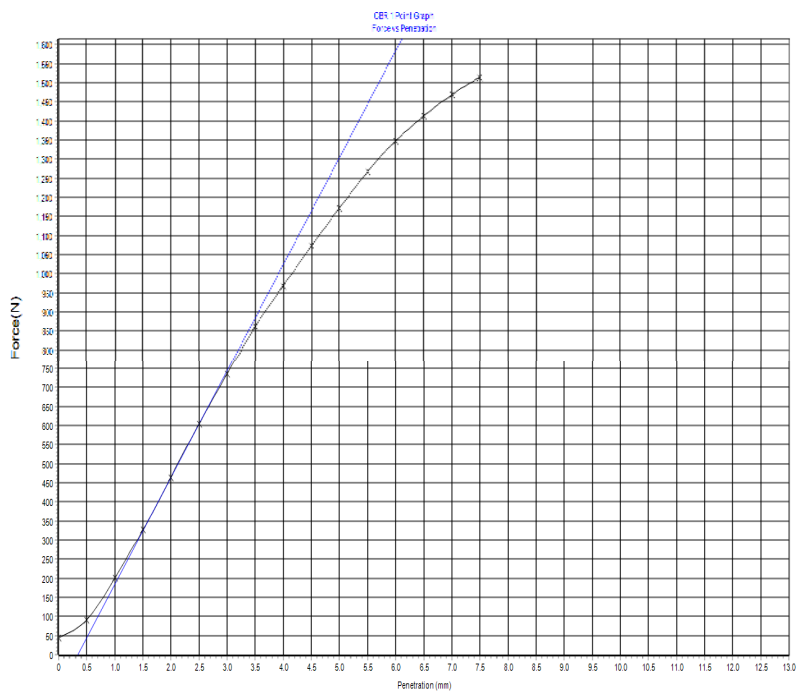


California Bearing Ratio Report (1 Point)

Client :	ARO	Report Number:	1-000-100-553 - 8
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	4/11/2022
Project Number :	1-000-100-553	Order Number :	
Project Name :	Kuranda Cemetery Stage 1	Test Method :	Q113C & Q145A
Location:	ARO0231 Kuranda Heights Road , Kuranda	Page 1 of 1	

Sample Number :	22/533	SAMPLE LOCATION	
Date Sampled :	13/10/2022	Kuranda Cemetery Stage 1	
Date Tested :	31/10/2022	TP3	
Sampled By :	Client	0.3m - 1.5m	
Sampling Method :	Unknown		
Material Source :	Insitu	Lot Number :	TP3
Material Type :	Subgrade	Test Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m ³) :	1.74
Optimum Moisture Content (%) :	16.5
Compactive Effort :	Standard
Nominated Percentage of MDD :	97.0
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	97.1
Achieved Percentage of OMC :	101
Dry Density Before Soak (t/m ³) :	1.69
Dry Density After Soak (t/m ³) :	
Moisture Content Before Soak (%) :	16.7
Moisture Content After Soak (%) :	
Density Ratio After Soak (%) :	
Field Moisture Content (%) :	13.8
Top Moisture Content - After Penetration (%) :	24.5
Total Moisture Content - After Penetration (%) :	21.6
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	1.9



CBR Surcharge (kg) :	4.5	CBR 2.5mm (%) :	5
Oversize (%) :		CBR 5.0mm (%) :	6
Oversize Material Replaced (%) :		CBR Value (%) :	6

Soil Description :	
Site Selection :	
Plasticity Method :	AS1289.3.9.2
Curing Time :	76

<p>Accredited for compliance with ISO/IEC 17025-Testing</p>	<p>APPROVED SIGNATORY</p> <p>Paul Patane - Technician NATA Accreditation Number : 9523</p>
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Quality of Materials Report

Client :	ARO	Report Number:	1-000-100-553 - 3
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	1/11/2022
Project Name :	Kuranda Cemetery Stage 1	Order Number :	
Project Number :	1-000-100-553	Test Method :	AS1289.3.6.1
Location:	ARO0231 Kuranda Heights Road , Kuranda	Page 1 of 1	

Sample Number :	22/533	SAMPLE LOCATION	
Sampling Method :	Unknown	Kuranda Cemetery Stage 1	
Sampled By :	Client	TP3	
Date Sampled :	13/10/2022	0.3m - 1.5m	
Date Tested :	31/10/2022	Test Number :	
Material Type :	Subgrade	Lot Number :	TP3
Material Source :	Insitu	Specification Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

AS Sieve Size(mm)	Percent Passing	Specification Limits	
100			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0	100		
16.0			
13.2	100		
9.5	100		
6.7	99		
4.75	99		
2.36	98		
1.18	93		
0.600	89		
0.425	86		
0.300	82		
0.150	69		
0.075	60		

	Test Method	Results		
Liquid Limit (%) :	AS1289.3.9.2	38	Shrinkage Comments :	Curling Occurred
Plastic Limit (%) :	AS1289.3.2.1	25	Mould Length (mm) :	150.0
Plasticity Index (%) :	AS1289.3.3.2	13	Sample History	Dry
Linear Shrinkage (%) :	AS1289.3.4.1	8		
Soil Description :				

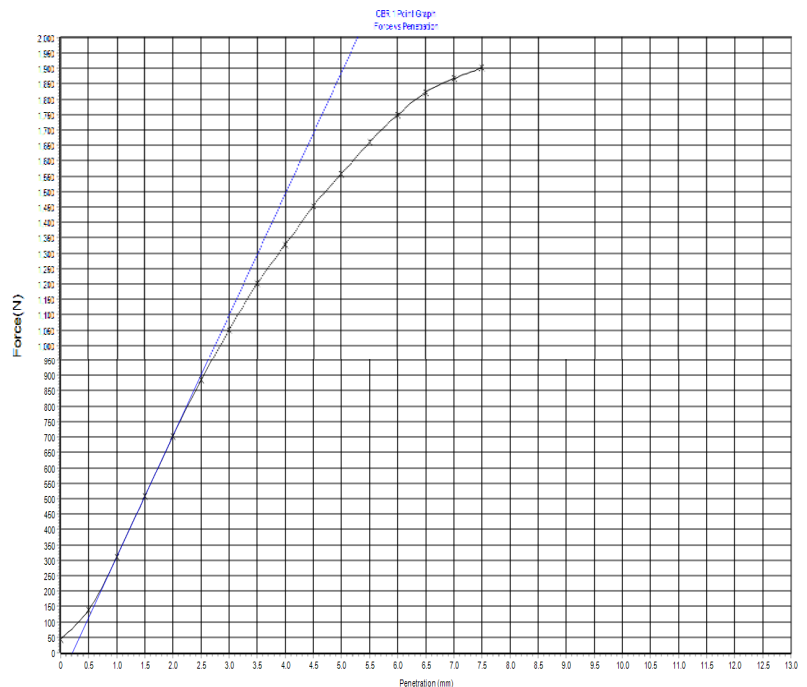
<p>NATA WORLD RECOGNISED ACCREDITATION</p> <p>Accredited for compliance with ISO/IEC 17025-Testing</p>	APPROVED SIGNATORY
	 Paul Patane - Technician NATA Accreditation Number 9523

California Bearing Ratio Report (1 Point)

Client :	ARO	Report Number:	1-000-100-553 - 9
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	4/11/2022
Project Number :	1-000-100-553	Order Number :	
Project Name :	Kuranda Cemetery Stage 1	Test Method :	Q113C & Q145A
Location:	ARO0231 Kuranda Heights Road , Kuranda	Page 1 of 1	

Sample Number :	22/534	SAMPLE LOCATION	
Date Sampled :	13/10/2022	Kuranda Cemetery Stage 1	
Date Tested :	31/10/2022	TP4	
Sampled By :	Client	0.3m - 1.4m	
Sampling Method :	Unknown		
Material Source :	Insitu	Lot Number :	TP4
Material Type :	Subgrade	Test Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

Moisture Method :	AS1289.2.1.1
Maximum Dry Density (t/m ³) :	1.67
Optimum Moisture Content (%) :	19.0
Compactive Effort :	Standard
Nominated Percentage of MDD :	97.0
Nominated Percentage of OMC :	100
Achieved Percentage of MDD :	97.0
Achieved Percentage of OMC :	101
Dry Density Before Soak (t/m ³) :	1.62
Dry Density After Soak (t/m ³) :	
Moisture Content Before Soak (%) :	19.1
Moisture Content After Soak (%) :	
Density Ratio After Soak (%) :	
Field Moisture Content (%) :	16.8
Top Moisture Content - After Penetration (%) :	25.0
Total Moisture Content - After Penetration (%) :	22.8
Soak Condition :	Soaked
Soak Period (days) :	4
Swell (%) :	1.4



CBR Surcharge (kg) :	4.5	CBR 2.5mm (%) :	7
Oversize (%) :		CBR 5.0mm (%) :	8
Oversize Material Replaced (%) :		CBR Value (%) :	8

Soil Description :	
Site Selection :	
Plasticity Method :	AS1289.3.9.2
Curing Time :	76



Accredited for compliance with ISO/IEC 17025-Testing

APPROVED SIGNATORY



Paul Patane - Technician
NATA Accreditation Number :
9523

Document Code RFA40-10



Quality of Materials Report

Client :	ARO	Report Number:	1-000-100-553 - 4
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	1/11/2022
Project Name :	Kuranda Cemetery Stage 1	Order Number :	
Project Number :	1-000-100-553	Test Method :	AS1289.3.6.1
Location:	ARO0231 Kuranda Heights Road , Kuranda		Page 1 of 1

Sample Number :	22/534	SAMPLE LOCATION	
Sampling Method :	Unknown	Kuranda Cemetery Stage 1	
Sampled By :	Client	TP4	
Date Sampled :	13/10/2022	0.3m - 1.4m	
Date Tested :	31/10/2022	Test Number :	
Material Type :	Subgrade	Lot Number :	TP4
Material Source :	Insitu	Specification Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

AS Sieve Size(mm)	Percent Passing	Specification Limits	
100			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0	100		
16.0			
13.2	100		
9.5	100		
6.7	99		
4.75	99		
2.36	98		
1.18	96		
0.600	94		
0.425	92		
0.300	89		
0.150	79		
0.075	70		

	Test Method	Results		
Liquid Limit (%) :	AS1289.3.9.2	37	Shrinkage Comments :	Curling Occurred
Plastic Limit (%) :	AS1289.3.2.1	21	Mould Length (mm) :	149.8
Plasticity Index (%) :	AS1289.3.3.2	16	Sample History	Dry
Linear Shrinkage (%) :	AS1289.3.4.1	10		
Soil Description :				

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		 Paul Patane - Technician NATA Accreditation Number 9523



Quality of Materials Report

Client :	ARO	Report Number:	1-000-100-553 - 5
Address :	51 Sheridan Street, Cairns, QLD, 4870	Report Date :	1/11/2022
Project Name :	Kuranda Cemetery Stage 1	Order Number :	
Project Number :	1-000-100-553	Test Method :	AS1289.3.6.1
Location:	ARO0231 Kuranda Heights Road , Kuranda		Page 1 of 1

Sample Number :	22/535	SAMPLE LOCATION	
Sampling Method :	Unknown	Kuranda Cemetery Stage 1	
Sampled By :	Client	TP4	
Date Sampled :	13/10/2022	1.4m - 2.3m	
Date Tested :	28/10/2022	Test Number :	
Material Type :		Lot Number :	TP4
Material Source :	Insitu	Specification Number :	
Remarks :	Sample tested as received, This report does not endorse sampling.		

AS Sieve Size(mm)	Percent Passing	Specification Limits	
100			
75.0			
63.0			
53.0			
37.5			
26.5			
19.0	100		
16.0			
13.2	100		
9.5	100		
6.7	100		
4.75	100		
2.36	100		
1.18	98		
0.600	96		
0.425	94		
0.300	93		
0.150	89		
0.075	84		

	Test Method	Results		
Liquid Limit (%) :	AS1289.3.9.2	42	Shrinkage Comments :	Curling Occurred
Plastic Limit (%) :	AS1289.3.2.1	29	Mould Length (mm) :	149.8
Plasticity Index (%) :	AS1289.3.3.2	13	Sample History	Dry
Linear Shrinkage (%) :	AS1289.3.4.1	6		
Soil Description :				

<p>NATA WORLD RECOGNISED ACCREDITATION</p> <p>Accredited for compliance with ISO/IEC 17025-Testing</p>	APPROVED SIGNATORY
	 Paul Patane - Technician NATA Accreditation Number 9523

APPENDIX C
Reinforced Road Batter Design File Note

REINFORCED ROAD BATTER DESIGN FILE NOTE – KURANDA CEMETARY ACCESS ROAD

Project Number: ARO0231

INTRODUCTION

This file note aims to summarise the design process and outcome of proposed batter reinforcement required for the proposed access road within the Kuranda cemetery.

This report should be read in conjunction with ARO’s overarching Geotechnical Report which details the site understanding and investigations undertaken. This report explicitly discusses the modelling undertaken and process to determine the most cost-effective batter construction.

SUBSURFACE CONDITIONS

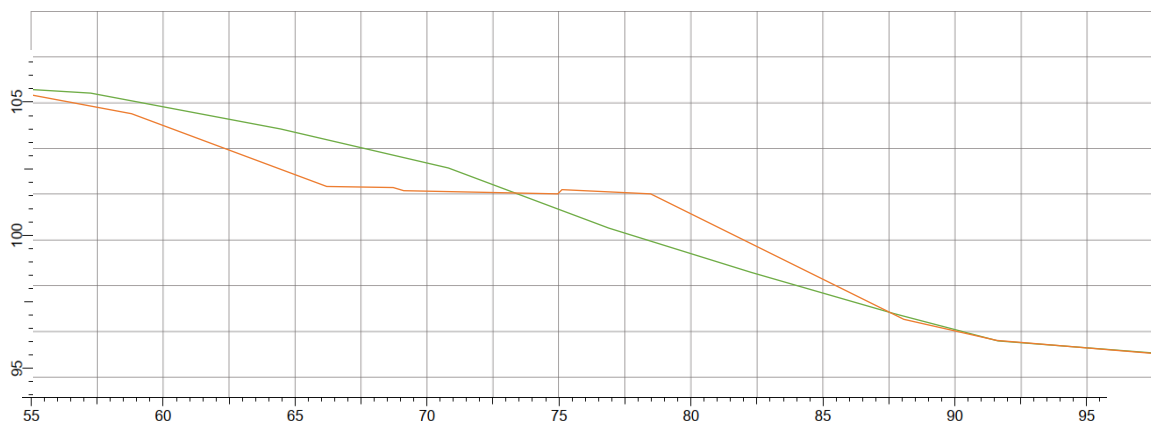
The subsurface conditions are detailed in the table below. Test pit 4 was undertaken at the location of the proposed batter so the soil profile of this test pit has been adopted.

Table 1: Subsurface Conditions

Soil Condition	Depth of Layer			
	Test Pit 1	Test Pit 2	Test Pit 3	Test Pit 4
Loamy Topsoil	GL to 0.3m	GL to 0.3m	GL to 0.3m	GL to 0.3m
Firm Clayey Silt (residual soil)	0.3m - 1.5m	0.3m - 1.4m	0.3m - 1.5m	0.3m - 1.4m
Extremely Weathered Mudstone Extremely Low Strength	1.5m - 1.9m	1.4m - 1.9m	1.5m – 2.4m	1.4m – 2.4m
Distinctly Weathered Mudstone Very Low Strength	1.9m+	1.9m+	2.4m+	2.4m+

SLOPE GEOMETRY

The slope geometry was surveyed by Mareeba Shire Council. The roadway at the section under investigation is proposed to be constructed as cut-to-fill. The cross section is approximately 1 in 4. The below is an illustration of the existing batter and the proposed cut to fill batter.



RISK ASSESSMENT (AGS 2007)

A risk assessment of the site(s) was undertaken in accordance with the Australian Geomechanics Society (AGS) 2007 Guidelines for landslide risk assessment. Results have been summarised in Table 1.

Table 2 - Qualitative assessment of risk to property due to future site works

	Potential Hazard	Risk to	Condition	WITHOUT Engineering Controls			Engineering Controls to Reduce Risk	WITH Engineering Controls						
				Consequence	Likelihood	Qualitative Risk		Consequence	Likelihood	Qualitative Risk				
Existing	Earth slides in 1V:3H to 1V:2H (20-26 degree) slopes on site	Road (Roadway)	Dry	Minor	Rare	Very Low	Provide adequate drainage and erosion protection, including lined drains at the crest of batters. Vegetate existing, exposed batter slopes with deep rooted, native species. Use vegetation matting (or approved equivalent) to assist with seeding/ germination/ establishment and erosion protection.	Minor	Rare	Very Low				
			Wet	Minor	Unlikely	Low		Minor	Rare	Very Low				
	Earth slides in 1V:2H or steeper slopes on site	Road (Roadway)	Dry	Medium	Likely	Low		Positive retention of the slope is recommended to reduce risk of slope failure	Refer to Future/ Proposed					
			Wet	Medium	Almost Certain	Moderate								
Future/ Proposed	Earth slide in future cut batters less than 1V:2H (~26 degrees)	Road (Roadway)	Dry	Minor	Rare	Very Low	Provide adequate drainage and erosion protection, including lined drains at the crest of batters. Vegetate existing, exposed batter slopes with deep rooted, native species. Use vegetation matting (or approved equivalent) to assist with seeding/ germination/ establishment.					Minor	Rare	Very Low
			Wet	Minor	Unlikely	Low						Minor	Rare	Very Low
	Earth slide in future cut or fill batters greater than 1V:2H (~26 degrees)	Road (Roadway)	Dry	Medium	Unlikely	Low	Limit batter/bench heights to appropriate heights or provide positive support/retention. Stable batter profiles should be designed and certified by a suitably qualified and experienced RPEQ. Provide adequate drainage and erosion protection, including lined drains at the crest and toe of batters. Vegetate existing, exposed batter slopes with deep rooted, native species. Use vegetation matting (or approved equivalent) to assist with seeding/ germination/ establishment and erosion protection.	Medium	Rare	Low				
			Wet	Medium	Possible	Moderate		Medium	Rare	Low				
	Failure of future retention structure and resulting earth slide	Road (Roadway)	Dry	Major	Barely Credible	Very Low		Suitably designed and certified retention systems to be installed - Provide adequate drainage and erosion protection, including lined drains at the crest and toe of batters. Vegetate existing, exposed batter slopes with deep rooted, native species. Use vegetation matting (or approved equivalent) to assist with seeding/ germination/ establishment and erosion protection.	Major	Barely Credible	Very Low			
			Wet	Major	Rare	Low			Major	Rare	Low			
	Degradation of earth batters	Road (Roadway)	Dry	Minor	Likely	Moderate	Provide adequate drainage and erosion protection, including lined drains at the crest of batters. Vegetate existing, exposed batter slopes with deep rooted, native species. Use vegetation matting (or approved equivalent) to assist with seeding/ germination/ establishment and erosion protection.	Minor	Rare	Very Low				
			Wet	Minor	Almost Certain	High		Provide erosion control at locations of high erosion potential (riverbanks, creek banks, stormwater outlets and/ or flow paths.)	Minor	Unlikely	Low			

The qualitative risk to property of the existing slopes at less than 1V:2H was assessed as between “Very Low” to “Low” without engineering controls. Normally regulators accept risk levels of “Low” or “Very Low” when assessed in accordance with AGS (2007). Where risks levels are assessed to be above these limits, engineering controls are typically introduced to reduce the risks to acceptable levels.

The proposed design seeks to develop batters that are at grades of 1V:2H. The assessment of risk for these slopes indicated a low-moderate level of risk. In such circumstances engineering controls are required to reduce the risk levels to acceptable levels.

A limit state analysis of the existing condition and proposed solution was undertaken to confirm the suitability of the preferred option. The below section describes the process and findings of the modelling.







LIMIT STATE ANALYSIS

Limit State Analysis of the sites was undertaken using the proprietary software RocScience Slide2. The type and extent of engineering controls required were determined by modelling the existing conditions and then applying increasing levels of support until the required factors of safety have been reached.

Material Properties

The material properties identified in Table 3 were adopted for the various soil types used in the slope stability analyses.

Table 3: Material Properties

Material Description		Bulk Density	Drained (“Effective”) Soil Parameters		Undrained (“Total”) Soil Parameters	
			Friction angle	Cohesion	Friction angle	Cohesion
			γ_b (kN/m ³)	ϕ' (degrees)	c' (kPa)	ϕ (degrees)
	Loamy Topsoil	16	28	1	0	25
	Clayey Silt Residual Soil - Firm (DCP 3-6)	18	30	2	0	30
	Fill (Residual Soil reclaimed from site)	18	30	2	0	30
	Extremely Weathered Mudstone Extremely Low Strength	20	30	3	0	50
	Distinctly Weathered Mudstone Very Low Strength	20	30	5	-	-
	Rock Fill Working Platform	20	35	0	-	-

The model utilised a section output from the design file and the soil layer profile was adopted from the test pit undertaken at this location (Test Pit 4).

Slope Stability Assessment

Condition States

The stability analysis for the selected profiles were performed for

- dry (“normal”) conditions and
- Two variants of the (2) wet (“extreme”) conditions. These are referred to as *saturated drained* and *saturated undrained*.

The drained and undrained conditions refer to the rate of loads being applied to the soil matrix and the consequential ability of water to drain from the same matrix.

In the undrained condition loads are applied quickly. The loads are transferred into the soil-water matrix. The load is transferred into the water, which is trapped in the soil matrix, thus increasing the water (pore) pressure. Once the water pressure exceeds the pressure carried by the soil matrix, the water “pushes” the soil particles apart, and failure occurs. This is like what happens in quicksand or in mud-rushes. This is referred to as the *saturated-undrained* condition.

In the drained conditions, the load is applied more slowly. In the soil-water matrix, the load is transferred from the water to the soil matrix – as the water is able to drain (i.e. leaves the soil matrix). This is referred to as the *saturated drained* condition. To know at what stage this occurs is more complex. To make a rationalised assumption of how this occurs, the saturated drained conditions were modelled by assuming a fully saturated profile, then solving the groundwater conditions to a steady state solution. This is to understand where the phreatic surface (i.e., groundwater) is likely to be in a saturated – steady state condition. This would represent a likely soil profile that would exist after a prolonged period of rain, such as in the monsoonal condition. Once this has been determined, it is used as an input to the slope stability assessment for the saturated drained condition.

Factors of Safety

For the purposes of assessing stability the following is provided which are considered appropriate to the site:

- A calculated factor of safety¹ > 1.5 indicates that the profile is likely to be stable.
- A calculated factor of safety from 1.0 – 1.5 indicates a marginally stable profile.
- A calculated factor of safety < 1.0 indicates a marginally stable profile.

Generally, for normal operating conditions a long-term factor of safety of 1.5 is acceptable. For short term or “extreme” conditions, it may be acceptable to design for a reduced factor of safety of 1.2.

The proposed geometry was assessed in Slide2. The results of the analyses are summarised in Table 4.

Table 4: Factor of Safety for Unreinforced Batter

Calculated Factor of Safety		
Dry Conditions	Wet Conditions	
	Undrained	Drained (Steady State Groundwater)
1.307	1.741	0.826

The results of the stability analyses show that the factors of safety are not within the acceptable limits during both wet and dry conditions. These results indicate instability of the batter. As such retention of the batter is required.

Where a batter is unstable several options can be considered.

- i) Batter steepness can be reduced to a stable profile, or
- ii) Numerous forms of positive retention or reinforcement
 - a. These can take the form of soil nails, micropiles, anchors, or geosynthetic reinforced structures. These forms of reinforcement act by confining the soil to act as a single mass by increasing the resistive forces along the slip plane. Other types of reinforcement include gravity retaining and cantilever retaining walls, which is generally a passive reinforcement type that provides an inertial resistive force due to self-weight or converts horizontal pressures from behind the wall to vertical pressures on the ground below respectively.

OPTIONS ASSESSMENT

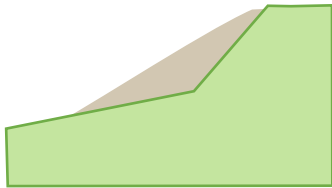
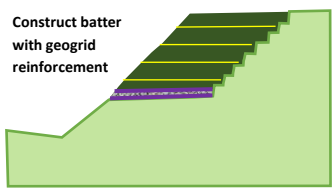
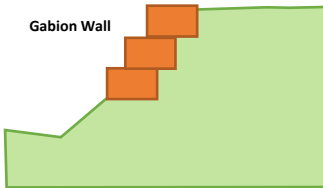
As this batter is a new construction three options were considered. These include;

1. Reducing batter steepness;
2. Constructing a Geosynthetic Reinforced Soil Batter; or
3. Constructing a Gravity Retaining Wall (Gabion Structure)

Reducing the batter steepness was not Considered feasible due to the significant additional material needed to construct the batter due to the existing downslope batter of approximately 25%. The toe would be required to “chase” the batter for a significant length. This would encroach the existing gully, hence, was not considered further.

¹ In general terms, the factor of safety (FoS) is calculated by dividing the forces resisting instability (i.e. strength of the soil) by the forces driving instability (i.e. the weight of the soil, groundwater, and loads on the slope).

Table 5: Proposed Solutions

	Proposed Solution		
	Option 1: Batter back slope (decrease angle)	Option 2: Reinforced Earth	Option 3: Gabion Retaining Wall
			
Technical Feasibility	Yes. However, decreasing the batter angle will move the bottom of batter further into the gully, and increasing the overall batter height. This will require significantly more fill material.	Yes.	Yes.
Cost	Low	Low	Medium
Constructability	Simple construction. However, imported fill	Simple construction. Can be constructed by installing the geogrid structure whilst constructing the batter. Limited additional effort is required.	Medium complexity construction
Safety	Can be constructed in a safe manner.	Can be constructed in a safe manner.	Can be constructed in a safe manner.
Comment	Fill material would likely need to be imported. Limited expertise needed for construction. Lower value for Money (VfM) option when compared to Option 2.	Limited expertise needed for construction. Considered the most feasible and greatest value for money option.	Higher cost. Lower value for Money (VfM) option when compared to Option 2.
Cost Estimate	-	\$140K	\$180K
Design Life	100 years	100 years	100 years

A cost estimate for option 2 and 3 was undertaken, a detailed breakdown has been included in Appendix A.

The reinforced earth solution was further explored through modelling using proprietary software RocScience Slide 2, with results documented in Table 6.

Table 6: Summary of batter stability analysis of reinforced earth structure

Assessed Factor of Safety		
Dry Conditions	Undrained	Drained (Steady State Groundwater)
1.803	1.270	1.831

The reinforced earth design solution is the most appropriate construction method for the reasons;

- It is considered the greatest value for money solution.

There are specific reasons which contribute to these outcomes including:

- Technical Feasibility
 - Technically feasible, the slope can be constructed to achieve a suitable factor of safety.
 - Considered suitable for the site, material will be won on site from the road construction.
- Constructability
 - Uses insitu material;
 - Requires limited additional excavation over the (unstable) unreinforced earth solution.
 - Simple construction methodology
 - Can be safely constructed using traditional equipment and approaches.
- Value for Money

- Considered to be the lowest-cost solution to achieve a stable batter profile.

SPECIFICATIONS

Excavation Characteristics

Excavations will be required for the removal of the existing materials and benching as required to provide a foundation for the geosynthetic reinforcement.

Bulk Works

Bulk excavation in natural soils would generally be possible with a small to medium size backhoe excavator.

Compaction Procedure and Specifications

Provided the placement moisture content of the imported fill or select in-situ material approximates the OMC for compaction, suitable compaction levels should be achievable using typical compaction machinery (5-10t vibrating sheepsfoot roller or compactor, vibrating plate compactors and compaction wheels.

For the above plant, the fill material should be compacted in layers not exceeding 300mm loose thickness lifts. This is more than typical compaction requirements – but has been specified by the manufacturer to ensure that the damage to the geogrid during installation is minimised. Final maximum placement layer thickness will need to be determined by a geotechnical engineer when the compaction plant as well as the material type and conditions are known.

Minimum requirements for compaction have been outlined in Table 7.

Table 7: Minimum compaction requirements

Soil Types	Test Method	Trafficable Areas	Non-Trafficable Areas	
		Embankment/ Embedment Material (%)	Embedment Material (%)	Embankment Material (%)
Cohesionless	Density Index	70	60	Compaction will depend on site requirements
Cohesive	Standard Dry Density Ratio, Hilf Density Ratio	95	90	

Field density testing should be carried out to check the standard of compaction achieved and the placement moisture content. The frequency and location of testing should be as specified in AS/ NZS 2566.2, Section 5.6.4.

Batters

The following maximum batter angles are recommended. Short term – apply to the formation of temporary construction batters, which may be required as part of the construction, but are not expected to form part of the ultimate solution. The long-term angles apply to the batters which are used to form the permanent solution.

Table 2: Maximum batter angles

Material	Non-Trafficable Areas	
	Short Term	Long Term
Controlled Fill	1V:1H	1V:2H
Natural Clays & Silts	1V:1.5H	1V:3H
Natural Sands & Gravels	1V:1.5H	1V:3H

In addition to the batter angles, it should be noted that a number of caveats apply to the maximum batter angles.

- 1) Batter heights are limited to 3.0m.
- 2) Batter profiles assume limited seepage.
- 3) Fill batters are contingent on suitable compaction being achieved. Fill batters should be over filled and cut-back to the design profile.
- 4) Subject to Inspection by a suitably qualified and experienced RPEQ (Geotechnical)

Geosynthetic Reinforcement

Geogrid

Miragrid 40/40 or approved equivalent has been specified as a suitable geogrid.

The geogrid is required to have;

- a design life of 100 years in the environment proposed to be installed.
- the same or better short- and long-term strength parameters.
- the same or better installation damage factor.

Geofabric

Bidim Green A34 or approved equivalent is specified for use to enclose the rock working platform and horizontal rock drain.

The geofabric is required to have;

- a design life of 100 years in the environment proposed to be installed.
- the same or better short- and long-term strength parameters.
- the same or better installation damage factor.
- the same or better filtration properties.

Material usage

The following recommendations apply to the materials on site and any imported materials intended for use during construction.

- The surficial fill materials encountered are considered suitable for re-use as general embankment fill.
- The insitu natural soils, where free from organic and deleterious material, may be used for embankment fill, provided the moisture content of the soils on placement approximates the optimum moisture content (OMC) required for compaction. This will require conditioning to bring the soil to optimum. However, it should be noted that the on-site soils could be expected to provide difficulties in handling, placement and compaction if the appropriate moisture content could not be achieved, particularly if the soils are overly moist.
- A moisture content within the range of OMC -2% to OMC +2% (Standard compaction) is recommended.
- Rock, or cobbles over 63mm greatest dimension, which cannot be broken down should be removed.
- Any imported fill, if required to make up embankment deficiencies should be fair to good quality and conform to the following general specification(s):
 - Minimum soaked CBR = 10%
 - Maximum Aggregate size = 63mm
 - Shrink/ Swell Index Maximum of 1.0%
- Embankment Materials should conform to the material quality specifications in AS/ NZS 2566:2002, Appendix G.

Pavement Gravels should comply with the appropriate TMR quality specifications for base, sub-base and sub-grade materials.

CONSTRUCTION INSPECTIONS

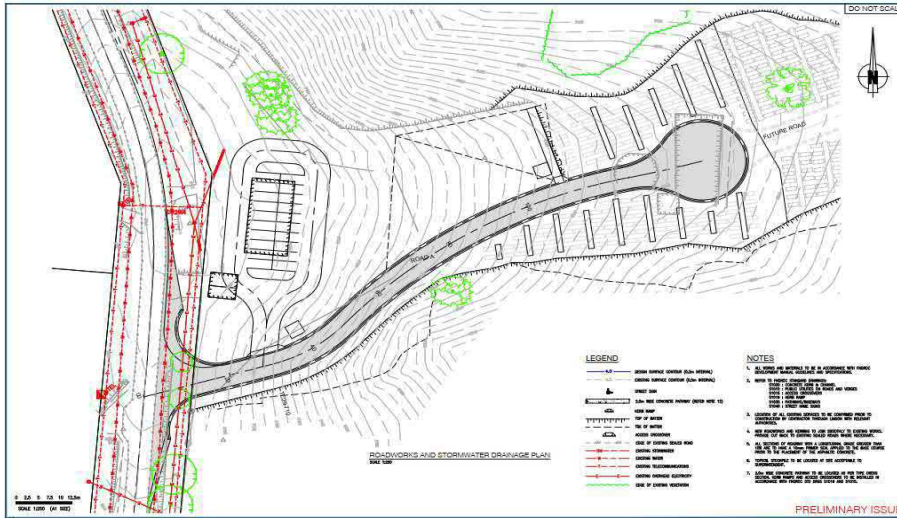
Through the construction of the proposed works, inspections by a suitably qualified and experienced geotechnical engineer are required to be undertaken to confirm design assumptions. Localised landslips may occur during construction activities. All works should aim to minimise disturbance of the natural slope outside of the immediate earthworks zone. Where possible, all earthworks should be completed in the dry season. Construction activities should not take place in heavy or prolonged rainfall due to the potential reduction of slope stability. Works should be protected prior to forecast rainfall.

SUMMARY AND RECOMMENDATIONS

It is recommended that the findings and suggested geogrid reinforcement, and working platform/drainage layer works described in this geotechnical report be included in the batter construction. The proposed geogrid and drainage platform will ensure that the batter will remain geotechnically stable.

APPENDIX A

Cost Estimate



Cost Estimate Summary

Client: Mareeba Shire Council
Job: Kuranda Cemertary
Ch: 30m-50m

Option	Ht	Cost (Ex-GST)	Comment
Recommendation			
1	Gabions	3 \$ 177,688	Technically Feasible See preliminary design checks/ calcs - Concept Design More Expensive than GRS solution 100 Year Design Life
2	Geosynthetic Reinforced Structure	3 \$ 139,020	Technically Feasible Less Expensive than Gabion Structure 100 Year Design Life

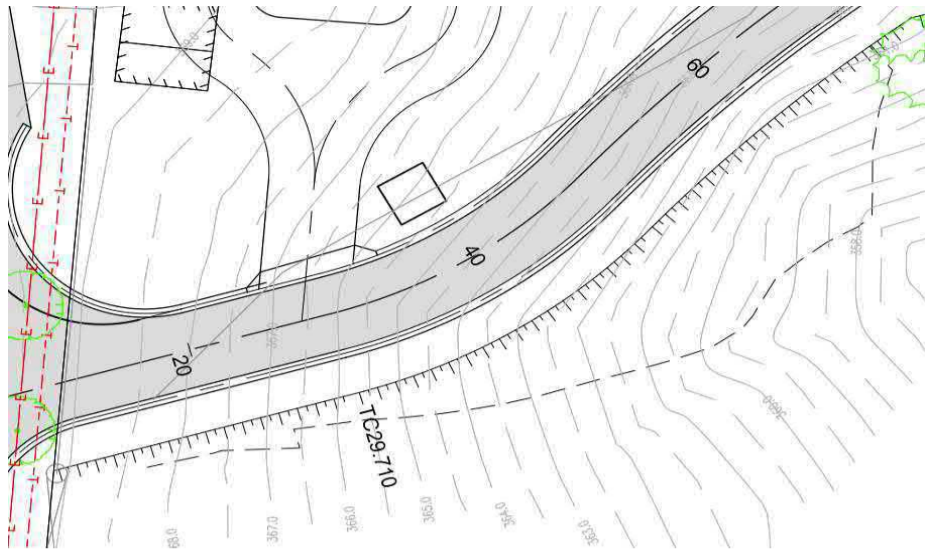
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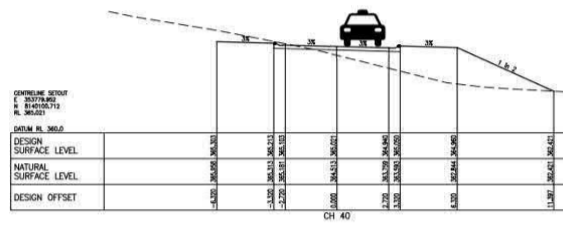
Client: Mareeba Shire Council
Job: Kuranda Cemetary
CH: 30m-50m



Survey



Proposed Geometry



Project: **Kuranda Cemetary**
 Client: **Mareeba Shire Council**
 Treatment: **Mass Block, Gravity Wall**
 Site ID:

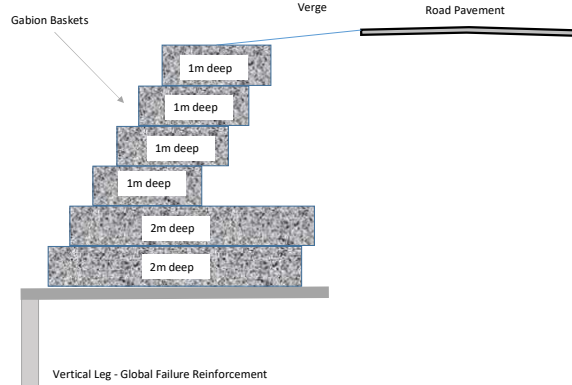


ASSUMPTIONS

SCHEDULE OF QUANTITIES AND COSTS

Assumptions

Structure		
Length of Structure	20	m
Height of Structure	3	m
Gabion Basket - DIMENSIONS		
Gabion Basket Height	0.5	m
Gabion Basket Width	2	m
Gabion Basket Depth (lower)	2	m
Gabion Basket Depth (upper)	1	m
Depth of Excavation / Compacted base layer under Gabions		m
Road and Pavement		
Road Length (Affected)		m
Road Width		m
Pavement Depth		mm
Gravel Top-Up (Treatment) to replace lost material		mm
Drainage Works - Rock Protection		
Length of Required Rock Protection		m
Height of Rock Protection		m
Minimum Rock Size (diameter)		m
Foundation		
Width	2.6	
Depth	0.25	m
Vertical Leg (Depth)	2	m
Vertical Leg (Width)	0.3	m
Internal re-inforcement	N12/150	
Minimum Cover	50	mm
Minimum Concrete Strength	40	Mpa



Civil Works (General)		
Local Area Factor	Stable Excavation Profile (1V: 1	H) 1.1 (Use QRA Rate)

Project: Kuranda Cemetary
 Client: Mareeba Shire Council
 Treatment: Mass Block, Gravity Wall



Estimate of Costs

Price Schedule

Note: All Rates and Amounts are Exclusive of GST

Revision No. 1

Description	Amount \$
SUMMARY OF PRICE ESTIMATES	
0 INVESTIGATIONS, TESTING & REPORTS	\$ -
1 PRELIMINARIES	\$ 37,000.00
2 EROSION AND SEDIMENT CONTROL	\$ 6,500.00
3 EARTHWORKS	\$ 13,683.00
4 ROADWORKS	\$ 255.00
5 STORMWATER DRAINAGE	\$ 450.00
6 GEOTECHNICAL WORKS	\$ 119,800.00
TOTAL VALUE OF WORK (Excluding GST)	\$ 177,688.00
GST	\$ 17,768.80
TOTAL VALUE OF WORK (Including GST)	\$ 195,456.80

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
0	INVESTIGATIONS, TESTING & REPORTS				\$ -	
0.1	Detailed Geotechnical Site Investigation & Report	1	Item	0.00	\$ -	Complete
0.2	Soil Testing	1	Item	0.00	\$ -	
0.3	Detail Survey	1	Item	0.00	\$ -	
0.4	Approvals Management (Planning, Preparation and Implementation)	1	PS	0.00	\$ -	
	INVESTIGATIONS, TESTING & REPORTS				\$ -	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
1	PRELIMINARIES				\$ -	
1.1	Building and Construction Industry Fee and Levy:				\$ -	Incl.
1.2	Notifiable Project Fee	1	Item		\$ -	Incl.
1.3	Portable Long Service Levy	1	Item		\$ -	Incl.
1.4	Audit Testing as directed by Superintendent (Prov. Sum - If ordered)	1	PS		\$ 5,000.00	PS
1.5	"As-built" Survey and provision of as-constructed drawings to Council format	1	Item	3,000.00	\$ 3,000.00	
1.6	Quality Testing	1	Item	1,500.00	\$ 1,500.00	
1.7	Relocating existing services (Prov. Sum)	1	PS	0.00	\$ -	Not Required
1.8	Development of Management Plans:				\$ -	
1.8.1	Traffic Management Plan	1	Item	0.00	\$ -	Not Required
1.8.2	Quality Management Plan	1	Item	0.00	\$ -	Not Required
1.8.3	Workplace Health and Safety Management Plan	1	Item	0.00	\$ -	Not Required
1.9	Implementation of Management Plans:				\$ -	
1.9.1	Traffic Management Plan	1	Item	0.00	\$ -	Not Required
1.9.2	Quality Management Plan	1	Item	1,500.00	\$ 1,500.00	
1.9.3	Workplace Health and Safety Management Plan	1	Item	1,500.00	\$ 1,500.00	
1.10	Setting out works	1	Item	3,000.00	\$ 3,000.00	
1.11	Project sign and public notification	1	Item	1,500.00	\$ 1,500.00	
1.12	Site establishment and disestablishment	1	Item	20,000.00	\$ 20,000.00	
	PRELIMINARIES TOTAL				\$ 37,000.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
2	EROSION AND SEDIMENT CONTROL				\$ -	
2.01	Development of Contractors Erosion and Sediment Control Plan in Accordance with the requirements of Legislative requirements (Environmental Protection Act, 1984)	1	Item	1,500.00	\$ 1,500.00	
2.02	Implementation of Erosion and Sediment Control Plan in accordance to Item 2.01	1	Item	5,000.00	\$ 5,000.00	
	EROSION AND SEDIMENT CONTROL TOTAL				\$ 6,500.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
3	EARTHWORKS				\$ -	
3.01	Clear, grub and dispose of material off site as directed by the Superintendent (Provisional Qty)	64	m ²	12.00	\$ 768.00	
3.02	Detailed excavation for Gabions and Remove spoil from Site	90	m ³	135.00	\$ 12,150.00	Remove Soil to stable batter profile, Box out base for foundation -Remove to Spoil
3.03	Remove unsuitable material, dispose of on the Principal's property where directed and reinstate with acceptable materials from the Principal's property (Provisional Qty)	9	m ³	85.00	\$ 765.00	Allowance = 10%
	EARTHWORKS TOTAL				\$ 13,683.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
4	ROADWORKS				\$ -	
4.01	Grade and trim pavement box	0	m ²	85.00	\$ -	
4.02	Supply, load, cart, spread and compact Type 2.2 CBR 60 base course material (compacted volume)	0	m ³	125.00	\$ -	
4.03	2 Coat Bitument Seal (14mm, 10mm)	0	m ²	22.00	\$ -	
4.04	Road Edge Guide Posts (Provisional Quantity)	3	No.	85.00	\$ 255.00	
4.05	Supply and Install Traffic Signs	0	No.	750.00	\$ -	
4.06	Supply and Install sub-soil drains (megaflow)	0	No.	65.00	\$ -	
4.07	Construct Barrier Kerb and Channel	0	m	375.00	\$ -	
	ROADWORKS TOTAL				\$ 255.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
5	STORMWATER DRAINAGE				\$ -	
5.01	Supply and place Drainage Rock (150mm+) Nom diameter to subsoil outlet	1	m ²	450.00	\$ 450.00	
	STORMWATER DRAINAGE TOTAL				\$ 450.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
6	GEOTECHNICAL WORKS				\$ -	
6.01	(a) Supply and install, No-fines Concrete Block including, geofabric underlay, subsoil drainage, supply, place, filling. (W x H x D)	120	m ³	2,250.00	\$ 270,000.00	Not included in total sum
	(b) Supply and install, Gabion Baskets including, geofabric underlay, subsoil drainage, supply, place, filling. (W x H x D)	120	m ³	500.00	\$ 60,000.00	
6.02	Construct reinforced concrete base slab and anchor wall for base	25	m ³	1,750.00	\$ 43,750.00	
6.03	Supply, load, cart, spread Granular Backfill (20mm Aggregate - min).	90	m ³	175.00	\$ 15,750.00	
6.04	Supply and install Type 3 Non-woven geotextile	60	m ²	5.00	\$ 300.00	
	GEOTECHNICAL WORKS TOTAL				\$ 119,800.00	Lower Bound

Project: **Kuranda Cemetary**
 Client: **Mareeba Shire Council**
 Treatment: **Mass Block, Gravity Wall**
 Site ID:



ASSUMPTIONS

SCHEDULE OF QUANTITIES AND COSTS

Assumptions

Structure

Length of Structure	20	m
Height of Structure	3	m

Drainage - Gravel Drains

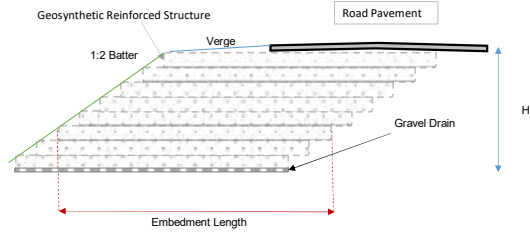
Gravel Drain - Depth	0.15	m
Gravel Drain - Width	3	m
Gravel Drain - Spacing	2	m
No. of Gravel Drains	2	

Geosynthetic Reinforcement

Length of Geosynthetic (Geogrid) reinforcement	6	m
Height between Geosynthetic layers	0.6	m
No. of Geosynthetic Layers	5	

Civil Works (General)

Local Area Factor	Stable Excavation Profile (1V: 1	H)
	1.1	(Use QRA Rate)



Project: Kuranda Cemertary
 Client: Mareeba Shire Council
 Treatment: Mass Block, Gravity Wall



Estimate of Costs

Price Schedule

Note: All Rates and Amounts are Exclusive of GST

Revision No. 1

Description	Amount \$
SUMMARY OF PRICE ESTIMATES	
0 INVESTIGATIONS, TESTING & REPORTS	\$ -
1 PRELIMINARIES	\$ 37,000.00
2 EROSION AND SEDIMENT CONTROL	\$ 6,500.00
3 EARTHWORKS	\$ 12,915.00
4 ROADWORKS	\$ 255.00
5 STORMWATER DRAINAGE	\$ -
6 GEOTECHNICAL WORKS	\$ 82,350.00
TOTAL VALUE OF WORK (Excluding GST)	\$ 139,020.00
GST	\$ 13,902.00
TOTAL VALUE OF WORK (Including GST)	\$ 152,922.00

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
0	INVESTIGATIONS, TESTING & REPORTS				\$ -	
0.1	Detailed Geotechnical Site Investigation & Report	1	Item	0.00	\$ -	Complete
0.2	Soil Testing	1	Item	0.00	\$ -	
0.3	Detail Survey	1	Item	0.00	\$ -	
0.4	Approvals Management (Planning, Preparation and Implementation)	1	PS	0.00	\$ -	
	INVESTIGATIONS, TESTING & REPORTS				\$ -	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
1	PRELIMINARIES				\$ -	
1.1	Building and Construction Industry Fee and Levy:				\$ -	Incl.
1.2	Notifiable Project Fee	1	Item	0.00	\$ -	Incl.
1.3	Portable Long Service Levy	1	Item	0.00	\$ -	Incl.
1.4	Audit Testing as directed by Superintendent (Prov. Sum - If ordered)	1	PS		\$ 5,000.00	PS
1.5	"As-built" Survey and provision of as-constructed drawings to Council format	1	Item	3,000.00	\$ 3,000.00	
1.6	Quality Testing	1	Item	1,500.00	\$ 1,500.00	
1.7	Relocating existing services (Prov. Sum)	1	PS	0.00	\$ -	Not Required
1.8	Development of Management Plans:				\$ -	
1.8.1	Traffic Management Plan	1	Item	0.00	\$ -	Not Required
1.8.2	Quality Management Plan	1	Item	0.00	\$ -	Not Required
1.8.3	Workplace Health and Safety Management Plan	1	Item	0.00	\$ -	Not Required
1.9	Implementation of Management Plans:				\$ -	
1.9.1	Traffic Management Plan	1	Item	0.00	\$ -	
					\$ -	Not Required
1.9.2	Quality Management Plan	1	Item	1,500.00	\$ 1,500.00	
1.9.3	Workplace Health and Safety Management Plan	1	Item	1,500.00	\$ 1,500.00	
1.10	Setting out works	1	Item	3,000.00	\$ 3,000.00	
1.11	Project sign and public notification	1	Item	1,500.00	\$ 1,500.00	
1.12	Site establishment and disestablishment	1	Item	20,000.00	\$ 20,000.00	
	PRELIMINARIES TOTAL				\$ 37,000.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
2	EROSION AND SEDIMENT CONTROL				\$ -	
2.01	Development of Contractors Erosion and Sediment Control Plan in Accordance with the requirements of Legislative requirements (<i>Environmental Protection Act, 1994</i>)	1	Item	1,500.00	\$ 1,500.00	
2.02	Implementation of Erosion and Sediment Control Plan in accordance to Item 2.01	1	Item	5,000.00	\$ 5,000.00	
	EROSION AND SEDIMENT CONTROL TOTAL				\$ 6,500.00	

Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
3	EARTHWORKS				\$ -	
3.01	Clear, grub and dispose of material off site as directed by the Superintendent (Provisional Qty)	0	m ²	12.00	\$ -	
3.02	Detailed excavation for GRS and Remove spoil from Site	90	m ³	135.00	\$ 12,150.00	Remove Soil to stable batter profile, Box out base for foundation -Remove to Spoil
3.03	Remove unsuitable material, dispose of on the Principal's property where directed and reinstate with acceptable materials from the Principal's property (Provisional Qty)	9	m ³	85.00	\$ 765.00	Allowance = 10%
	EARTHWORKS TOTAL				\$ 12,915.00	

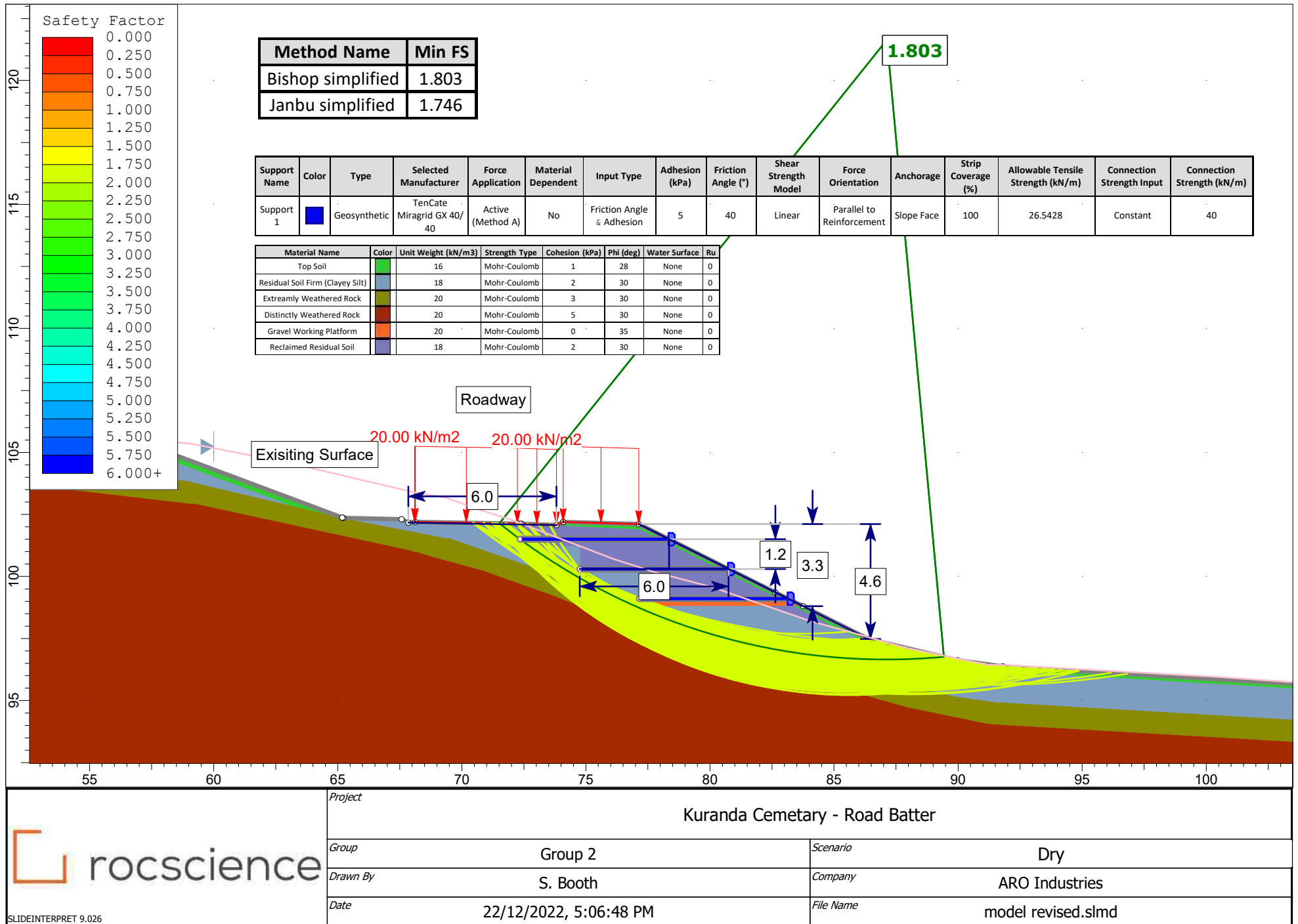
Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
4	ROADWORKS				\$ -	
4.01	Grade and trim pavement box	0	m ²	85.00	\$ -	
4.02	Supply, load, cart, spread and compact Type 2.2 CBR 60 base course material (compacted volume)	0	m ³	125.00	\$ -	
4.03	2 Coat Bitument Seal (14mm, 10mm)	0	m ²	22.00	\$ -	
4.04	Road Edge Guide Posts (Provisional Quantity)	3	No.	85.00	\$ 255.00	
4.05	Supply and Install Traffic Signs	0	No.	750.00	\$ -	
4.06	Supply and Install sub-soil drains (mega flow)	0	No.	65.00	\$ -	
4.07	Construct Barrier Kerb and Channel	0	m	375.00	\$ -	
	ROADWORKS TOTAL				\$ 255.00	

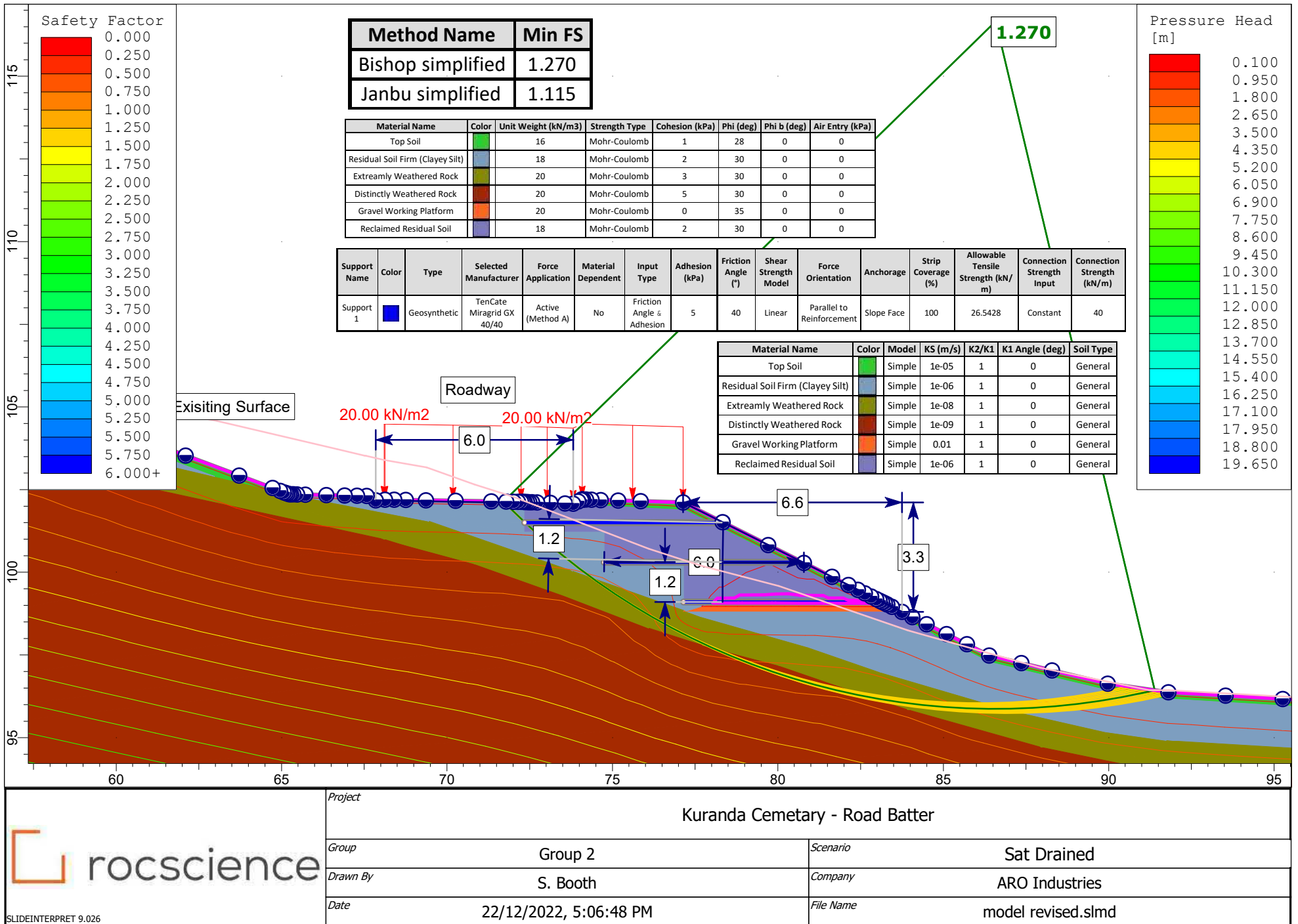
Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
5	STORMWATER DRAINAGE				\$ -	
5.01	Supply and place Drainage Rock (450mm+) . Nom diameter to front of wall, and to	0	m ²	450.00	\$ -	
	STORMWATER DRAINAGE TOTAL				\$ -	

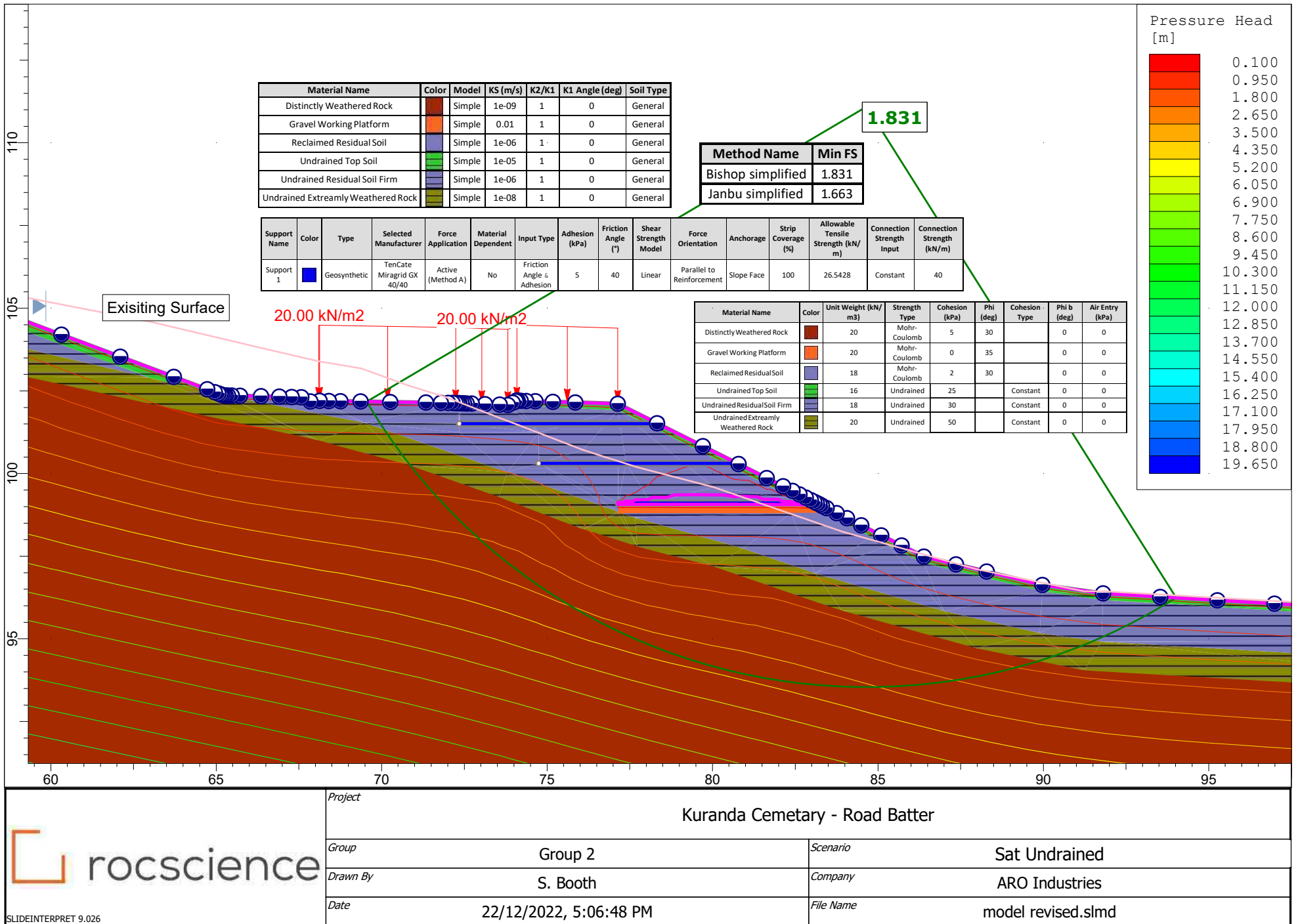
Item	Description	Qty	Unit	Rate \$	Amount \$	Comment
6	GEOTECHNICAL WORKS				\$ -	
6.01	Supply and install Geosynthetic reinforcement (to be installed at 600mm height	720	m ²	20.00	\$ 14,400.00	Miragrid (GX60/30) includes 20% overlap
6.02	(a) Supply, load, cart, spread and compact Type 2.2 CBR 60 material (compacted volume)	360	m ³	175.00	\$ 63,000.00	Could be less if won material is utilised subject to meeting suitable material specifications.
	(b) Place, spread and compact suitable material won from site (compacted volume)	360	m ³	50.00	\$ 18,000.00	Not included in sum
6.03	Supply and Install Gravel Drain Layers -Includes Drainage materials (gravel) + geotextile wrapping	18	m ³	175.00	\$ 3,150.00	
6.04	Supply and Install Gravel Working Platform -Includes Drainage materials (gravel) + geotextile wrapping	0	m ³	175.00	\$ -	
6.05	Topsoil, grass seeding and Grassroots Geofabric matting to batter surface	60	m ²	30.00	\$ 1,800.00	Batter erosion protection and vegetating
6.06					\$ -	
	GEOTECHNICAL WORKS TOTAL				\$ 82,350.00	

APPENDIX B

Preliminary Gabion Design and RocScience Slide2 Modelling of GRS Solution

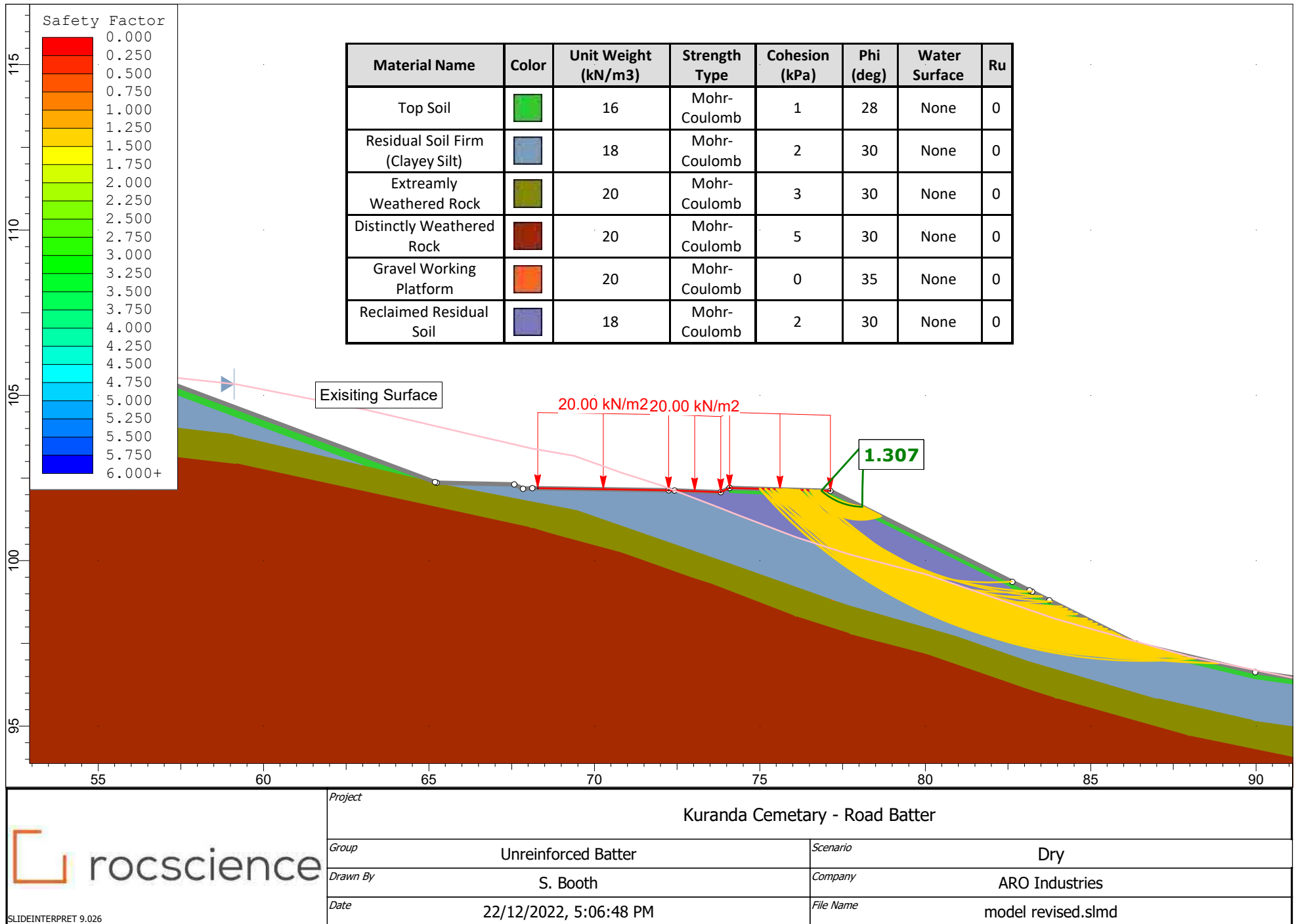


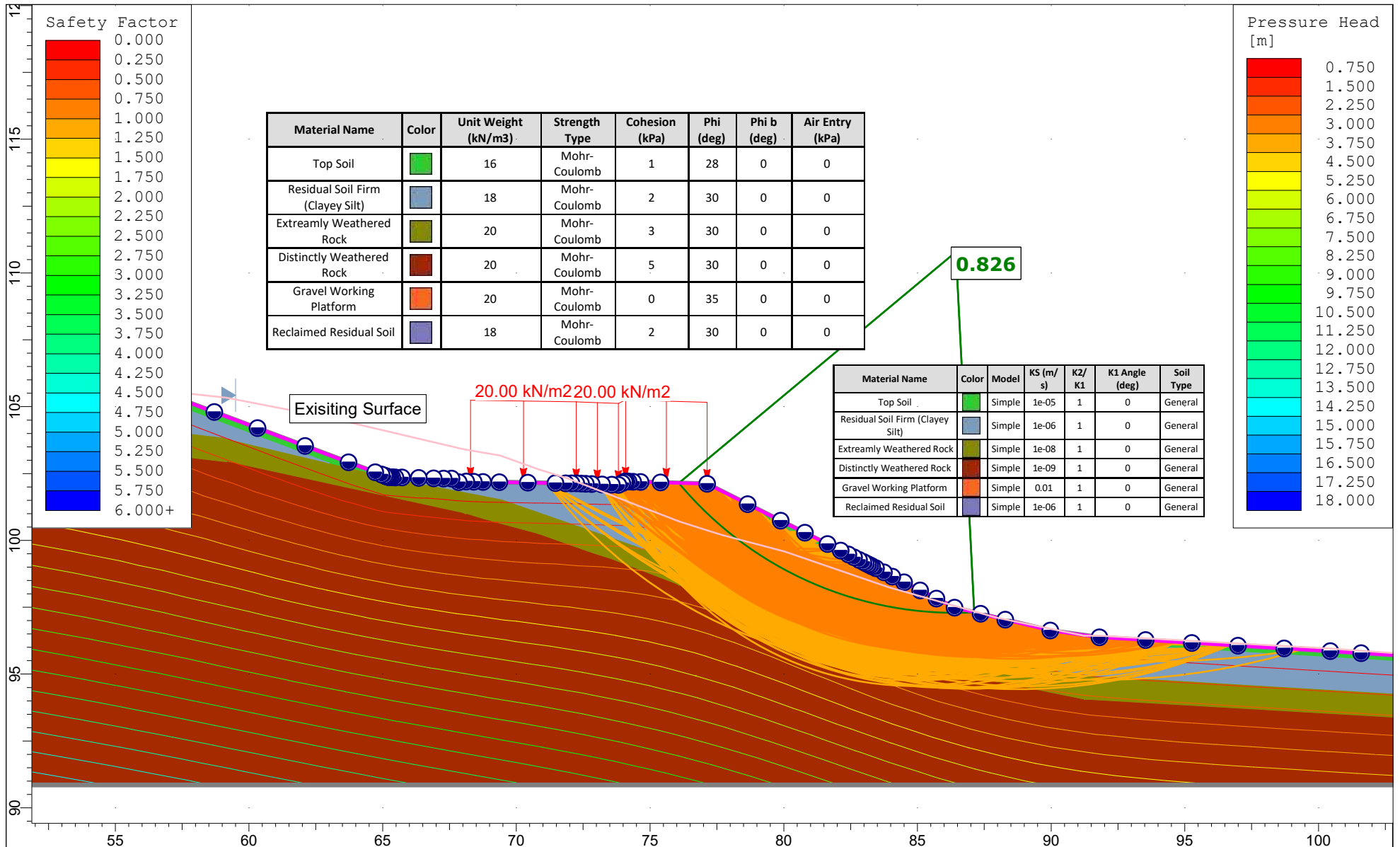




Project	Kuranda Cemetary - Road Batter		
Group	Group 2	Scenario	Sat Undrained
Drawn By	S. Booth	Company	ARO Industries
Date	22/12/2022, 5:06:48 PM	File Name	model revised.slmd

SLIDEINTERPRET 9.026



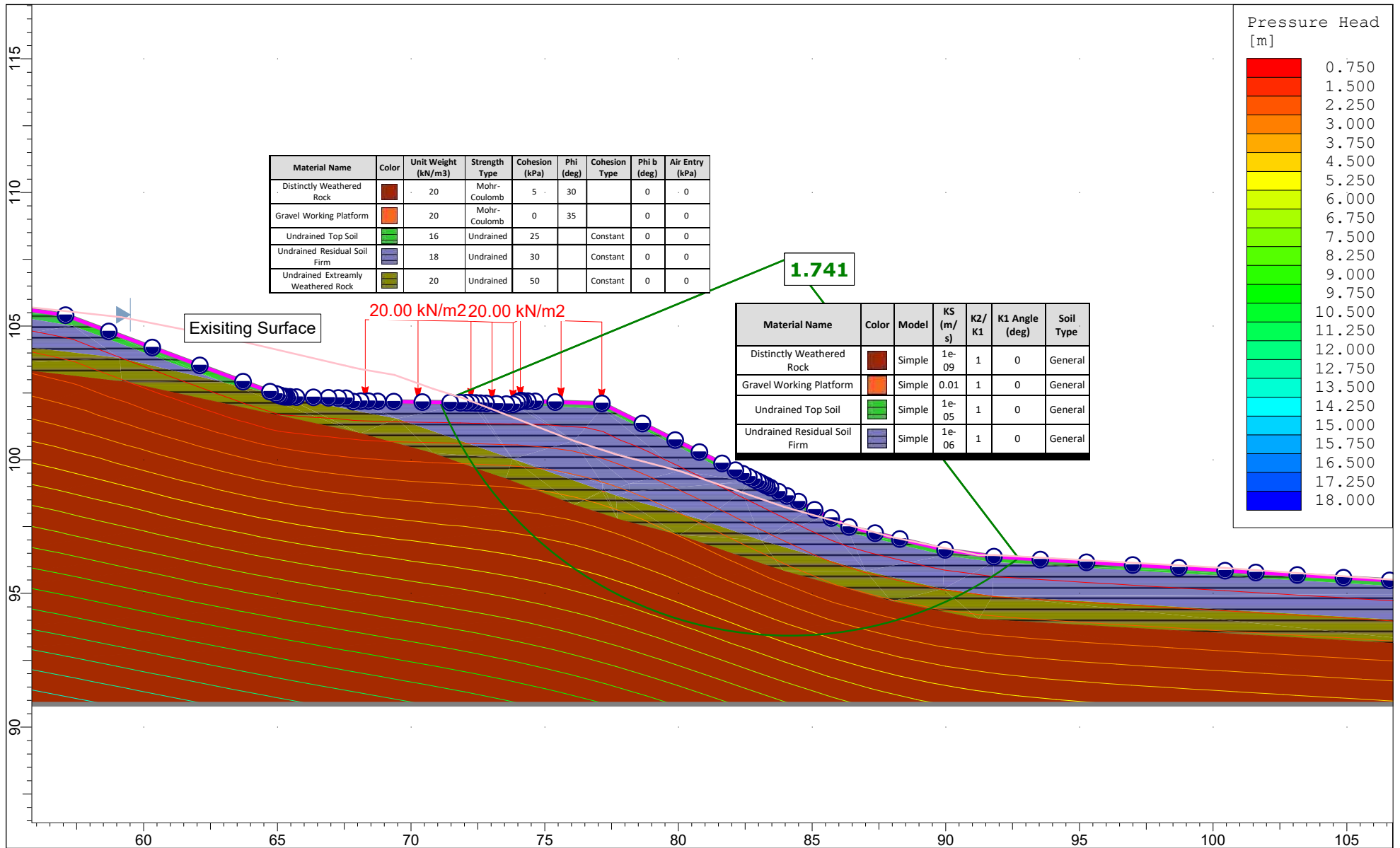


Material Name	Color	Unit Weight (kN/m ³)	Strength Type	Cohesion (kPa)	Phi (deg)	Phi b (deg)	Air Entry (kPa)
Top Soil		16	Mohr-Coulomb	1	28	0	0
Residual Soil Firm (Clayey Silt)		18	Mohr-Coulomb	2	30	0	0
Extreamly Weathered Rock		20	Mohr-Coulomb	3	30	0	0
Distinctly Weathered Rock		20	Mohr-Coulomb	5	30	0	0
Gravel Working Platform		20	Mohr-Coulomb	0	35	0	0
Reclaimed Residual Soil		18	Mohr-Coulomb	2	30	0	0

Material Name	Color	Model	K _S (m/s)	K ₂ /K ₁	K ₁ Angle (deg)	Soil Type
Top Soil		Simple	1e-05	1	0	General
Residual Soil Firm (Clayey Silt)		Simple	1e-06	1	0	General
Extreamly Weathered Rock		Simple	1e-08	1	0	General
Distinctly Weathered Rock		Simple	1e-09	1	0	General
Gravel Working Platform		Simple	0.01	1	0	General
Reclaimed Residual Soil		Simple	1e-06	1	0	General

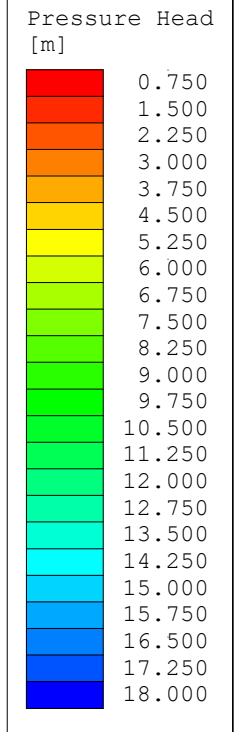
	Project Kuranda Cemetary - Road Batter	
	Group Unreinforced Batter	Scenario Sat Drained
	Drawn By S. Booth	Company ARO Industries
	Date 22/12/2022, 5:06:48 PM	File Name model revised.slmd

SLIDEINTERPRET 9.026



Material Name	Color	Unit Weight (kN/m³)	Strength Type	Cohesion (kPa)	Phi (deg)	Cohesion Type	Phi b (deg)	Air Entry (kPa)
Distinctly Weathered Rock	Dark Red	20	Mohr-Coulomb	5	30		0	0
Gravel Working Platform	Orange	20	Mohr-Coulomb	0	35		0	0
Undrained Top Soil	Light Green	16	Undrained	25		Constant	0	0
Undrained Residual Soil Firm	Blue-Gray	18	Undrained	30		Constant	0	0
Undrained Extremely Weathered Rock	Dark Green	20	Undrained	50		Constant	0	0

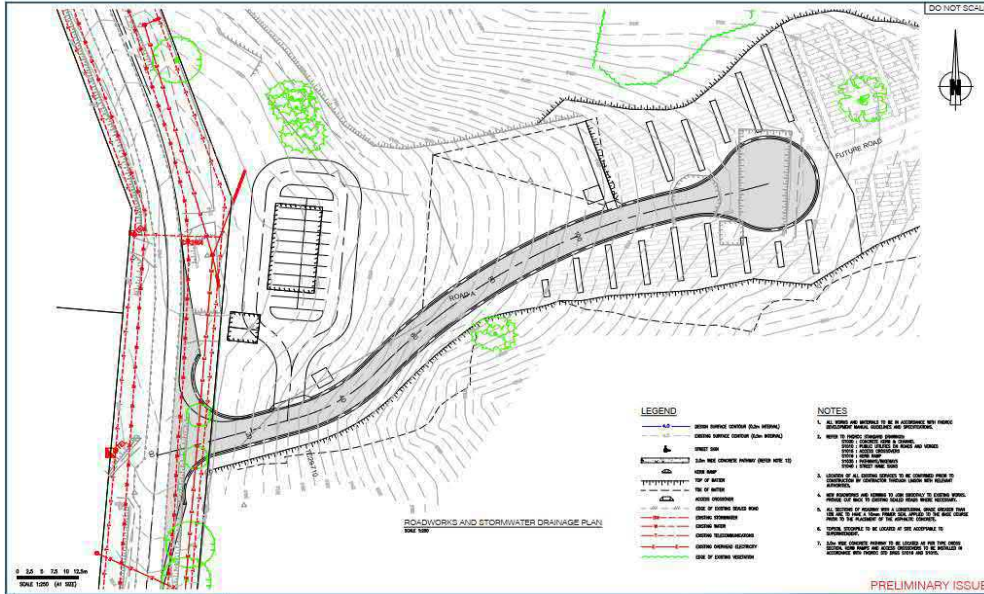
Material Name	Color	Model	KS (m/s)	K2/K1	K1 Angle (deg)	Soil Type
Distinctly Weathered Rock	Dark Red	Simple	1e-09	1	0	General
Gravel Working Platform	Orange	Simple	0.01	1	0	General
Undrained Top Soil	Light Green	Simple	1e-05	1	0	General
Undrained Residual Soil Firm	Blue-Gray	Simple	1e-06	1	0	General



	Project		Kuranda Cemetary - Road Batter	
	Group	Unreinforced Batter	Scenario	Sat Undrained
	Drawn By	S. Booth	Company	ARO Industries
	Date	22/12/2022, 5:06:48 PM	File Name	model revised.slmd

SLIDEINTERPRET 9.026

Client Mareeba Shire Council
Job Kuranda Cemetary

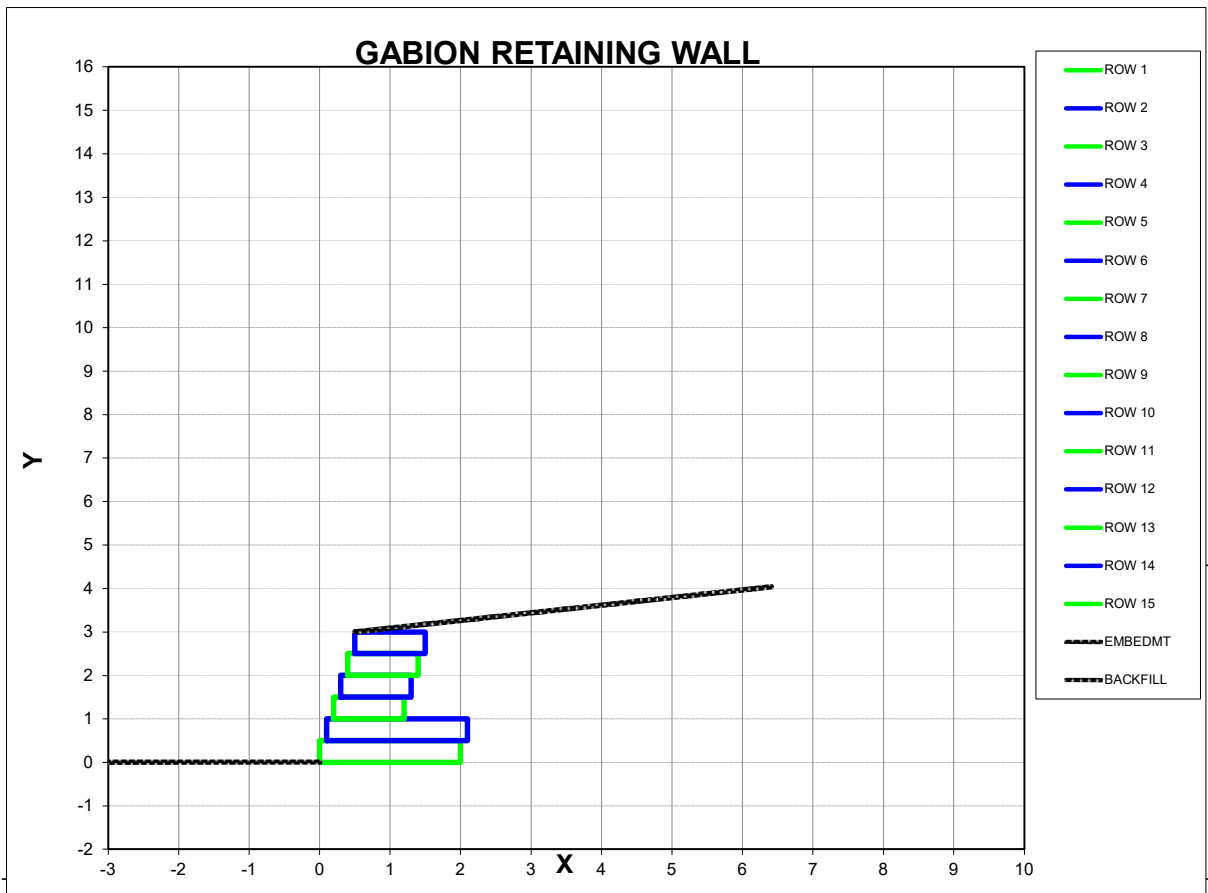


Concept Design Report

- 1 Problem Definition & Design Assumptions
- 2 Design Standard
- 3 Design Calculations & Compliance Assessment
- 4 Specifications
- 5 Cost Estimate

PRELIMINARY ONLY

Date: 28/02/2023



Row #	Width (m)	Height (m)	offset (from toe) (r)	Area (m ²)	X (m)	Moment (m ²)	Y (m)	Moment (m ³)
15				0.000	0.000	0.000	0.000	0.000
14				0.000	0.000	0.000	0.000	0.000
13				0.000	0.000	0.000	0.000	0.000
12				0.000	0.000	0.000	0.000	0.000
11				0.000	0.000	0.000	0.000	0.000
10				0.000	0.000	0.000	0.000	0.000
9				0.000	0.000	0.000	0.000	0.000
8				0.000	0.000	0.000	0.000	0.000
7			0.60	0.000	0.600	0.000	0.000	0.000
6	1.0	0.50	0.50	0.500	1.000	0.500	2.750	1.375
5	1.0	0.50	0.40	0.500	0.900	0.450	2.250	1.125
4	1.0	0.50	0.30	0.500	0.800	0.400	1.750	0.875
3	1.0	0.50	0.20	0.500	0.700	0.350	1.250	0.625
2	2.0	0.50	0.10	1.000	1.100	1.100	0.750	0.750
1	2.0	0.50	0.00	1.000	1.000	1.000	0.250	0.250
h=		3.0		4.000	0.950	3.800	1.250	5.000

Section 2 -Design Standard

PROBLEM DESCRIPTION: GRAVITY RETAINING WALL

TYPE: GABIONS

PROJECT NAME:	Mareeba Shire Council	PROJECT #:	231
LOCATION:	Kuranda Cemertary	SECTION:	0
GEOTECHNICAL ENGINEER:	Shaun Booth	REPORT #:	1
NOTES:		DRAWING #:	
		DATE:	28/02/2023

Design Standard: **AS4768 - 2002**
 Earth Retaining Structures

Section 3 -Design Calculations & Compliance Assessment

PROBLEM DESCRIPTION: GRAVITY RETAINING WALL

TYPE: **GABIONS**

PROJECT NAME:	Mareeba Shire Council	PROJECT #:	ARO0231
LOCATION:	Kuranda Cemetary	SECTION:	0
GEOTECHNICAL ENGINEER:	Shaun Booth	REPORT #:	1
NOTES:		DRAWING #:	
		DATE:	28/02/2023

Design Model: COULOMB'S THEORY (1776)

Assumptions (General)

- 1 The retaining wall is smooth & Vertical
- 2 No shear Stress generated along the wall at failure
- 3 Assumes controlled backfill
- 4 Assumes no re-inforcing in soil mass - therefore a global (lumped) geotechnical resistance factor may be used in the analysis rather than partial material design factors

Assumptions (Safety in Design)

- | | |
|----------------------------------|-------|
| 1 Factor of Safety (Overturning) | 2.000 |
| 2 Factor of Safety (Sliding) | 2.000 |

Limitations:

- 1 Analysis does not consider flowing water within the analysis
- 2 Analysis does not cover retaining structures supporting excavations in saturated clays or other soil or loading conditions. In these case(s) an undrained analysis may need to be performed to assess critical loading case
- 3 Analysis Does NOT - consider the local or global stability of the site (To be assessed seperately)
- 4 Analysis Does NOT - consider the Ultimate limit state capacity of individual components of the retention system
- 5 Analysis Does NOT - consider the Serviceability capacities/ or compliance of the system or individual components of the retention system

Design Checks

Check	Description	Outcome	Comments
1	Overturning:	Pass	$SF_o = \frac{\sum Mr}{\sum Mo}$
2	Sliding	Pass	$SF_s = \frac{\sum Fr}{\sum Fs}$
3	Eccentricity of Resultant Force	Pass	Resultant Force Occurs in middle 1/3
4	Bearing Capacity	Pass	Applied bearing pressure on LHS & RHS toe are less than the defined allowable bearing pressure

Calculations

COULOMB'S THEORY (1776)

BACK

$$\begin{aligned} \text{Active earth pressure coefficient } K_a &= \frac{\sin^2(\alpha + \Phi)}{\sin^2 \alpha \sin(\alpha - \delta) \left[1 + \sqrt{\frac{\sin(\Phi + \delta) \sin(\Phi - \beta)}{\sin(\alpha - \delta) \sin(\alpha + \beta)}} \right]^2} \\ &= \frac{0.703}{1.000 \cdot 0.926 \left[1 + \sqrt{\frac{0.820 \cdot 0.391}{0.926 \cdot 0.985}} \right]^2} \\ &= \frac{0.703}{2.350} \end{aligned}$$

$$K_a = 0.299$$

$$\begin{aligned} \text{Active soil thrust } P_s &= 0.5K_a \gamma s H^2 \\ &= 24.243 \text{ kN (per m width of wall)} \end{aligned}$$

$$\begin{aligned} \text{Active surcharge thrust } P_q &= \frac{\sin \alpha}{\sin(\alpha + \beta)} K_a q H \\ &= \frac{1.000}{0.985} \cdot 4.489 \\ &= 4.559 \text{ kN (per m width of wall)} \end{aligned}$$

$$\begin{aligned} \text{Horizontal active soil thrust } P_{hs} &= P_s \cos(\delta - \omega) \\ &= 22.460 \text{ kN (per m width of wall)} \end{aligned}$$

$$\begin{aligned} \text{Horizontal active surcharge thrust } P_{hq} &= P_q \cos(\delta - \omega) \\ &= 4.223 \text{ kN (per m width of wall)} \end{aligned}$$

$$\begin{aligned} \text{Vertical active soil thrust } P_{vs} &= P_s \sin(\delta - \omega) \\ &= 9.125 \text{ kN (per m width of wall)} \end{aligned}$$

$$\begin{aligned} \text{Vertical active surcharge thrust } P_{vq} &= P_q \sin(\delta - \omega) \\ &= 1.716 \text{ kN (per m width of wall)} \end{aligned}$$

FRONT

$$\begin{aligned} \text{Inclination angle to vertical } \omega_p &= 0.000 \\ \text{Front face angle to horizontal } \alpha_p &= 90 - \omega_p \\ &= 90.000 \\ \text{Backfill slope } \beta_p &= 0.000 \\ \text{Angle of wall friction } \delta_p &= 0.000 \end{aligned}$$

$$\begin{aligned} \text{Passive earth pressure coefficient } K_p &= \frac{\sin^2(\alpha - \Phi)}{\sin^2 \alpha \sin(\alpha + \delta) \left[1 - \sqrt{\frac{\sin(\Phi + \delta) \sin(\Phi + \beta)}{\sin(\alpha + \delta) \sin(\alpha + \beta)}} \right]^2} \\ &= \frac{0.703}{1.000 \cdot 1.000 \left[1 - \sqrt{\frac{0.545 \cdot 0.545}{1.000 \cdot 1.000}} \right]^2} \\ &= \frac{0.703}{0.207} \end{aligned}$$

$$K_p = 3.392$$

$$\begin{aligned} \text{Passive soil thrust } P_p &= 0.5K_p \gamma s d^2 \\ &= 0.000 \text{ kN} \end{aligned}$$

Check Bearing

Applied bearing pressure	P	=	$\frac{\sum W}{B}$	(1±	6e/B)	
		=	86.280	(1±	0.735)
Right		=	149.719	kPa	≤	150.000 kPa
Left		=	22.842	kPa	≤	150.000 kPa

Result
Pass
Result
Pass

Overall Result
Pass

Safety In Design

(Source: Appendix E; AS 4678 - 2002)

E2 DESIGN METHODS

E2.1 Safety in design

According to this Standard, safety is incorporated in the design process by the following:

- Using conservative soil properties in the analysis of stability, deformation, seepage or other ground engineering problems. This Standard prescribes or recommends factors by which characteristic material properties are multiplied in order to lead to a safe design (Section 5).
- Factoring up loads where they contribute to ground failure or excessive deformation, and factoring down loads that resist failure or reduce deformations (Section 4).
- The designer should be aware that additional safety in design may result from—
 - performing laboratory or field tests that tend to underestimate strength or overestimate deformation of soils;
 - sampling and testing soils with a bias towards finding the most unfavourable result;
 - using methods of analysis that are known to give conservative results; and
 - using empirical correlations that tend to err on the safe side.

Conversely, safety may be reduced where the above techniques are deemed to yield non-conservative results.

NOTE: The following alternative design approaches to retaining walls may be used, provided the same design considerations and performance criteria as outlined in this Standard are satisfied:

- For walls other than reinforced soil walls, a global (lumped) geotechnical resistance factor may be used, rather than partial material design factors. No guidance is given in this Standard for the choice of global factors.
- A safe design of conventional retaining structures can also be achieved by analysing limit equilibrium conditions using the worst credible soil parameters. A factor of safety just exceeding 1 would be sufficient to prevent failure. However, if the chosen safety factor is also intended to limit displacements to a tolerable maximum, the lowest credible soil strength will need to be further reduced by dividing it by a partial factor. This approach is referred to as the Direct Assessment (Worst Credible Scenario) method. No guidance for this approach is given in this Standard.

E2.2 Representative material properties

E2.2.1 General

In this Standard, representative material properties are called characteristic values. The meaning of characteristic value may vary depending on the particular material involved and conventions in the relevant industry.

Material design factors (Section 5) are thus applied to characteristic values (refer Clause 1.4.1.4).

E2.2.2 Soil shear strength parameters

The Mohr-Coulomb failure criteria contains two parameters, c' and ϕ' commonly referred to as the cohesion and the friction angle respectively, regardless of their true physical interpretation. Different sets of strength parameters are defined depending on loading and drainage conditions or the stress-strain characteristics as follows:

- Peak values are strength parameters determined from the highest strength value recorded during the test. Peak values are traditionally used in the analysis of bearing capacity and the determination of earth pressures.
- Effective strength parameters c' and ϕ' as obtained from a drained shear test or an undrained shear test with pore pressure measurements. These parameters are used for the analysis of free-draining granular soils and the long-term stability of clays.
- Undrained strength parameters c_u and ϕ_u as obtained from an undrained shear test. These parameters are used for the analysis of short-term stability, or stability under sudden loading of clays.
- Ultimate, constant volume or critical values (ϕ_{cr} or ϕ_{c_v}) are derived from measurements where the sheared specimen has reached constant volume conditions (usually at a strain of say 10%). These values are used in analyses based on the concept of critical state soil mechanics.
- Residual values (ϕ_r) are determined at very large strains (say 100%). They may be relevant for the analysis of the global stability of a wall in a slope with a history of instability.

For any analysis involving soil shear strength, an appropriate set of shear strength parameters has to be chosen.

Section 3 -Design Calculations & Compliance Assessment

PROBLEM DESCRIPTION: GRAVITY RETAINING WALL

TYPE: GABIONS

PROJECT NAME:	Mareeba Shire Council	PROJECT #:	ARO0231
LOCATION:	Kuranda Cemetary	SECTION:	0
GEOTECHNICAL ENGINEER:	Shaun Booth	REPORT #:	1
NOTES:		DRAWING #:	
		DATE:	28/02/2023

Design Model: RANKINE EARTH PRESSURE THEORY

Assumptions (General)

- 1 The retaining wall is smooth & Vertical
- 2 No shear Stress generated along the wall at failure
- 3 Rankine's Earth Pressure Theory is better for Estimating Kp
- 4 Assumes controlled backfill
- 5 Assumes no re-inforcing in soil mass - therefore a global (lumped) geotechnical resistance factor may be used in the analysis rather than partial material design factors (AS 4678 Cl: E2.1; Note (a))

Assumptions (Safety in Design)

- | | |
|----------------------------------|-------|
| 1 Factor of Safety (Overturning) | 2.000 |
| 2 Factor of Safety (Sliding) | 2.000 |

Limitations:

- 1 Only Valid for vertical Walls
- 2 Analysis only valid for very specific cases for inclined fill behind the wall i.e. ($\beta = \delta$)
- 3 Assumption : $\delta = 0$ degrees
- 4 Analysis does not consider flowing water within the analysis
- 5 Analysis does not cover retaining structures supporting excavations in saturated clays or other soil or loading conditions.
In these case(s) an undrained analysis may need to be performed to assess critical loading case
- 6 Analysis Does NOT - consider the local or global stability of the site (To be assessed seperately)
- 7 Analysis Does NOT - consider the Ultimate limit state capacity of individual components of the retention system
- 8 Analysis Does NOT - consider the Serviceability capacities/ or compliance of the system or individual components of the retention system

Design Checks

Check	Description	Outcome	Comments
1	Overturning:	Pass	$SF_o = \frac{\sum M_r}{\sum M_o}$
2	Sliding	Fail	$SF_s = \frac{\sum F_r}{\sum F_s}$
3	Eccentricity of Resultant Force	Pass	Resultant Force Occurs in middle 1/3
4	Bearing Capacity	Pass	Applied bearing pressure on LHS & RHS toe are less than the defined allowable bearing pressure

Calculations

RANKINE'S THEORY (1857)

Active earth pressure coefficient

$$K_A = \cos\beta \left(\frac{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi'}}{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi'}} \right)$$

$$0.985 \left[\frac{0.985 - \sqrt{0.970 - 0.703}}{0.985 + \sqrt{0.970 - 0.703}} \right]$$

$$0.985 \left[\frac{0.469}{1.501} \right]$$

$$K_a = 0.307$$

Active soil thrust	P_s	=	$0.5K_a \gamma_s H^2$	
		=	24.903	kN (per m width of wall)
Active surcharge thrust	P_q	=	$\frac{\sin\alpha}{\sin(\alpha+\beta)} K_a q H$	
		=	$\frac{1.000}{0.985}$	4.612
		=	4.683	kN (per m width of wall)
Horizontal active soil thrust	P_{hs}	=	$\gamma_s \cos(\delta - \omega)$	
		=	23.071	kN (per m width of wall)
Horizontal active surcharge thrust	P_{hq}	=	$\gamma_q \cos(\delta - \omega)$	
		=	4.338	kN (per m width of wall)
Vertical active soil thrust	P_{vs}	=	$\gamma_s \sin(\delta - \omega)$	
		=	9.373	kN (per m width of wall)
Vertical active surcharge thrust	P_{vq}	=	$\gamma_q \sin(\delta - \omega)$	
		=	1.763	kN (per m width of wall)

FRONT

Inclination angle to vertical	ω_p	=	0.000	(Assume 0 for Rankine Theory)
Front face angle to horizontal	α_p	=	90 - ω_p	
		=	90.000	
Backfill slope	β_p	=	0.000	(Assume 0 for Rankine Theory)
Angle of wall friction	δ_p	=	0.000	(Assume 0 for Rankine Theory)

Passive earth pressure coefficient

$$K_p = \cos\beta \left(\frac{\cos\beta + \sqrt{\cos^2\beta - \cos^2\phi'}}{\cos\beta - \sqrt{\cos^2\beta - \cos^2\phi'}} \right)$$

$$0.985 \left[\frac{0.985 + \sqrt{0.970 - 0.703}}{0.985 - \sqrt{0.970 - 0.703}} \right]$$

$$0.985 \left[\frac{1.501}{0.469} \right]$$

$$K_p = 3.155$$

Passive soil thrust	P_p	=	$0.5K_p \gamma_s d^2$	
		=	0.000	kN (per m width of wall)

Check Bearing

Applied bearing pressure $P = \frac{\sum W}{B} \quad (1 \pm 6e/B)$

$= 86.576 \quad (1 \pm 0.689)$

Right $= 146.197 \text{ kPa} \leq 150.000 \text{ O.K.}$

Left $= 26.954 \text{ kPa} \leq 150.000 \text{ O.K.}$

Result
Pass
Result
Pass

Overall Result
Pass

Safety In Design

(Source: Appendix E; AS 4678 - 2002)

E2 DESIGN METHODS

E2.1 Safety in design

According to this Standard, safety is incorporated in the design process by the following:

- (a) Using conservative soil properties in the analysis of stability, deformation, seepage or other ground engineering problems. This Standard prescribes or recommends factors by which characteristic material properties are multiplied in order to lead to a safe design (Section 5).
- (b) Factoring up loads where they contribute to ground failure or excessive deformation, and factoring down loads that resist failure or reduce deformations (Section 4).
- (c) The designer should be aware that additional safety in design may result from—
 - (i) performing laboratory or field tests that tend to underestimate strength or overestimate deformation of soils;
 - (ii) sampling and testing soils with a bias towards finding the most unfavourable result;
 - (iii) using methods of analysis that are known to give conservative results; and
 - (iv) using empirical correlations that tend to err on the safe side.

Conversely, safety may be reduced where the above techniques are deemed to yield non-conservative results.

NOTE: The following alternative design approaches to retaining walls may be used, provided the same design considerations and performance criteria as outlined in this Standard are satisfied:

- (a) For walls other than reinforced soil walls, a global (lumped) geotechnical resistance factor may be used, rather than partial material design factors. No guidance is given in this Standard for the choice of global factors.
- (b) A safe design of conventional retaining structures can also be achieved by analysing limit equilibrium conditions using the worst credible soil parameters. A factor of safety just exceeding 1 would be sufficient to prevent failure. However, if the chosen safety factor is also intended to limit displacements to a tolerable maximum, the lowest credible soil strength will need to be further reduced by dividing it by a partial factor. This approach is referred to as the Direct Assessment (Worst Credible Scenario) method. No guidance for this approach is given in this Standard.

E2.2 Representative material properties

E2.2.1 General

In this Standard, representative material properties are called characteristic values. The meaning of characteristic value may vary depending on the particular material involved and conventions in the relevant industry.

Material design factors (Section 5) are thus applied to characteristic values (refer Clause 1.4.1.4).

E2.2.2 Soil shear strength parameters

The Mohr-Coulomb failure criteria contains two parameters, c' and ϕ' commonly referred to as the cohesion and the friction angle respectively, regardless of their true physical interpretation. Different sets of strength parameters are defined depending on loading and drainage conditions or the stress-strain characteristics as follows:

- (a) Peak values are strength parameters determined from the highest strength value recorded during the test. Peak values are traditionally used in the analysis of bearing capacity and the determination of earth pressures.
- (b) Effective strength parameters c' and ϕ' as obtained from a drained shear test or an undrained shear test with pore pressure measurements. These parameters are used for the analysis of free-draining granular soils and the long-term stability of clays.
- (c) Undrained strength parameters c_u and ϕ_u as obtained from an undrained shear test. These parameters are used for the analysis of short-term stability, or stability under sudden loading of clays.
- (d) Ultimate, constant volume or critical values (ϕ_{cr} or ϕ_{cv}) are derived from measurements where the sheared specimen has reached constant volume conditions (usually at a strain of say 10%). These values are used in analyses based on the concept of critical state soil mechanics.
- (e) Residual values (ϕ_r) are determined at very large strains (say 100%). They may be relevant for the analysis of the global stability of a wall in a slope with a history of instability.

For any analysis involving soil shear strength, an appropriate set of shear strength parameters has to be chosen.



Section 4 - Specifications

PROBLEM DESCRIPTION: GRAVITY RETAINING WALL

TYPE: GABIONS

PROJECT NAME:	Mareeba Shire Council	PROJECT #:	ARO0231
LOCATION:	Kuranda Cemetary	SECTION:	0
GEOTECHNICAL ENGINEER:	Shaun Booth	REPORT #:	1
NOTES:		DRAWING #:	
		DATE:	28/02/2023

Specific Notes to go on Drawings

GABIONS AND MATTRESSES

MATERIALS

Wire, gabions and mattresses

General: Comply with AS 2423 . Galvanise all wire to AS 4534 . Coat all components with polyvinyl chloride to a minimum thickness of 0.5 mm.

Gabions: Use mesh with a wire diameter not less than 2 mm. Provide appropriate mesh size to retain the rock filling. Provide selvedge wires with a diameter not less the 3.15 mm and binding wire with a diameter not less than 2.5 mm.

Mattress: Use mesh with a wire diameter not less than 2 mm. Provide appropriate mesh size to retain the rock filling. Provide selvedge wires with a diameter not less than 2.5 mm and binding wire with a diameter not less than 1.6 mm.

Rock fill

General: Clean, hard, durable crushed rock, rock spalls or river gravel, with minimum size larger than the maximum opening size of the mesh or fabric forming the basket. Rocks must be cubical where possible. The smallest dimension must not be less than half the greatest dimension.

Properties: Wet/dry strength variation tested in accordance with Queensland Department of Transport and Main Roads test method Q205C or AS 1141.22 must not exceed 35%. Ten percent fines value tested in accordance with Queensland Department of Transport and Main Roads test method Q205B or AS 1141.22 must not be less than 140 kN.

Gabions: Provide rock of nominal size between 120 mm and 200 mm. Rock must be uniformly graded, with greater than 80% by number exceeding the 150 mm nominal size.

Mattresses: Provide rock of nominal size between 75 mm and 150 mm. Rock must be uniformly graded, with greater than 80% by number exceeding the 100 mm nominal size.

EXECUTION

Gabions

General: Construct gabion protection work in the locations and in accordance with the details shown on the drawings.

Surface preparation: Trim areas on which gabions are to be positioned to the specified shapes within a tolerance of ± 50 mm. Trimmed surfaces must be free of roots, stumps, brush, rocks and the like protrusions.

Geotextile fabric: Place type 3 geotextile behind all gabions.

Assembly: Assemble to comply with the drawings and recommendations of the manufacturer.

Positioning: Position assembled gabions empty in the works. Securely position the first row of gabions and fill before gabions in other rows are positioned.

Rock fill: Hand pack the exposed faces of the basket. The remainder may be filled using machine methods. Place the rock to produce a dense, evenly distributed filling with a minimum of voids. Maintain the tolerances and shape specified. Tie together the outer and inner panels of the

Damage: During the placing, do not damage the gabion mesh or geotextile.

APPENDIX D
ARO Industries Engineering Drawings

NEW KURANDA CEMETERY

Stage 1

AT

KURANDA HEIGHTS ROAD, KURANDA

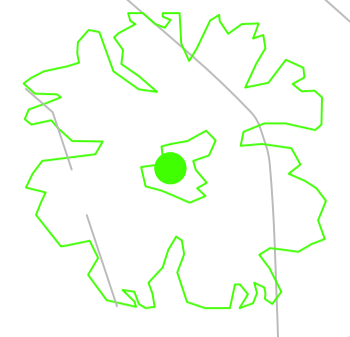
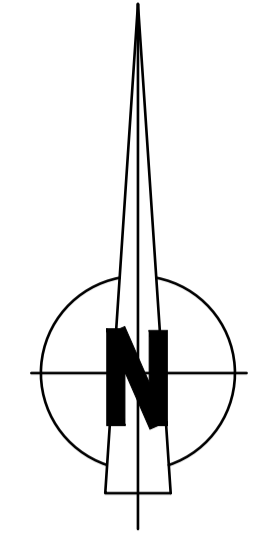


LOCALITY PLAN
NOT TO SCALE

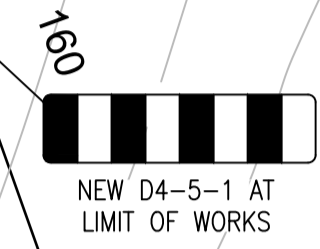
ARO INDUSTRIES DRAWINGS

ARO0231-C00	COVER SHEET, LOCALITY PLAN AND DRAWING SCHEDULE
ARO0231-C01	GENERAL ARRANGEMENT PLAN
ARO0231-C02	ROADWORKS AND STORMWATER DRAINAGE PLAN
ARO0231-C03	TYPE CROSS SECTION AND ROAD SETOUT DETAILS
ARO0231-C04	ROAD A AND STORMWATER LONGITUDINAL SECTION
ARO0231-C05	ROAD A ANNOTATED CROSS SECTIONS – SHEET 1 OF 3
ARO0231-C06	ROAD A ANNOTATED CROSS SECTIONS – SHEET 2 OF 3
ARO0231-C07	INTERSECTION SETOUT
ARO0231-C08	CARPARK SETOUT AND DETAILS
ARO0231-C09	EARTHWORKS GRADING PLAN
ARO0231-C10	EARTHWORKS SECTIONS
ARO0231-C11	EARTHWORKS BATTER REINFORCEMENT
ARO0231-C12	BATTER REINFORCEMENT NOTES SHEET 1 OF 2
ARO0231-C13	BATTER REINFORCEMENT NOTES SHEET 2 OF 2
ARO0231-C14	CONCRETE BEAM DETAILS – SHEET 1 OF 2
ARO0231-C15	CONCRETE BEAM DETAILS – SHEET 2 OF 2
ARO0231-C16	PEDESTRIAN PATHWAY AND ABLUTION BLOCK PAD DETAILS
ARO0231-C17	WATER RETICULATION PLAN
ARO0231-C18	EROSION AND SEDIMENT CONTROL PLAN

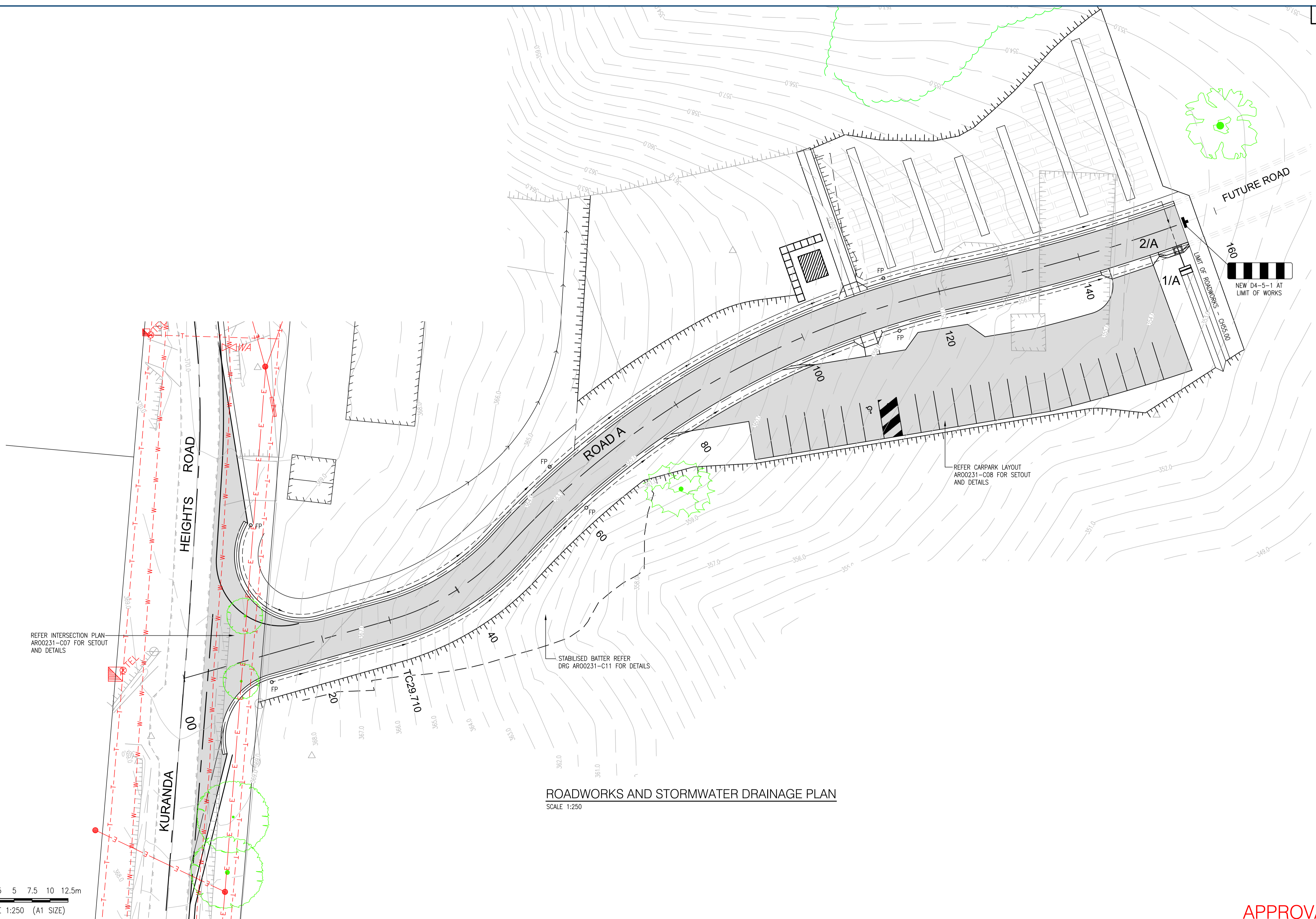
APPROVAL ISSUE



FUTURE ROAD



NEW D4-5-1 AT LIMIT OF WORKS



ROADWORKS AND STORMWATER DRAINAGE PLAN
SCALE 1:250

0 2.5 5 7.5 10 12.5m
SCALE 1:250 (A1 SIZE)

APPROVAL ISSUE

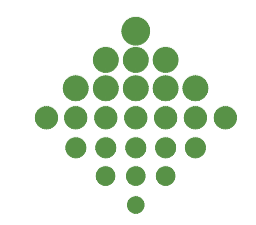
No.	Description	Reviewed	Approved	Date
3	APPROVAL ISSUE	-	-	14/03/2023
2	REVISED CARPARK LOCATION	-	-	10/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022



Client	MAREEBA SHIRE COUNCIL		
Project	NEW KURANDA CEMETERY - STAGE 1		
Title	ROADWORKS AND STORMWATER DRAINAGE PLAN		
Drawing No.	ARO0231-C02		

Drawn	MS	Designed	MS	Approved	
Drawing Check		Design Check		RPEQ	Date

Scale (A1 size)
1:250
Drawing is not to be used for construction unless approved.

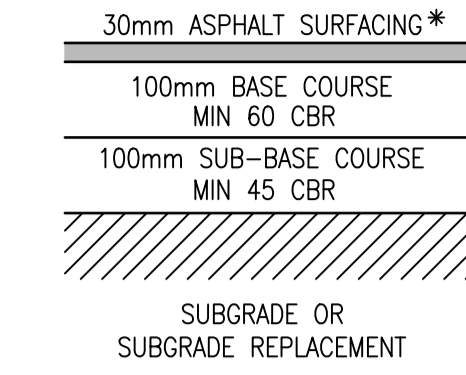


ARO

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NOTES

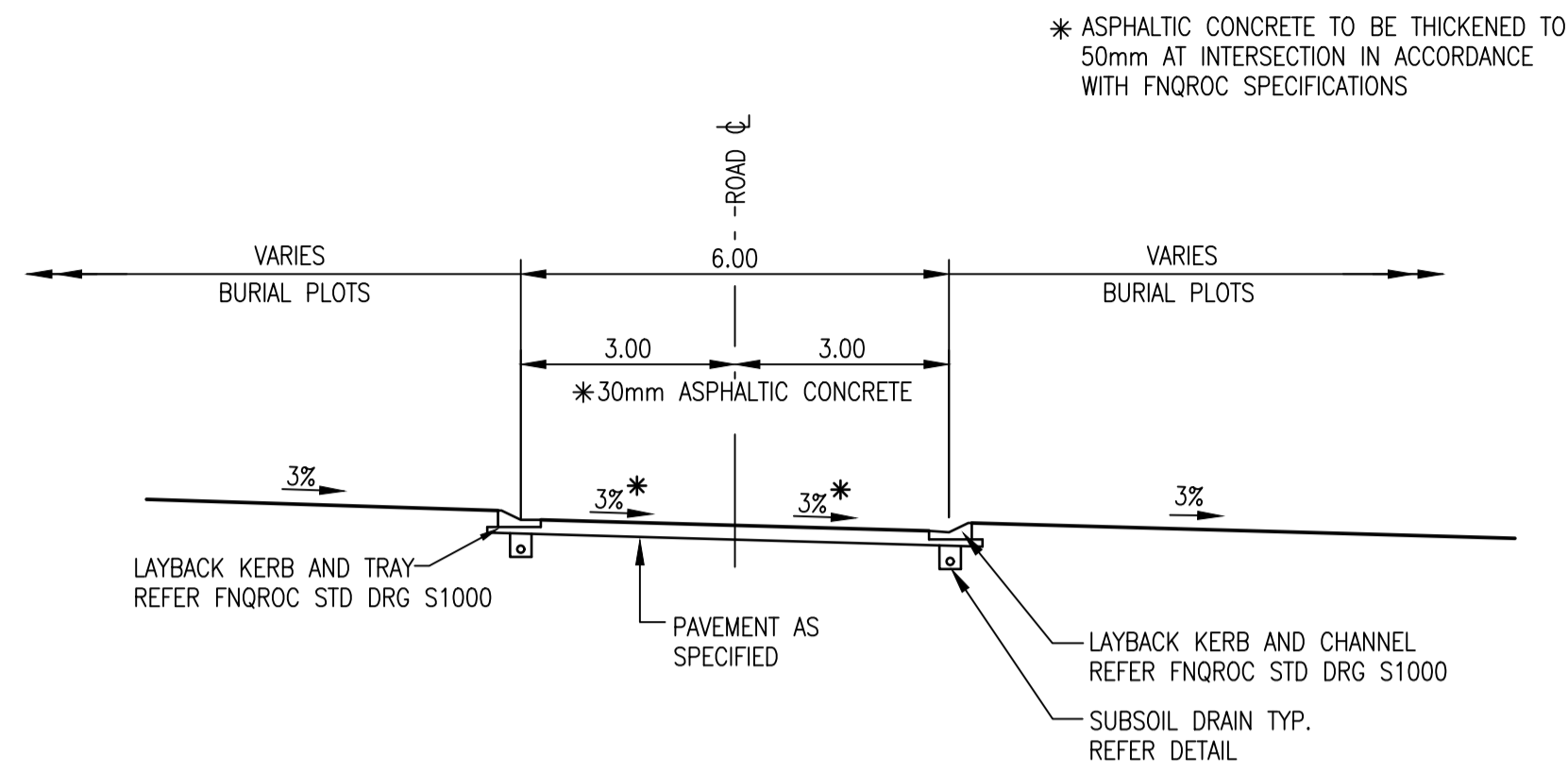
1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. PAVEMENT DESIGN IS BASED ON AN ASSUMED SUBGRADE CBR OF 6.
3. THE CONTRACTOR IS TO CONFIRM SUBGRADE CBR DURING CONSTRUCTION AND PAVEMENT DESIGN IS TO BE CONFIRMED WITH SUPERINTENDENT AND CAIRNS REGIONAL COUNCIL.
4. SUPERINTENDENT IS TO CONFIRM FINAL PAVEMENT DETAILS PRIOR TO CONSTRUCTION.



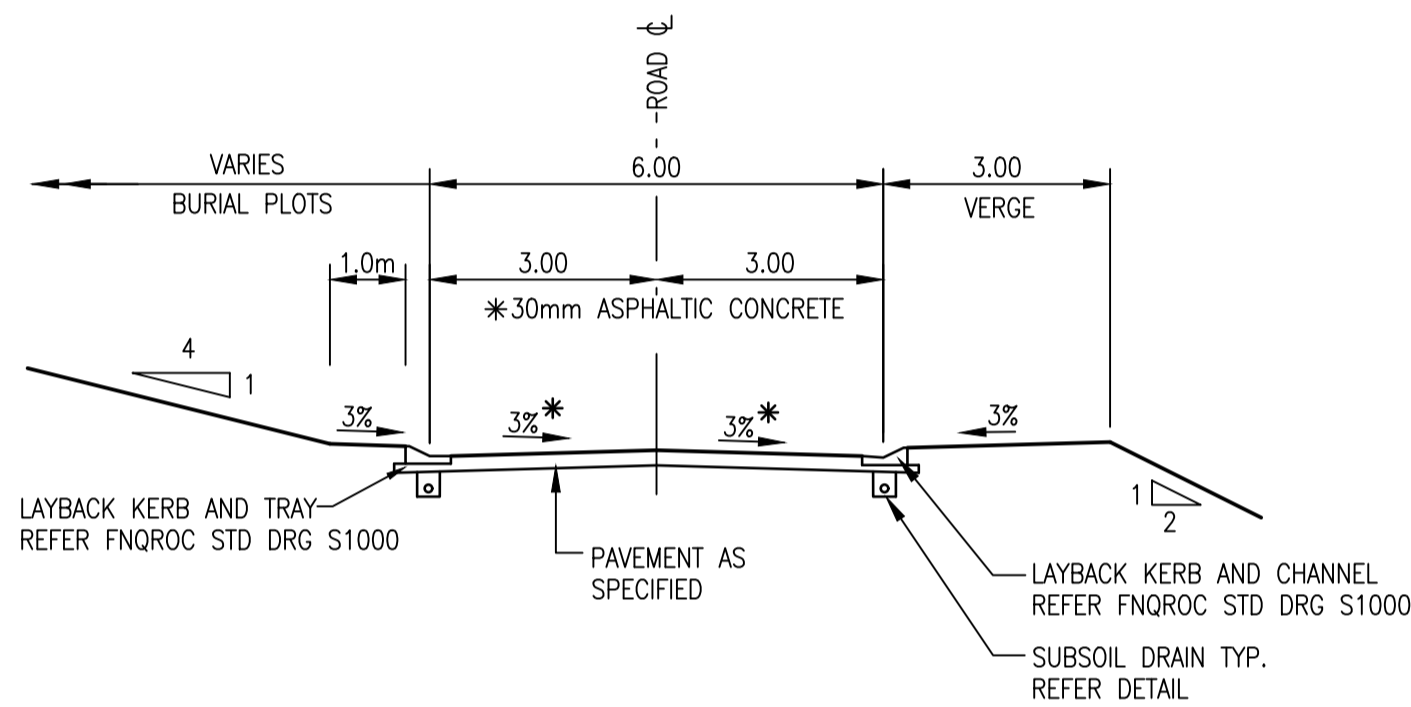
PAVEMENT DETAIL

ROAD A CONTROL LINE SETOUT

CHAINAGE	EASTING	NORTHING	BEARING	RAD/SPIRAL	A.LENGTH	DEFL.ANGLE
0.000	353742.013	8140088.418	74°12'15.23"			
TC 29.710	353770.601	8140096.506	74°12'15.23"			
39.423	353780.195	8140099.220		R = -35.000	19.427	31°48'06.83"
CC 49.137	353786.919	8140106.582	42°24'08.41"			
86.388	353812.878	8140135.009		R = 120.000	74.503	35°34'21.38"
CC 123.640	353850.529	8140143.029	77°58'29.79"			
177.334	353904.020	8140154.424		R = -230.000	107.388	26°45'05.90"
231.028	353946.657	8140188.676	51°13'23.89"			



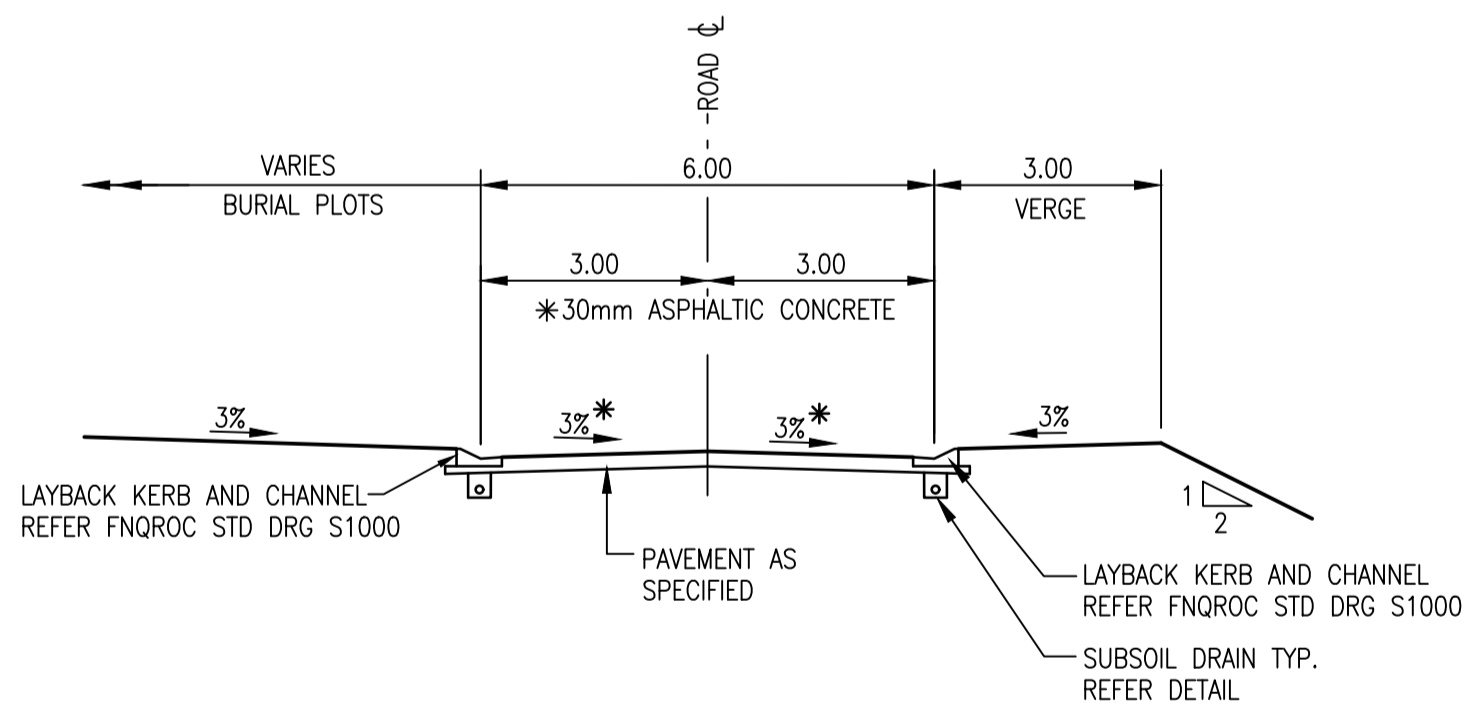
CH110.00 TO END



CH72.00 TO CH110.00

TYPICAL ROAD CROSS SECTIONS

SCALE 1:100

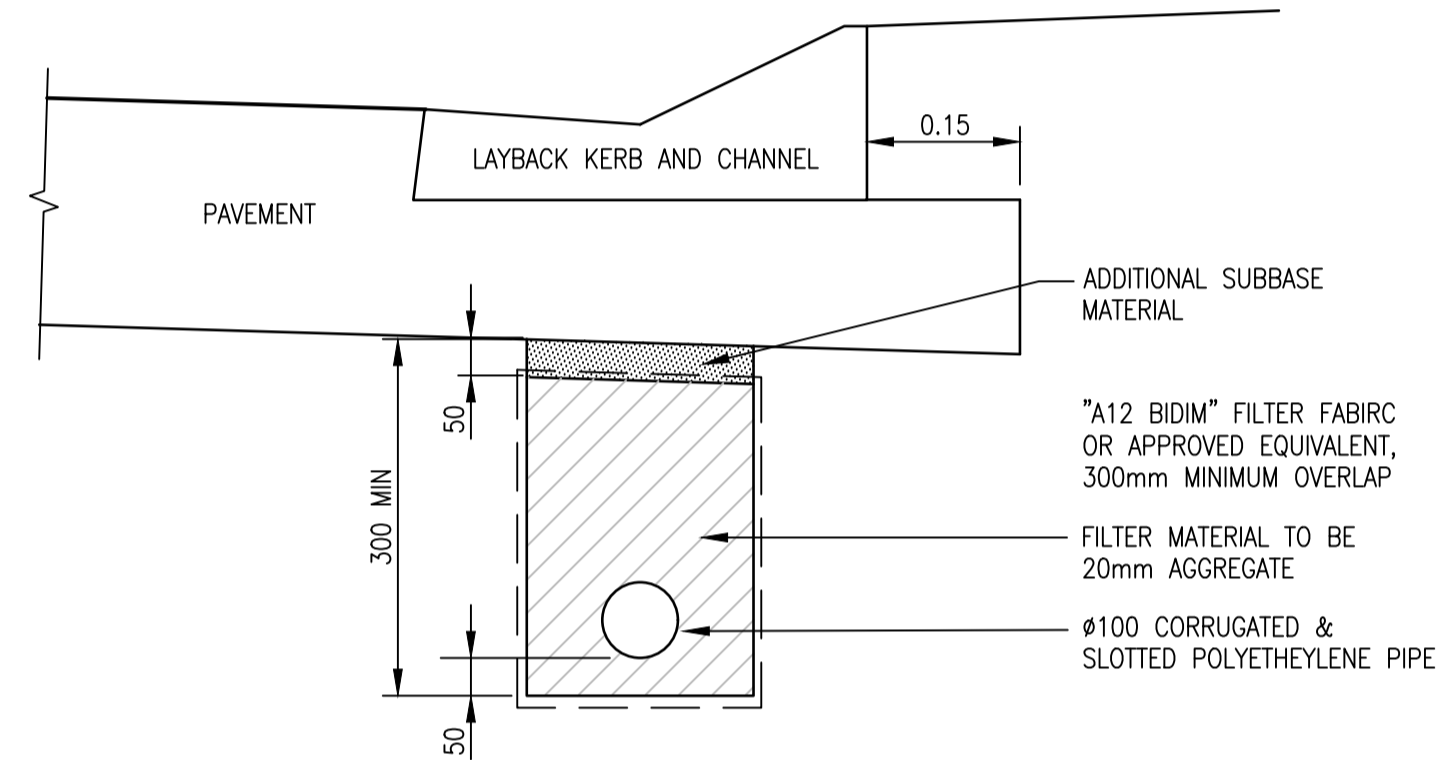


CH0.00 TO CH72.00

TYPICAL ROAD CROSS SECTIONS

SCALE 1:100

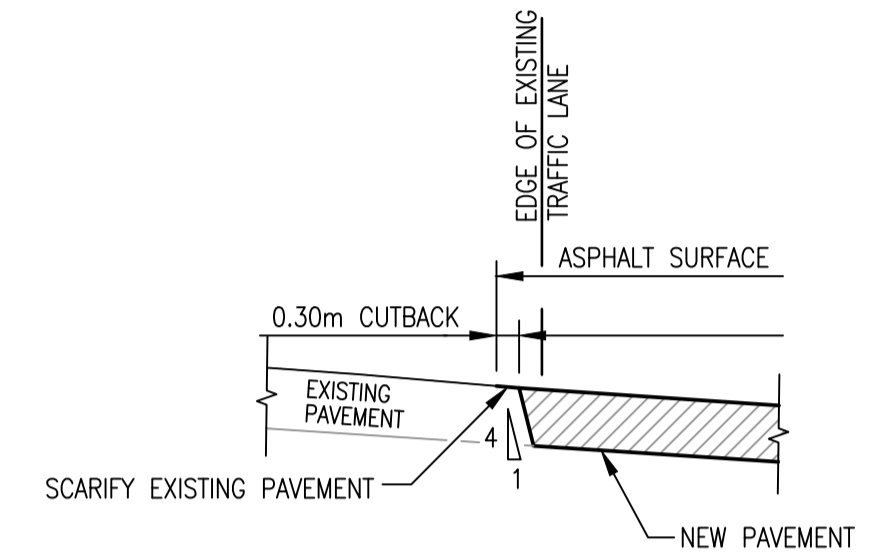
DESIGN SUBGRADE CBR 6
(REFER NOTES 2 & 3)



SUBSURFACE DRAINAGE FLUSHING POINTS SHALL BE PROVIDED AT HEAD OF LINES, HIGH POINTS AND NOT MORE THAN 50m SPACING IN ACCORDANCE WITH FNQROC STD DRG S1095

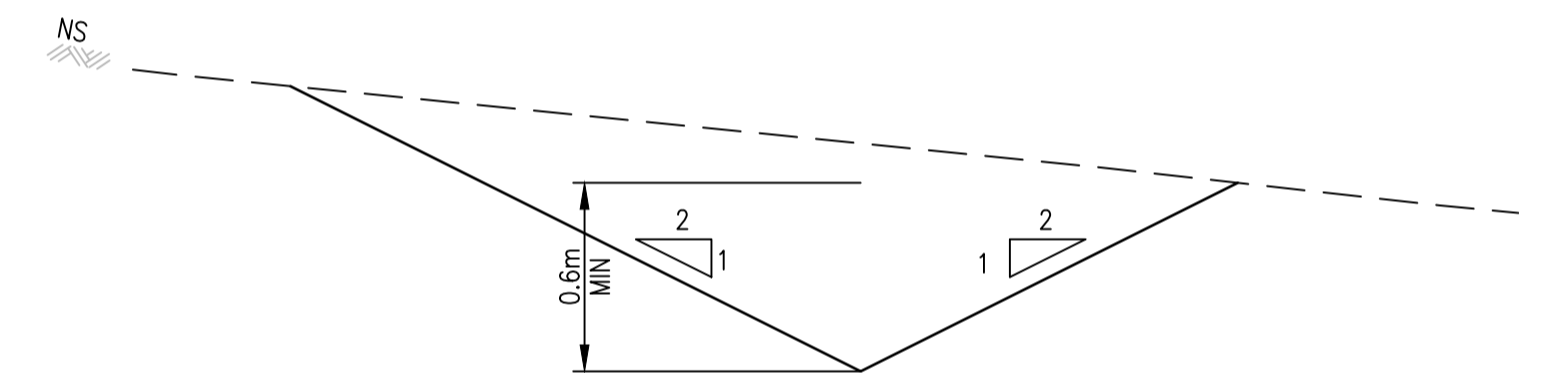
SUBSURFACE DRAINAGE

N.T.S.



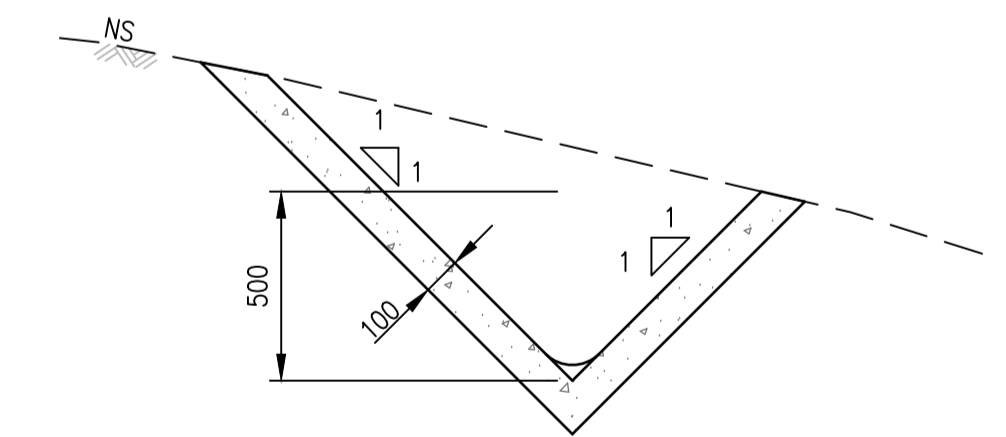
CUTBACK DETAIL

NOT TO SCALE



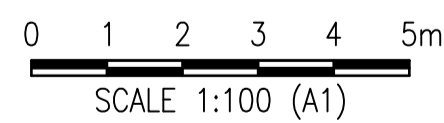
OUTLET DRAIN

NOT TO SCALE



CATCH DRAIN DETAIL

NOT TO SCALE



SCALE 1:100 (A1)

APPROVAL ISSUE

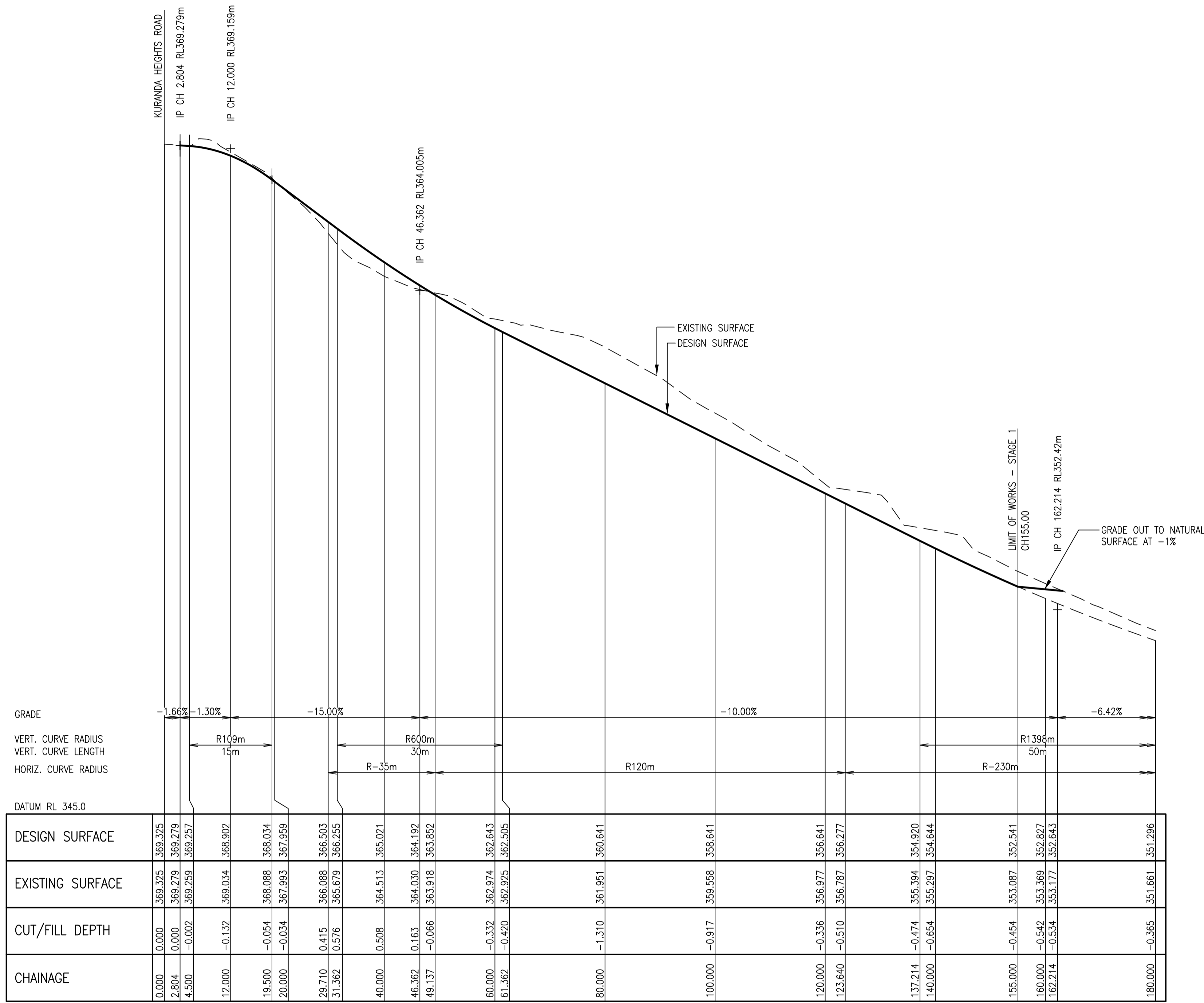
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2	APPROVAL ISSUE	-	-	14/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022



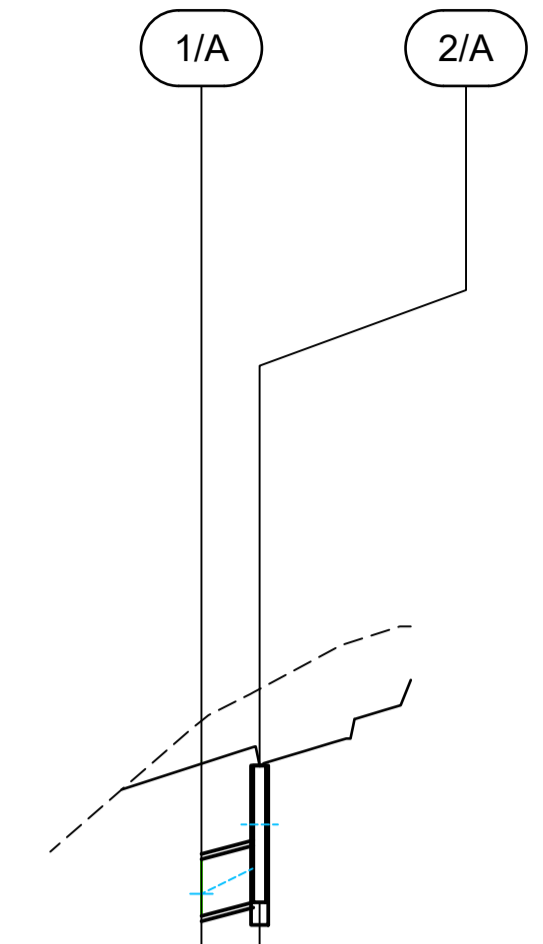
Client	MAREEBA SHIRE COUNCIL		
Project	NEW KURANDA CEMETERY - STAGE 1		
Title	TYPE CROSS SECTIONS AND MISCELLANEOUS DETAILS		
Client Logo			

Drawn	MS	Designed	MS	Approved	
Drawing Check		Design Check		RPEQ	Date

Scale (A1 size)	AS SHOWN
Drawing is not to be used for construction unless approved.	

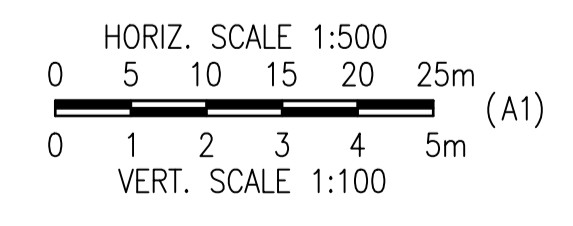
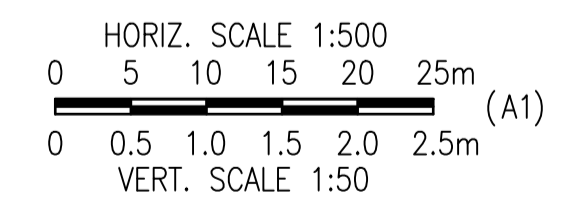


ROAD A LONGITUDINAL SECTION
SCALE HOR 1:500, VERT 1:100



DATUM RL	345.00		
COVER LEVEL	352.68	353.30	
DEPTH TO INVERT	0.38	0.90	
HYDRAULIC GRADE LINE	352.45	352.62	352.91
INVERT LEVEL	352.31	352.40	
PIPE CHAINAGE	0.00	3.85	
PIPE LENGTH	L=3.50		
PIPE SIZE (mm)	ø375		
PIPE GRADE (%)	2.65%		
PIPE GRADE (1 in)	1 in 37.8		
PIPE COVER MINIMUM	Cover=0.60		
PIPE CLASS	RCP (2)		
PIPE ROUGHNESS	n=0.013		
Vcap - CAPACITY VELOCITY (m/s)	Vcap=2.58		
Vc - CRITICAL DEPTH VELOCITY (m/s)	Vc=1.35		
Vn - NORMAL DEPTH VELOCITY (m/s)	Vn=2.30		
Vf - FULL PIPE VELOCITY (m/s)	Vf=0.83		
Qcap - CAPACITY FLOW (L/s)	Qcap=285		
Q - PIPE FLOW (L/s)	Q=92		
Qi - PIT INFLOW (L/s) & CHOKE (%)	Qi=92 100%		
Ku (& Kw) - PIT LOSS FACTORS	8.21		
PIT TYPE	HEADWALL	ON GRADE (S)	
PIT SETOUT	353881.47E 8140144.64N 352.31Z	353880.02E 8140148.51N 353.32Z	

LINE A
SCALE HOR 1:500, VERT 1:50



No.	Description	Reviewed	Approved	Date
2	APPROVAL ISSUE	-	-	14/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022



Client	MAREEBA SHIRE COUNCIL		
Project	NEW KURANDA CEMETERY - STAGE 1		
Title	ROAD A AND STORMWATER LONGITUDINAL SECTION		
Client Logo			

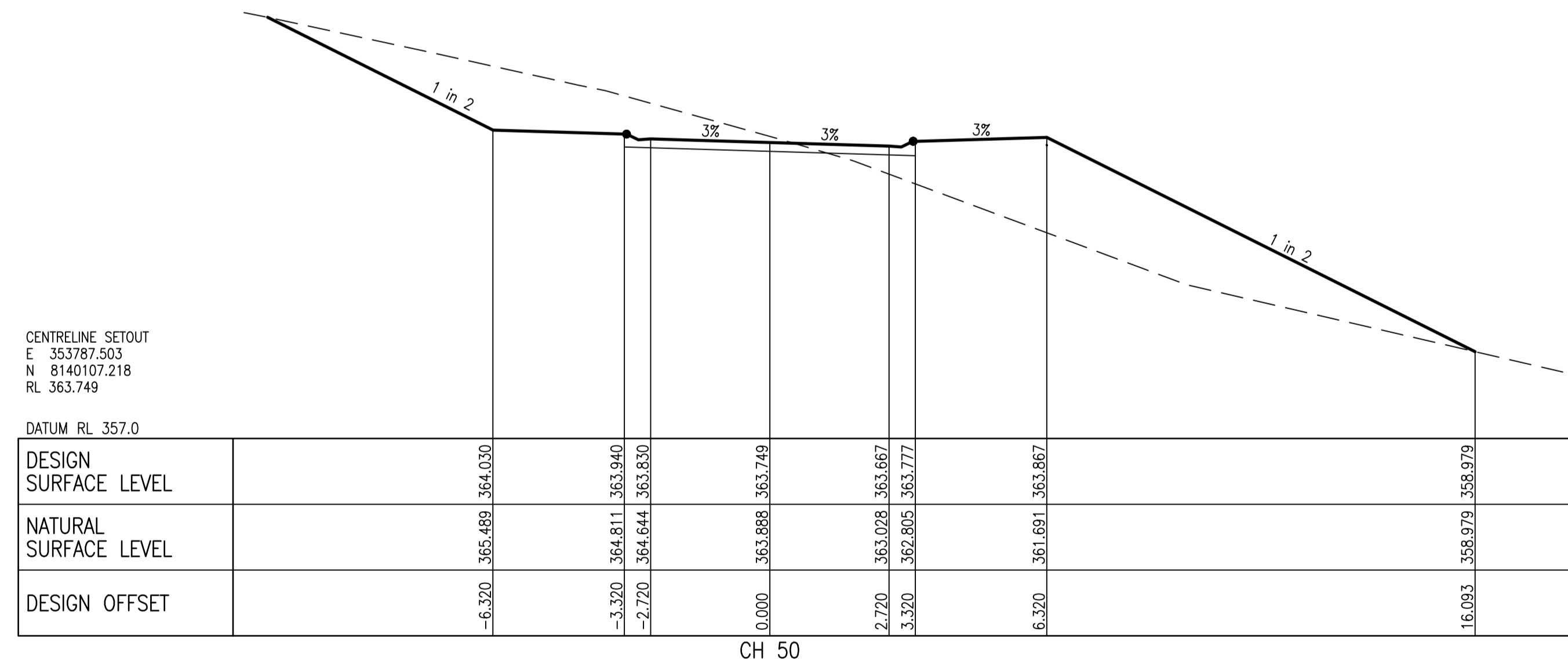
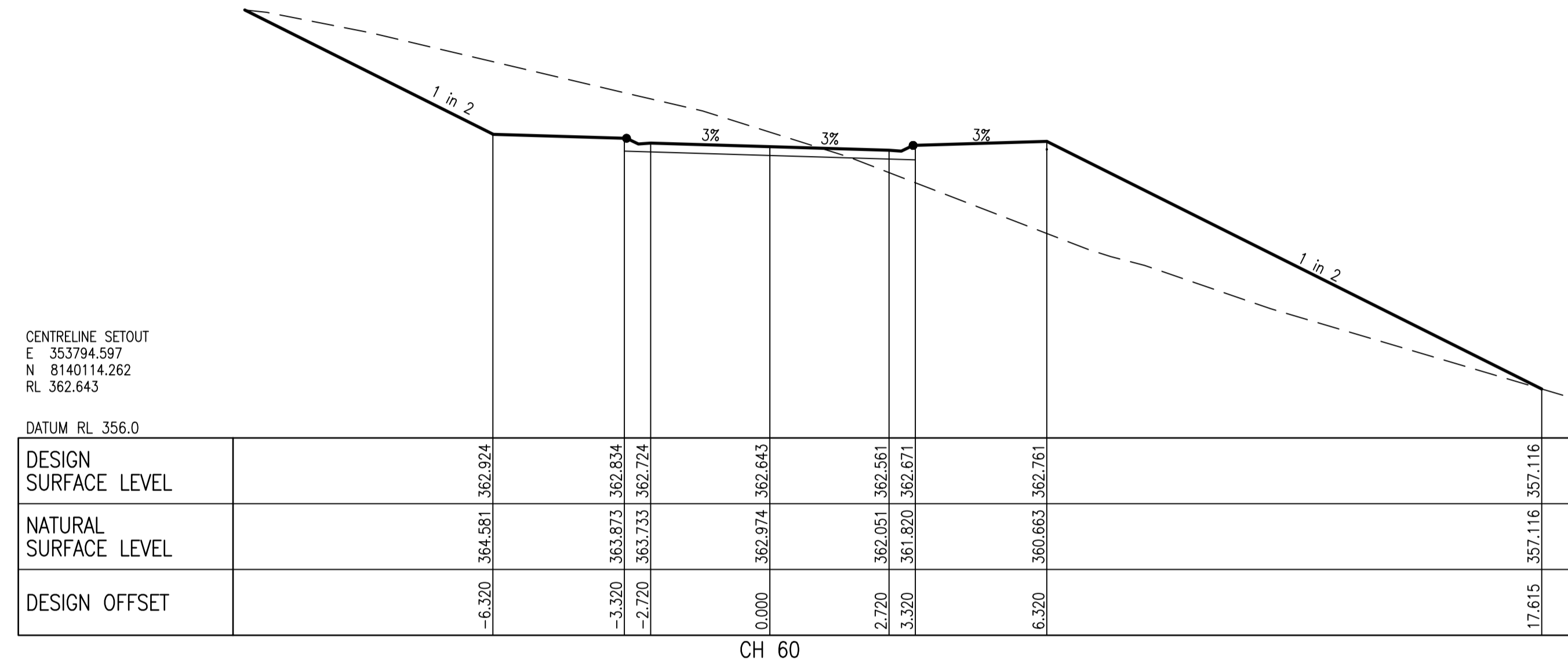
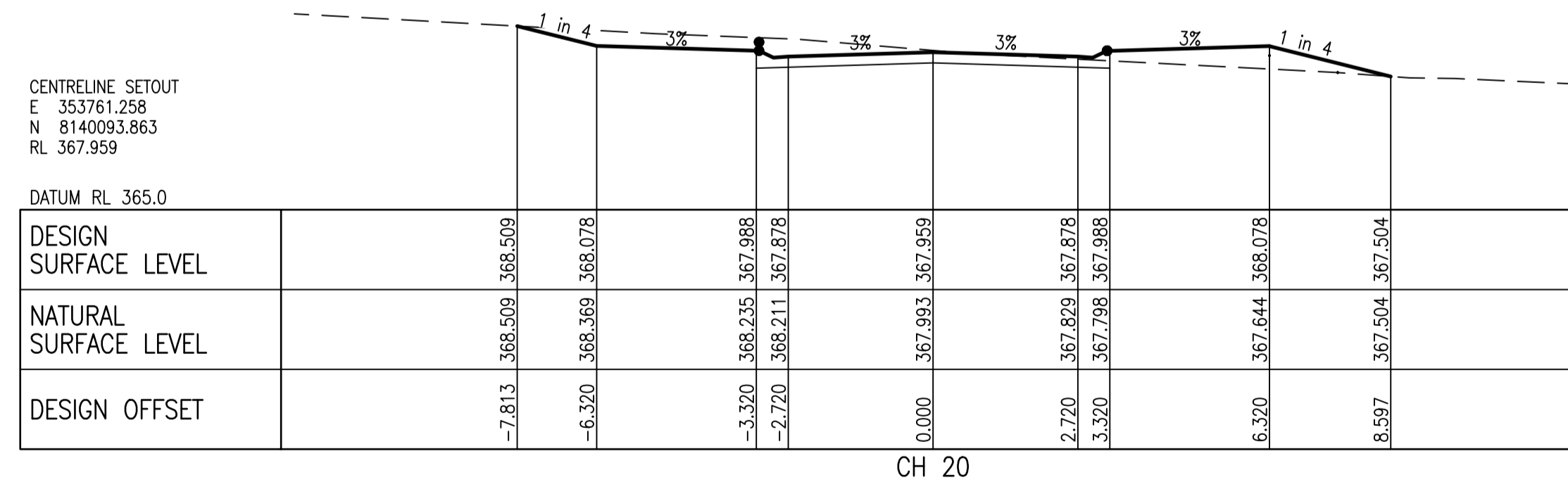
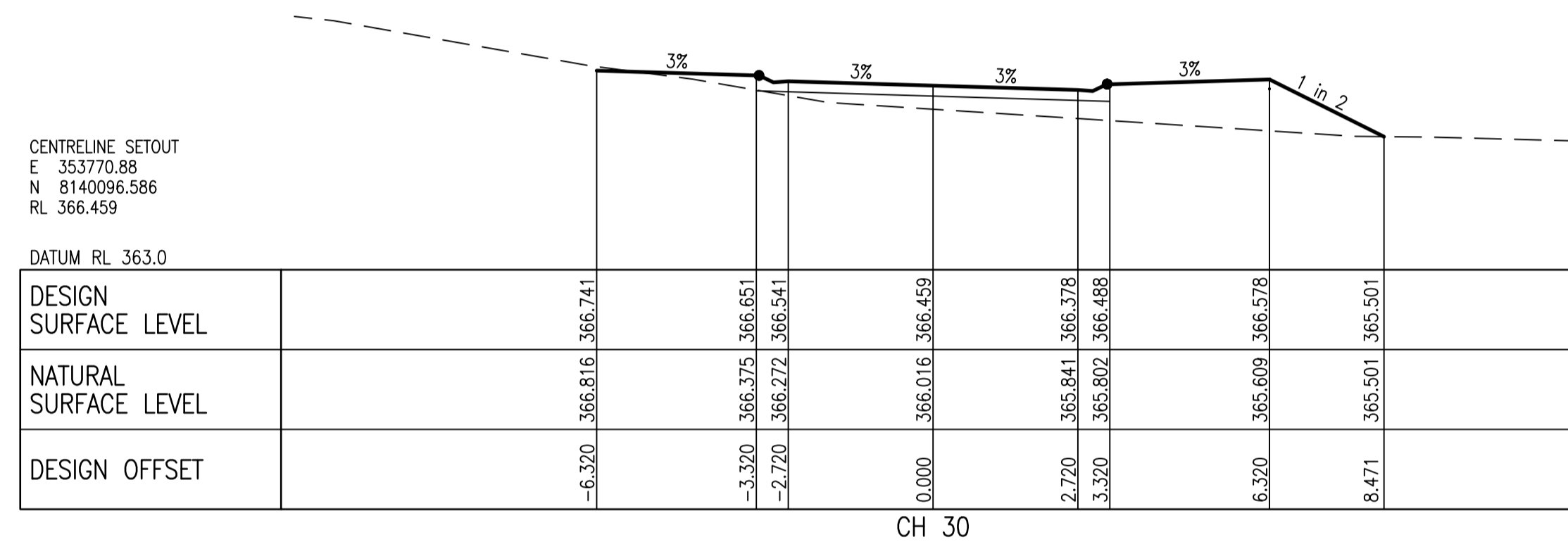
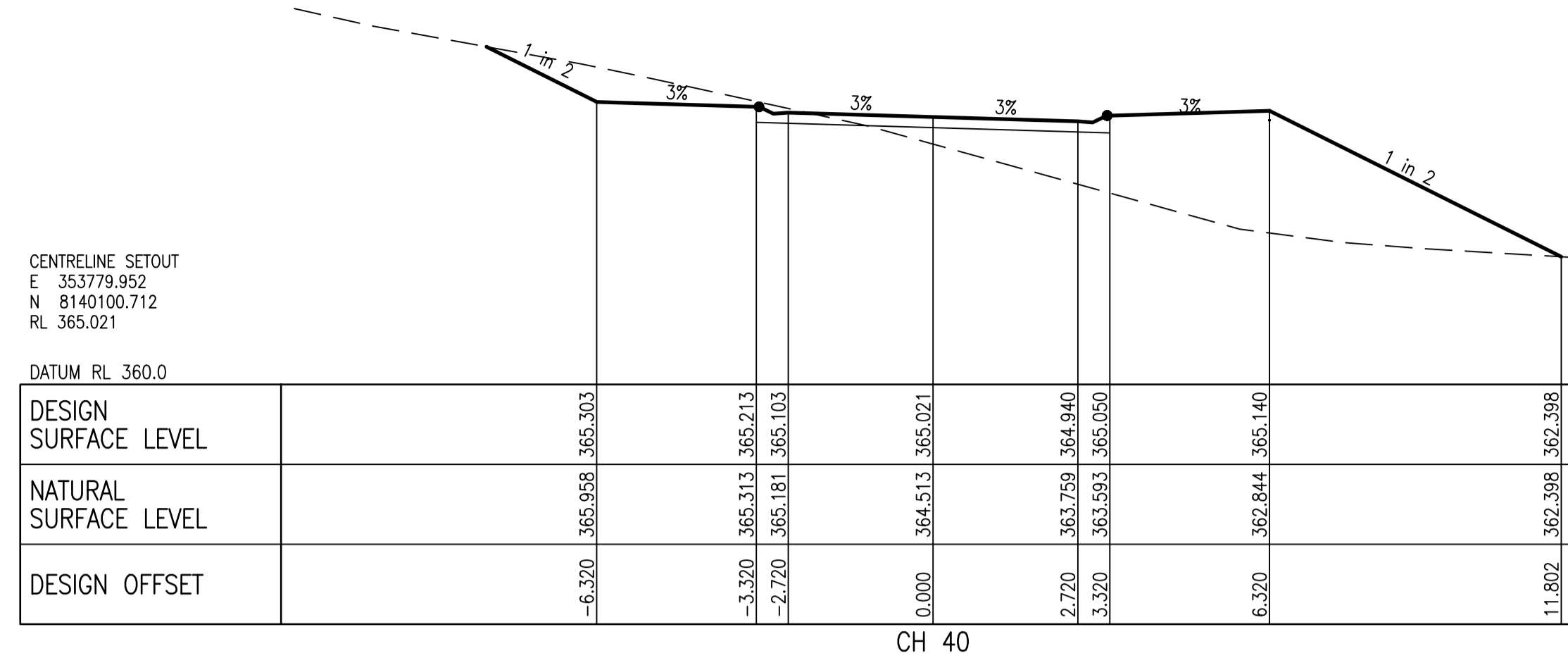
Drawn	MS	Designed	MS	Approved		Scale (A1 size)	AS SHOWN
Drawing Check		Design Check		RPEQ	Date	Drawing is not to be used for construction unless approved.	



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APPROVAL ISSUE

ARO0231-C04



APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
2	APPROVAL ISSUE	-	-	14/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022

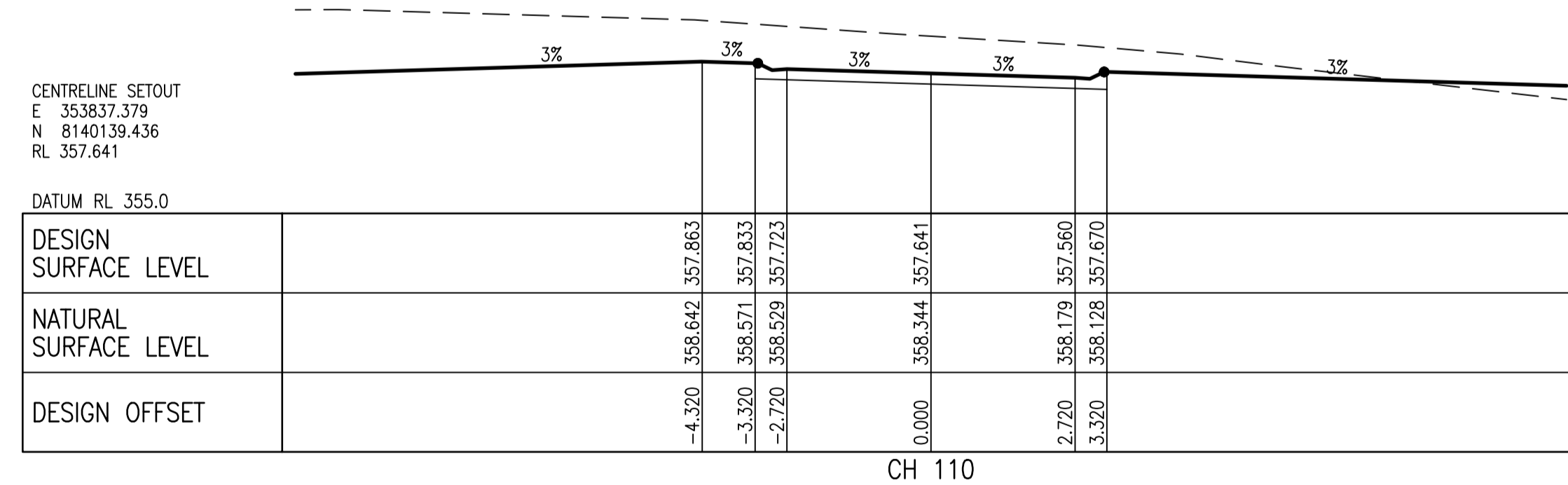
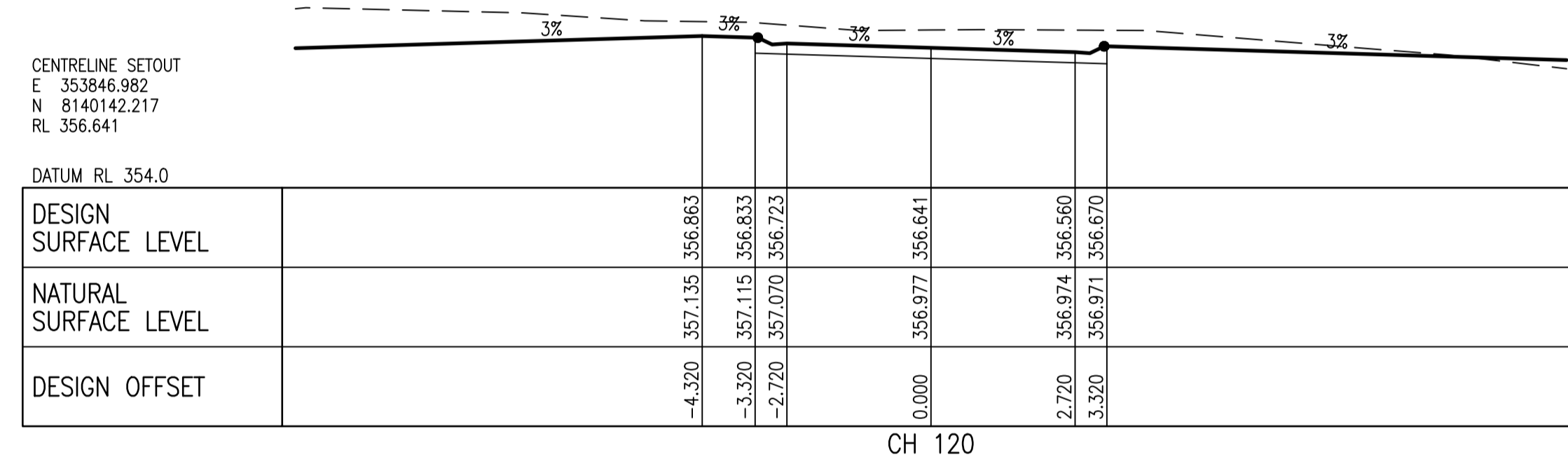
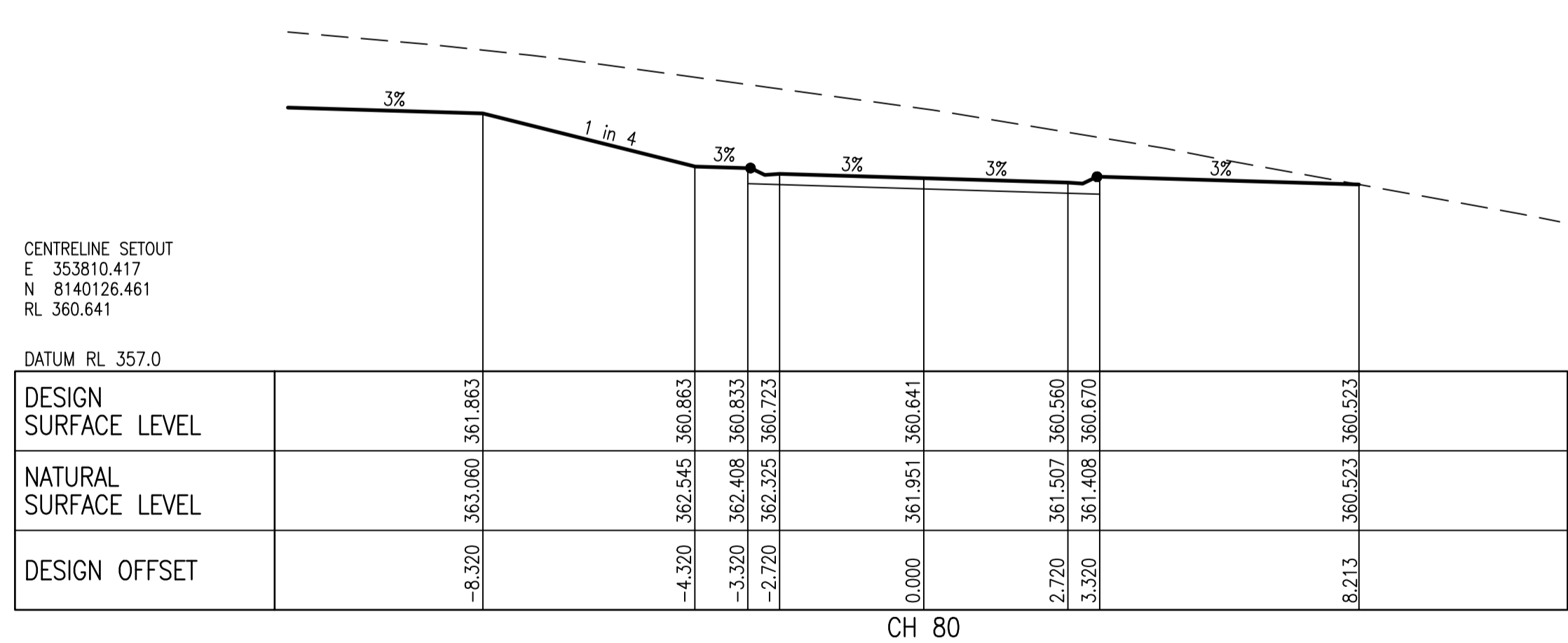
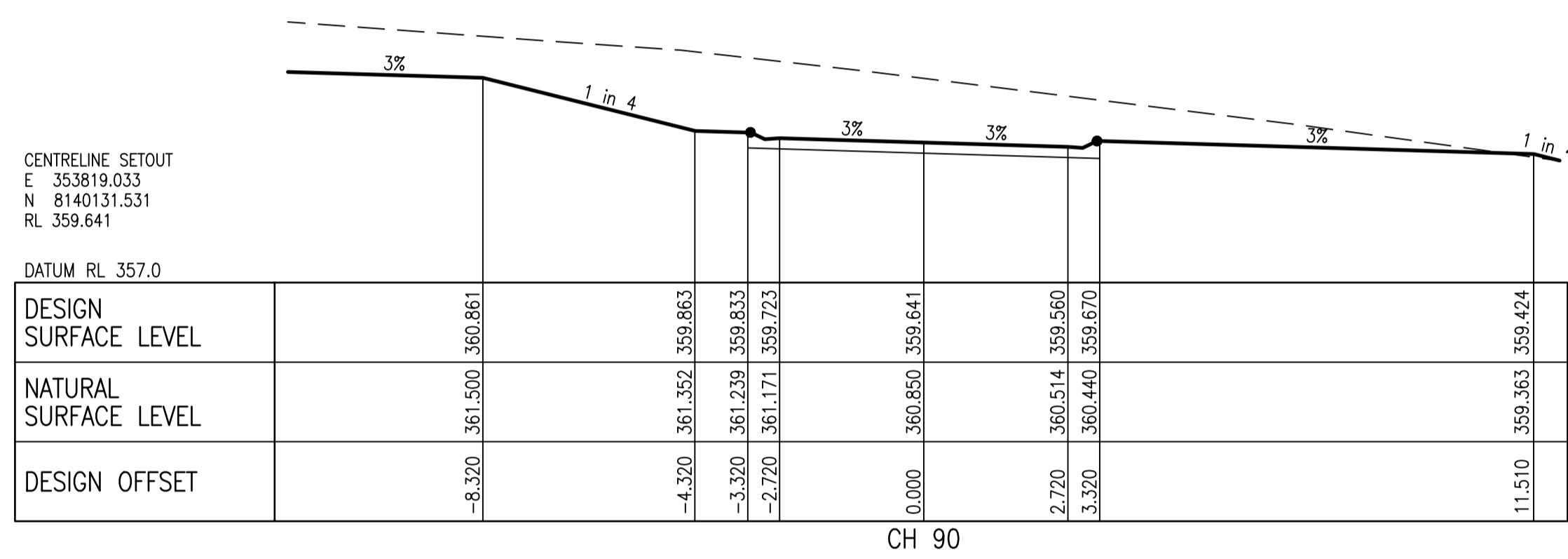
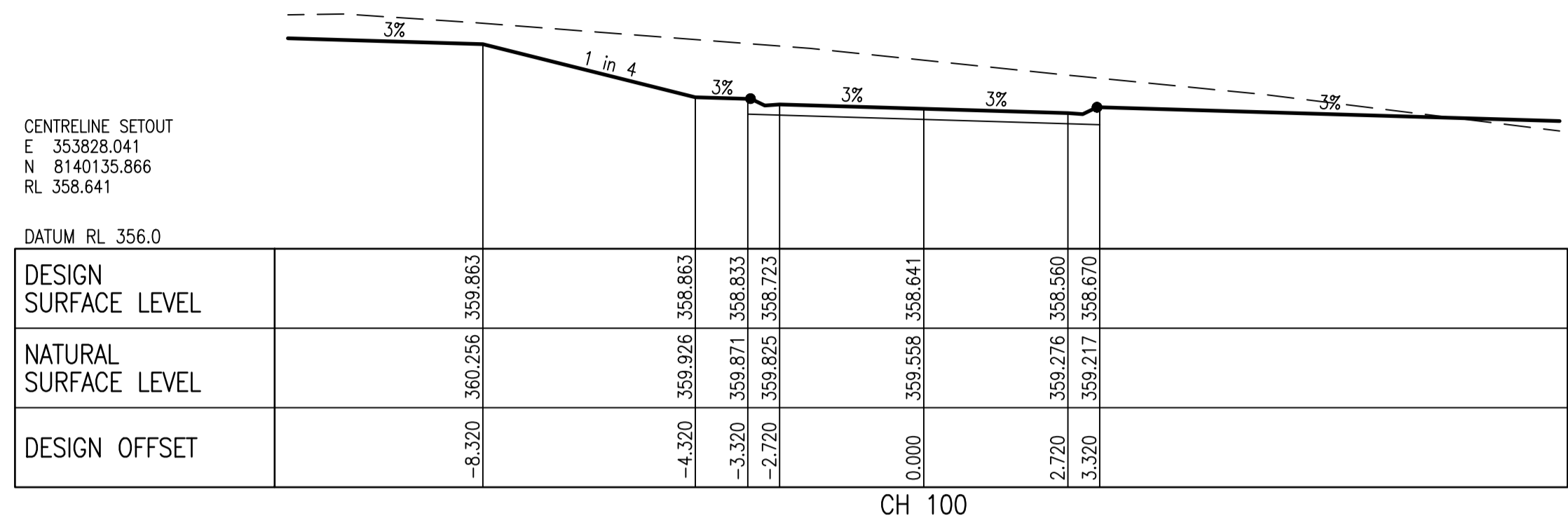


Client: MAREEBA SHIRE COUNCIL
Project: NEW KURANDA CEMETERY - STAGE 1
Title: ROAD A ANNOTATED CROSS SECTIONS SHEET 1 OF 2

Drawn: MS	Designed: MS	Approved: RPEQ	Date:
Drawing Check:	Design Check:	RPEQ	Date:



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APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
2	APPROVAL ISSUE	-	-	14/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022

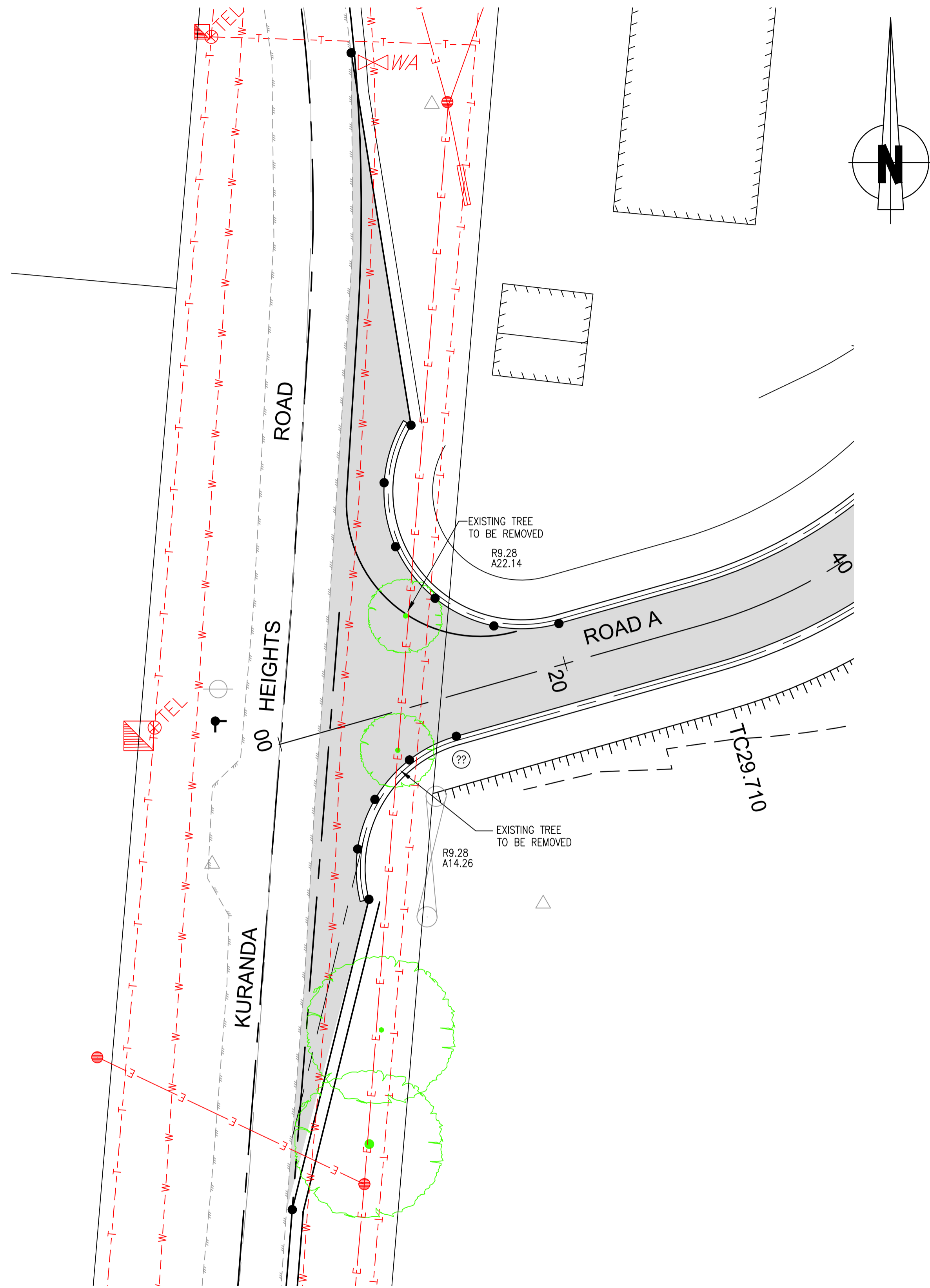


Client
MAREEBA SHIRE COUNCIL
Project
NEW KURANDA CEMETERY - STAGE 1
Title
ROAD A ANNOTATED CROSS SECTIONS
SHEET 2 OF 2



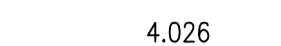







Drawn	Designed	Approved	Scale (A1 size)
MS	MS		AS SHOWN
Drawing Check	Design Check	RPEQ	Date
			Drawing is not to be used for construction unless approved.



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LEGEND

-  L&C LAYBACK KERB AND CHANNEL
-  4.6 DESIGN SURFACE CONTOUR (0.1m INTERVAL)
-  4.026 KERB LEVEL
-  R10.00 RADIUS
-  A15.75 ARC LENGTH
-  3.00 OFFSET FROM ROAD CENTRELINE
-  140 ROAD CHAINAGE
-  (5) KERB SETOUT POINT
-  STREET SIGN
-  SIGN

NOTES

1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNOROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. KERB LEVELS SHOWN ARE TO LIP OF KERB AND CHANNEL OR PAVEMENT AT FACE OF KERB.
3. DIMENSIONS AND KERB RADII SHOWN ARE TO LIP OF KERB AND CHANNEL OR TO FACE OF KERB ONLY.
4. KERB LEVELS ARE SHOWN EQUALLY DIVIDED BETWEEN KERB TANGENT POINTS.
5. REFER ALSO TO ROAD SETOUT DETAILS FOR COORDINATES OF ROAD CHAINAGES AND TANGENT POINTS.
6. REFER TO THE FOLLOWING FNOROC STANDARD DRAWINGS:
S1000 – CONCRETE KERB AND CHANNEL
7. ASPHALTIC CONCRETE THICKNESS ON ALL ROADS TO BE INCREASED TO 50mm AT INTERSECTIONS.

KURANDA HEIGHTS ROAD / ROAD A INTERSECTION
SCALE 1:200

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

APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
2	APPROVAL ISSUE	-	-	14/03/2023
1	PRELIMINARY ISSUE	-	-	31/10/2022

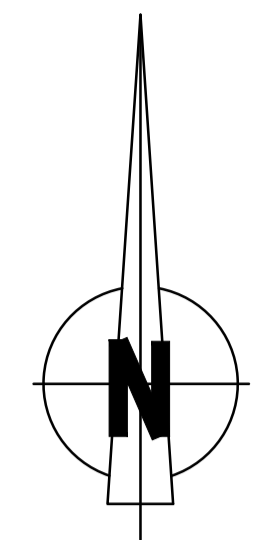
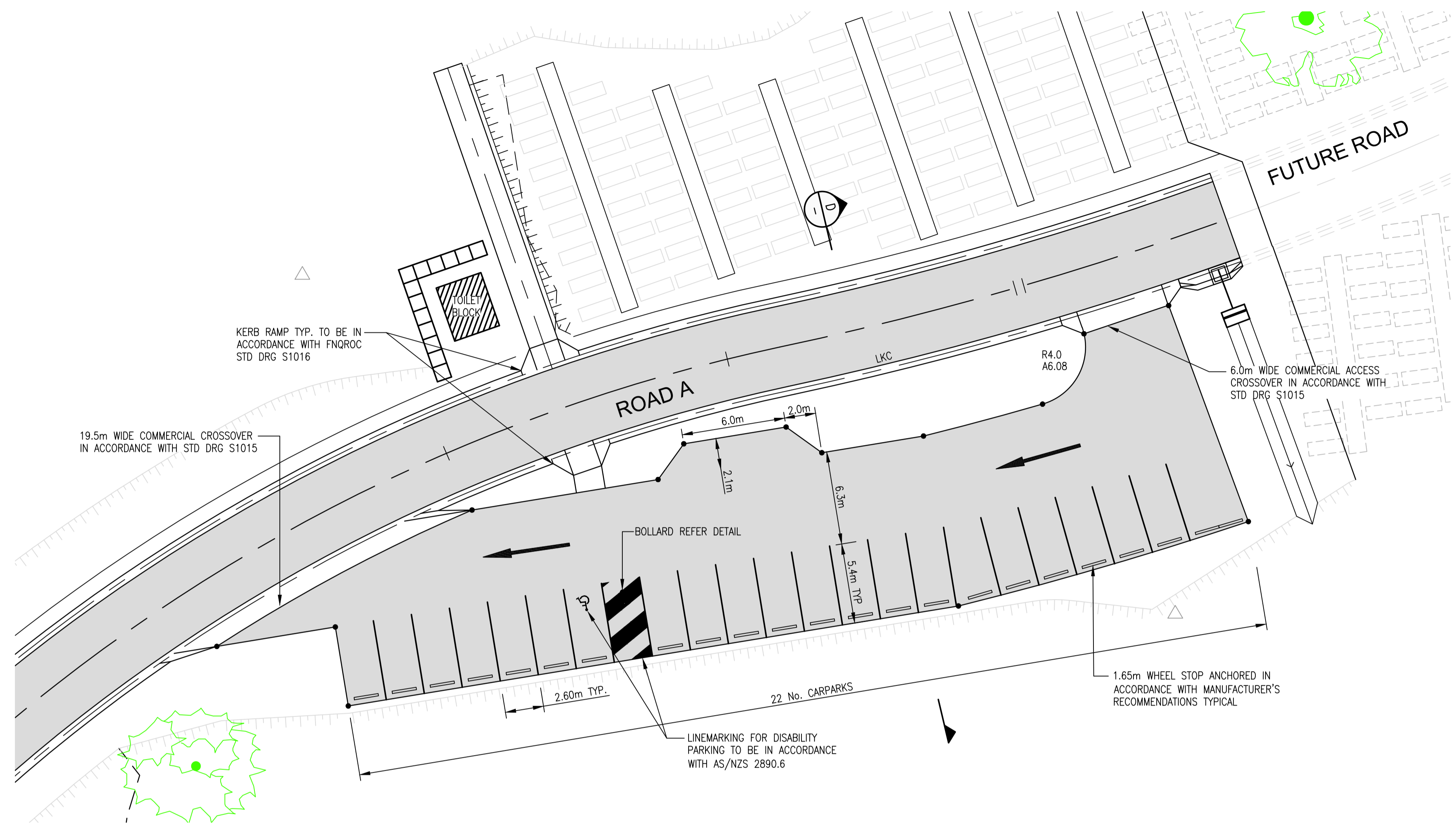


Client	MAREEBA SHIRE COUNCIL
Project	NEW KURANDA CEMETERY - STAGE 1
Title	INTERSECTION SETOUT
Drawing No.	ARO0231-C07

Drawn	MS	Designed	MS	Approved		Scale (A1 size)	AS SHOWN
Drawing Check		Design Check		RPEQ	Date	Drawing is not to be used for construction unless approved.	



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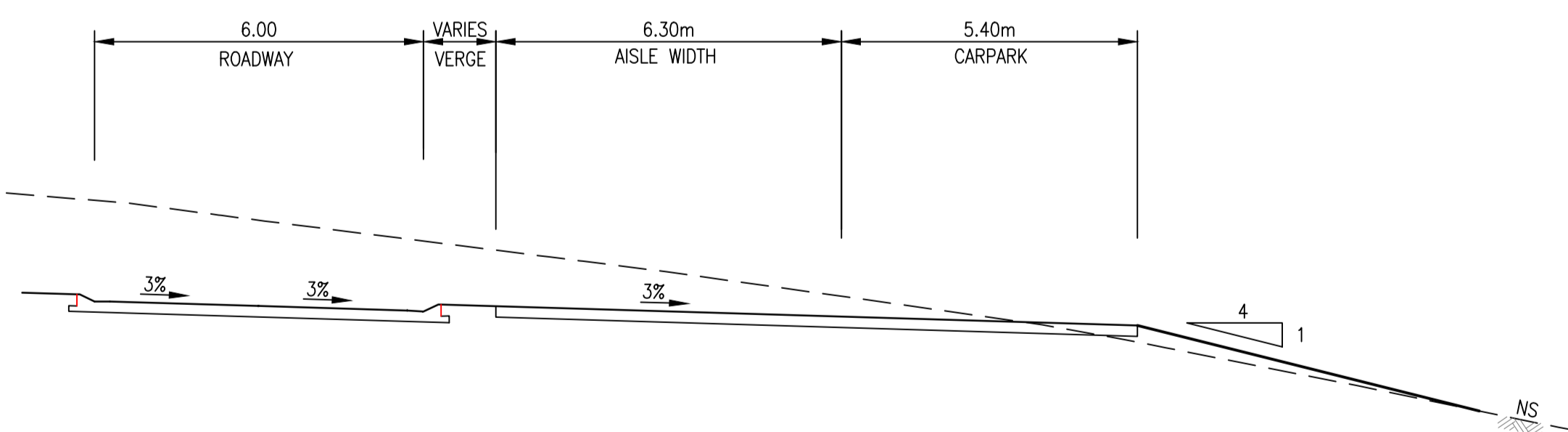
LEGEND

- LKC LAYBACK KERB AND CHANNEL
- LBKT LAYBACK KERB AND TRAY
- 4.6 DESIGN SURFACE CONTOUR (0.1m INTERVAL)
- R10.00 RADIUS
- A15.75 ARC LENGTH
- 140 ROAD CHAINAGE
- (25) KERB SETOUT POINT
- 2m WIDE CONCRETE PATHWAY
- KERB RAMP
- ACCESS CROSSOVER

NOTES

1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. KERB LEVELS SHOWN ARE TO LIP OF KERB AND CHANNEL OR PAVEMENT AT FACE OF KERB.
3. DIMENSIONS AND KERB RADII SHOWN ARE TO LIP OF KERB AND CHANNEL OR TO FACE OF KERB ONLY.
4. KERB LEVELS ARE SHOWN EQUALLY DIVIDED BETWEEN KERB TANGENT POINTS.
5. REFER ALSO TO ROAD SETOUT DETAILS FOR COORDINATES OF ROAD CHAINAGES AND TANGENT POINTS.
6. REFER TO THE FOLLOWING FNQROC STANDARD DRAWINGS:
S1000 - CONCRETE KERB AND CHANNEL
S1015 - ACCESS CROSSOVERS
S1016 - KERB RAMP
7. ASPHALTIC CONCRETE THICKNESS ON ALL ROADS TO BE INCREASED TO 50mm AT INTERSECTIONS AND CUL DE SAC HEADS.

CARPARK LAYOUT
SCALE 1:200



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

0 1 2 3 4 5m
SCALE 1:100 (A1)

No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE			14/03/2023



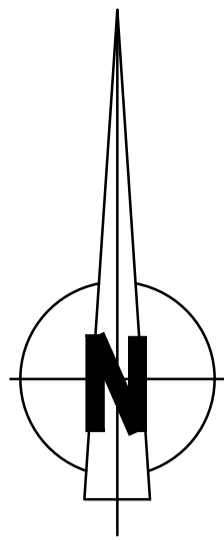
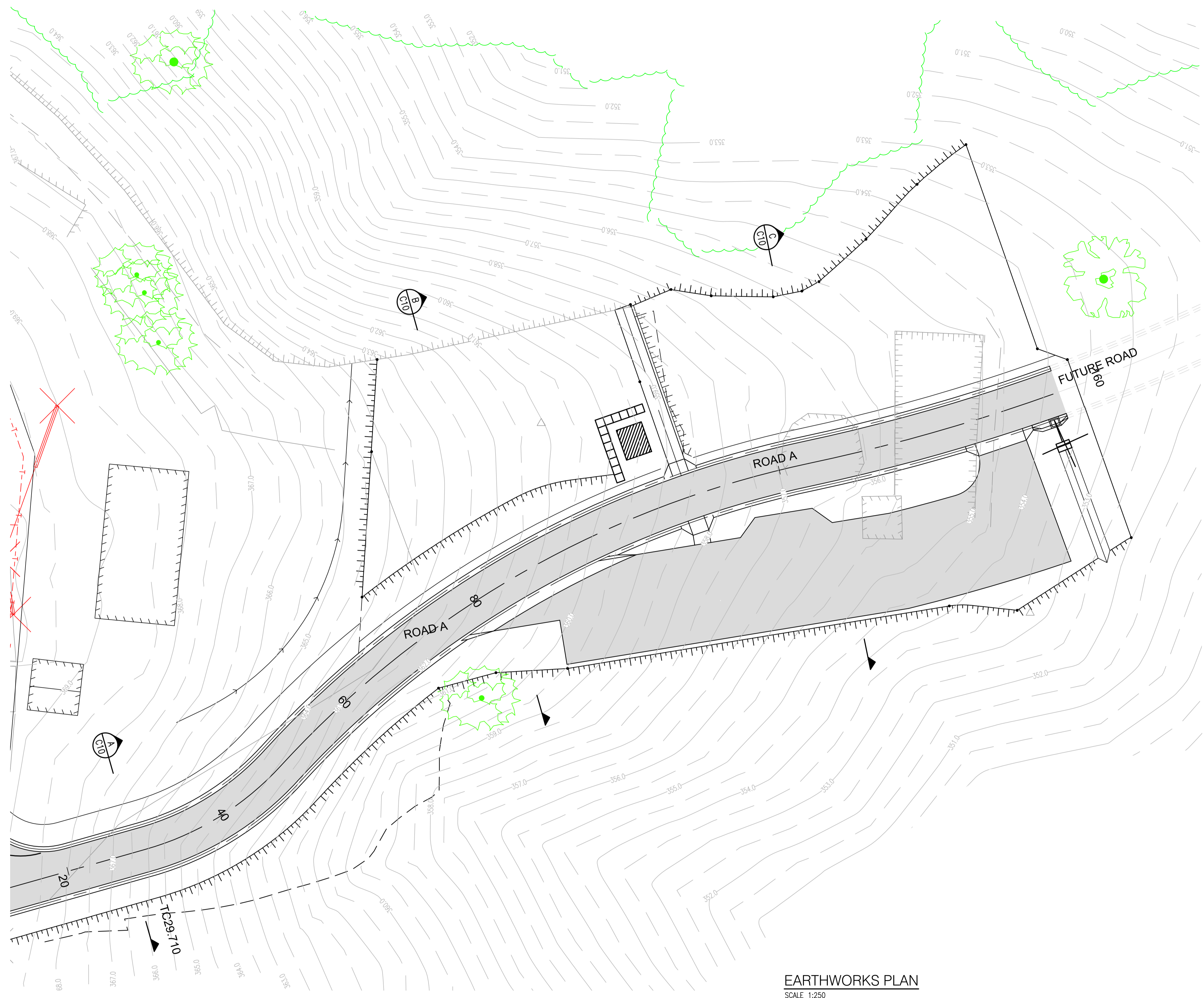
Client	MAREEBA SHIRE COUNCIL
Project	NEW KURANDA CEMETERY - STAGE 1
Title	CARPARK SETOUT AND DETAILS
Drawing No.	ARO0231-C08

Drawn	MS	Designed	MS	Approved		Scale (A1 size)	AS SHOWN
Drawing Check		Design Check		RPEQ	Date	Drawing is not to be used for construction unless approved.	



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APPROVAL ISSUE



LEGEND

- DIRECTION OF FALL ON LOTS
- FINISHED SURFACE LEVEL ON ALLOTMENT (REFER NOTE 1)
- EXISTING SURFACE LEVEL
- 4.0 DESIGN SURFACE CONTOUR (0.2m INTERVAL)
- 4.0 EXISTING SURFACE CONTOUR (0.5m INTERVAL)
- CUT AREAS
- FILL AREAS
- 2.0m WIDE CONCRETE PATHWAY (REFER NOTE 12)
- KERB RAMP
- TOP OF BATTER
- TOE OF BATTER
- ACCESS CROSSOVER
- EDGE OF EXISTING SEALED ROAD
- EXISTING STORMWATER
- EXISTING WATER
- EXISTING TELECOMMUNICATIONS
- EXISTING OVERHEAD ELECTRICITY
- EDGE OF EXISTING VEGETATION

NOTES

1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. DESIGN SURFACE LEVELS SHOWN ARE AFTER ALL EARTHWORKS ARE COMPLETED, INCLUDING 150mm TOPSOILING.
3. ALL DESIGN SURFACE LEVELS ARE TO BE GRADED EVENLY BETWEEN SHOWN LEVELS UNLESS OTHERWISE SHOWN.
4. LOCATION OF ALL EXISTING SERVICES TO BE CONFIRMED PRIOR TO CONSTRUCTION BY CONTRACTOR THROUGH LIAISON WITH RELEVANT AUTHORITIES.
5. TRIM AND DRILL SEED ALL BURIAL AREAS, FOOTPATHS/ROAD VERGES. BATTERS >0.5m TO BE HYDROMULCHED AFTER FINAL EARTHWORKS AND TOPSOILING IS COMPLETED.
6. TOPSOIL STOCKPILE TO BE LOCATED AT SITE ACCEPTABLE TO SUPERINTENDENT.

EARTHWORKS PLAN
SCALE 1:250

APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE			14/03/2023



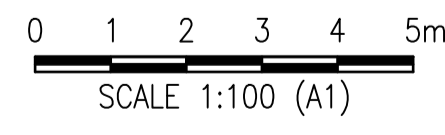
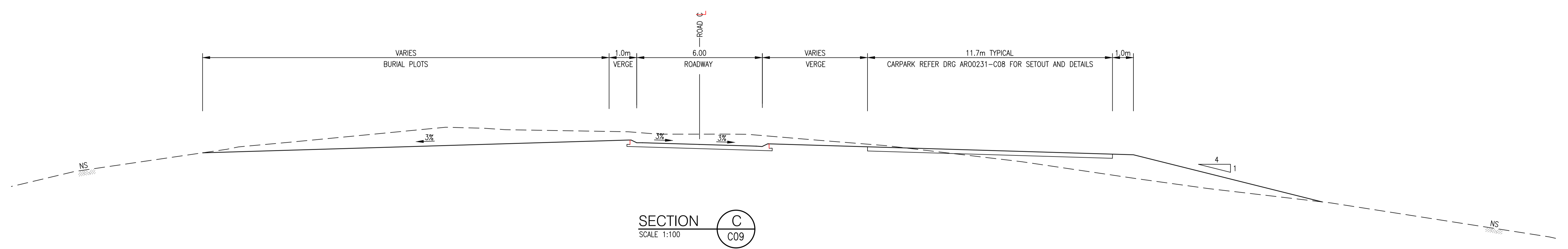
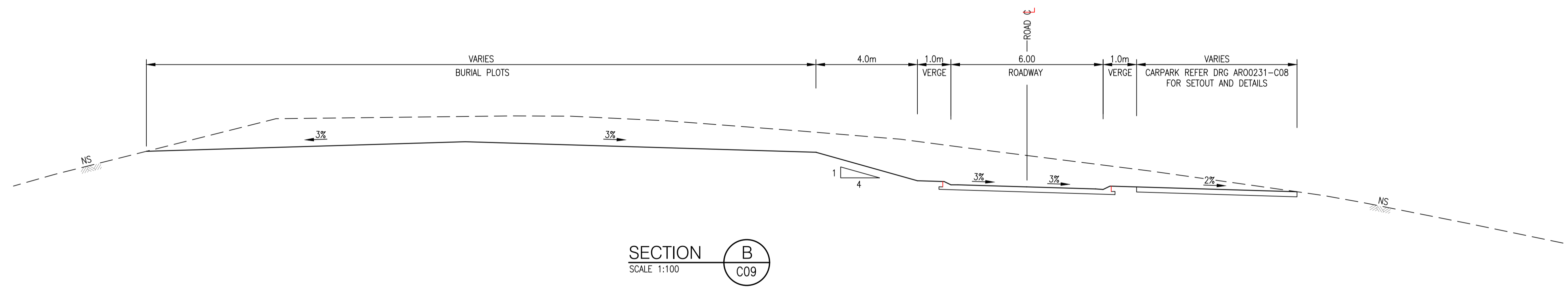
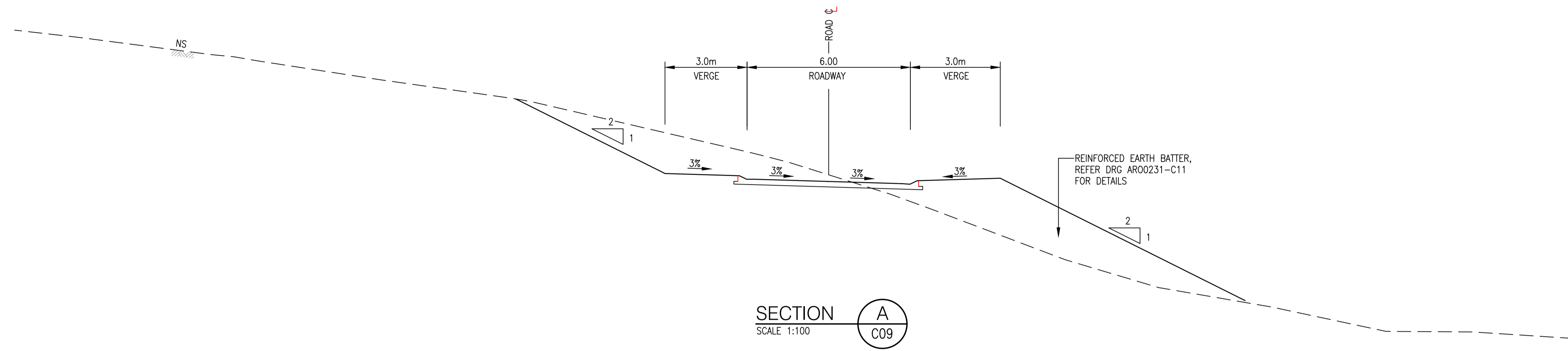
Client: MAREEBA SHIRE COUNCIL
 Project: NEW KURANDA CEMETERY - STAGE 1
 Title: EARTHWORKS GRADING PLAN

Drawn	Designed	Approved	Scale (A1 size)
MS	MS		1:250
Drawing Check	Design Check	RPEQ	Date

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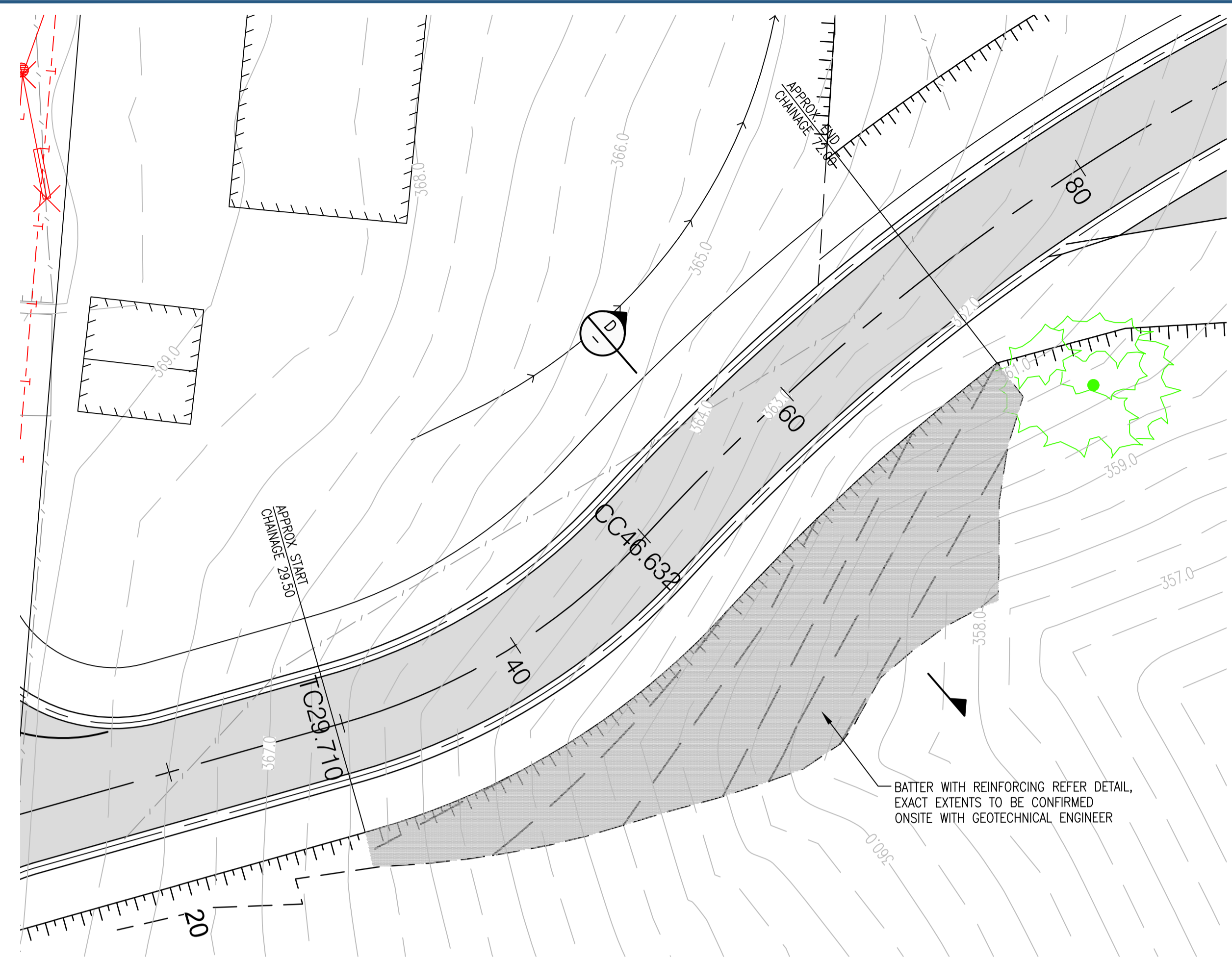
Client: MAREEBA SHIRE COUNCIL
 Project: NEW KURANDA CEMETERY - STAGE 1
 Title: EARTHWORKS TYPICAL CROSS SECTIONS
 Drawing No.: ARO0231-C10

Drawn	Designed	Approved
MS	MS	
Drawing Check	Design Check	RPEQ

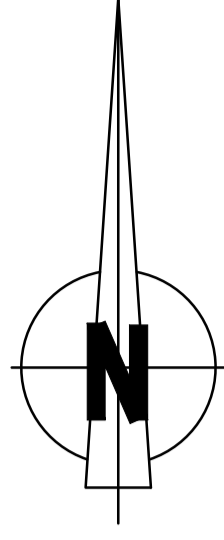
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LAYOUT PLAN
SCALE 1:200

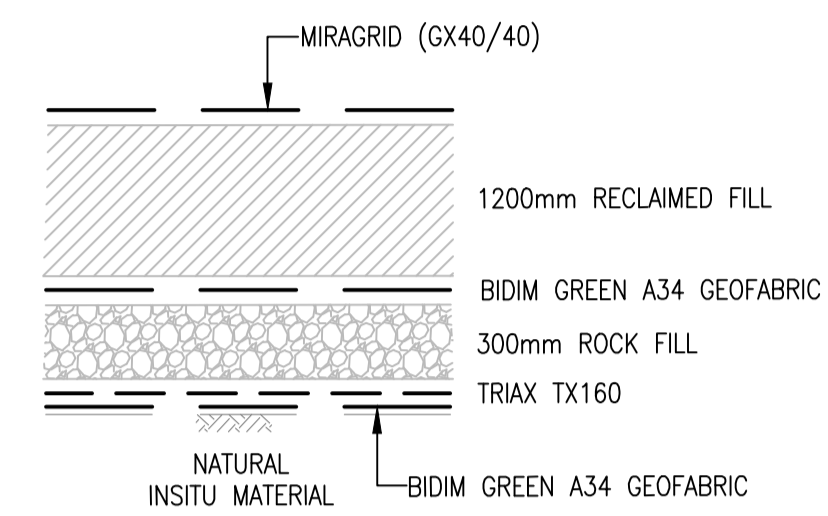


LEGEND

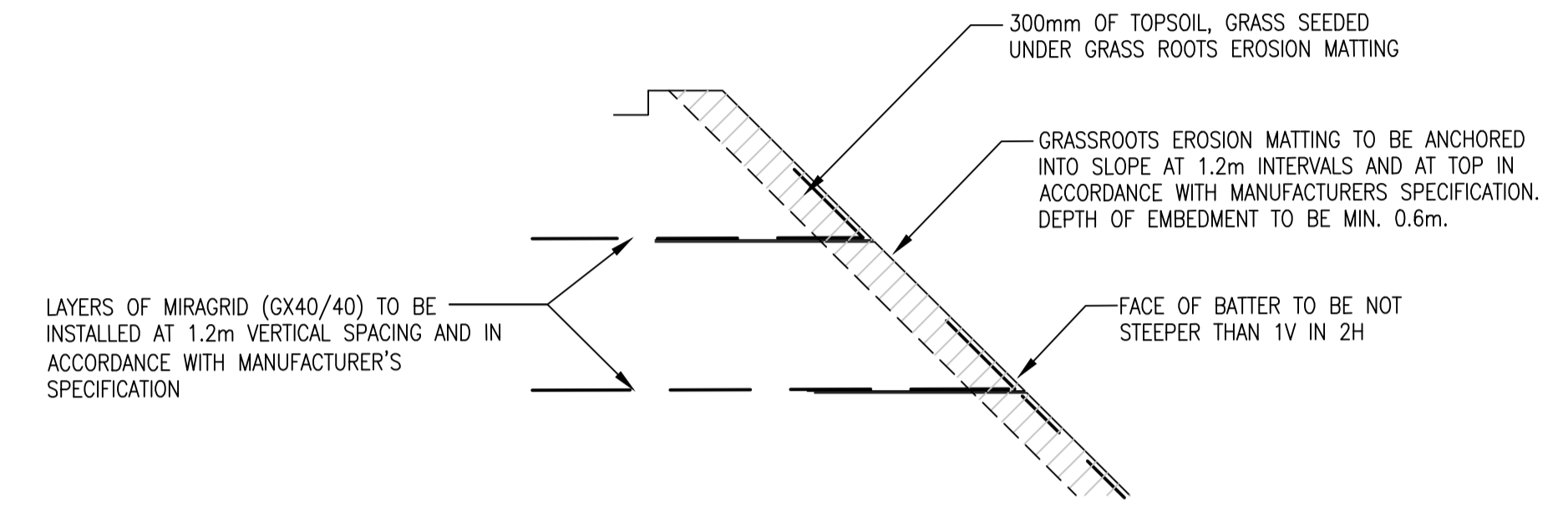
- TOP OF BANK
- TOE OF BATTER
- NEW ROAD PAVEMENT

NOTES

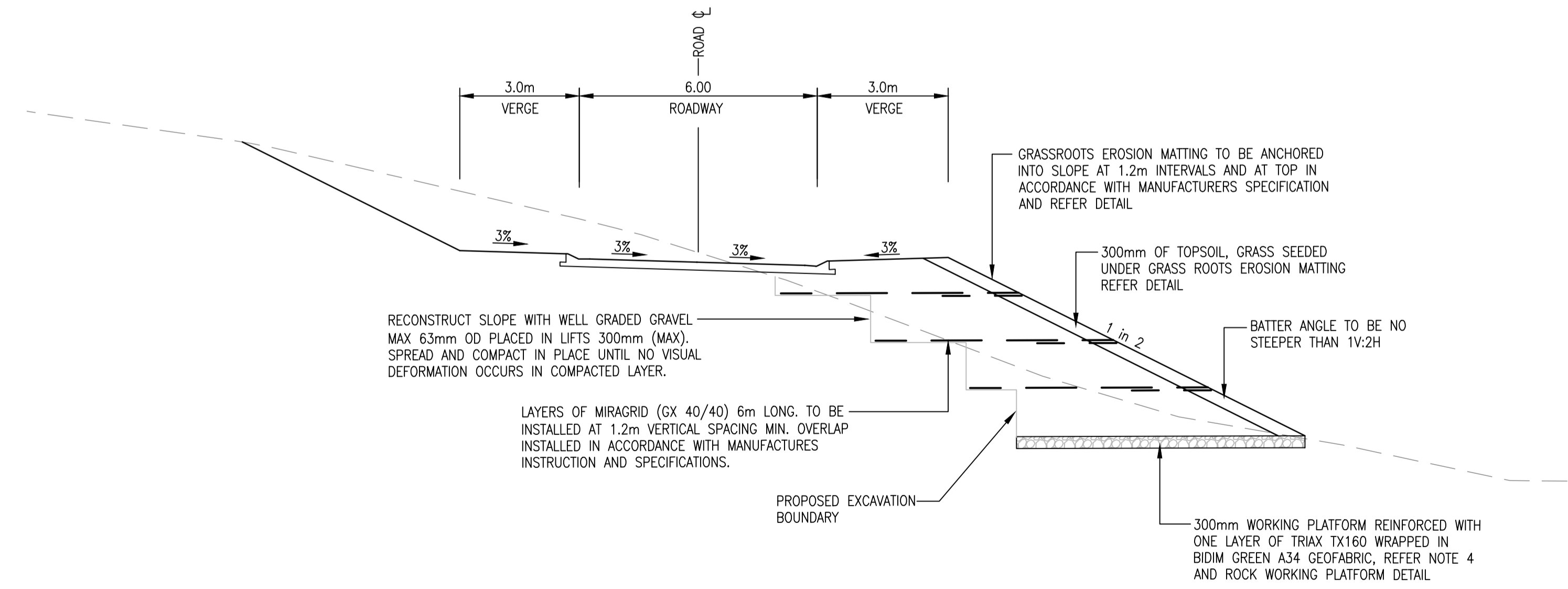
1. CONTRACTOR TO CONFIRM LOCATION AND DEPTH OF ALL EXISTING SERVICES PRIOR TO COMMENCEMENT OF WORKS.
2. CONTRACTOR TO CONFIRM CONSTRUCTION METHODOLOGY PRIOR TO COMMENCEMENT OF WORKS TO CONFIRM EXTENTS AND QUANTITY OF MIRAGRID (GX40/40) OR APPROVED EQUIVALENT.
3. FILL MATERIAL TO BE INORGANIC, NON-PERISHABLE MATERIAL. WHERE DIRECTED, RE-USE MATERIAL RECOVERED FROM EXCAVATIONS ON SITE. DRY OUT RECOVERED MATERIAL AS NECESSARY PRIOR TO USE. ADDITIONAL FILL MATERIAL TO BE CLASS A1 EARTHFILL IN ACCORDANCE WITH MRTS04.
4. TENSAR TRIAX TX160 TO BE PLACED ABOVE BIDIM GREEN PRIOR TO PLACING CRUSHED ROCK.



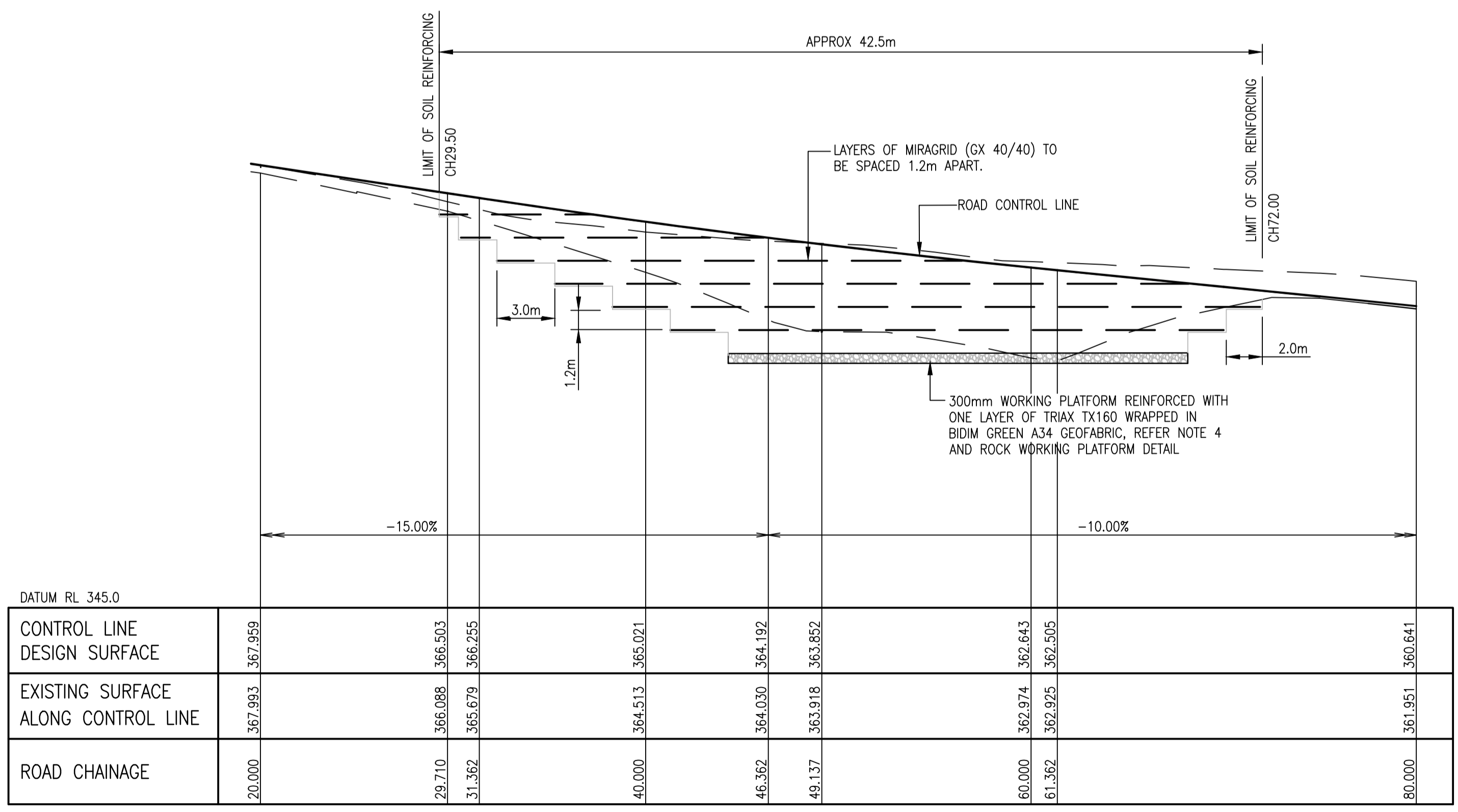
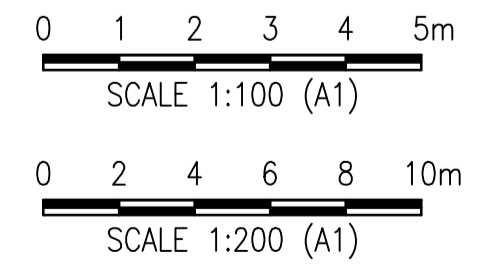
ROCK WORKING PLATFORM DETAIL
NOT TO SCALE



WRAPPED TOPSOILED FACE WITH EROSION MATTING TYP. DETAIL
NOT TO SCALE



SECTION D



ROAD A ELEVATION
SCALE 1:200

APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE			14/03/2023



Client: MAREEBA SHIRE COUNCIL
Project: NEW KURANDA CEMETERY - STAGE 1
Title: EARTHWORKS BATTER REINFORCEMENT

Drawn	Designed	Approved	Scale (A1 size)
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1. GENERAL NOTES

SECTION CONTENT

GROUND WORKS GENERALLY, PROTECTION OF TREES, SITE CLEARING, EXCAVATION, PLACING AND COMPACTING FILL, INSTALLATION OF GEOTEXTILE, GABIONS AND MATTRESSES, SLICED ROCK FILL, CRIB WALLS, EARTH REINFORCEMENT AND GROUND ANCHORS.

DEFINITIONS

DESCRIPTION AND CLASSIFICATION OF SOILS: TO AS 1726.

BAD GROUND: GROUND UNSUITABLE FOR THE PURPOSES OF THE WORKS, INCLUDING FILLING LIABLE TO SUBSIDENCE; GROUND FULL OF VEGETATIVE MATTER; GROUND CONTAINING CAVITIES, FAULTS OR FISSURES; GROUND CONTAMINATED BY HARMFUL SUBSTANCES INCLUDING OIL, CEMENT AND CHEMICALS; GROUND CONTAINING ACID SULPHATE SOIL; OR GROUND WHICH IS OR BECOMES SOFT, WET AND UNSTABLE; AND THE LIKE.

NON-RIPPABLE MATERIAL: AS DEFINED IN CLAUSE 7.8.
LINE OF INFLUENCE: A LINE EXTENDING DOWNWARD AND OUTWARD FROM THE BOTTOM EDGE OF A FOOTING, SLAB OR PAVEMENT AND DEFINING THE EXTENT OF FOUNDATION MATERIAL HAVING INFLUENCE ON THE STABILITY OR SUPPORT OF THE FOOTINGS, SLAB OR PAVEMENT.

SUBGRADE: THE PREPARED FORMATION ON WHICH A PAVEMENT OR SLAB IS CONSTRUCTED OR THE TOP PORTION OF EARTHWORKS IMMEDIATELY BELOW THE PAVEMENT OR SLAB. SUBGRADE IS CONSIDERED TO BE THE TOP 150 MM IN CUTTINGS AND THE TOP 300 MM IN EMBANKMENT UNLESS STATED OTHERWISE.
SUBGRADE LEVEL: THE TOP SURFACE OF THE PREPARED SUBGRADE ON WHICH A PAVEMENT OR SLAB IS CONSTRUCTED.

RELATIVE COMPACTION: THE RATIO BETWEEN THE CRITICAL ZONE (TREES): THE AREA DESCRIBED BY THE GREATER OF THE VERTICAL PROJECTION OF THE CANOPY OR A RADIUS OF TEN TIMES THE TREE TRUNK DIAMETER AND EXTENDING TO A DEPTH OF 750 MM BELOW THE GROUND.

MEASUREMENT

IF PROVISIONAL QUANTITIES ARE SPECIFIED, OR THERE HAVE BEEN VARIATIONS TO THE CONTRACT DIMENSIONS OF EXCAVATIONS, DO NOT COMMENCE BACKFILLING OR PLACE ANY PERMANENT WORK IN EXCAVATIONS UNTIL THE QUANTITIES OF EXCAVATION AND BACKFILLING HAVE BEEN AGREED AND RECORDED.

MEASUREMENT OF NON-RIPPABLE MATERIAL
IF PAYMENT IS TO BE CLAIMED FOR EXCAVATION IN NON-RIPPABLE MATERIAL, DO NOT REMOVE THE MATERIAL UNTIL THE LEVEL AND (IF APPLICABLE) CLASS OF MATERIAL HAVE BEEN DETERMINED.

2. QUALITY NOTES

2.1 INSPECTION

WITNESS POINTS

GIVE SUFFICIENT NOTICE SO THAT INSPECTION MAY BE MADE.

HOLD POINTS

DO NOT PROCEED WITHOUT APPROVAL, GIVE SUFFICIENT NOTICE SO THAT INSPECTION MAY BE MADE.

ITEM	DESCRIPTION	INSPECTION	HOLD POINT	DELIVERABLE
1	EXCAVATION TO STABLE BATTER PROFILE	✓		<ul style="list-style-type: none"> INSPECTION & TEST PLAN (ITP) PHOTO'S WITH GPS DATA INSPECTION AND CONFIRMATION BY GEOTECHNICAL ENGINEER
2	EXCAVATION TO FOUNDATION MATERIAL	✓	✓	<ul style="list-style-type: none"> ITP PHOTO'S WITH GPS DATA FOUNDATION TESTING (DCP) TO CONFIRM BEARING CAPACITY
3	CONSTRUCTION OF WORKING PLATFORM	✓	✓	<ul style="list-style-type: none"> ITP PHOTO'S WITH GPS DATA MATERIAL TESTING (ROCKFILL) MATERIAL DATASHEETS – GEOGRID – GEOFABRIC
4	CONSTRUCTION OF GRS STRUCTURE (INCL. OF ROCKFILL & INSTALL GEOGRIDS / GEOFABRICS) WORKING PLATFORM	✓	<ul style="list-style-type: none"> ✓ 1ST 3 LAYERS ONLY TO CONFIRM PROCESS, INSPECTIONS THERE AFTER 	<ul style="list-style-type: none"> ITP PHOTO'S WITH GPS DATA VIDEO'S OF ROLLING (DIGITAL) MATERIAL TESTING ROCKFILL MATERIAL DATASHEETS – GEOSYNTHETICS
5	SUBGRADE INSPECTION	✓	✓	<ul style="list-style-type: none"> ITP PHOTO'S & VIDEO (PROOF ROLL) SIGN OFF BY CONSTRUCTION ENGINEERS
6	BASE / SUB BASE INSPECTIONS	✓	✓	<ul style="list-style-type: none"> ITP PHOTO'S (DIGITAL) WITH GPS VIDEO OF PROOF ROLL SIGN OFF BY CONSTRUCTION ENGINEERS
7	SEAL DESIGN		✓	<ul style="list-style-type: none"> ITP RPEQ DESIGNED AND CERTIFIED, ISSUED TO SUPERINTENDENT FOR APPROVAL PHOTO'S DIGITAL WITH GPS
8	SEAL APPLICATION	✓		<ul style="list-style-type: none"> ITP PHOTO'S DIGITAL WITH GPS SPRAY SHEETS AGGREGATE SHEETS
9	SITE CLEAN UP	✓		<ul style="list-style-type: none"> INSPECTIONS – JOINT
10	AS CONSTRUCTED DRAWING PRODUCED IN ACCORDANCE WITH MBRC REQUIREMENTS		✓	<ul style="list-style-type: none"> AS CON PLANS PRODUCED IN ACCORDANCE WITH MBRC REQUIREMENTS
11	DAY-LABOUR INFO		✓	<ul style="list-style-type: none"> ALL WORKS UNDERTAKEN BY MBRC IS TO BE SUPPORTED BY DAY SHEETS SHOWING ALL PLANT MATERIALS LABOUR USED ON SITE ON A DAILY BASIS THIS IS TO BE SIGNED BY FOREMAN AND COUNTER SIGNED BY INSPECTING ENGINEER.

2. QUALITY CONT'D

2.2 SAMPLES

GENERAL

SUBMIT TO THE TESTING AUTHORITY SAMPLES OF THE FOLLOWING:

- EACH TYPE OF IMPORTED FILL.
- EACH TYPE OF EXCAVATED MATERIAL, WHICH IS TO BE RE-USED AS SELECT FILL OR EMBANKMENT FILL IN THE WORKS.

IDENTIFICATION

ATTACH A TAG TO EACH SAMPLE SHOWING RELEVANT INFORMATION INCLUDING DESCRIPTION, SOURCE AND NOMINAL SIZE OF MATERIAL.

2.3 CONTRACTOR'S SUBMISSIONS

MATERIALS

IMPORTED MATERIALS: NOTIFY THE SUPPLIER, SOURCE AND SUPPLIERS DESCRIPTION OF ALL IMPORTED MATERIALS.
RECYCLED PRODUCTS: NOTIFY THE NATURE, SOURCE, PROPORTIONS AND METHOD OF INCORPORATION OF ANY ADDED FILLERS OR BINDERS.

IMPORTED FILL: SUBMIT CERTIFICATION OR TEST RESULTS, WHICH ESTABLISH THE COMPLIANCE OF IMPORTED FILL.

3. SITE MANAGEMENT

3.1 EXISTING SERVICES

MARKING

BEFORE COMMENCING GROUND WORKS, LOCATE AND MARK EXISTING UNDERGROUND SERVICES IN THE AREAS THAT WILL BE AFFECTED BY THE EARTHWORKS OPERATIONS.

3.2 DEWATERING

KEEP EARTHWORKS FREE OF SURFACE WATER. PROVIDE AND MAINTAIN SLOPES, CROWNS AND DRAINS ON EXCAVATIONS AND EMBANKMENTS TO ENSURE SATISFACTORY DRAINAGE. PLACE CONSTRUCTION INCLUDING FILLING, PAVING, STRUCTURES AND SERVICES, ON GROUND FROM WHICH SURFACE WATER HAS BEEN REMOVED. PROTECT FRESHLY LAID WORK FROM WATER DAMAGE.

3.3 SITE RESTORATION

REQUIREMENT

WHERE EXISTING GROUND SURFACES ARE NOT REQUIRED TO BE VARIED AS PART OF THE WORKS, RESTORE THEM TO THE CONDITION EXISTING AT THE COMMENCEMENT OF THE WORK UNDER THE CONTRACT.

3.4 FENCING

TO BE REINSTATED ALONG EXISTING LINES USING MATERIALS COMMENSURATE WITH EXISTING. FENCE TO BE RE-TENSIONED TO MATCH EXISTING.

3.5 MANAGEMENT PLANS

- TRAFFIC MANAGEMENT PLAN
- ENVIRONMENTAL MANAGEMENT PLAN
- WORKPLACE HEALTH AND SAFETY
- QUALITY MANAGEMENT PLAN

4. CLEARING

4.1 SITE CLEARING

TIMING

DO NOT CLEAR ANY AREA UNTIL COMMENCEMENT OF OTHER WORK IN THE AREA IS IMMINENT.

EXTENT

GENERAL: CLEAR ONLY THE SITE AREAS TO BE OCCUPIED OR AFFECTED BY THE WORKS AND ANY OTHER AREAS THAT THE CONTRACT SPECIFICALLY REQUIRES TO BE CLEARED.

CONTRACTOR'S SITE AREAS: IF NOT INCLUDED WITHIN THE AREAS SPECIFIED ABOVE, CLEAR GENERALLY ONLY TO THE EXTENT NECESSARY FOR THE PERFORMANCE OF THE WORKS.

CLEARING OPERATIONS

OLD WORKS: REMOVE OLD SLABS, FOUNDATIONS, RETAINING WALLS, PAVING, ABANDONED SERVICES AND THE LIKE TO A DEPTH OF 300 MM BELOW EXISTING OR FINISHED SURFACE OR 500 MM BELOW SUBGRADE LEVEL (WHICHEVER IS LOWER).

REFILLING: UNLESS OTHERWISE SPECIFIED, REFILL GRUB HOLES AND THE LIKE WITH MATERIAL SIMILAR TO THE SURROUNDING SOIL.

4.2 SIDE TRACK

SIDE TRACK TO BE REMOVED AND VERGE RE-INSTATED TO MATCH EXISTING IN ACCORDANCE WITH STANDARDS AND SUPERINTENDENT DIRECTION.

5. TOLERANCES

SURFACE LEVEL

GENERAL: PROVIDE FINISHED SUBGRADE THAT IS EVENLY GRADED BETWEEN LEVEL POINTS, FREE DRAINING AND CONFORM TO THE REQUIRED TOLERANCES.

SMOOTHNESS: AS NORMALLY PRODUCED BY A GRADER BLADE (EXCEPT FOR BATTERS WITHOUT TOPSOIL). TOLERANCES: THE LIMITS IN THE TABLE 5.1 APPLY TO THE FINISHED SURFACE UNLESS OVERRIDDEN BY THE REQUIREMENTS FOR THE FINISHED LEVEL AND THICKNESS OF THE SURFACING.

TABLE 5.1 – TOLERANCES

ITEM	LEVEL TOLERANCES	
	ABSOLUTE	RELATIVE TO A 3.0m STRAIGHTEDGE *
CUT SUBGRADE LEVEL IN EARTH AND FILL SUBGRADE LEVEL	+0 mm -50mm	15mm
CUT SUBGRADE IN ROCK	+0 mm -75mm	UNSPECIFIED

* LIMITS TO INCORPORATE DUE ALLOWANCE FOR DESIGN SHAPE WHERE RELEVANT

OTHER GROUND SURFACES

ABSOLUTE LEVEL TOLERANCE: ± 50 MM, PROVIDED THE AREA MATCHES ADJACENT CONSTRUCTION.

HORIZONTAL SURFACES

ABSOLUTE TOLERANCE: ± 50 MM, EXCEPT WHERE ALIGNMENT WITH AN EXISTING ROAD STRUCTURE IS NECESSARY. JOIN NEW CONSTRUCTION TO THE EXISTING WORK IN A SMOOTH MANNER.

BATTERS

SLOPE: AVERAGE SLOPE NOT STEEPER THAN SHOWN ON THE DRAWINGS NOR MORE THAN 10% FLATTER, PROVIDED THAT FLATTER SLOPES DO NOT ENCROACH ON ABUTTING PROPERTY.

ABSOLUTE LEVEL TOLERANCE: FOR CUT BATTERS IN EARTH, ± 150 MM AND FOR CUT BATTERS IN ROCK AND FOR FILL BATTERS, ± 300 MM; BOTH MEASURED FROM THE AVERAGE SLOPE PLANE.

TOPSOIL TO BATTERS: ABSOLUTE LEVEL TOLERANCE ± 50 MM, PROVIDED THE AREA MATCHES ADJACENT CONSTRUCTION.

6. COMPACTION

6.1 METHOD OF COMPACTION AND TESTING

REQUIREMENT: SELECT THE METHODS OF COMPACTION AND COMPLIANCE TESTING TO SUIT THE MATERIAL CATEGORY LISTED IN TABLE 6.1.

TABLE 6.1 – COMPACTION METHOD

MATERIAL CATEGORY	COMPACT METHOD	DENSITY COMPLIANCE TESTS
1. COHESIONLESS SAND	COMPACTED LAYER METHOD	RELATIVE DRY DENSITY OR DENSITY INDEX (IF RDD GIVES MEANINGLESS ANSWERS)
2. SOILS OTHER THAN 1 ABOVE WHICH, AFTER COMPACTION, HAVE LESS THAN 20% OF STONE RETAINED ON THE 37.5mm SIEVE	COMPACTED LAYER METHOD	RELATIVE DRY DENSITY
3. COARSE GRANULAR SOILS WITH MORE THAN 70% OF STONE RETAINED ON THE 37.5mm SIEVE	MECHANICAL INTERLOCK METHOD	NIL ON MATERIAL IN GENERAL
4. SOILS OTHER THAN 3 ABOVE WHICH, AFTER COMPACTION, HAVE 20% – 70% OF STONE RETAINED ON THE 37.5mm SIEVE	COMPACTED LAYER METHOD OR MECHANICAL INTERLOCK METHOD	RELATIVE DRY DENSITY OR RDD WHERE APPROPRIATE ON THE FINER GRAINED MATERIALS WHICH COMPLETELY FILL THE VOIDS BETWEEN ROCKS

6.2 COMPACTED LAYER METHOD OF CONSTRUCTION

STONE SIZE: LIMIT STONE SIZE IN FILL MATERIAL TO LESS THAN TWO-THIRDS OF THE UNCOMPACTED LAYER DEPTH.

EXECUTION: PLACE AND COMPACT FILL MATERIAL UNIFORMLY IN LAYERS.
COMPACTION LAYER THICKNESS: COMPLY WITH TABLE 6.2 FOR THE ALLOWABLE LOOSE LAYER THICKNESS FOR THE LOCATION AND PROPERTIES OF THE MATERIAL BEING COMPACTED, WHERE THE UNCOMPACTED THICKNESS OF A LAYER WOULD OTHERWISE BE LESS THAN THE SPECIFIED MINIMUM THICKNESS, A LESSER THICKNESS OF NEWLY PLACED MATERIAL MAY BE EMPLOYED BY LOOSENING THE UNDERLYING MATERIAL TO GIVE A TOTAL DEPTH EQUAL TO THE MINIMUM THICKNESS.

TABLE 6.2 – LAYER THICKNESS FOR COMPACTION

MATERIAL/LOCATION	LOOSE LAYER THICKNESS	
	MINIMUM	MAXIMUM
GENERAL FILL IN ROAD EMBANKMENT	150	300
CLAY FILL IN WATER RETAINING STRUCTURES	150	200
SUBGRADE	100	200
BACKFILL OTHER THAN SAND	–	100
SAND BACKFILL	150	300

6.3 MECHANICAL INTERLOCK METHOD OF CONSTRUCTION

EXECUTION: PLACE AND COMPACT COARSE GRANULAR FILL MATERIAL UNIFORMLY IN LAYERS. ROLL EACH LAYER UNTIL NO PERMANENT VISIBLE LOWERING OF THE SURFACE OCCURS.

MINIMUM THICKNESS OF UNCOMPACTED LAYERS: GREATER OF 150 MM OR 1.5 TIMES THE MAXIMUM ROCK SIZE IN THE LAYER.

MAXIMUM THICKNESS OF UNCOMPACTED LAYERS: COMPLY WITH TABLE 6.3 FOR THE SPECIFIED MODULE WEIGHTS, WHICH APPLY TO BOTH DRAWN AND SELF-PROPELLED SINGLE DRUM ROLLERS. INTERPOLATE LAYER THICKNESS FOR MODULE WEIGHTS BETWEEN THE LISTED VALUES.

6. COMPACTION CONT'D

DO NOT SCALE

TABLE 6.3 – MAXIMUM THICKNESS OF UNCOMPACTED LAYERS

LOCATION	MINIMUM RELATIVE COMPACTION (STANDARD) (COHESIVE SOILS GENERALLY) (SEE NOTES 1, 2, 3, 4)	MINIMUM DENSITY INDEX (COHESIONLESS SOILS) (SEE NOTES 1, 5)
SINGLE 1 OR 2 STOREY RESIDENTIAL DWELLING SITES		
a) ALLOTMENT FILL	95%	65%
b) BUILDING PAD (SEE NOTE 6)	100%	80%
COMMERCIAL, INDUSTRIAL AND MULTI UNIT RESIDENTIAL DEVELOPMENTS		
a) ALLOTMENT FILL	98%	70%
b) BUILDING PAD (SEE NOTE 6)	100%	80%
ROAD AND STRUCTURAL (OTHER THAN BUILDING) FORMATIONS INCLUDING EMBANKMENTS, FOOTPATHS, PAVED AREAS AND SHOULDERS (SEE NOTE 7)		
a) >0.3m BELOW SUBGRADE LEVEL	95%	65%
b) ≤0.3m BELOW SUBGRADE LEVEL	100%	80%
ALL OTHER AREAS EG. PARKS		
a) >0.3m BELOW DESIGN LEVEL	90%	62%
b) ≤0.3m BELOW DESIGN LEVEL	95%	65%

LOCATION	MINIMUM RELATIVE COMPACTION (STANDARD) (COHESIVE SOILS GENERALLY) (SEE NOTES 1, 2, 3, 4)	MINIMUM DENSITY INDEX (COHESIONLESS SOILS) (SEE NOTES 1, 5)
REPLACEMENT OF UNSUITABLE OR OVER-EXCAVATED SUBGRADE MATERIAL	100%	80%
BACKFILLING OF GRUB HOLES	100%	80%

NOTES:

- FIELD DRY DENSITY TO AS 1289.5.31, AS 1289.5.3.5 OR AS 1289.5.8.1. IF USING AS 1289.5.8.1, CALIBRATE THE SURFACE MOISTURE-DENSITY GAUGE IN ACCORDANCE WITH AS 1289.5.8.4 BEFORE USE ON SITE.
- STANDARD MAXIMUM DRY DENSITY TO AS 1289.5.1.1
- RELATIVE COMPACTION (% OF MAXIMUM DRY DENSITY) TO AS 1289.5.4.1
- FOR PLASTIC SOILS, COMPACT SOILS DESIGNATED UNDER THE UNIFIED CLASSIFICATIONS SYSTEM AS OH CH MH TO NOT LESS THAN 92% NOR GREATER THAN 96% OF STANDARD MAXIMUM DRY DENSITY AT MOISTURE CONTENTS OF BETWEEN 90% AND 120% OF OPTIMUM MOISTURE CONTENT.
- DENSITY INDEX TO AS 1289.5.6.1 MAXIMUM AND MINIMUM DRY DENSITIES TO AS 1289.5.5.1
- AVERAGE IMPOSED BEARING PRESSURE OF FLOOR SLAB NOT TO EXCEED 20 kPa. IMPOSED BEARING PRESSURES OF STRIP AND PAD FOOTINGS NOT TO EXCEED 100 kPa.
- IN THE CONTEXT OF THIS SPECIFICATION, ROAD FORMATION IS DEEMED TO INCLUDE ALL THE AREA WITHIN THE DESIGNATED ROAD RESERVE. STRUCTURAL FORMATION IS DEEMED TO INCLUDE THE AREA UNDER THE PAVING PLUS A NOMINAL 1.0m FROM THE EDGE OF THE PAVED AREA.

APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE	-	-	10/03/2023

Client Logo

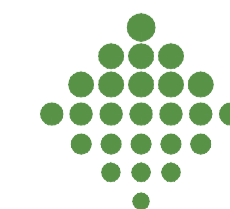


Client	MAREEBA SHIRE COUNCIL		
Project	NEW KURANDA CEMETERY - STAGE 1		
Title	BATTER REINFORCEMENT NOTES - SHEET 1 OF 2		

Drawing No.

ARO0231-C12

Drawn	Designed	Approved	Scale (A1 size)
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Drawing Check	Design Check	RPEQ	Date
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Revision

1

7. EXCAVATION

7.1 GENERAL
 EXTENT
 SITE SURFACE: EXCAVATE OVER THE SITE TO GIVE CORRECT LEVELS AND PROFILES AS THE BASIS FOR CONSTRUCTION, PAVING, FILLING, LANDSCAPING AND THE LIKE. MAKE ALLOWANCE FOR COMPACTION OR SETTLEMENT.
 FOOTINGS: EXCAVATE FOR FOOTINGS, PITS, WELLS, SHAFTS AND THE LIKE, TO THE REQUIRED SIZES AND DEPTHS. CONFIRM THAT THE BEARING CAPACITY IS AS SPECIFIED.
 PREPARATION
 PRIOR TO EXCAVATING, CUT ANY PAVEMENT WEARING SURFACE, CONCRETE FOOTPATH, KERB AND CHANNEL OR THE LIKE BY SAW OR OTHER APPROVED MEANS TO GIVE A CLEAN BREAK LINE ALONG THE EDGE OF EXCAVATION.
 EXISTING FOOTINGS, SLABS AND PAVEMENTS
 IF EXCAVATION IS REQUIRED BELOW THE LINE OF INFLUENCE OF AN EXISTING FOOTING, SLAB OR PAVEMENT, USE METHODS THAT MAINTAIN THE SUPPORT OF THE FOOTING, SLAB OR PAVEMENT AND ENSURE THAT THE STRUCTURE AND FINISHES SUPPORTED BY THE FOOTING ARE NOT DAMAGED.
7.2 SURFACE DRAINAGE
 CATCH DRAINS
 CONSTRUCT CATCH DRAINS AT THE TOP OF CUTTINGS. GRADE AND TRIM THE CATCH DRAINS TO ENSURE THE FREE FLOW OF WATER AND CONNECT TO THE DRAINAGE SYSTEM. INSTALL EROSION PROTECTION MEASURES WHERE NECESSARY.
 TABLE DRAINS
 PROFILE: NEATLY TRIM EARTH TABLE DRAINS TO THE REQUIRED PROFILE, GRADE AND ALIGNMENT. INSTALL EROSION PROTECTION MEASURES WHERE NECESSARY.
 GRADING: CONSTRUCT TABLE DRAINS WITH A MINIMUM GRADE OF 0.5% AND WITH A MAXIMUM LENGTH OF 50 M BEFORE DIVERSION TO DRAINAGE SYSTEM.
7.3 PROVISIONAL DEPTHS
 CONTRACT DEPTHS
 THE FOOTING OR PIER DEPTHS SHOWN ON THE DRAWINGS ARE ONLY A BASIS FOR MEASUREMENT OF QUANTITIES. ACTUAL EXCAVATION LEVELS WILL BE DETERMINED ON THE BASIS OF MATERIAL ENCOUNTERED.
7.4 EXPLOSIVES
 DO NOT USE EXPLOSIVES.
7.5 BEARING SURFACES
 GENERAL
 PROVIDE HORIZONTAL BEARING SURFACES FOR LOAD BEARING ELEMENTS INCLUDING FOOTINGS. STEP TO ACCOMMODATE LEVEL CHANGES. MAKE THE STEPS TO THE APPROPRIATE COURSES IF SUPPORTING MASONRY.
 DETEIORATION
 IF THE BEARING SURFACE DETEIORATES AFTER APPROVAL, EXCAVATE FURTHER TO A SOUND SURFACE BEFORE PLACING THE LOAD BEARING ELEMENT.
7.6 REINSTATEMENT OF EXCAVATION
 GENERAL
 WHERE EXCAVATION EXCEEDS THE REQUIRED EXTENT, WHETHER AS A RESULT OF BAD GROUND (AND WHERE FOOTING LEVELS OR THE LIKE ARE NOT VARIED) OR AS A RESULT OF EXCESS EXCAVATION, REINSTATE TO THE CORRECT DEPTH AND REQUIRED BEARING VALUE.
 PARTICULAR
 WITHIN THE 'LINE OF INFLUENCE' OF FOOTINGS, BEAMS OR OTHER STRUCTURAL ELEMENTS: REFILL OVER-EXCAVATION WITH CONCRETE OF STRENGTH APPROPRIATE TO THE LOADING, MINIMUM 15 MPA. BELOW SLABS OR PAVEMENTS: REFER TO CLAUSE 9.0.

7.7 ADJACENT STRUCTURES
 TEMPORARY SUPPORTS
 GENERAL: PROVIDE SUPPORTS TO ADJACENT STRUCTURES WHERE NECESSARY, SUFFICIENT TO PREVENT DAMAGE ARISING FROM THE WORKS.
 LATERAL SUPPORTS: PROVIDE LATERAL SUPPORT USING SHORING.
 VERTICAL SUPPORTS: PROVIDE VERTICAL SUPPORT WHERE NECESSARY USING PILING OR UNDERPINNING OR BOTH.
 PERMANENT SUPPORTS
 IF PERMANENT SUPPORTS FOR ADJACENT STRUCTURES ARE NECESSARY AND ARE NOT DESCRIBED, GIVE NOTICE AND OBTAIN INSTRUCTIONS.
 ENCROACHMENTS
 IF ENCROACHMENTS FROM ADJACENT STRUCTURES ARE ENCOUNTERED AND ARE NOT SHOWN ON THE DRAWINGS, GIVE NOTICE AND OBTAIN INSTRUCTIONS.
 ROCK BOLTING
 PROVIDE PROPRIETARY HIGH STRENGTH STEEL BARS OR TUBES ANCHORED INTO HOLES DRILLED IN THE ROCK AND TENSIONED AGAINST PLATES BEARING ON THE ROCK FACE TO PROVIDE TEMPORARY OR PERMANENT SUPPORT FOR THE ROCK FACE. REFER CLAUSE 18.0.
7.8 NON-RIPPABLE MATERIAL
 GENERAL
 WHERE THE METHODS OF MEASUREMENT REQUIRE DIFFERENTIATION OF NON-RIPPABLE MATERIAL, THE FOLLOWING CRITERIA APPLY. MACHINE CLASSIFICATION TO AS 2868.
 CONFINED EXCAVATION
 DEFINITION: EXCAVATION OF TRENCHES AND TO BROADER AREAS LESS THAN 1000 M² IN EXTENT.
 CLASSIFICATION: CLASSIFY MATERIAL AS NON-RIPPABLE IF ANY OF THE NOMINATED CLASSES OF CRAWLER EXCAVATOR FITTED WITH A HEAVY DUTY BUCKET, CANNOT RIP AT A PRODUCTION RATE (IN SITU VOLUME) EXCEEDING THE NOMINATED VALUES. FIT BUCKET TEETH WITH HIGH PENETRATION BOOTS, APPROVED BY THE MACHINE MANUFACTURER FOR USE ON THE PARTICULAR MACHINE IN ROCK.
 CLASS 55 CRAWLER EXCAVATOR FITTED WITH A MAXIMUM 450 MM WIDE BUCKET: MAXIMUM PRODUCTION RATE 1.5 M³ PER HOUR.
 CLASS 85 CRAWLER EXCAVATOR FITTED WITH A MAXIMUM 600 MM WIDE BUCKET: MAXIMUM PRODUCTION RATE 3 M³ PER HOUR.
 CLASS 115 CRAWLER EXCAVATOR FITTED WITH A MAXIMUM 750 MM WIDE BUCKET: MAXIMUM PRODUCTION RATE 4.5 M³ PER HOUR.
 CLASS 155 CRAWLER EXCAVATOR FITTED WITH A MAXIMUM 900 MM WIDE BUCKET: MAXIMUM PRODUCTION RATE 7 M³ PER HOUR.
 CLASS 200 CRAWLER EXCAVATOR FITTED WITH A MAXIMUM 1050 MM WIDE BUCKET: MAXIMUM PRODUCTION RATE 10 M³ PER HOUR.
 OTHER EXCAVATION
 CLASSIFICATION: CLASSIFY MATERIAL AS NON-RIPPABLE IF THE NOMINATED CLASSES OF CRAWLER TRACTOR, EQUIPPED WITH A HEAVY DUTY, SINGLE TINE PARALLELOGRAM RIPPER (APPROVED BY THE MACHINE MANUFACTURER FOR USE ON THE PARTICULAR MACHINE IN ROCK), CANNOT RIP AT A PRODUCTION RATE (IN SITU VOLUME) EXCEEDING THE NOMINATED VALUES.
 CLASS 150C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 50 M³ PER HOUR.
 CLASS 200C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 75 M³ PER HOUR.
 CLASS 300C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 90 M³ PER HOUR.
 CLASS 400C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 105 M³ PER HOUR.
 CLASS 500C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 120 M³ PER HOUR.
 CLASS 600C CRAWLER TRACTOR: MAXIMUM PRODUCTION RATE OF 135 M³ PER HOUR.

8. FILLING

8.1 FILL MATERIAL
 GENERAL
 MATERIAL TYPE: INORGANIC, NON-PERISHABLE MATERIAL.
 SULPHUR CONTENT: DO NOT USE FILLING WITH SULPHUR CONTENT EXCEEDING 0.5% WITHIN 0.5 M OF CEMENT BOUND ELEMENTS (FOR EXAMPLE CONCRETE STRUCTURES OR MASONRY), UNLESS SUCH ELEMENTS ARE PROTECTED BY IMPERMEABLE MEMBRANES OR BY OTHER SUITABLE MEANS.
 SOURCES
 WHERE DIRECTED, RE-USE MATERIAL RECOVERED FROM EXCAVATIONS ON THE SITE. DRY OUT RECOVERED MATERIAL AS NECESSARY PRIOR TO USE.
 FILL TYPES
 GENERAL FILL: WELL GRADED MATERIAL, MAXIMUM PARTICLE SIZE 75 MM, PLASTICITY INDEX ≤ 55%.
 SELECT FILL: GRANULAR MATERIAL COMPLYING WITH THE FOLLOWING PROPERTIES.
 • PARTICLE SIZE: 75 MM MAXIMUM.
 • PROPORTION PASSING 0.075 MM SIEVE: 25% MAXIMUM.
 • PLASTICITY INDEX: ≥ 2%, ≤ 15%.
 • SOAKED CBR: NOT LESS THAN 15.
 ROAD EMBANKMENT FILL: WELL GRADED MATERIAL WITH MAXIMUM PLASTICITY INDEX 35% AND MAXIMUM PARTICLE SIZE DETERMINED BY LOCATION AND LAYER THICKNESS, BUT NOT EXCEEDING TWO-THIRDS OF THE UNCOMPACTED LAYER THICKNESS.
 FILL SUBGRADE: USE CLASS 3 MATERIAL OR SELECT FILL.
 SPECIAL FILL: REFER ANNEXURE.
8.2 PREPARATION FOR FILLING
 GENERAL
 REMOVE LOOSE MATERIAL, DEBRIS AND ORGANIC MATTER.
 BENCHING
 IF FILLING IS TO BE PLACED AGAINST A GROUND SURFACE THAT SLOPES MORE THAN 1V:4H, BENCH INTO THE NATURAL SURFACE FOR AT LEAST 1 M AT EVERY 1 M CHANGE OF LEVEL TO FORM A KEY FOR THE FILLING.
 UNDER GROUND SLABS, PAVEMENTS AND OTHER LOAD BEARING ELEMENTS
 UNDER FILLING THAT WILL SUPPORT SLABS, PAVEMENTS AND OTHER LOAD-BEARING ELEMENTS, COMPACT THE STRIPPED SURFACE AS FOR FILLING. IF NECESSARY LOOSEN THE MATERIAL TO A DEPTH OF 200 MM AND ADJUST THE MOISTURE CONTENT.
 UNDER EARTH MOUNDS
 CULTIVATE THE GROUND BY RIPPING TO A DEPTH OF 200 MM BEFORE MOUND FORMATION.
 ROCK
 REMOVE ANY OVERHANGING ROCK LEDGES. REMOVE ANY LOOSE OR UNSTABLE BLOCKS OF ROCK.
8.3 PLACING FILL
 GENERAL
 LAYERS: PLACE AND COMPACT FILL IN ACCORDANCE WITH THE COMPACTED LAYER METHOD OF CONSTRUCTION SPECIFIED IN CLAUSE 6.2 TO ACHIEVE THE DENSITY SPECIFIED IN CLAUSE 6.4.
 PLACING AT STRUCTURES
 GENERAL: PLACE AND COMPACT FILLING IN LAYERS SIMULTANEOUSLY ON BOTH SIDES OF STRUCTURES, CULVERTS AND PIPELINES TO AVOID DIFFERENTIAL LOADING. COMMENCE COMPACTION OF EACH LAYER AT THE STRUCTURE AND PROCEED AWAY FROM IT.
 PLACING AGAINST CONCRETE: DO NOT PLACE FILL AGAINST CONCRETE UNTIL THE CONCRETE STRENGTH IS MORE THAN 80% OF THE SPECIFIED STRENGTH.
 SUPPORTS: REMOVE ANY TEMPORARY SUPPORTS TO EXCAVATIONS PROGRESSIVELY AS BACKFILLING PROCEEDS.

9. SUBGRADE PREPARATION

GENERAL
 TRIM THE SUBGRADE TO AN EVEN SURFACE FREE FROM LOOSE MATERIAL.
 COMPACTION
 COMPACT, OR RECOMPACT, SUBGRADE MATERIAL TO OBTAIN THE DENSITY SPECIFIED IN CLAUSE 6.4. SUBGRADE AFFECTED BY MOISTURE
 WHERE THE SUBGRADE IS UNABLE TO SUPPORT CONSTRUCTION EQUIPMENT, OR IT IS NOT POSSIBLE TO COMPACT THE OVERLYING PAVEMENT BECAUSE OF HIGH SUBGRADE MOISTURE CONTENT, PERFORM ONE OR MORE OF THE FOLLOWING:
 • ALLOW THE SUBGRADE TO DRY UNTIL IT WILL SUPPORT EQUIPMENT AND ALLOW COMPACTION.
 • SCARIFY THE SUBGRADE TO A DEPTH OF 150mm, WORK AS NECESSARY TO ACCELERATE DRYING, AND RECOMPACT WHEN THE MOISTURE CONTENT APPROXIMATES THE OPTIMUM.
 • EXCAVATE THE WET MATERIAL AND REPLACE WITH CLASS 3 MATERIAL OR SELECT FILL.
 • TREAT THE MATERIAL WITH LIME MIXED IN BY APPROVED SPECIALISED PLANT.
 SIDE DRAIN, MITRE DRAIN AND BLANKET COURSE
 GENERAL: CONSTRUCT PAVEMENT DRAINAGE SYSTEM TO COMPLY WITH COUNCIL STANDARD DRAWINGS FOR ROADS, CONSTRUCT SIDE DRAINS ON BOTH SIDES UNLESS DIRECTED OTHERWISE.
 MATERIAL: CONFORM TO THE FILTER MATERIAL REQUIREMENTS AS OUTLINED BELOW.
 FILTER MATERIAL
 MATERIAL REQUIREMENTS
 FILTER MATERIAL SELECTION: SELECT THE APPROPRIATE GRANULAR MATERIAL OR SCREENINGS TO SUIT THE APPLICATION. AT LEAST 98% OF THE FILTER MATERIAL MUST BE RETAINED ON THE A.S. SIEVE SIZE EQUAL TO OR IMMEDIATELY GREATER THAN 1.5 TIMES THE SLOT WIDTH OR OPENING DIAMETER OF THE SLOTTED DRAINAGE PIPE OR PROPRIETARY DRAINAGE MEDIA.
 PERMEABILITY: ACHIEVE A PERMEABILITY OF 0.01-10 mm/s DETERMINED IN ACCORDANCE WITH AS 1289.6.7.1.
 GRANULAR MATERIAL: NATURAL OR MANUFACTURED GRANULAR MATERIAL FREE FROM ORGANIC MATTER CONFORMING TO THE GRADING SPECIFIED IN TABLE 3.1. GRANULAR FILTER MATERIAL SHALL CONSIST OF HARD, DURABLE AND CLEAN SAND, GRAVEL, RECYCLED MATERIAL OR CRUSHED ROCK, FREE FROM CLAY BALLS AND ORGANIC MATTER, AND SHALL HAVE A PH VALUE GREATER THAN 6.0 AND LESS THAN 8.0.
 SCREENINGS: 5mm OR 10mm NOMINAL SINGLE SIZE SCREENINGS CONFORMING TO THE GRADING SPECIFIED IN TABLE 3.2.
 PAVEMENT DRAINAGE
 SIDE DRAIN: 5mm OR 10mm SCREENINGS.
 MITRE DRAIN/ BLANKET COURSE: SCREENINGS OR CLASS 1 MATERIAL.

9. SUBGRADE PREPARATION CONT'D

CONSTRUCTION: DO NOT ALLOW CONSTRUCTION EQUIPMENT TO TRAVEL OR STAND DIRECTLY ON CONSTRUCTED SUBSOIL DRAINS.
 SPRINGS OR SEEPS
 IF SPRINGS OR SEEPS ARE FOUND, PROVIDE DRAINAGE AS DIRECTED.
 DRAINING DEPRESSIONS
 IF SUBGRADE IS REPLACED, GRADE DEPRESSIONS IN THE NATIVE MATERIAL TO DRAIN TO THE SUBSOIL DRAINAGE SYSTEM OR CONNECT BY MITRE DRAINS.
 IN ROCK SUBGRADES, DRAIN DEPRESSIONS WITH SUBGRADE DRAINS AT LEAST 150 MM WIDE, BACKFILLED WITH COARSE FILTER, AND CONNECTED TO THE SUBSOIL DRAINAGE SYSTEM.
 UNSUITABLE MATERIAL
 REMOVE ROOTS, BOULDERS, SILT, ORGANIC MATTER AND OTHER UNSUITABLE MATERIALS.
 REMOVE OR LIME TREAT SUBGRADE WITH A SOAKED CBR LESS THAN 3 TO AN APPROVED DEPTH WHICH SHALL NOT BE LESS THAN 150 MM. IF REMOVED, REPLACE WITH CLASS 3 MATERIAL OR SELECT FILL.
 BACKFILLING
 REINSTATE OVER-EXCAVATION, INCLUDING EXCAVATION FOR GRUB HOLES TO THE CORRECT LEVEL WITH CLASS 3 MATERIAL OR SELECT FILL AND COMPACT TO COMPLY WITH CLAUSE 6.4.
 RECTIFICATION
 IF A SECTION OF SUBGRADE MATERIAL FAILS TO MEET THE REQUIRED DENSITY AFTER COMPACTION, REWORK OR RECTIFY AS FOLLOWS:
 • FILL SUBGRADES: REMOVE THE NON-COMPLYING MATERIAL, REPLACE WITH CLASS 3 MATERIAL OR SELECT FILL AND RECOMPACT.
 • CUT SUBGRADES: REWORK THE MATERIAL, OR REPLACE WITH CLASS 3 MATERIAL OR SELECT FILL AND RECOMPACT.
 PROOF ROLLING
 TIMING: FOLLOWING COMPLETION OF SUBGRADE COMPACTION AND TRIMMING, INSPECT THE WHOLE OF THE SUBGRADE AREA BY PROOF ROLLING WITH A FULLY LOADED SINGLE REAR AXLE TRUCK (OR ACCEPTABLE EQUIVALENT).
 ACCEPTANCE OF SUBGRADE: NO VISIBLE SIGNS OF DEFORMATION OR INSTABILITY IN THE SUBGRADE DURING PROOF ROLLING

10. GEOTEXTILES

GENERAL
 TESTING: TO AS 3706.
 BASE MATERIALS: POLYAMIDE, POLYOLEFINES, POLYESTER AND POLYVINYL MATERIALS, EITHER SINGLY OR IN COMBINATION.
 FILAMENT PROPERTIES: ROT-PROOF, CHEMICALLY STABLE AND WITH LOW WATER ABSORBENCY. NON-WOVEN GEOTEXTILES MUST HAVE THE FILAMENTS BONDED BY NEEDLE PUNCHING, HEAT OR CHEMICAL BONDING PROCESSES. WOVEN GEOTEXTILES MUST HAVE THE FILAMENTS INTERLACED IN TWO SETS, MUTUALLY AT RIGHT ANGLES. ONE SET MUST BE PARALLEL TO THE LONGITUDINAL DIRECTION OF THE GEOTEXTILE.
 ULTRAVIOLET RADIATION RESISTANCE
 EXPOSED CONDITIONS: FOR USE SUCH AS SILT FENCE, RETAIN 90% OF ITS ORIGINAL STRENGTH AFTER THREE MONTHS EXPOSURE TO SUNLIGHT.
 UNEXPOSED CONDITIONS: RETAIN 90% OF ITS ORIGINAL STRENGTH AFTER ONE MONTH EXPOSURE TO SUNLIGHT.
 APPLICATIONS
 TYPE 1, NON WOVEN: MATERIAL PROPERTIES TO COMPLY WITH TABLE 12.1. SUITABLE FOR FILTER DRAIN IN GRANULAR SOILS SUBJECT TO LIGHT COMPACTION EQUIPMENT. LIMIT THE MAXIMUM AGGREGATE SIZE IN CONTACT WITH THE GEOTEXTILE TO 37.5 MM.
 TYPE 2, NON WOVEN: MATERIAL PROPERTIES TO COMPLY WITH TABLE 12.1. SUITABLE FOR FILTER DRAIN FOR SIDE DRAINS IN ROADWORK AND GENERAL NON-ROADWORK APPLICATIONS. LIMIT THE MAXIMUM AGGREGATE SIZE IN CONTACT WITH THE GEOTEXTILE TO 75 MM.
 GABION TYPE 3, NON WOVEN: MATERIAL PROPERTIES TO COMPLY WITH TABLE 12.1. SUITABLE FOR GENERAL USE IN ROADWORK (OTHER THAN SIDE DRAINS), CRIB WALLS, AND GABIONS. LIMIT THE MAXIMUM AGGREGATE SIZE IN CONTACT WITH THE GEOTEXTILE TO 200 MM.
 TYPE 4, NON WOVEN: MATERIAL PROPERTIES TO COMPLY WITH TABLE 12.1. SUITABLE FOR SCOUR PROTECTION WORKS, WHERE THE MAXIMUM ROCK SIZE EXCEEDS 200 MM.

DESIGNATION/ TYPE	WIDE STRIP TENSILE STRENGTH 5 PERCENTILE VALUE (kN/m)	TRAPEZOIDAL TEAR STRENGTH 5 PERCENTILE VALUE (N)	G RATING (NOTE)	PORE SIZE EOS (µm)	PERMITTIVITY (s ⁻¹)
TYPE 1 NON WOVEN	>5.0	>180	>1000	<250	>1.00
TYPE 2 NON WOVEN	>9.0	>270	>2000	<180	>1.00
TYPE 3 NON WOVEN	>13.0	>360	>3000	<180	>1.00
TYPE 4 NON WOVEN	>20.0	>550	>5000	<160	>1.00

NOTE:
 G RATING = GEOTEXTILE STRENGTH RATING = (H₅₀ x L)^{0.5}
 H₅₀ = NORMALISED DROP HEIGHT (mm), A DETERMINED USING THE DROP CONE TEST PROCEDURE IN AS 3706.5
 L = PLUNGER FAILURE LOAD (N), AS DETERMINED USING THE CBR PLUNGER TEST PROCEDURE IN AS 3706.4
 FILTER TUBE: NON WOVEN OR WOVEN GEOTEXTILE SUITABLE FOR SUMP PROTECTION BOOM. MINIMUM WEIGHT 285g/m², PORE SIZE EOS <75µm, PERMITTIVITY >0.2s⁻¹
 SILT FENCE: NON WOVEN OR WOVEN GEOTEXTILE. G RATING > 2500, WIDE STRIP TENSILE STRENGTH (5 PERCENTILE VALUE) >4kN/m, PERMITTIVITY >0.2s⁻¹
 STORAGE
 STORE GEOTEXTILE UNDER PROTECTIVE COVER OR WRAPPED WITH A WATERPROOF AND ULTRAVIOLET PROTECTIVE SHEERING. DO NOT STORE GEOTEXTILE DIRECTLY ON THE GROUND OR EXPOSE THEM TO EXCESSIVE HEAT.
 PREPARATION
 BEFORE PLACING GEOTEXTILE, TRIM THE GROUND TO A SMOOTH SURFACE FREE FROM CAVITIES AND PROJECTING ROCKS.
 PLACING
 FIXING: LAY THE MATERIAL FLAT, BUT NOT STRETCHED TIGHT, AND SECURE IT WITH ANCHOR PINS. OVERLAP JOINTS AT 300 MM MINIMUM.
 TRAFFIC: DO NOT ALLOW VEHICLES AND CONSTRUCTION EQUIPMENT ON THE GEOTEXTILE UNTIL IT HAS BEEN COVERED WITH A LAYER OF FILL OR PAVEMENT MATERIAL AT LEAST 150 MM THICK.
 SUNLIGHT: DO NOT EXPOSE THE MATERIAL TO SUNLIGHT FOR MORE THAN 14 DAYS.

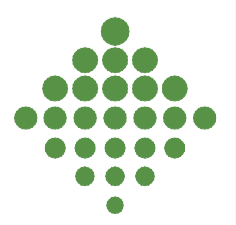
No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE	-	-	14/03/2023



Client		MAREEBA SHIRE COUNCIL	
Project		NEW KURANDA CEMETERY - STAGE 1	
Title		BATTER REINFORCEMENT NOTES - SHEET 2 OF 2	
Drawing No. ARO0231-C13			

Drawn	Designed	Approved	Scale (A1 size)
MS	MS		1:100
Drawing Check	Design Check	RPEQ	Date

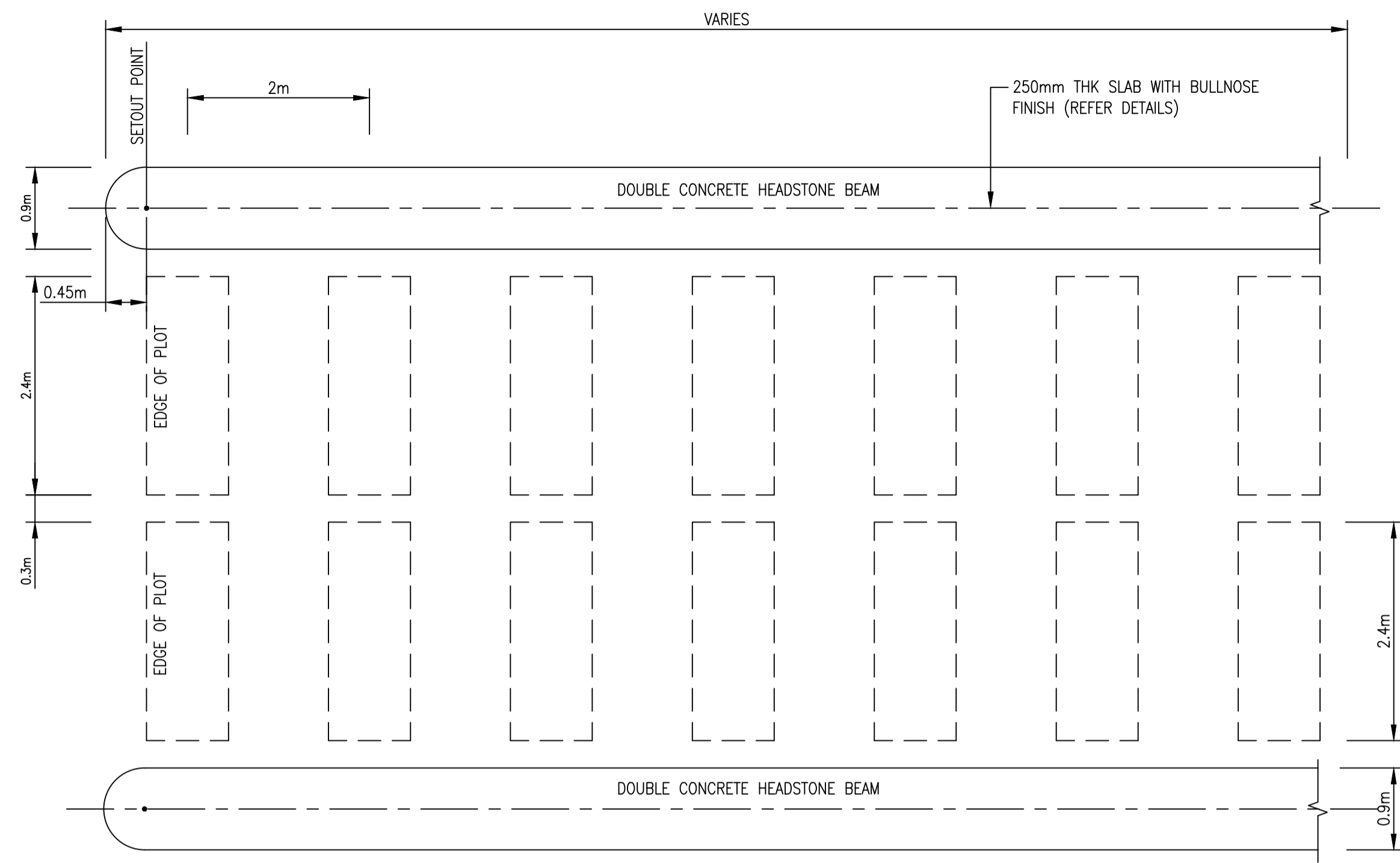
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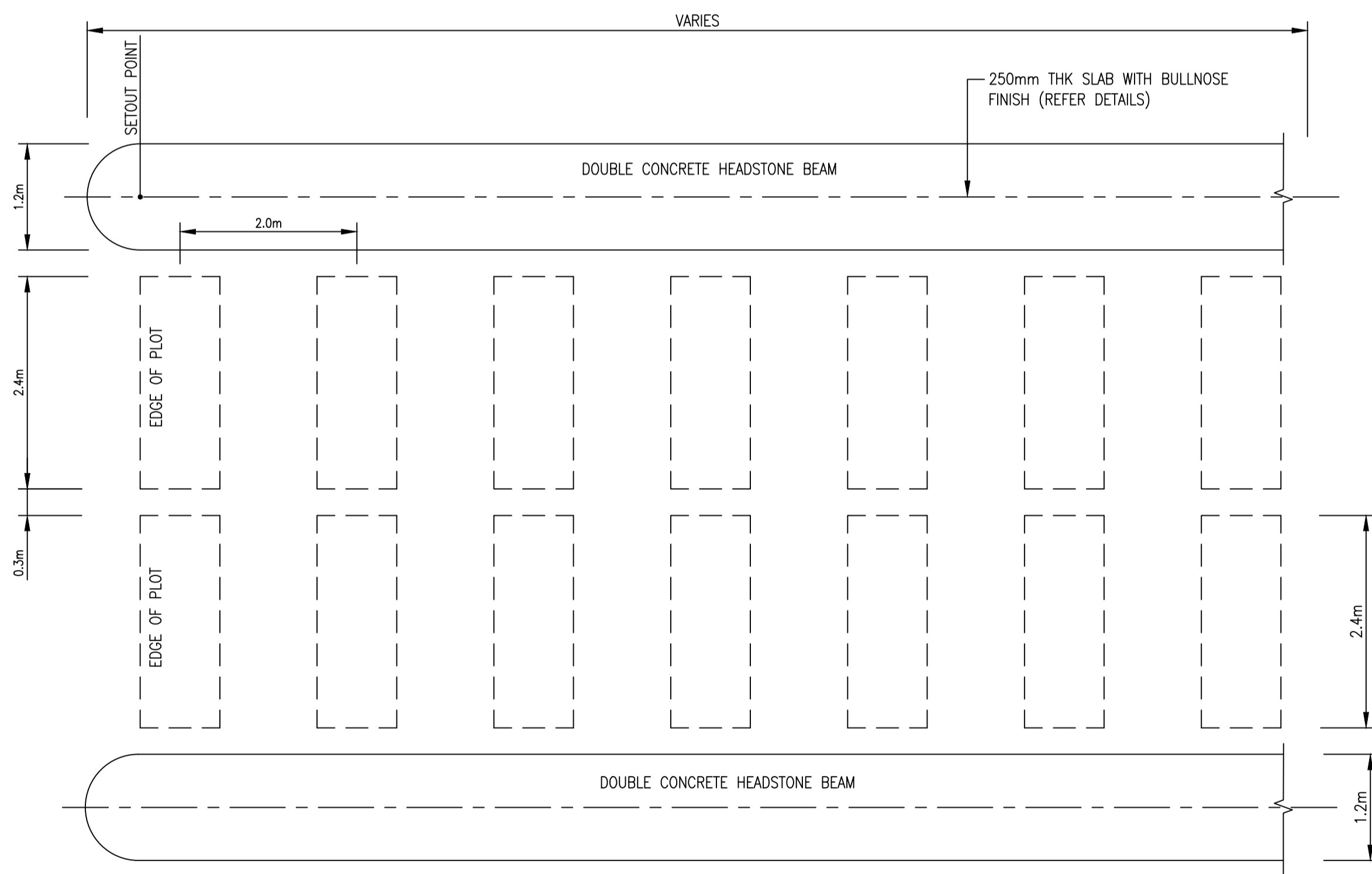
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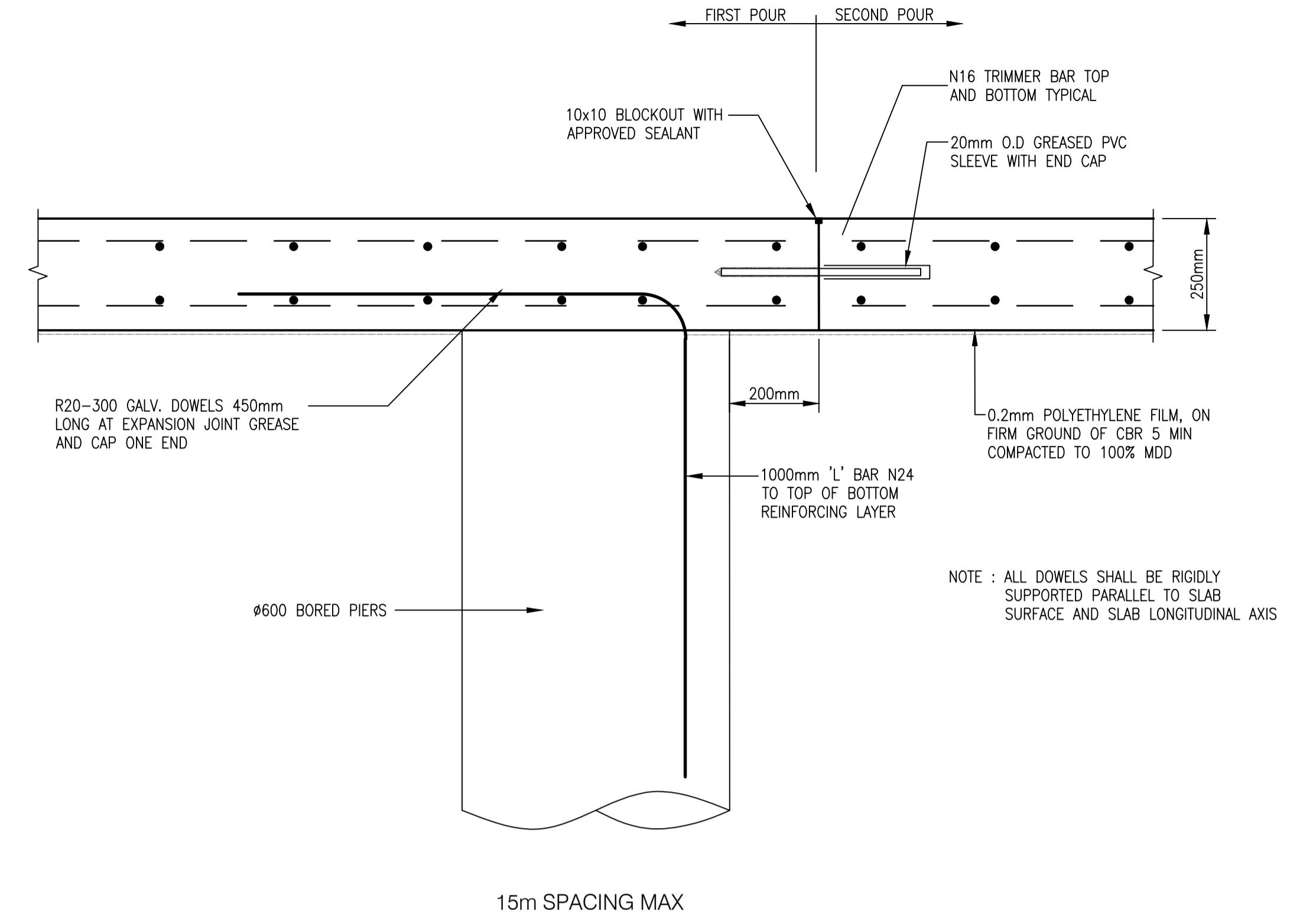
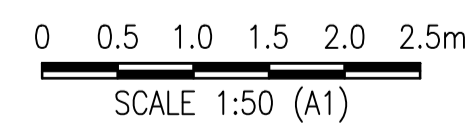
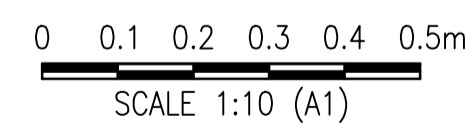
APPROVAL ISSUE



LAYOUT PLAN - 900mm WIDE BEAMS
SCALE 1:50



LAYOUT PLAN - 1200mm WIDE BEAMS
SCALE 1:50



EXPANSION JOINT DETAIL (EJ)
SCALE 1:10

APPROVAL ISSUE

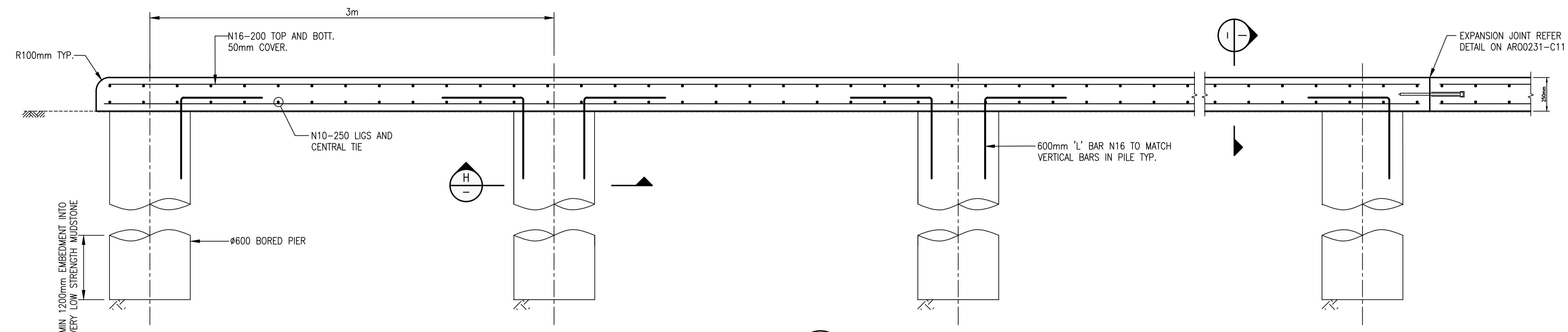
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1	APPROVAL ISSUE	-	-	14/03/2023



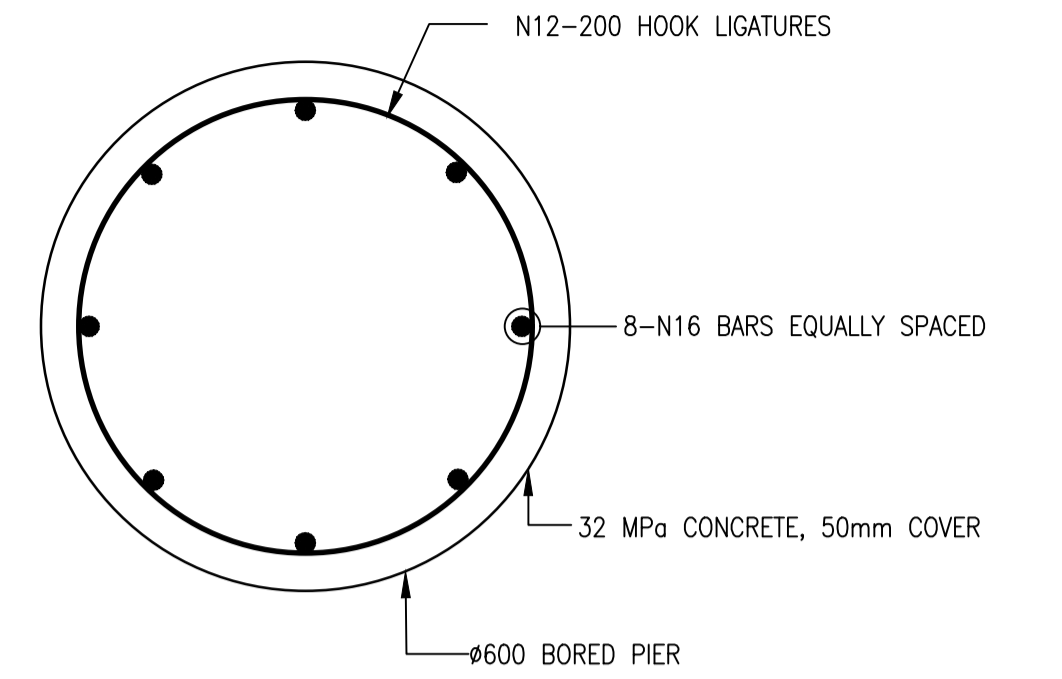
Client	MAREEBA SHIRE COUNCIL
Project	NEW KURANDA CEMETERY
Title	CONCRETE BEAM DETAILS SHEET 1 OF 2
Drawing No.	ARO0231-C14

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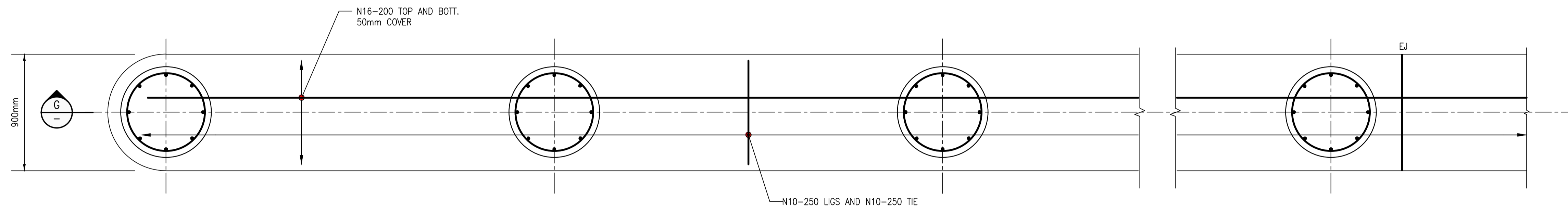
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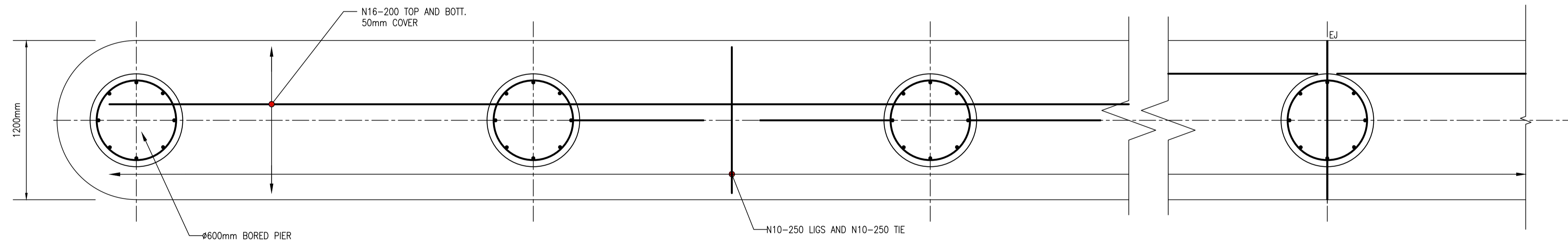
SECTION G
SCALE 1:20



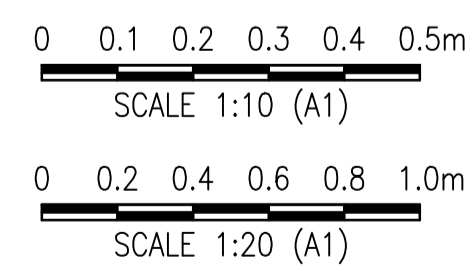
SECTION H
SCALE 1:10



PLAN - 900mm WIDE BEAMS
SCALE 1:20



PLAN - 1200mm WIDE BEAMS
SCALE 1:20



APPROVAL ISSUE

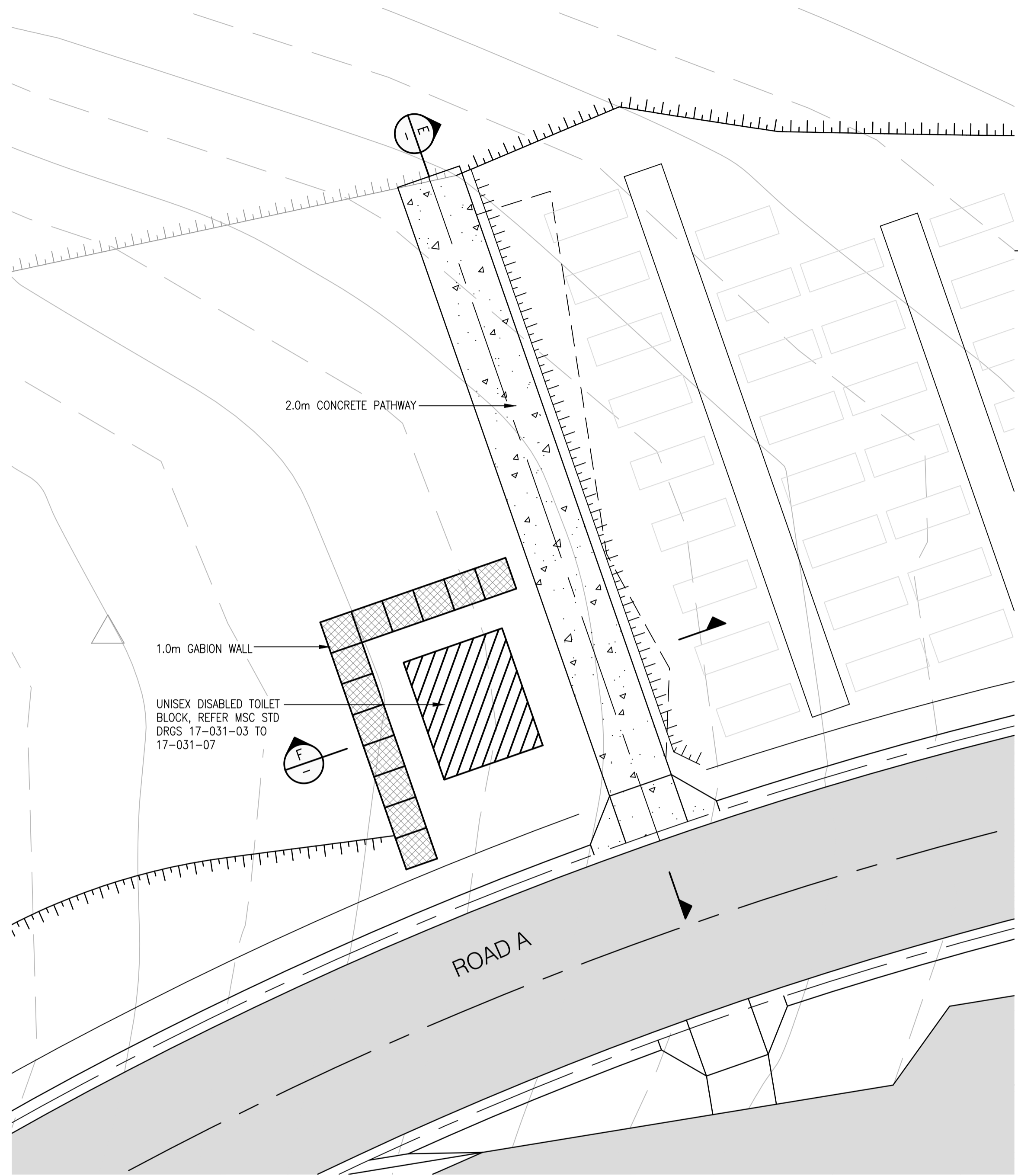
No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE	-	-	14/03/2023



Client	MAREEBA SHIRE COUNCIL
Project	NEW KURANDA CEMETERY
Title	CONCRETE BEAM DETAILS SHEET 2 OF 2
Drawing No.	ARO0231-C15

Drawn	MS	Designed	SB	Approved	RPEQ	Date	Scale (A1 size)	AS SHOWN
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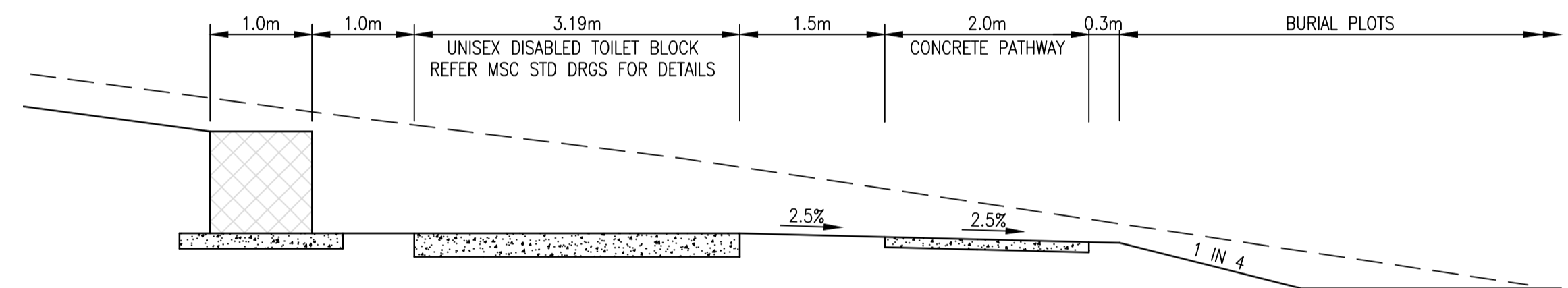
LAYOUT PLAN
SCALE 1:100

LEGEND

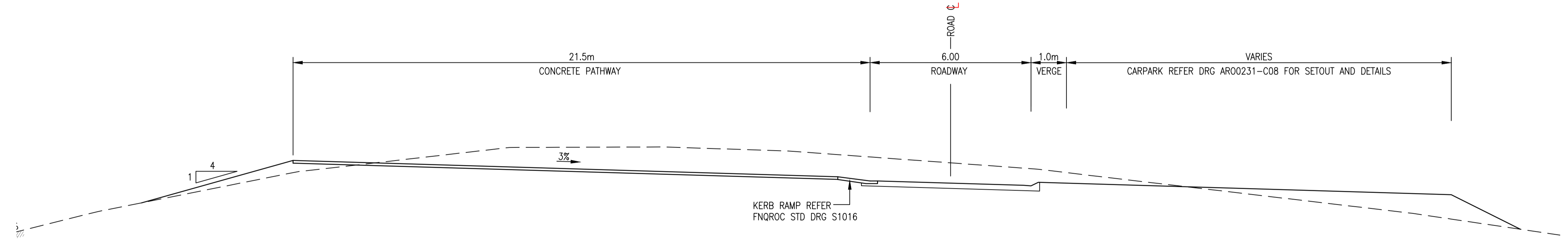
- FINISHED SURFACE LEVEL
- EXISTING SURFACE LEVEL
- DESIGN SURFACE CONTOUR (0.2m INTERVAL)
- EXISTING SURFACE CONTOUR (0.5m INTERVAL)
- 2.0m WIDE CONCRETE PATHWAY (REFER NOTE 12)
- KERB RAMP
- TOP OF BATTER
- TOE OF BATTER
- EDGE OF EXISTING VEGETATION

NOTES

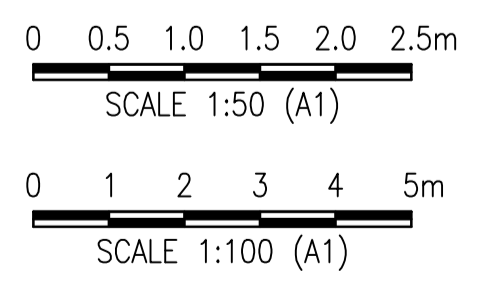
1. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
2. DESIGN SURFACE LEVELS SHOWN ARE AFTER ALL EARTHWORKS ARE COMPLETED, INCLUDING 75mm TOPSOILING.
3. BATTERS SHALL BE 1 IN 4 UNLESS NOTED OTHERWISE.
4. ALL DESIGN SURFACE LEVELS ARE TO BE GRADED EVENLY BETWEEN SHOWN LEVELS UNLESS OTHERWISE SHOWN.
5. REFER TO FNQROC STANDARD DRAWINGS:
S1000 : CONCRETE KERB & CHANNEL
S1016 : KERB RAMP
S1035 : PATHWAYS/BIKEWAYS
6. TRIM AND DRILL SEED ALL FOOTPATHS/ROAD VERGES. BATTERS >0.5m TO BE HYDROMULCHED AFTER FINAL EARTHWORKS AND TOPSOILING IS COMPLETED.
7. TOPSOIL STOCKPILE TO BE LOCATED AT SITE ACCEPTABLE TO SUPERINTENDENT.
8. 2.0m WIDE CONCRETE PATHWAY TO BE LOCATED AS SHOWN. KERB RAMPS TO BE INSTALLED IN ACCORDANCE WITH FNQROC STD DRGS S1016.



SECTION F
SCALE 1:50



SECTION E
SCALE 1:100



APPROVAL ISSUE

No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE	-	-	14/03/2023



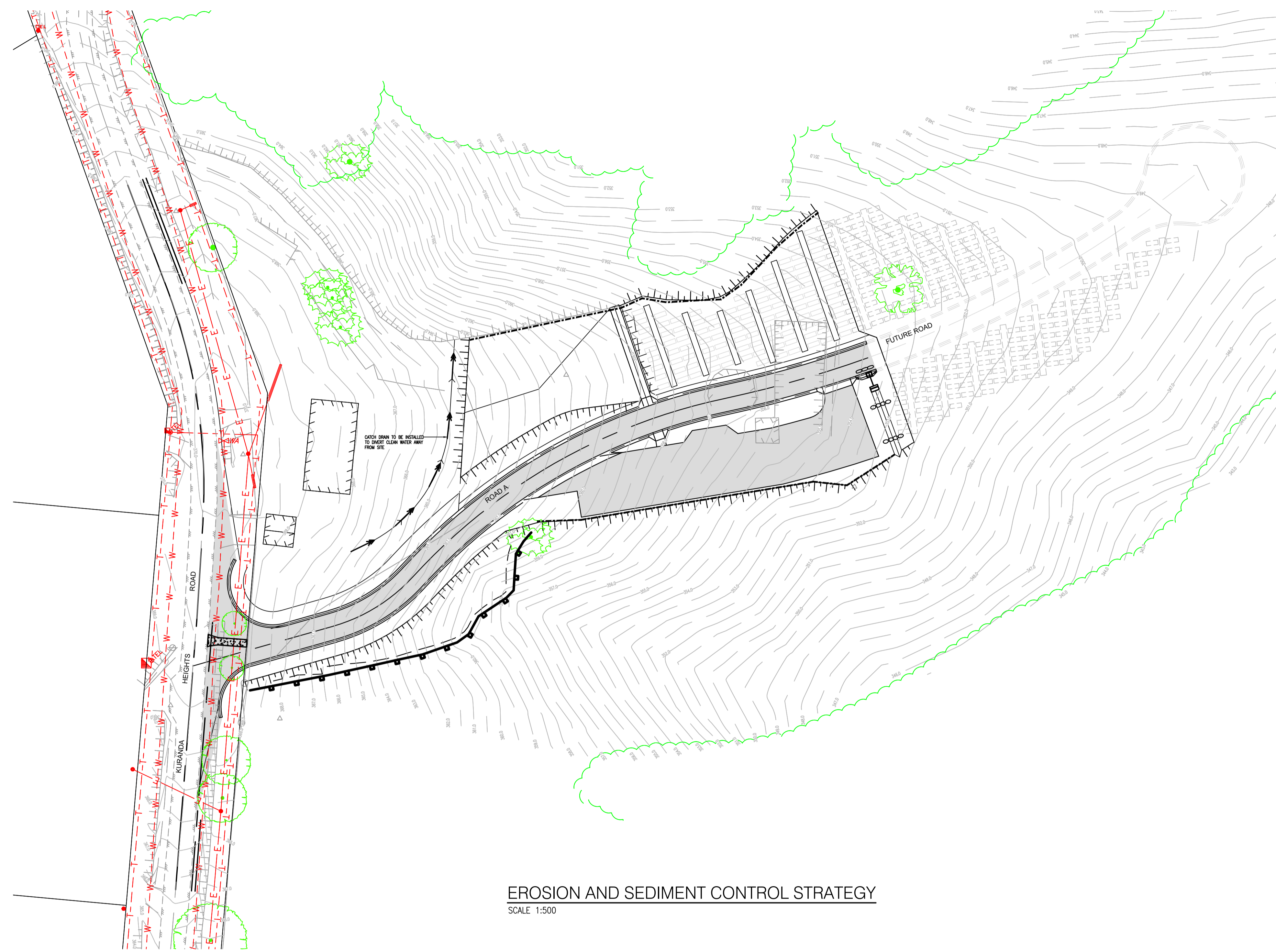
Client	MAREEBA SHIRE COUNCIL
Project	NEW KURANDA CEMETERY - STAGE 1
Title	PEDESTRIAN PATHWAY AND ABLUTION BLOCK PAD

Drawn	MS
Designed	MS
Approved	
Drawing Check	
Design Check	
RPEQ	
Date	

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LEGEND

- CHECK DAMS, 0.3m HIGH PLACED ROCK
- EXISTING SURFACE CONTOUR (0.5m INTERVAL)
- BATTER TOP
- BATTER TOE
- MULCH BANK
- CATCH DRAIN
- STABILISED ENTRY
- SEDIMENT FENCE
- SANDBAG KERB INLET PIT
- EDGE OF EXISTING VEGETATION

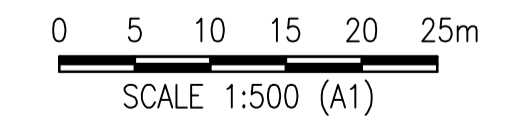
NOTES

1. NO WORKS TO COMMENCE ON SITE UNTIL CONTRACTORS EROSION AND SEDIMENT CONTROL PLAN IS APPROVED BY MAREEBA SHIRE COUNCIL.
2. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH FNQROC DEVELOPMENT MANUAL GUIDELINES AND SPECIFICATIONS.
3. CONTRACTOR TO NOTE REQUIREMENTS AND RESPONSIBILITIES FOR SEDIMENT AND EROSION CONTROL AS PER FNQROC & CONTRACT SPECIFICATION.
4. TOPSOIL STOCKPILES TO BE LOCATED AT SITE ACCEPTABLE TO SUPERINTENDENT AND SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE APPROVED ACCORDINGLY.
5. MOVEMENT OF CONSTRUCTION EQUIPMENT SHALL BE LIMITED TO THE AREA OF WORK AND EXISTING ROADS.
6. ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED AND MAINTAINED AFTER EACH STORM EVENT AND AT REGULAR INTERVALS.
7. CONTRACTOR TO HAVE SINGLE ACCESS POINT ONLY UNLESS DIRECTED OTHERWISE BY SUPERINTENDENT.
8. CONTOURS SHOWN ARE NATURAL SURFACE CONTOURS PRIOR TO ANY BULK EARTHWORKS TAKING PLACE.
9. PROVIDE MULCH TO TOP OF BATTERS.
10. CATCH DRAINS TO BE CONSTRUCTED PRIOR TO COMMENCEMENT OF WORKS.
11. ALL VEHICLES LEAVING THE SITE MUST EXIT VIA WASHDOWN FACILITY.
12. DEPTHS FOR CLEARING, GRUBBING AND STRIPPING TO BE CONFIRMED DURING THE EARLY STAGES OF SITE CLEARING. ANY VARIATIONS TO THE DEPTHS NOMINATED ON THE ENGINEERING DRAWINGS TO BE APPROVED BY THE SUPERINTENDENT.

SCHEDULE OF MEASURES

- DRAINAGE CONTROL**
- D1. CATCH DIRTY WATER RUNOFF AND DIVERT TO SEDIMENT CONTROL DEVICES: - CONSTRUCT CATCH DRAIN AS SHOWN.
 - D2. PROVIDE MULCH BANKS UP SLOPE FROM BATTERS TO PREVENT STORMWATER RUNOFF DOWN BATTER FACE.
- EROSION CONTROL**
- E1. BATTERS >0.5m HIGH ARE TO BE REVEGETATED AT COMPLETION OF EARTHWORKS (BONDED FIBRE MATRIX HYDROMULCH TO BE USED).
 - E2. PROVIDE MULCH BANKS TO TOP OF ALL BATTERS.
 - E3. SAND BAGS TO BE PLACED ALONG COMPLETED ROAD VERGES WHILE AWAITING RE-VEGETATION OF SITE.
 - E4. SANDBAGS TO BE PLACED ALONG COMPLETED CATCH DRAINS WHILE AWAITING RE-VEGETATION OF SITE.
- SEDIMENT CONTROL**
- S1. CONSTRUCT STABILISED ENTRY POINTS.
 - S2. CONSTRUCT SEDIMENT FENCE DOWNSTREAM OF STOCKPILES AND BATTERS.
 - S3. CONSTRUCT SANDBAG CHECK DAMS AT 40m CENTRES ALONG KERB AND AT KERB INVERTS.
 - S4. PROVIDE KERB LINE TURF STRIPS WITH RETURNS AT 10m INTERVALS.

EROSION AND SEDIMENT CONTROL STRATEGY
SCALE 1:500



No.	Description	Reviewed	Approved	Date
1	APPROVAL ISSUE	-	-	14/03/2023



Client	MAREEBA SHIRE COUNCIL		
Project	NEW KURANDA CEMETERY - STAGE 1		
Title	EROSION AND SEDIMENT CONTROL STRATEGY		

Drawn	MS	Designed	MS	Approved		Scale (A1 size)	1:250
Drawing Check		Design Check		RPEQ	Date	Drawing is not to be used for construction unless approved.	

APPROVAL ISSUE

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DA Form 1 – Development application details

Approved form (version 1.3 effective 28 September 2020) made under section 282 of the Planning Act 2016.

This form **must** be used to make a development application **involving code assessment or impact assessment**, except when applying for development involving only building work.

For a development application involving **building work only**, use *DA Form 2 – Building work details*.

For a development application involving **building work associated with any other type of assessable development (i.e. material change of use, operational work or reconfiguring a lot)**, use this form (*DA Form 1*) and parts 4 to 6 of *DA Form 2 – Building work details*.

Unless stated otherwise, all parts of this form **must** be completed in full and all required supporting information **must** accompany the development application.

One or more additional pages may be attached as a schedule to this development application if there is insufficient space on the form to include all the necessary information.

This form and any other form relevant to the development application must be used to make a development application relating to strategic port land and Brisbane core port land under the *Transport Infrastructure Act 1994*, and airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*. For the purpose of assessing a development application relating to strategic port land and Brisbane core port land, any reference to a planning scheme is taken to mean a land use plan for the strategic port land, Brisbane port land use plan for Brisbane core port land, or a land use plan for airport land.

Note: All terms used in this form have the meaning given under the Planning Act 2016, the Planning Regulation 2017, or the Development Assessment Rules (DA Rules).

PART 1 – APPLICANT DETAILS

1) Applicant details

Applicant name(s) (individual or company full name)	Mareeba Shire Council C/- ARO Industries Pty Ltd
Contact name (only applicable for companies)	Tracy Stanesby
Postal address (P.O. Box or street address)	51 Sheridan Street
Suburb	Cairns
State	QLD
Postcode	4870
Country	Australia
Contact number	(07) 4281 6897
Email address (non-mandatory)	tracy@arindustries.com.au
Mobile number (non-mandatory)	0423 972 217
Fax number (non-mandatory)	
Applicant's reference number(s) (if applicable)	MCU/22/0009

2) Owner's consent

2.1) Is written consent of the owner required for this development application?

- Yes – the written consent of the owner(s) is attached to this development application
- No – proceed to 3)

PART 2 – LOCATION DETAILS

3) Location of the premises (complete 3.1) or 3.2), and 3.3) as applicable)

Note: Provide details below and attach a site plan for any or all premises part of the development application. For further information, see DA Forms Guide: Relevant plans.

3.1) Street address and lot on plan

- Street address **AND** lot on plan (all lots must be listed), **or**
 Street address **AND** lot on plan for an adjoining or adjacent property of the premises (appropriate for development in water but adjoining or adjacent to land e.g. jetty, pontoon. All lots must be listed).

a)	Unit No.	Street No.	Street Name and Type	Suburb
		70	Kuranda Heights Road	Kuranda
	Postcode	Lot No.	Plan Type and Number (e.g. RP, SP)	Local Government Area(s)
		2	RP730337	Mareeba
b)	Unit No.	Street No.	Street Name and Type	Suburb
	Postcode	Lot No.	Plan Type and Number (e.g. RP, SP)	Local Government Area(s)

3.2) Coordinates of premises (appropriate for development in remote areas, over part of a lot or in water not adjoining or adjacent to land e.g. channel dredging in Moreton Bay)

Note: Place each set of coordinates in a separate row.

- Coordinates of premises by longitude and latitude

Longitude(s)	Latitude(s)	Datum	Local Government Area(s) (if applicable)
		<input type="checkbox"/> WGS84 <input type="checkbox"/> GDA94 <input type="checkbox"/> Other: <input type="text"/>	

- Coordinates of premises by easting and northing

Easting(s)	Northing(s)	Zone Ref.	Datum	Local Government Area(s) (if applicable)
		<input type="checkbox"/> 54 <input type="checkbox"/> 55 <input type="checkbox"/> 56	<input type="checkbox"/> WGS84 <input type="checkbox"/> GDA94 <input type="checkbox"/> Other: <input type="text"/>	

3.3) Additional premises

- Additional premises are relevant to this development application and the details of these premises have been attached in a schedule to this development application
 Not required

4) Identify any of the following that apply to the premises and provide any relevant details

- In or adjacent to a water body or watercourse or in or above an aquifer

Name of water body, watercourse or aquifer:

- On strategic port land under the *Transport Infrastructure Act 1994*

Lot on plan description of strategic port land:

Name of port authority for the lot:

- In a tidal area

Name of local government for the tidal area (if applicable):

Name of port authority for tidal area (if applicable):

- On airport land under the *Airport Assets (Restructuring and Disposal) Act 2008*

Name of airport:

<input type="checkbox"/> Listed on the Environmental Management Register (EMR) under the <i>Environmental Protection Act 1994</i>
EMR site identification: <input type="text"/>
<input type="checkbox"/> Listed on the Contaminated Land Register (CLR) under the <i>Environmental Protection Act 1994</i>
CLR site identification: <input type="text"/>

5) Are there any existing easements over the premises?
Note: Easement uses vary throughout Queensland and are to be identified correctly and accurately. For further information on easements and how they may affect the proposed development, see [DA Forms Guide](#).

Yes – All easement locations, types and dimensions are included in plans submitted with this development application

No

PART 3 – DEVELOPMENT DETAILS

Section 1 – Aspects of development

6.1) Provide details about the first development aspect
a) What is the type of development? <i>(tick only one box)</i>
<input type="checkbox"/> Material change of use <input type="checkbox"/> Reconfiguring a lot <input checked="" type="checkbox"/> Operational work <input type="checkbox"/> Building work
b) What is the approval type? <i>(tick only one box)</i>
<input checked="" type="checkbox"/> Development permit <input type="checkbox"/> Preliminary approval <input type="checkbox"/> Preliminary approval that includes a variation approval
c) What is the level of assessment?
<input checked="" type="checkbox"/> Code assessment <input type="checkbox"/> Impact assessment <i>(requires public notification)</i>
d) Provide a brief description of the proposal <i>(e.g. 6 unit apartment building defined as multi-unit dwelling, reconfiguration of 1 lot into 3 lots):</i>
Reconfiguring a Lot – Subdivision (1 into 2 lots)
e) Relevant plans <i>Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see DA Forms guide: Relevant plans.</i>
<input checked="" type="checkbox"/> Relevant plans of the proposed development are attached to the development application
6.2) Provide details about the second development aspect
a) What is the type of development? <i>(tick only one box)</i>
<input type="checkbox"/> Material change of use <input type="checkbox"/> Reconfiguring a lot <input type="checkbox"/> Operational work <input type="checkbox"/> Building work
b) What is the approval type? <i>(tick only one box)</i>
<input type="checkbox"/> Development permit <input type="checkbox"/> Preliminary approval <input type="checkbox"/> Preliminary approval that includes a variation approval
c) What is the level of assessment?
<input type="checkbox"/> Code assessment <input type="checkbox"/> Impact assessment <i>(requires public notification)</i>
d) Provide a brief description of the proposal <i>(e.g. 6 unit apartment building defined as multi-unit dwelling, reconfiguration of 1 lot into 3 lots):</i>
e) Relevant plans <i>Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see DA Forms Guide: Relevant plans.</i>
<input type="checkbox"/> Relevant plans of the proposed development are attached to the development application
6.3) Additional aspects of development
<input type="checkbox"/> Additional aspects of development are relevant to this development application and the details for these aspects that would be required under Part 3 Section 1 of this form have been attached to this development application
<input checked="" type="checkbox"/> Not required

Section 2 – Further development details

7) Does the proposed development application involve any of the following?	
Material change of use	<input type="checkbox"/> Yes – complete division 1 if assessable against a local planning instrument
Reconfiguring a lot	<input type="checkbox"/> Yes – complete division 2
Operational work	<input checked="" type="checkbox"/> Yes – complete division 3
Building work	<input type="checkbox"/> Yes – complete <i>DA Form 2 – Building work details</i>

Division 1 – Material change of use

Note: This division is only required to be completed if any part of the development application involves a material change of use assessable against a local planning instrument.

8.1) Describe the proposed material change of use			
Provide a general description of the proposed use	Provide the planning scheme definition <i>(include each definition in a new row)</i>	Number of dwelling units <i>(if applicable)</i>	Gross floor area (m ²) <i>(if applicable)</i>

8.2) Does the proposed use involve the use of existing buildings on the premises?	
<input type="checkbox"/> Yes	
<input type="checkbox"/> No	

Division 2 – Reconfiguring a lot

Note: This division is only required to be completed if any part of the development application involves reconfiguring a lot.

9.1) What is the total number of existing lots making up the premises?	

9.2) What is the nature of the lot reconfiguration? <i>(tick all applicable boxes)</i>	
<input type="checkbox"/> Subdivision <i>(complete 10)</i>	<input type="checkbox"/> Dividing land into parts by agreement <i>(complete 11)</i>
<input type="checkbox"/> Boundary realignment <i>(complete 12)</i>	<input type="checkbox"/> Creating or changing an easement giving access to a lot from a constructed road <i>(complete 13)</i>

10) Subdivision				
10.1) For this development, how many lots are being created and what is the intended use of those lots:				
Intended use of lots created	Residential	Commercial	Industrial	Other, please specify:
Number of lots created				

10.2) Will the subdivision be staged?	
<input type="checkbox"/> Yes – provide additional details below	
<input type="checkbox"/> No	
How many stages will the works include?	
What stage(s) will this development application apply to?	

11) Dividing land into parts by agreement – how many parts are being created and what is the intended use of the parts?

Intended use of parts created	Residential	Commercial	Industrial	Other, please specify:
Number of parts created				

12) Boundary realignment

12.1) What are the current and proposed areas for each lot comprising the premises?

Current lot		Proposed lot	
Lot on plan description	Area (m ²)	Lot on plan description	Area (m ²)

12.2) What is the reason for the boundary realignment?

13) What are the dimensions and nature of any existing easements being changed and/or any proposed easement? (attach schedule if there are more than two easements)

Existing or proposed?	Width (m)	Length (m)	Purpose of the easement? (e.g. pedestrian access)	Identify the land/lot(s) benefitted by the easement

Division 3 – Operational work

Note: This division is only required to be completed if any part of the development application involves operational work.

14.1) What is the nature of the operational work?

<input checked="" type="checkbox"/> Road work	<input checked="" type="checkbox"/> Stormwater	<input checked="" type="checkbox"/> Water infrastructure
<input checked="" type="checkbox"/> Drainage work	<input checked="" type="checkbox"/> Earthworks	<input checked="" type="checkbox"/> Sewage infrastructure
<input type="checkbox"/> Landscaping	<input type="checkbox"/> Signage	<input checked="" type="checkbox"/> Clearing vegetation
<input type="checkbox"/> Other – please specify:		

14.2) Is the operational work necessary to facilitate the creation of new lots? (e.g. subdivision)

<input checked="" type="checkbox"/> Yes – specify number of new lots:	2
<input type="checkbox"/> No	

14.3) What is the monetary value of the proposed operational work? (include GST, materials and labour)

\$

PART 4 – ASSESSMENT MANAGER DETAILS

15) Identify the assessment manager(s) who will be assessing this development application

Mareeba Shire Council

16) Has the local government agreed to apply a superseded planning scheme for this development application?

<input checked="" type="checkbox"/> Yes – a copy of the decision notice is attached to this development application
<input type="checkbox"/> The local government is taken to have agreed to the superseded planning scheme request – relevant documents attached
<input type="checkbox"/> No

PART 5 – REFERRAL DETAILS

17) Does this development application include any aspects that have any referral requirements?

Note: A development application will require referral if prescribed by the Planning Regulation 2017.

No, there are no referral requirements relevant to any development aspects identified in this development application – proceed to Part 6

Matters requiring referral to the **Chief Executive of the Planning Act 2016:**

- Clearing native vegetation
- Contaminated land (*unexploded ordnance*)
- Environmentally relevant activities (ERA) (*only if the ERA has not been devolved to a local government*)
- Fisheries – aquaculture
- Fisheries – declared fish habitat area
- Fisheries – marine plants
- Fisheries – waterway barrier works
- Hazardous chemical facilities
- Heritage places – Queensland heritage place (*on or near a Queensland heritage place*)
- Infrastructure-related referrals – designated premises
- Infrastructure-related referrals – state transport infrastructure
- Infrastructure-related referrals – State transport corridor and future State transport corridor
- Infrastructure-related referrals – State-controlled transport tunnels and future state-controlled transport tunnels
- Infrastructure-related referrals – near a state-controlled road intersection
- Koala habitat in SEQ region – interfering with koala habitat in koala habitat areas outside koala priority areas
- Koala habitat in SEQ region – key resource areas
- Ports – Brisbane core port land – near a State transport corridor or future State transport corridor
- Ports – Brisbane core port land – environmentally relevant activity (ERA)
- Ports – Brisbane core port land – tidal works or work in a coastal management district
- Ports – Brisbane core port land – hazardous chemical facility
- Ports – Brisbane core port land – taking or interfering with water
- Ports – Brisbane core port land – referable dams
- Ports – Brisbane core port land – fisheries
- Ports – Land within Port of Brisbane’s port limits (*below high-water mark*)
- SEQ development area
- SEQ regional landscape and rural production area or SEQ rural living area – tourist activity or sport and recreation activity
- SEQ regional landscape and rural production area or SEQ rural living area – community activity
- SEQ regional landscape and rural production area or SEQ rural living area – indoor recreation
- SEQ regional landscape and rural production area or SEQ rural living area – urban activity
- SEQ regional landscape and rural production area or SEQ rural living area – combined use
- Tidal works or works in a coastal management district
- Reconfiguring a lot in a coastal management district or for a canal
- Erosion prone area in a coastal management district
- Urban design
- Water-related development – taking or interfering with water
- Water-related development – removing quarry material (*from a watercourse or lake*)
- Water-related development – referable dams
- Water-related development – levees (*category 3 levees only*)
- Wetland protection area

Matters requiring referral to the **local government:**

- Airport land
- Environmentally relevant activities (ERA) (*only if the ERA has been devolved to local government*)

<input type="checkbox"/> Heritage places – Local heritage places
Matters requiring referral to the Chief Executive of the distribution entity or transmission entity: <input type="checkbox"/> Infrastructure-related referrals – Electricity infrastructure
Matters requiring referral to: <ul style="list-style-type: none"> • The Chief Executive of the holder of the licence, if not an individual • The holder of the licence, if the holder of the licence is an individual <input type="checkbox"/> Infrastructure-related referrals – Oil and gas infrastructure
Matters requiring referral to the Brisbane City Council: <input type="checkbox"/> Ports – Brisbane core port land
Matters requiring referral to the Minister responsible for administering the Transport Infrastructure Act 1994: <input type="checkbox"/> Ports – Brisbane core port land (<i>where inconsistent with the Brisbane port LUP for transport reasons</i>) <input type="checkbox"/> Ports – Strategic port land
Matters requiring referral to the relevant port operator , if applicant is not port operator: <input type="checkbox"/> Ports – Land within Port of Brisbane’s port limits (<i>below high-water mark</i>)
Matters requiring referral to the Chief Executive of the relevant port authority: <input type="checkbox"/> Ports – Land within limits of another port (<i>below high-water mark</i>)
Matters requiring referral to the Gold Coast Waterways Authority: <input type="checkbox"/> Tidal works or work in a coastal management district (<i>in Gold Coast waters</i>)
Matters requiring referral to the Queensland Fire and Emergency Service: <input type="checkbox"/> Tidal works or work in a coastal management district (<i>involving a marina (more than six vessel berths)</i>)

18) Has any referral agency provided a referral response for this development application?		
<input type="checkbox"/> Yes – referral response(s) received and listed below are attached to this development application		
<input checked="" type="checkbox"/> No		
Referral requirement	Referral agency	Date of referral response
Identify and describe any changes made to the proposed development application that was the subject of the referral response and this development application, or include details in a schedule to this development application (<i>if applicable</i>).		

PART 6 – INFORMATION REQUEST

19) Information request under Part 3 of the DA Rules
<input checked="" type="checkbox"/> I agree to receive an information request if determined necessary for this development application
<input type="checkbox"/> I do not agree to accept an information request for this development application
Note: <i>By not agreeing to accept an information request I, the applicant, acknowledge:</i>
<ul style="list-style-type: none"> • <i>that this development application will be assessed and decided based on the information provided when making this development application and the assessment manager and any referral agencies relevant to the development application are not obligated under the DA Rules to accept any additional information provided by the applicant for the development application unless agreed to by the relevant parties</i> • <i>Part 3 of the DA Rules will still apply if the application is an application listed under section 11.3 of the DA Rules.</i>
<i>Further advice about information requests is contained in the DA Forms Guide.</i>

PART 7 – FURTHER DETAILS

20) Are there any associated development applications or current approvals? (e.g. a preliminary approval)			
<input checked="" type="checkbox"/> Yes – provide details below or include details in a schedule to this development application <input type="checkbox"/> No			
List of approval/development application references	Reference number	Date	Assessment manager
<input checked="" type="checkbox"/> Approval <input type="checkbox"/> Development application	MCU/22/0009	25 January 2023	Mareeba Shire Council
<input type="checkbox"/> Approval <input type="checkbox"/> Development application			

21) Has the portable long service leave levy been paid? (only applicable to development applications involving building work or operational work)		
<input type="checkbox"/> Yes – a copy of the receipted QLeave form is attached to this development application <input checked="" type="checkbox"/> No – I, the applicant will provide evidence that the portable long service leave levy has been paid before the assessment manager decides the development application. I acknowledge that the assessment manager may give a development approval only if I provide evidence that the portable long service leave levy has been paid <input type="checkbox"/> Not applicable (e.g. building and construction work is less than \$150,000 excluding GST)		
Amount paid	Date paid (dd/mm/yy)	QLeave levy number (A, B or E)
\$		

22) Is this development application in response to a show cause notice or required as a result of an enforcement notice?
<input type="checkbox"/> Yes – show cause or enforcement notice is attached <input checked="" type="checkbox"/> No

23) Further legislative requirements			
Environmentally relevant activities			
23.1) Is this development application also taken to be an application for an environmental authority for an Environmentally Relevant Activity (ERA) under section 115 of the <i>Environmental Protection Act 1994</i> ?			
<input type="checkbox"/> Yes – the required attachment (form ESR/2015/1791) for an application for an environmental authority accompanies this development application, and details are provided in the table below <input checked="" type="checkbox"/> No <i>Note: Application for an environmental authority can be found by searching "ESR/2015/1791" as a search term at www.qld.gov.au. An ERA requires an environmental authority to operate. See www.business.qld.gov.au for further information.</i>			
Proposed ERA number:		Proposed ERA threshold:	
Proposed ERA name:			
<input type="checkbox"/> Multiple ERAs are applicable to this development application and the details have been attached in a schedule to this development application.			
Hazardous chemical facilities			
23.2) Is this development application for a hazardous chemical facility ?			
<input type="checkbox"/> Yes – Form 69: Notification of a facility exceeding 10% of schedule 15 threshold is attached to this development application <input checked="" type="checkbox"/> No <i>Note: See www.business.qld.gov.au for further information about hazardous chemical notifications.</i>			

Clearing native vegetation

23.3) Does this development application involve **clearing native vegetation** that requires written confirmation that the chief executive of the *Vegetation Management Act 1999* is satisfied the clearing is for a relevant purpose under section 22A of the *Vegetation Management Act 1999*?

- Yes – this development application includes written confirmation from the chief executive of the *Vegetation Management Act 1999* (s22A determination)
- No

Note: 1. Where a development application for operational work or material change of use requires a s22A determination and this is not included, the development application is prohibited development.
2. See <https://www.qld.gov.au/environment/land/vegetation/applying> for further information on how to obtain a s22A determination.

Environmental offsets

23.4) Is this development application taken to be a prescribed activity that may have a significant residual impact on a **prescribed environmental matter** under the *Environmental Offsets Act 2014*?

- Yes – I acknowledge that an environmental offset must be provided for any prescribed activity assessed as having a significant residual impact on a prescribed environmental matter
- No

Note: The environmental offset section of the Queensland Government's website can be accessed at www.qld.gov.au for further information on environmental offsets.

Koala habitat in SEQ Region

23.5) Does this development application involve a material change of use, reconfiguring a lot or operational work which is assessable development under Schedule 10, Part 10 of the Planning Regulation 2017?

- Yes – the development application involves premises in the koala habitat area in the koala priority area
- Yes – the development application involves premises in the koala habitat area outside the koala priority area
- No

Note: If a koala habitat area determination has been obtained for this premises and is current over the land, it should be provided as part of this development application. See koala habitat area guidance materials at www.des.qld.gov.au for further information.

Water resources

23.6) Does this development application involve **taking or interfering with underground water through an artesian or subartesian bore, taking or interfering with water in a watercourse, lake or spring, or taking overland flow water under the Water Act 2000**?

- Yes – the relevant template is completed and attached to this development application and I acknowledge that a relevant authorisation or licence under the *Water Act 2000* may be required prior to commencing development
- No

Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.qld.gov.au for further information.

DA templates are available from <https://planning.dsdmip.qld.gov.au/>. If the development application involves:

- Taking or interfering with underground water through an artesian or subartesian bore: complete DA Form 1 Template 1
- Taking or interfering with water in a watercourse, lake or spring: complete DA Form 1 Template 2
- Taking overland flow water: complete DA Form 1 Template 3.

Waterway barrier works

23.7) Does this application involve **waterway barrier works**?

- Yes – the relevant template is completed and attached to this development application
- No

DA templates are available from <https://planning.dsdmip.qld.gov.au/>. For a development application involving waterway barrier works, complete DA Form 1 Template 4.

Marine activities

23.8) Does this development application involve **aquaculture, works within a declared fish habitat area or removal, disturbance or destruction of marine plants**?

- Yes – an associated resource allocation authority is attached to this development application, if required under the *Fisheries Act 1994*
- No

Note: See guidance materials at www.daf.qld.gov.au for further information.

Quarry materials from a watercourse or lake

23.9) Does this development application involve the **removal of quarry materials from a watercourse or lake** under the *Water Act 2000*?

- Yes – I acknowledge that a quarry material allocation notice must be obtained prior to commencing development
 No

Note: Contact the Department of Natural Resources, Mines and Energy at www.dnrme.qld.gov.au and www.business.qld.gov.au for further information.

Quarry materials from land under tidal waters

23.10) Does this development application involve the **removal of quarry materials from land under tidal water** under the *Coastal Protection and Management Act 1995*?

- Yes – I acknowledge that a quarry material allocation notice must be obtained prior to commencing development
 No

Note: Contact the Department of Environment and Science at www.des.qld.gov.au for further information.

Referable dams

23.11) Does this development application involve a **referable dam** required to be failure impact assessed under section 343 of the *Water Supply (Safety and Reliability) Act 2008* (the *Water Supply Act*)?

- Yes – the 'Notice Accepting a Failure Impact Assessment' from the chief executive administering the *Water Supply Act* is attached to this development application
 No

Note: See guidance materials at www.dnrme.qld.gov.au for further information.

Tidal work or development within a coastal management district

23.12) Does this development application involve **tidal work or development in a coastal management district**?

- Yes – the following is included with this development application:
- Evidence the proposal meets the code for assessable development that is prescribed tidal work (*only required if application involves prescribed tidal work*)
 - A certificate of title
- No

Note: See guidance materials at www.des.qld.gov.au for further information.

Queensland and local heritage places

23.13) Does this development application propose development on or adjoining a place entered in the **Queensland heritage register** or on a place entered in a local government's **Local Heritage Register**?

- Yes – details of the heritage place are provided in the table below
 No

Note: See guidance materials at www.des.qld.gov.au for information requirements regarding development of Queensland heritage places.

Name of the heritage place:		Place ID:	
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Brothels

23.14) Does this development application involve a **material change of use for a brothel**?

- Yes – this development application demonstrates how the proposal meets the code for a development application for a brothel under Schedule 3 of the *Prostitution Regulation 2014*
 No

Decision under section 62 of the Transport Infrastructure Act 1994

23.15) Does this development application involve new or changed access to a state-controlled road?

- Yes – this application will be taken to be an application for a decision under section 62 of the *Transport Infrastructure Act 1994* (subject to the conditions in section 75 of the *Transport Infrastructure Act 1994* being satisfied)
 No

Walkable neighbourhoods assessment benchmarks under Schedule 12A of the Planning Regulation

23.16) Does this development application involve reconfiguring a lot into 2 or more lots in certain residential zones (except rural residential zones), where at least one road is created or extended?

- Yes – Schedule 12A is applicable to the development application and the assessment benchmarks contained in schedule 12A have been considered
- No

Note: See guidance materials at www.planning.dsdmip.qld.gov.au for further information.

PART 8 – CHECKLIST AND APPLICANT DECLARATION

24) Development application checklist

I have identified the assessment manager in question 15 and all relevant referral requirement(s) in question 17

Yes

Note: See the *Planning Regulation 2017* for referral requirements

If building work is associated with the proposed development, Parts 4 to 6 of [DA Form 2 – Building work details](#) have been completed and attached to this development application

Yes

Not applicable

Supporting information addressing any applicable assessment benchmarks is with the development application

Note: This is a mandatory requirement and includes any relevant templates under question 23, a planning report and any technical reports required by the relevant categorising instruments (e.g. local government planning schemes, State Planning Policy, State Development Assessment Provisions). For further information, see [DA Forms Guide: Planning Report Template](#).

Yes

Relevant plans of the development are attached to this development application

Note: Relevant plans are required to be submitted for all aspects of this development application. For further information, see [DA Forms Guide: Relevant plans](#).

Yes

The portable long service leave levy for QLeave has been paid, or will be paid before a development permit is issued (see 21)

Yes

Not applicable

25) Applicant declaration

By making this development application, I declare that all information in this development application is true and correct

Where an email address is provided in Part 1 of this form, I consent to receive future electronic communications from the assessment manager and any referral agency for the development application where written information is required or permitted pursuant to sections 11 and 12 of the *Electronic Transactions Act 2001*

Note: It is unlawful to intentionally provide false or misleading information.

Privacy – Personal information collected in this form will be used by the assessment manager and/or chosen assessment manager, any relevant referral agency and/or building certifier (including any professional advisers which may be engaged by those entities) while processing, assessing and deciding the development application. All information relating to this development application may be available for inspection and purchase, and/or published on the assessment manager's and/or referral agency's website.

Personal information will not be disclosed for a purpose unrelated to the *Planning Act 2016*, *Planning Regulation 2017* and the DA Rules except where:

- such disclosure is in accordance with the provisions about public access to documents contained in the *Planning Act 2016* and the *Planning Regulation 2017*, and the access rules made under the *Planning Act 2016* and *Planning Regulation 2017*; or
- required by other legislation (including the *Right to Information Act 2009*); or
- otherwise required by law.

This information may be stored in relevant databases. The information collected will be retained as required by the *Public Records Act 2002*.

PART 9 – FOR COMPLETION OF THE ASSESSMENT MANAGER – FOR OFFICE USE ONLY

Date received: Reference number(s):

Notification of engagement of alternative assessment manager	
Prescribed assessment manager	
Name of chosen assessment manager	
Date chosen assessment manager engaged	
Contact number of chosen assessment manager	
Relevant licence number(s) of chosen assessment manager	

QLeave notification and payment			
<i>Note: For completion by assessment manager if applicable</i>			
Description of the work			
QLeave project number			
Amount paid (\$)		Date paid (dd/mm/yy)	
Date receipted form sighted by assessment manager			
Name of officer who sighted the form			