16 March 2022

COASTAL WALKWAY UPGRADE BRIDGE DESIGN ADVICE, GREY ROAD GULLY AND KURNABINNA GULLY, HALLETT COVE, SA 5158

FACTUAL GEOTECHNICAL REPORT

ASPECT STUDIOS

ADL2022-0050AB Rev0

ADL2022-0050AB		
Date	Revision	Comments
16 March 2022	0	Factual Only

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1 EXECUTIVE SUMMARY

This report presents the results of a geotechnical site investigations carried out near to the location of proposed bridge abutment structures Grey Gully and Kurnabinna Gully Hallett Cove, Adelaide, SA, with regards to the City of Marion's renewal plan for the Coastal Walking Trial Cell 5 and 6.

Based on the assessment results within the area of Cell 5 and 6, the subsurface materials are a thin veneer of residual soils composed of loose to medium dense gravels underlain by gently sloping laminated low strength sedimentary rock units (Siltstone/Sandstone) occur at both sites. However, at 3 of the 4 bridge abutments the depth of the residual soils was substantial and will impact on the bridge anchor block depth of embedment.

A separate pull anchor test report has been provided in the CMW report ADL2022-0050AC Rev0 dated 9/3/2022.

2 INTRODUCTION

CMW Geosciences (CMW) was authorised by Aspect Studio to assess the geotechnical conditions for the proposed upgrade of the Coastal Walking Trail (CWT) near to the location of bridge abutment structures at Cell 5 and 6. The scope of work and associated terms and conditions of our engagement are as detailed in our services proposal letter ADL2020-0142AA Rev1 dated 13 February 2022.

Included herein is our results and observation report.

3 INFORMATION PROVIDED

The following documents have been provided to inform CMW of the design with respect to the existing landform.

- J0439-CIV-DRG-1065[B]
- J0439-CIV-DRG-1066[B]
- J0439-CIV-DRG-1067-2[]
- J0439-CIV-DRG-1068-2[]

4 PROJECT BACKGROUND

The Marion Coastal Walkway covers an 8km section from Marino to Hallett Cove and was constructed in the mid-late 1990's. The City of Marion's Coastal Walkway Plan provides a renewal plan that prioritises sections for upgrade and repair. A high priority has been placed on Cell 5 (Grey Rd Gully), Cell 6 (Kurnabinna Gully) and Cell 10 (Field River).

This walkway has strategic importance as a key link in the 70km Coast Park Trail from North Haven to Sellicks Beach. The upgrade works will enable it to become an important and iconic connecting piece to other major open space networks, including Marino Conservation Park, Hallett Cove Conservation Park and Glenthorne National Park.

CMW has previously undertaken geotechnical assessments for these two locations to assess the stability of the areas of the existing boardwalks for the construction of an elevated boardwalks. During detailed design it has been identified that suspension bridges are the preferred construction method to traverse these two locations and geotechnical information is required to inform foundation designs.

This report provides a description of subsurface conditions assessed by a percussion drill rig investigation near to the location of proposed bridge abutment structures Grey Gully and Kurnabinna Gully. Figure 1 provides an illustration of the bridge design layout.

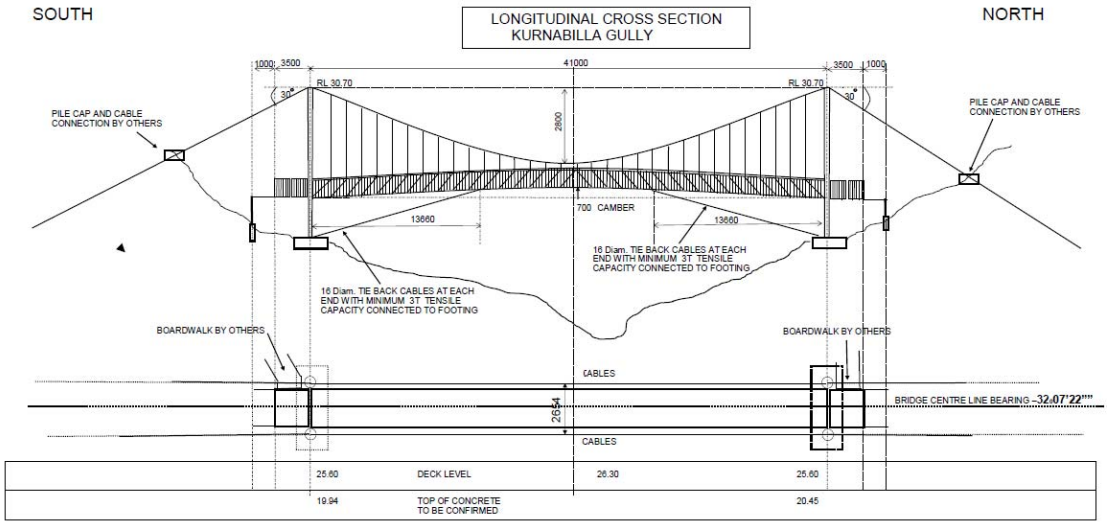


Figure 1: Layout of the Kurnabinna Gully Bridge

5 SCOPE OF WORKS

Based on our site visit and revision to the drilling method and bridge locations, CMW are proposing the following scope of works:

Site Visit
Undertake a site walk over with the bridge designer to assess abutment locations based on site features. Discuss creation of access tracks for both the drilling rig, and construction plant.

Field Investigation
Once abutment locations are agreed upon and site access permits and access tracks have been provided and constructed by others, CMW are able to undertake.
Drilling of 1x borehole at each abutment location to a depth of 15 metres, using 105mm percussion techniques with a drilling rig provided by Aspect Studio. Total of 4 x 15m boreholes.
At each location drill and install additional boreholes (up to 3 at each site) and install anchors for anchor pull out testing.
Provide a factual geotechnical report, which outlines the ground conditions encountered and present the results of field testing.

6 METHODOLOGY

Given the bridge abutment sites are difficult to access due to topography and potentially poor subsurface conditions such Aspect Studio engaged a specialist in drilling upon rock slopes to undertake the drilling. The rig used a percussion method to drill into the subsurface.

This method of investigation produced a crushed product during the drilling process in which the subsurface conditions of the site as per AS1726 were estimated. To support these drill investigation samples, additional mapping included an assessment of strength and defect spacing characteristic of the rock mass at nearby rock outcropping locations.

All investigation sites required rope access to collect this information.

7 GEOTECHNICAL ASSESSMENT

7.1 General Description

As a typical description of both sites is each gully is steep and bear very little vegetation. Refer to the attached photos with annotations of borehole locations and the position of structures within the slope.

At both site it is apparent that soil does not cover the steepest sections of the slopes and that the creek at the base of each gully has eroded away the soil and medium strength siltstone outcrops.

7.2 Regional Geology

7.2.1 Grey Gully

Published geological maps on the South Australian Resources Information Gateway (SARIG) indicate that the area is underlain by Pleistocene Aged Hindmarsh Clay, Carisbrooke Sand and sediments of the Ochre Cove Formation (TpQa5). To the south of the project area, it is expected to be underlain by Reneylla Siltstone Member (Neer) formation comprising dark red siltstone, sandy to gritty in part, with dolomitic lenses and rare small pebbles. To east and northeast of the site, it is expected to be underlain by Wilmington Formation comprising fine to medium grained grey-green sandstones interlayered with coarse-grained lithic sandstone, grey-green to red-brown siltstone and dolomite, basal conglomeratic beds. Refer to Figure 2 for an image extracted from the published map.

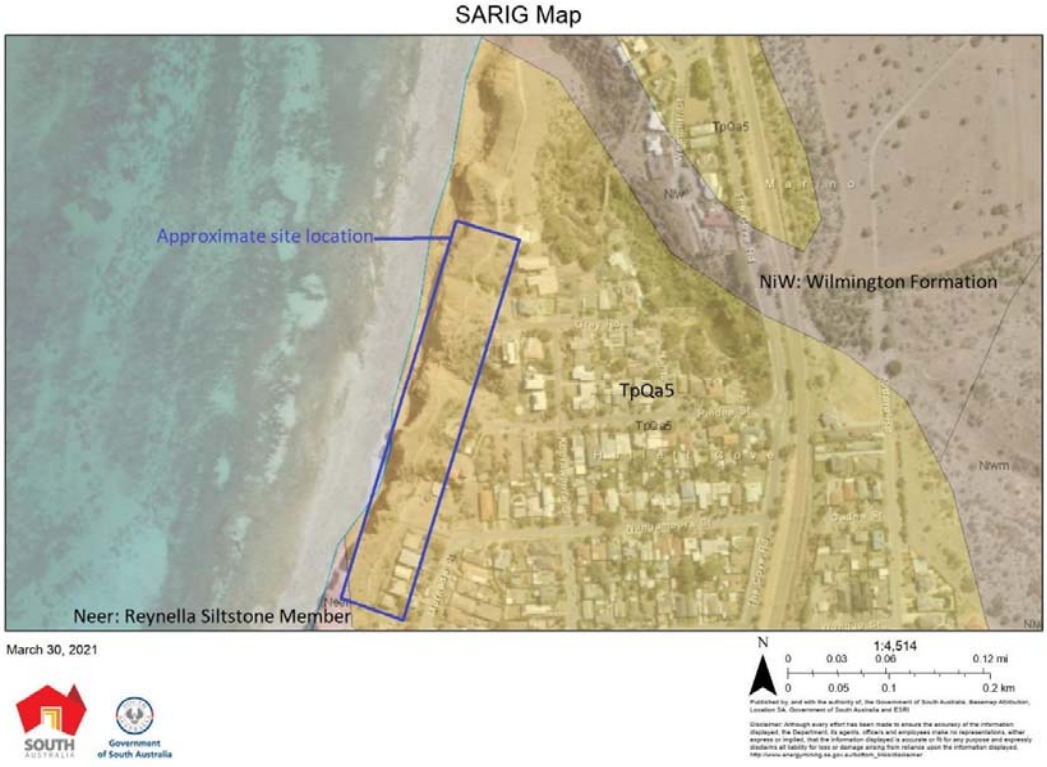


Figure 2: Regional Geological Map overlain on Aerial Imagery.

7.2.2 Kurnabinna Gully

Published geological maps on the South Australian Resources Information Gateway (SARIG) indicate that the area is underlain by the Reynella Siltstone Member (Neer) formation comprising dark red siltstone, sandy to gritty in part, with dolomitic lenses and rare small pebbles. Refer to Figure 3 for an image extracted from the published map.



Figure 3: Regional Geological Map overlain on Aerial Imagery

7.3 Geotechnical Mapping

The field assessment was carried out in February and March 2022 by a CMW Geosciences Engineer in general accordance with AS1726 (2017), Geotechnical Site Investigations. The scope of fieldwork completed included mapping rock outcrops at each site.

The Engineering data collected at each site is tabulated with respect to a rock unit. Refer to the Field Logging Guide provided for the definition of abbreviations and further details of the geotechnical parameters assigned. A 'Defect' has been assigned as the term describing a visual weakness / fracture in the rock mass.

RQD refers to Rock Quality Designation and has in this project been assessed relative to a 3D block of rock of length greater than 100mm length either in X, Y and Z dimension. RQD has not been classified in accordance to a 2D transect in the rock cutting (as is the case in a rock core). This is because the thinly laminated siltstone is strongly anisotropic.

Separately a general classification of the Geological strength Index (GSI) has been undertaken for the representative rock units within the project site. Refer to Appendix A for this assessment and the classification terms associated with this assessment.

In addition, photographs at each site of the surface conditions, are presented in Appendix A. The approximate locations of the respective assessment sites referred to above are also shown.

7.4 Subsurface Conditions

The soil and rock units are considered to generally be consistent with the published geology for the area and can be generalised according to the following subsurface sequence:

Grey Gully and Kurnabinna Gully

CALCRETE	An inconsistent thickness and lateral extent but hard and dense
Unit 1: CLAY	Gravelly clay of hard consistency and medium plasticity.
Unit 2: GRAVEL (GP)	Medium to coarse grained, sub-angular to angular with fine to coarse grained sand, red brown, with grey; Residual Soil to extremely weathered siltstone.
Unit 3: SILTSTONE	Fine grained, laminated, red brown, highly weathered siltstone.
Unit 4: SILTSTONE	Fine grained, laminated, red brown, moderately weathered siltstone.
Unit 5: SILTSTONE	Fine grained, laminated, red brown, slightly weathered siltstone.

Note thinly layers of sandstone were encountered but difficult to locate. Typically, the sandstone layers were of lower strength and higher weathering than the adjacent siltstone rock.

Following a walk over the project area, select area have been geotechnically assessed for geological units and geotechnical soil and rock mass conditions.

Most soil units were of limited depth and predominantly topsoil for at least 200mm (that is contained organic matter) underlain by residual soil. Soil descriptions for this project are simplified into primary units and are considered for design purposes to be topsoil and residual soils (clayey gravel over siltstone or sandy gravel over sandstone) and are assessed as being in a loose density or stiff consistency, dry state. Moisture is expected to be strongly influence by the seasonal or human induced surface water flows. The soil units are assessed to be poorly consolidated and easily eroded (transported).

Typical Geotechnical Parameters for the general rock units observed are provided in Table 1.

As a general statement the siltstone observed at the site is a uniform/consistent rock mass in block shape and strength increase with depth and is considered a Fair to Good rock mass. Transitions from extremely to moderately to slightly weathered bedrock occurs progressively but over a short depth. It is unknown at depth if the rock type is of higher strength and has less defects per meter.

In addition, three defect sets have been observed. A bedding parallel defect set, and 2 subvertical defect sets. Given the folding of the sedimentary units at the site, the 2 vertical defect sets are joints, but the bedding parallel defect set maybe either related to the fabric in the rock mass or an axial cleavage related to the folding. Refer to Appendix A for information of these defect sets.

It is noted that the conditions assessed have been exposed to the elements for a long period of time.

Table 1: Typical Geotechnical Parameters									
Strata	**Strength**	**Weathering**	**Joint Sets**	**Aperture (mm)**	**Persistence (m)**	**Planarity**	**Roughness**	**RQD %**	**GSI**
Siltstone	L	XW - HW	3	0 - 2	<100	ST	SM	10	35
	M	MW	3	0 - 2	<200	ST	RO/UN	40	45
	M/H	MW - SW	3	1	>300	ST	RO	80	55
Refer to Classification codes in Appendix A for descriptions									

7.5 Groundwater

Groundwater was not encountered during the investigation and is not anticipated to impact the footing of the bridge structures.

Based on available information published in regional geology (SARIG 2020), groundwater is not expected to influence this design site. However, it should be noted that perched groundwater, or near surface (subterranean) water may be encountered locally where more permeable materials are encountered overlying cohesive soils or bedrock.

8 LIMITATIONS

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general surface condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of subsurface ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use Aspect Studio in relation to Coastal Trail Bridge Upgrade Project located in Hallett Cove SA, in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than City of Marion and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

9 CLOSURE

Should there be any questions in relation to this request for report, please contact the undersigned.

For and on behalf of CMW Geosciences

Prepared by:	Reviewed and authorised by:
Yan Wang	John Slade
Project Geotechnical Engineer	**Principal Geotechnical Engineer, CPEng**

Distribution: 1 electronic copy to Aspect Studio via email
Original held at CMW Geosciences

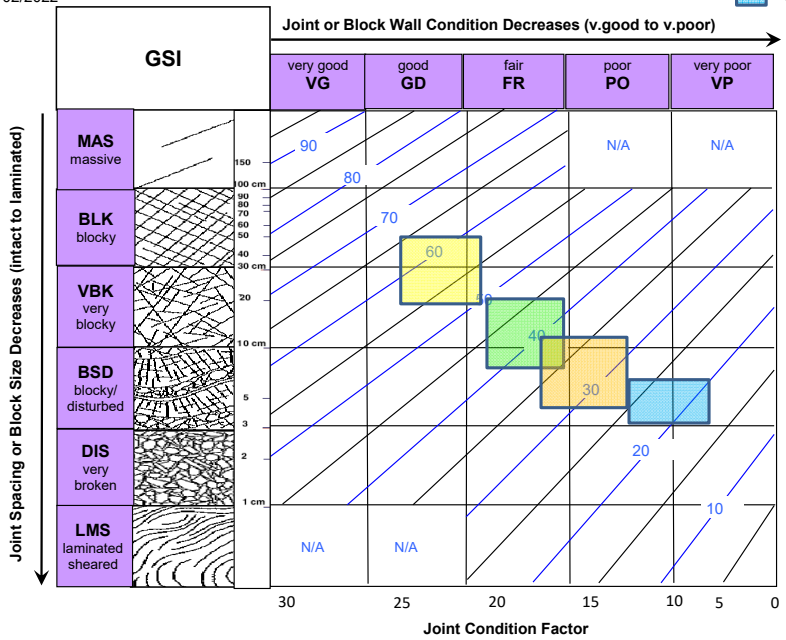
Attachments: Drawings and Site Investigation Results

Appendix A
Drawings and Site Investigation Results

Client	Aspect Studio
Project	Coastal Walk Way - Bridge Foundation Investigation
Project #	ADL2022-0050 Rev0
Topic	Existing Slope - Rock Mass Mapping
Author	John Slade
Date	21/02/2022

CMW Overall General Assessment

Type	Weathering	Strength	Unit
Slate	SW	H/M	5
Slate / Sandstone	SW, MW	M	4
Slate	XW / HW	L	3
Slate	RS/XW	VL	2



Structure Descriptions

MAS : intact rock with no or only a few widely spaced joints.
joint spacing >100cm

BLK : well interlocked, relatively undisturbed rock consists of cubical blocks formed by 3 intersecting joint sets.
joint spacing 30 - 100cm

VBK : interlocked, partially disturbed rock with multi-faceted angular blocks formed by 4 or more joint sets
joint spacing 10 - 30cm

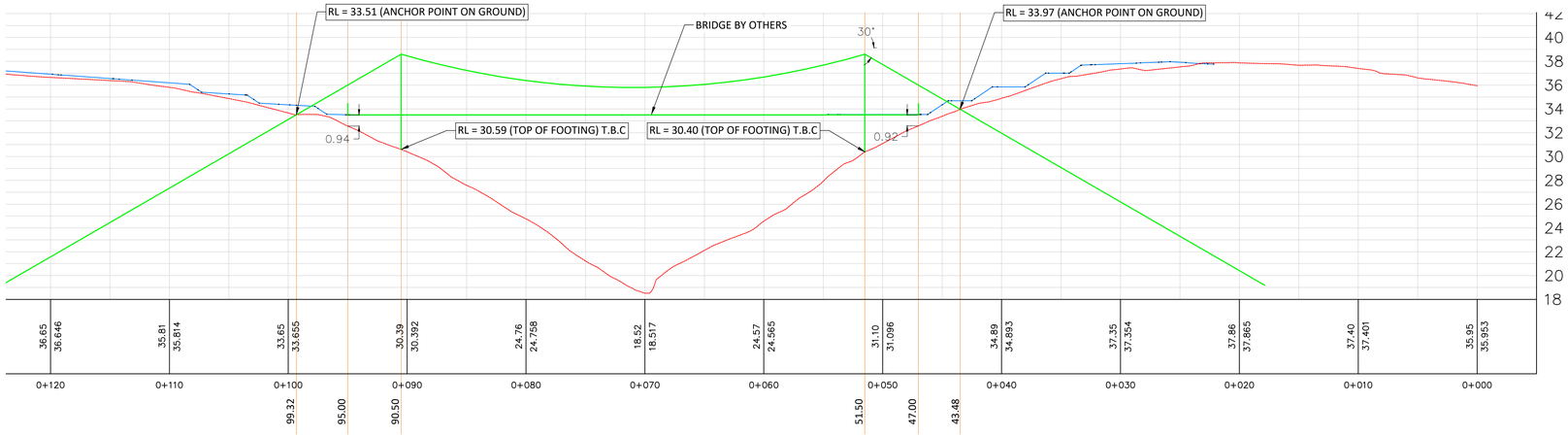
BSD : folded rock with angular blocks formed by many intersecting joint sets. Persistence of foliation.
joint spacing 3 - 10cm

DIS : disintegrated, poorly interlocked, heavily broken rock with a mix of angular and rounded fragments.
joint spacing <3cm

LMS : no blockiness, close spaced schistosity or shear planes.
joint spacing <1cm

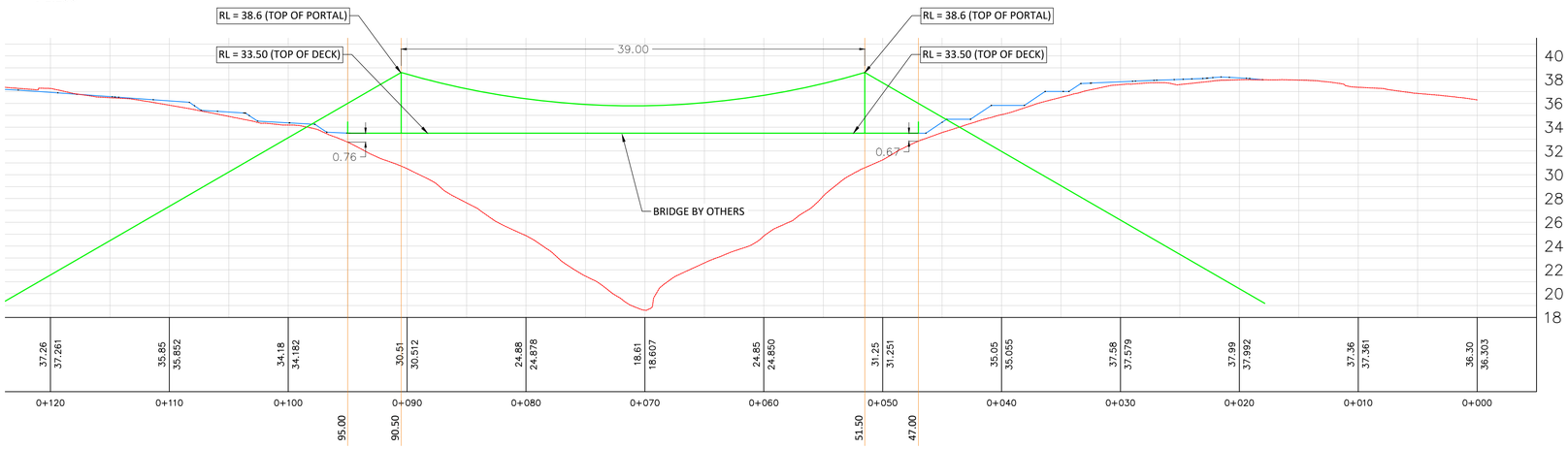
Surface Condition Descriptions

VG : very rough, fresh unweathered
GD : rough, slightly weathered, Fe stained
FR : smooth, moderately weathered and altered
PO : slickensided, highly weathered, with compact coatings, fillings or angular fragments
VP : slickensided, highly weathered, soft clay coatings or fillings



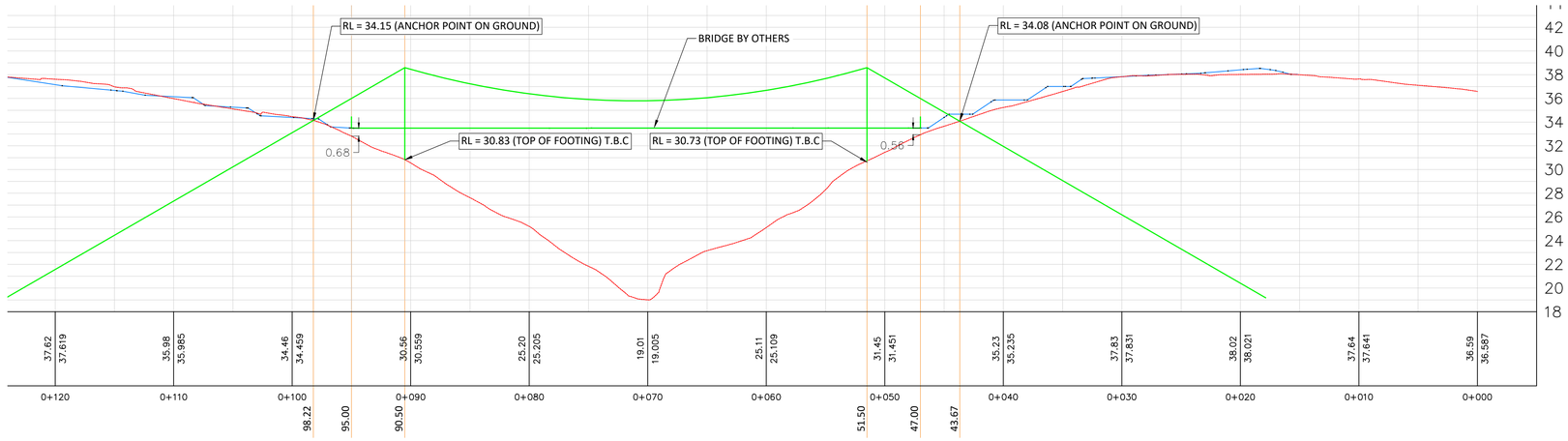
LONGITUDINAL SECTION - BRIDGE 1 WEST EDGE

SCALE: H 1:250
V 1:250



LONGITUDINAL SECTION - BRIDGE 1 CENTRE LINE

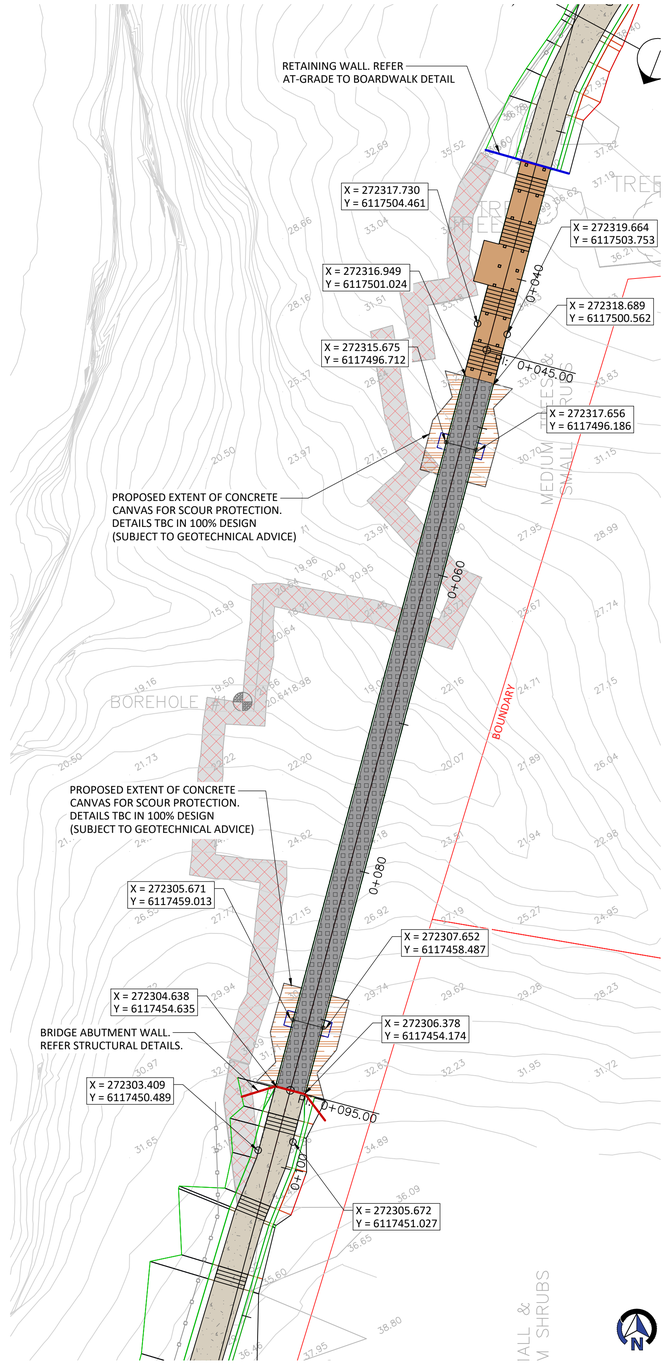
SCALE: H 1:250
V 1:250



LONGITUDINAL SECTION - BRIDGE 1 EAST EDGE

SCALE: H 1:250
V 1:250

NOTE:
1. FOR GENERAL NOTES REFER TO DRAWING J0439-CIV-DRG-1001
2. ALL DIMENSIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION.
3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL, SERVICES AND OTHER CONSULTANTS DRAWINGS.
4. REFER STRUCTURAL DRAWINGS FOR DETAILS OF BOARD WALK AND SUSPENSION BRIDGE.



BRIDGE 1 GREY ROAD PART PLAN

SCALE: 1:200

NOTE: BRIDGE FOOTINGS TBC IN 100% DESIGN ISSUE SUBJECT TO GEOTECHNICAL INVESTIGATOINS

SCALE 1 : 250
0 5 10 15 20 25 m

REVIEW

CLIENT:	REV:	DATE:	DESCRIPTION:	IVR:	APR'D:	TITLE:	NAME:
ASPECT Studios™						DRAFTER	ESA
						DRAFTING CHECK	TM
						DESIGNER	JSH
	B	18/02/2022	ISSUED FOR 90% DD		JCA	DESIGN CHECK	JCA
	A	08/02/2022	ISSUED FOR REVIEW		JCA	PROJECT MANAGER	JSH

MARION COSTAL WALKWAY UPGRADE
CELL 5: GREY ROAD GULLY
HALLETT COVE, SA 5158
BRIDGE 01 - ELEVATIONS

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SCALE:	DATE:	PHASE:	SHT SIZE:
1:250	18/02/2022	REVIEW	A1

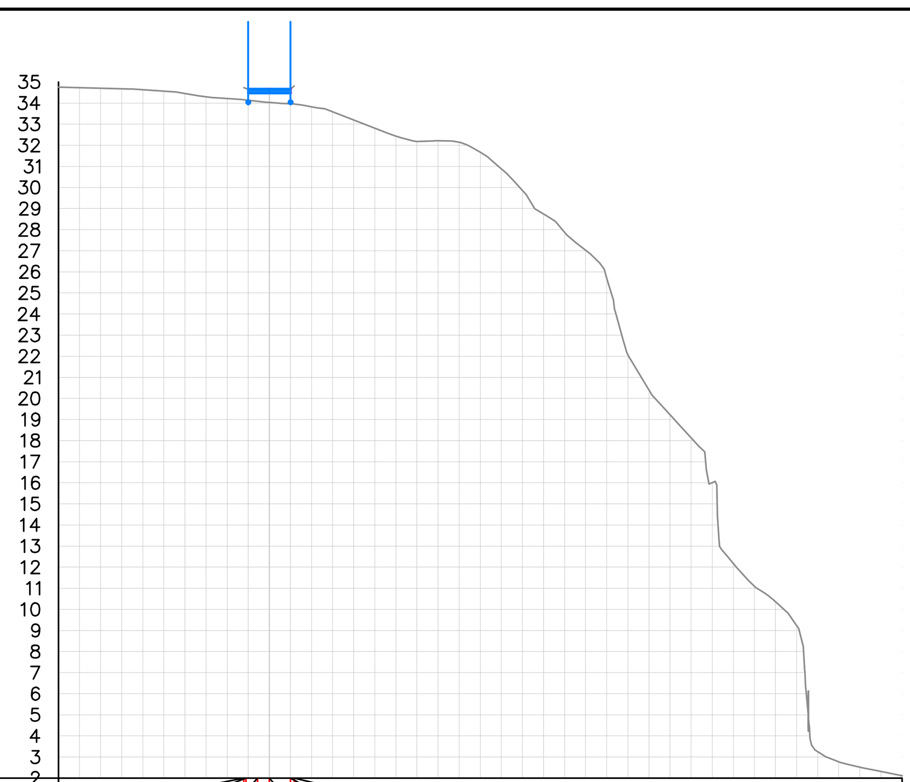
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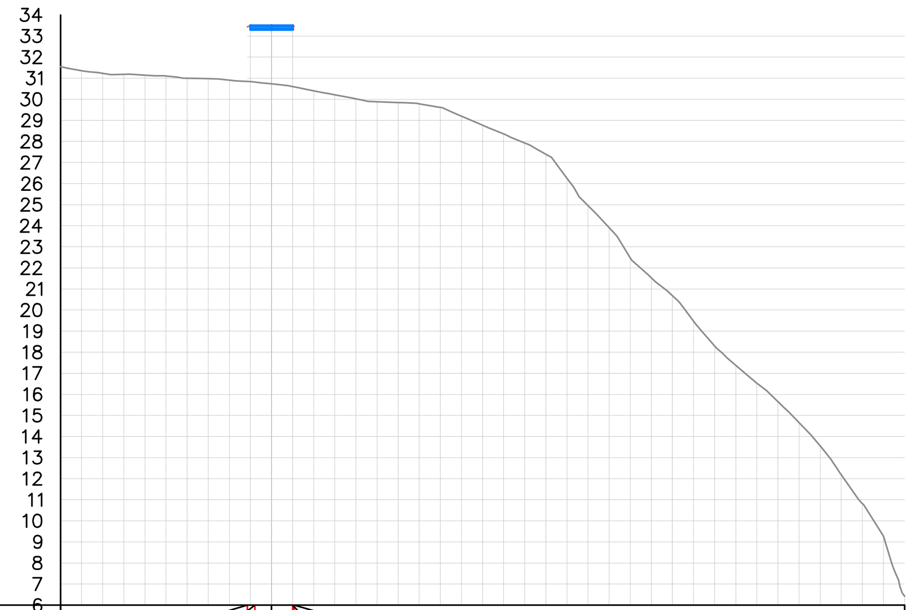
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10mm AT A1



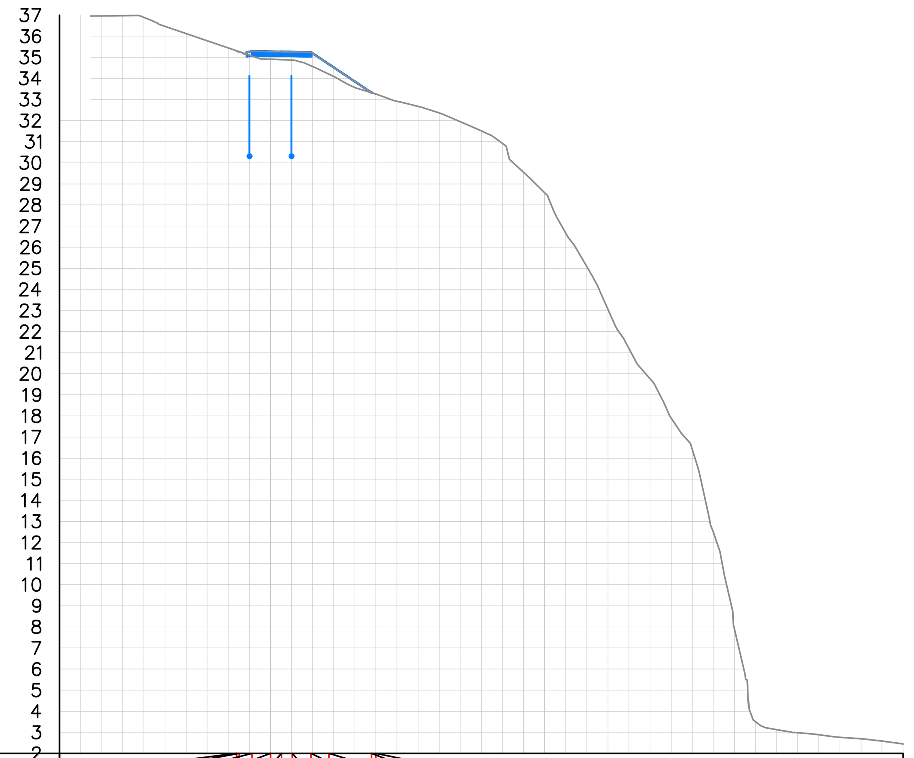
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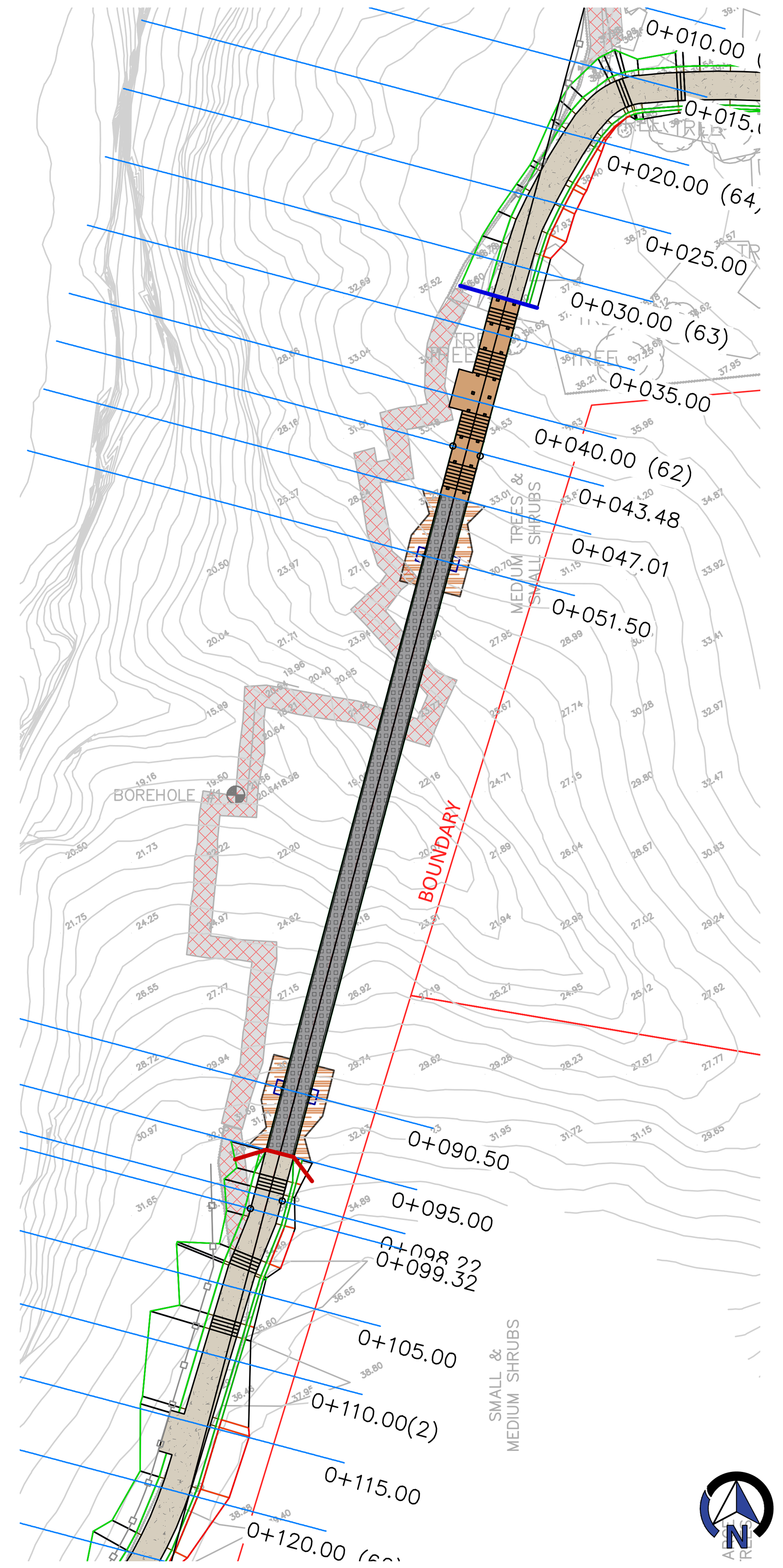
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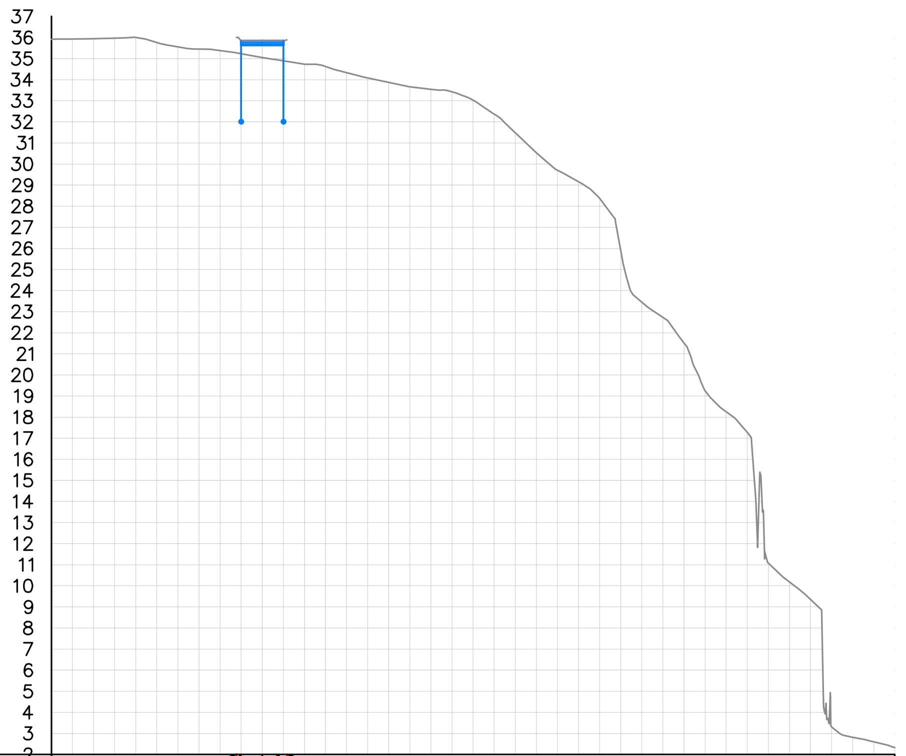
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LEVEL DIFFERENCE	−0.03 −0.01 0.23 0.36 0.37 0.39 0.63 0.46 0.00 −0.01
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BRIDGE 1 GREY ROAD KEY PLAN

SCALE: 1:200



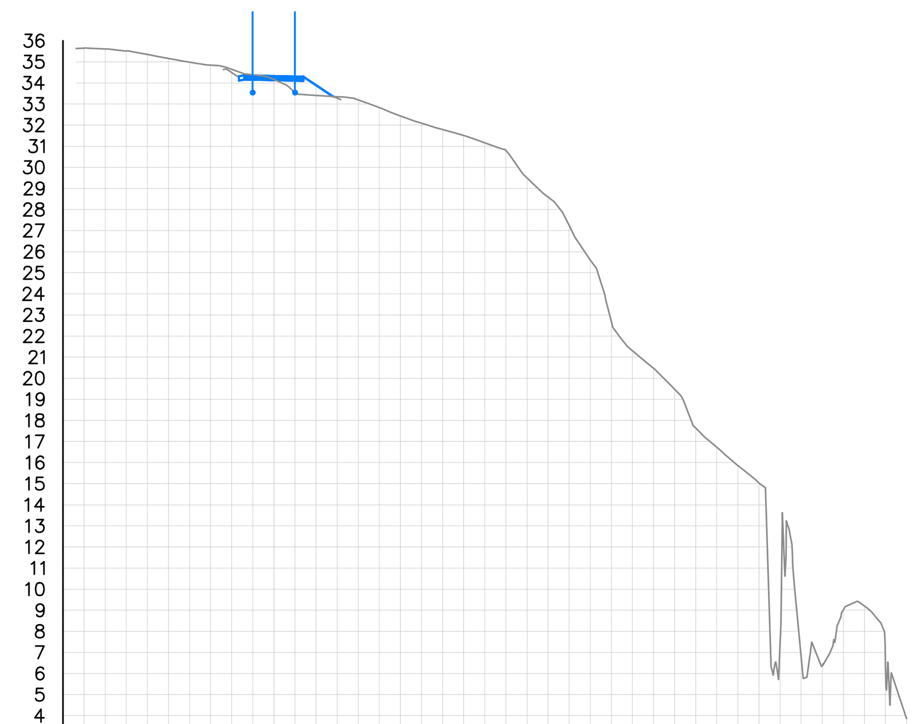
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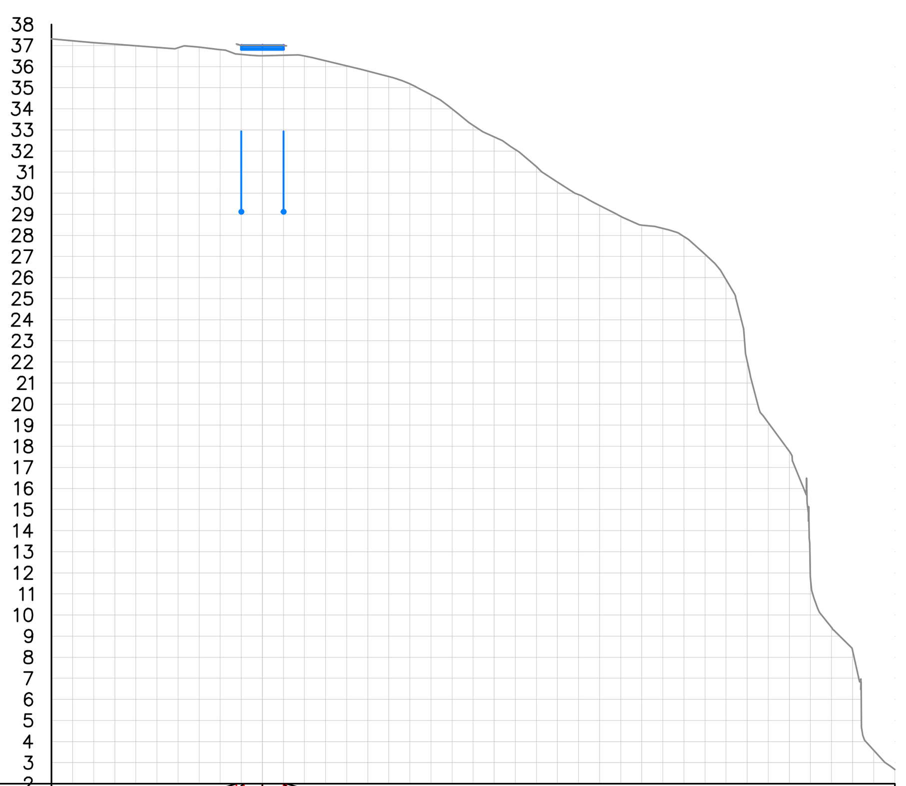
0+051.50

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EXISTING ELEVATIONS	30.55 30.66 30.79 30.88 30.97 31.00 31.00 30.94 30.83 30.73 30.60 30.40 30.05 29.67 29.29 28.98 28.46 27.82 27.42 27.48 27.32 26.54 25.36 24.21 22.70 21.91 20.61 18.33 17.42 16.64 15.68 14.69 13.62 12.68 9.39 3.94 2.82 2.50 2.29 2.09 1.90
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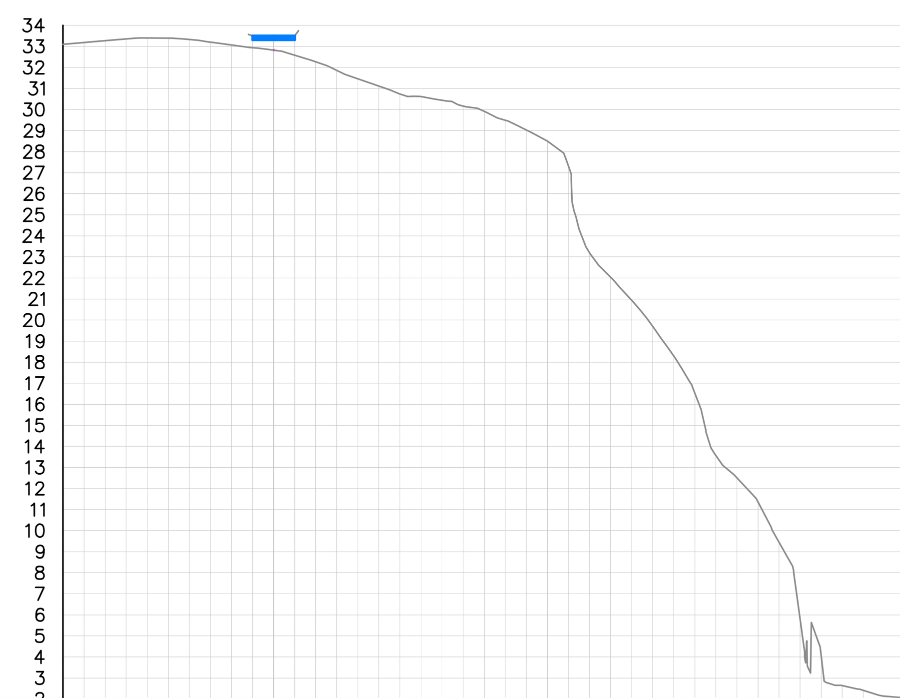
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EXISTING ELEVATIONS	35.65 35.61 35.52 35.35 35.16 34.99 34.84 34.64 34.38 34.16 33.54 33.41 33.35 33.20 32.83 32.43 32.09 31.79 31.51 31.16 30.80 29.50 28.59 27.23 25.59 22.69 21.30 20.47 19.48 17.63 16.73 15.87 15.04 7.44 6.75 6.37 9.04 9.19 6.30 3.86
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0+035.00

PROPOSED ELEVATIONS	37.08 37.00 37.00 37.00 36.98
EXISTING ELEVATIONS	37.31 37.22 37.13 37.07 36.99 36.91 36.89 36.92 36.81 36.58 36.52 36.54 36.51 36.28 36.04 35.79 35.53 35.18 34.67 34.00 33.21 32.67 32.06 31.26 30.52 29.93 29.41 28.90 28.49 28.33 27.94 27.10 25.90 22.05 19.11 17.75 11.74 9.40 8.33 3.59 2.67
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0+047.01

PROPOSED ELEVATIONS	33.57 33.50 33.50 33.50 33.74
EXISTING ELEVATIONS	33.10 33.18 33.27 33.35 33.40 33.39 33.33 33.21 33.06 32.93 32.82 32.58 32.27 31.86 31.46 31.12 30.73 30.62 30.44 30.17 29.92 29.49 29.03 28.50 27.32 23.20 22.03 20.94 19.70 18.30 16.53 13.56 12.51 11.37 9.44 5.80 4.09 2.64 2.42 2.14 2.04
LEVEL DIFFERENCE	0.62 0.56 0.67 0.91 1.22
OFFSET	−1.20 −1.00 0.00 1.00 1.19



0+095.00

PROPOSED ELEVATIONS	33.00 32.99 33.35 33.50 33.50 33.50 33.00
EXISTING ELEVATIONS	34.24 34.13 34.02 33.88 33.71 33.58 33.45 33.20 32.90 32.81 32.74 32.57 32.25 32.05 32.01 31.87 31.71 31.59 31.51 31.26 30.93 30.47 29.76 28.65 26.82 25.12 23.21 22.32 21.55 20.78 19.95 18.86 17.45 16.56 15.78 14.77 13.37 12.01 10.99 9.98 3.42
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OFFSET	−2.41 −2.39 −1.69 −0.99 0.00 1.00 2.00



0+110.00

PROPOSED ELEVATIONS	36.65 36.36 35.99 36.23 36.21 36.20 36.18 35.62 33.78 33.69
EXISTING ELEVATIONS	37.69 37.70 37.14 36.78 36.39 35.97 35.85 35.79 35.46 34.85 34.38 33.99 33.56 33.12 32.73 32.31 31.76 31.23 30.06 28.44 26.10 23.54 21.63 19.47 14.68 13.10 11.15 6.45 5.35 3.91 3.37 3.11 2.93 2.78 2.61 2.43 2.21
LEVEL DIFFERENCE	0.12 0.05 −0.09 0.34 0.36 0.39 0.55 0.70 0.07 0.06
OFFSET	−2.34 −1.80 −1.26 −0.73 0.00 0.67 1.67 2.90 5.67 5.85

NOTE:
1. FOR GENERAL NOTES REFER TO DRAWING J0439-CIV-DRG-1001
2. ALL DIMENSIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION.
3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL, SERVICES AND OTHER CONSULTANTS DRAWINGS.
4. REFER STRUCTURAL DRAWINGS FOR DETAILS OF BOARD WALK AND SUSPENSION BRIDGE.

VERTICAL AND HORIZONTAL SCALE 1 : 100

0 1 2 3 4 5 10 m

DD

CLIENT: ASPECT Studios™

REV:	DATE:	DESCRIPTION:	IVR:	APR'D:
B	18/02/2022	ISSUED FOR 90% DD		JCA
A	08/02/2022	ISSUED FOR REVIEW		JCA

TITLE:	NAME:
DRAFTER	ESA
DRAFTING CHECK	TM
DESIGNER	JSH
DESIGN CHECK	JCA
PROJECT MANAGER	JSH

MARION COSTAL WALKWAY UPGRADE
CELL 5: GREY ROAD GULLY
HALLETT COVE, SA 5158
BRIDGE 01 - CROSS SECTIONS

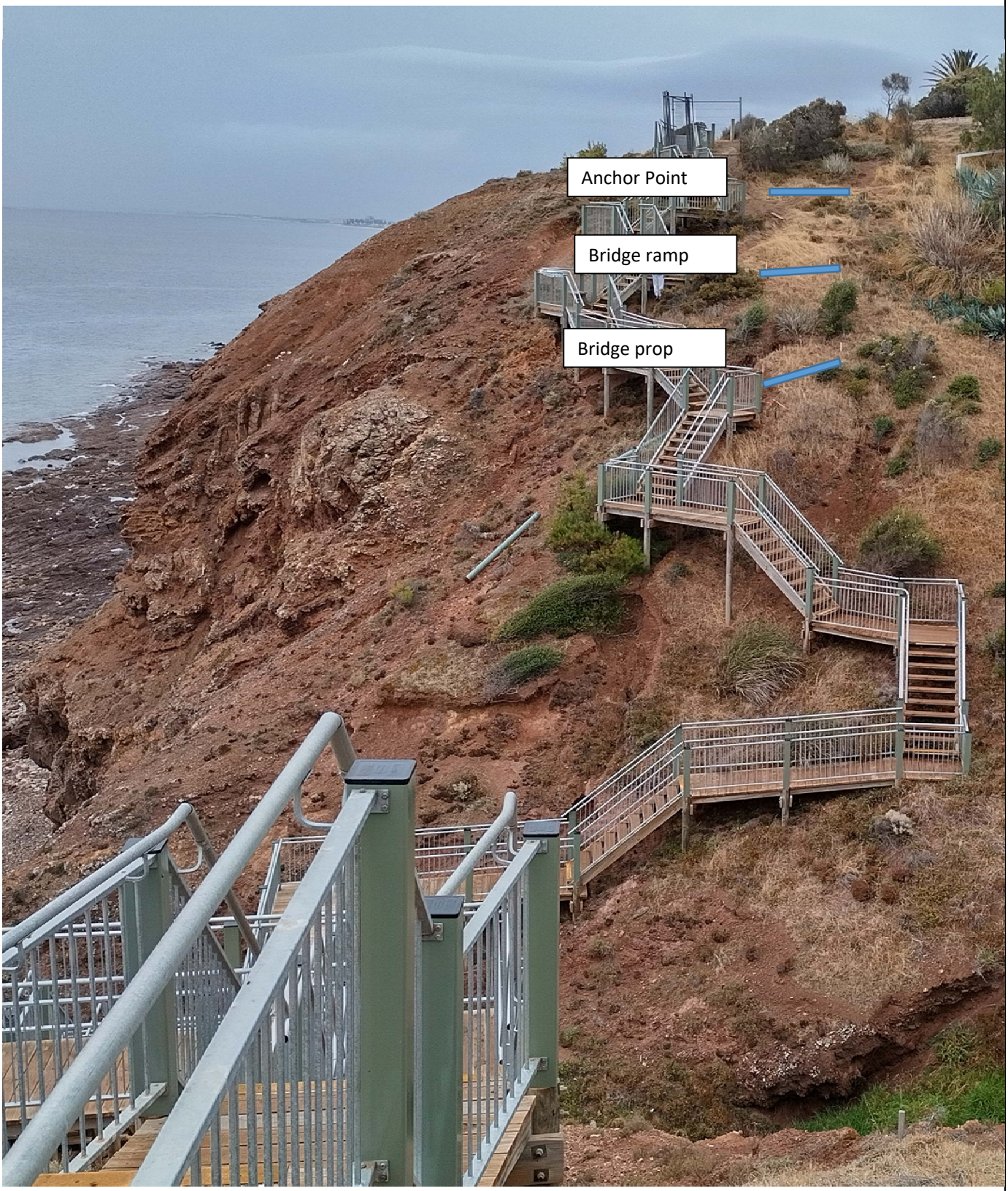
www.innovis.com.au INNOVIS Agile Outcomes

SCALE: 1:100 | DATE: 24/02/2022 | PHASE: DD | SHT SIZE: A1
DRAWING NUMBER: J0439-CIV-DRG-1067-2 | REVISION: B

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PRINT DATE:

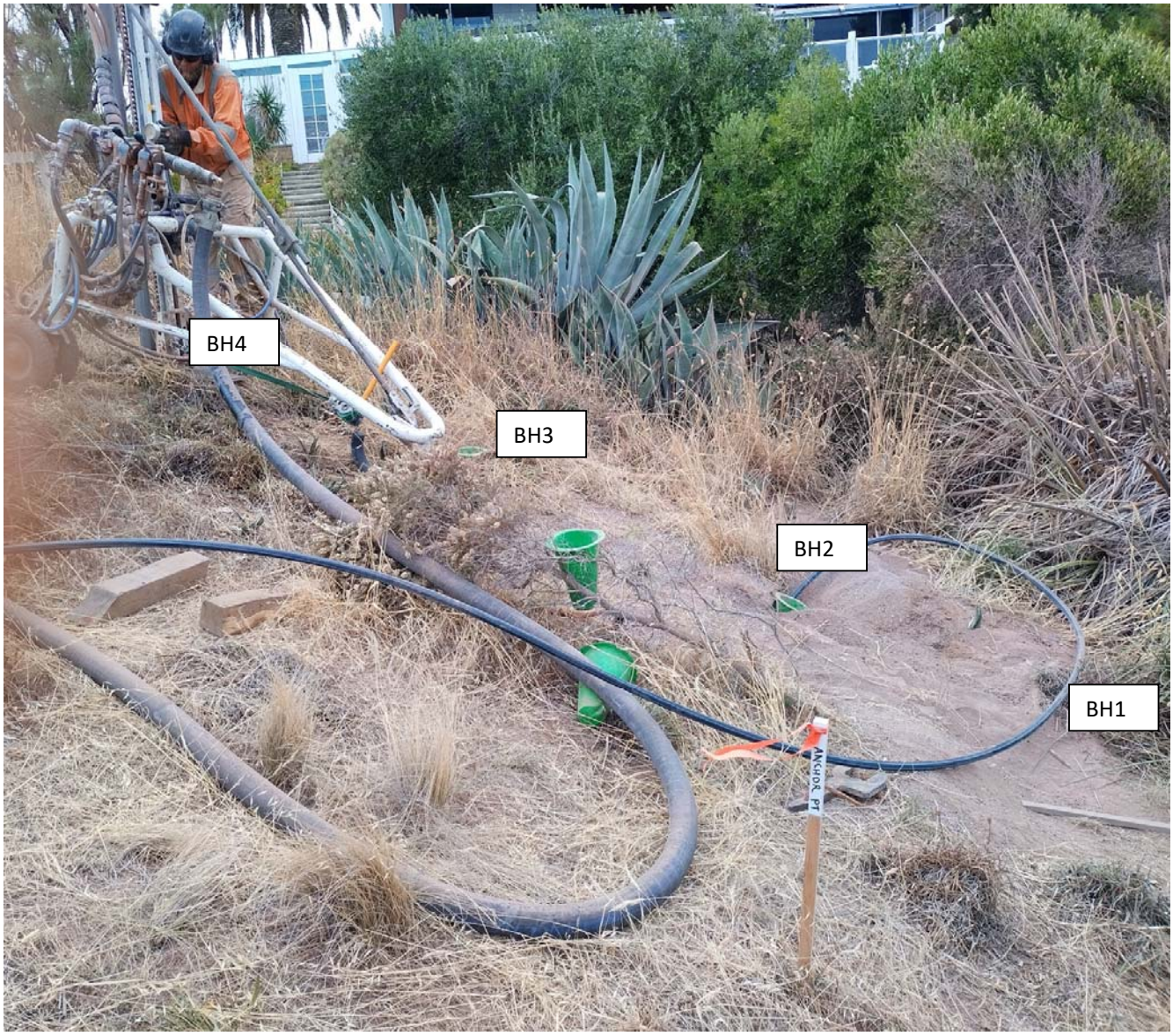
FILE LOCATION:



View looking north at the overall slope of Grey Gully North and structure locations marked in blue.

Client:	**Aspect Studio**
Project:	**Coastal Walk Way - Bridge Foundation Investigation**
Description:	**General View - Grey Gully North**
Project No:	**ADL2022-0050 Rev0**
Date:	**15/02/2022**

CMW Geosciences



View looking east at borehole locations at and above the eastern anchor point of Grey Gully North

Client:	**Aspect Studio**
Project:	**Coastal Walk Way - Bridge Foundation Investigation**
Description:	**Borehole Location Plan – Grey Gully North**
Project No:	**ADL2022-0050 Rev0**
Date:	**15/02/2022**

CMW Geosciences

BOREHOLE LOGS

Client: Aspect Studio
Project: Coastal Walk Way - Bridge Foundation Investigation
Description: Borehole Logs
Project No: ADL2022-0050 Rev0
Drill Rig: Marini dachs with a 3" DTH
Water used: none

Location	Grey Gully North					
Number	BH1		Borehole angle	50		
Date	15/02/2022		Northing			
Engineer	JVS		Easting			
Method	Percussion		mRL			
Groundwater	Not encountered		Comment	2.5m from eastern boundary, along contour of anchor		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	**Unit**
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	1	Silty Clay: CI, medium plasticity, red, grey, white with fine to coarse angular gravels. Calcareous mottle.	NA	NA	Colluvial soil	1
1	3	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
3	4	Slate: red, tabular, thinly laminated	VLS	HW	Fissile rock mass with oxidized coating on defects	3
4	5	Slate: red, tabular, thinly laminated	LS	HW	Bedrock	4
5	6	Slate: blue, tabular, thinly laminated	MS	MW	Slate and Sandstone	4
6	7	Slate: red, blue, tabular, thinly laminated	MS	MW		5
7	8	Slate: red, tabular, thinly laminated	MS	MW		5
8	9	Slate: red, tabular, thinly laminated	MS	MW		5
9	10	Slate: red, tabular, thinly laminated	MS	MW		5
10	11	Slate: red, tabular, thinly laminated	MS	MW		5
11	12	Slate: red, tabular, thinly laminated	MS	MW		5
12	13	Slate: red, tabular, thinly laminated	MS	MW	12.5 to 12.7 thin band of residual soil	5
13	14	Slate: red, tabular, thinly laminated	MS	MW		5
14	15	Slate: red, tabular, thinly laminated	MS	MW		5
15	16	Slate: red, tabular, thinly laminated	MS	MW		5
16	17	Slate: red, tabular, thinly laminated	MS	MW		5
17	18	Slate: red, tabular, thinly laminated	MS	MW		5
18	19	Slate: red, tabular, thinly laminated	MS	MW		5
19	20	Slate: red, tabular, thinly laminated	MS	MW		5

Location	Grey Gully North					
Number	BH2		Borehole angle	90		
Date	15/02/2022		Northing			
Engineer	JVS		Easting			
Method	Percussion		mRL			
Groundwater	Not encountered		Comment	1m up slope of BH1 - Trial Anchor Test 1m.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	1	Gravelly Clay: CI, medium plasticity, red, grey, white with fine to coarse angular slate gravels.	NA	NA	Calcareous colluvial soil	1

Location	Grey Gully North					
Number	BH3		Borehole angle	90		
Date	15/02/2022		Northing			
Engineer	JVS		Easting			
Method	Percussion		mRL			
Groundwater	Not encountered		Comment	1m up slope of BH2 - Trial Anchor Test 3m.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	1	Gravelly Clay: CI, medium plasticity, red, grey, white with fine to coarse angular slate gravels.	NA	NA	Calcareous colluvial soil	1
1	3	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2

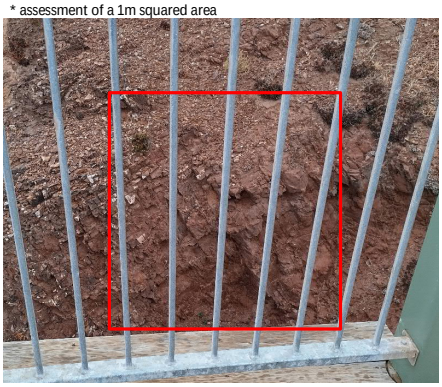
Location	Grey Gully North					
Number	BH4		Borehole angle	90		
Date	15/02/2022		Northing			
Engineer	JVS		Easting			
Method	Percussion		mRL			
Groundwater	Not encountered		Comment	1m up slope of BH3 - Trial Anchor Test 5m (3m decoupled).		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	1.5	Gravelly Clay: CI, medium plasticity, red, grey, white with fine to coarse angular slate gravels.	NA	NA	Calcareous soil, laminated slate gravels	1
1.5	3	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
3	4.5	Slate: red, tabular, thinly laminated	VLS	HW	Fissile rock mass with oxidized coating on defects	3
4.5	5	Slate: red, tabular, thinly laminated	LS	HW	Bedrock	4

Note adjustments to depth of bedrock unit to be made given location of drilling and proposed structure location.
Refer to site classification note for further descriptions. All boreholes met intended depths.

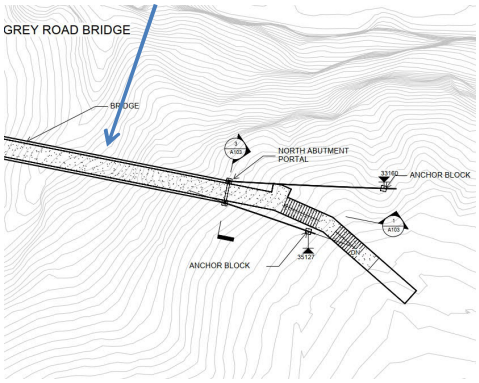
Client	Aspect Studio
Project	Coastal Walk Way - Bridge Foundation Investigation
Project Number	ADL2022-0050 Rev0
Topic	Existing Slope - Rock Mass Mapping
Author	John Slade
Date	21/02/2022

Window Map Location: Grey Gully North Window Map Lower batter mapping

* assessment of a 1m squared area



Location Sketch:



Rock Mass Classification

Fracture Frequency (per m)	Block Size (m)	Average GSI	RQD%	Joint Sets	Joint Roughness	Joint Alteration	Joint Water
20	0.1 x 0.1 x 0.1	40 to 50	10	3+	St, Ro	stained <1mm	none

Defect Characteristics

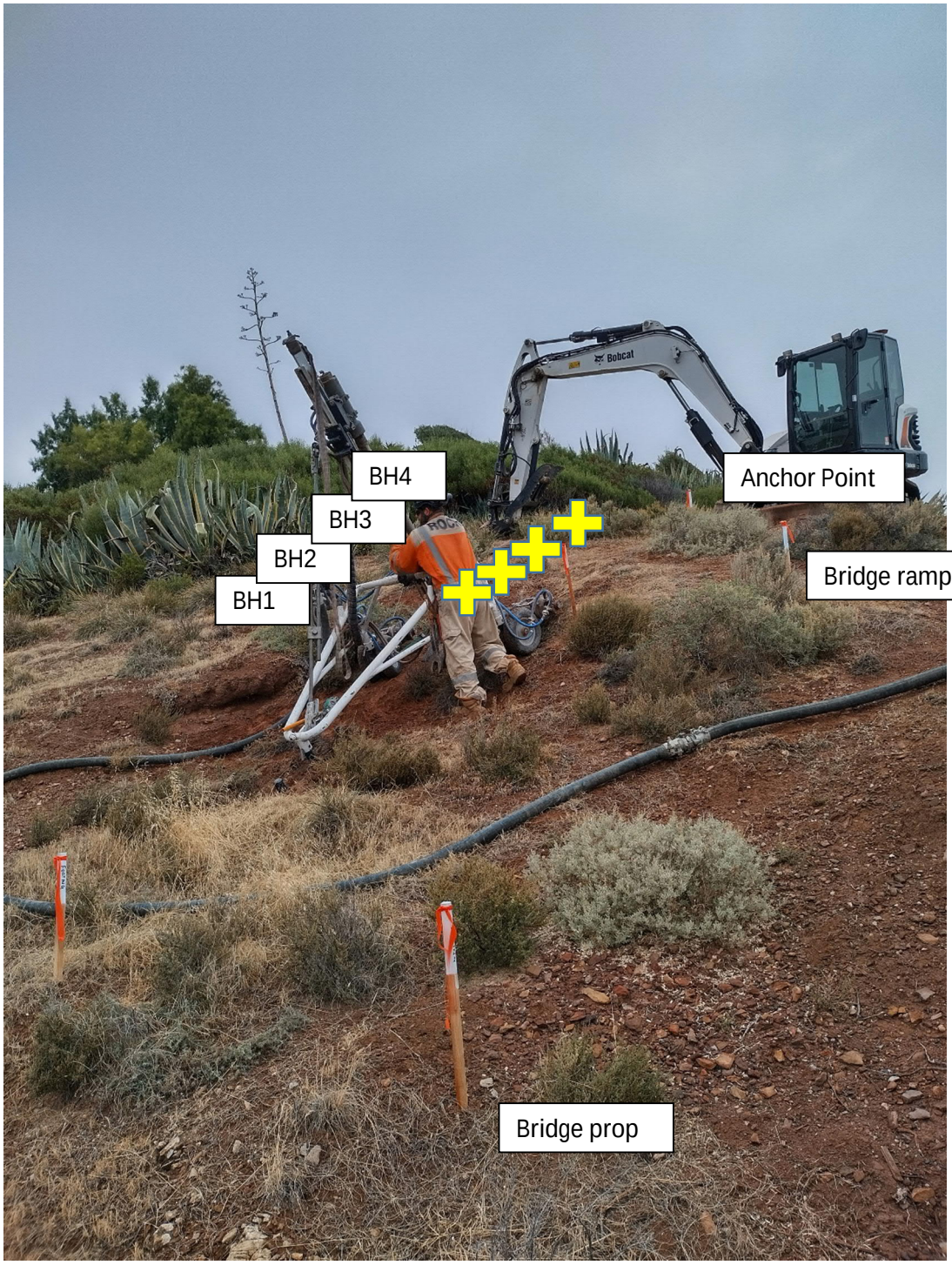
Type	Dip	Dip Direction	Infill Type	Infill (mm)	Persistence (m)	Planarity	Roughness	Spacing (m)
Bed parting	10	270	Veneer	<1	0.3	St	Ro	0.05
Joint	80	10	Veneer	<1	0.7	St	Ro	0.2
Cleavage	80	90	Stain	<1	0.5	Ir	Ro	0.1

Rock Classification

Rock Type	Rock Fabric	Average Intact Rock Strength Is(50)	Average Weathering
Slate	Laminated	>0.3 <1	MW

Comment:
Lower slope profile. Inclined bedding planes to the west, subvertical joints and subvertical cleavage.
View looking west at northern Grey Gully





View looking east at borehole locations at and above the eastern bridge ramp of Grey Gully South

Client:	Aspect Studio
Project:	Coastal Walk Way - Bridge Foundation Investigation
Description:	Borehole Location Plan – Grey Gully South
Project No:	ADL2022-0050 Rev0
Date:	15/02/2022

CMW Geosciences



View looking south at the overall slope of Grey Gully South and structure locations marked in blue.

Client:	Aspect Studio
Project:	Coastal Walk Way - Bridge Foundation Investigation
Description:	General View - Grey Gully South
Project No:	ADL2022-0050 Rev0
Date:	15/02/2022

CMW Geosciences

ATTACHMENT A - ESTIMATE OF COSTS AND FEES

Client: Aspect Studio
Project: Coastal Walk Way - Bridge Foundation Investigation
Description: Borehole Logs
Project No: ADL2022-0050 Rev0
Drill Rig: Marini dachs with a 3" DTH
Water used: none

Location	Grey Gully South					
Number	BH1		Borehole angle	50		
Date	16/02/2022		Northing			
Engineer	JVS		Easting			
Method	Percussion		mRL			
Groundwater	Not encountered		Comment	0.5m east of bridge landing		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	**Unit**
0	0.3	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.3	1	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
1	2	Slate: red, tabular, thinly laminated	VLS/LS	HW/MW	MP fines	3
2	4	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
4	5	Clayey Gravel: fine to coarse angular gravels (laminated slate), yellow, red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
5	6	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
6	7	Slate: yellow, red, tabular, thinly laminated	VLS/LS	HW/MW	MP fines	3
7	8	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
8	9	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
9	10	Slate: red, tabular, thinly laminated	MS	SW		5
10	11	Slate: red, tabular, thinly laminated	MS	SW	1mm oxide coating on defects	5
11	12	Slate: red, tabular, thinly laminated	MS	SW		5
12	13	Slate/Sandstone: red, yellow tabular, thinly laminated	MS	MW	12.5 to 12.7 thin band (residual soil)	5
13	14	Sandstone: yellow, tabular, thinly laminated	LS	MW		4
14	15	Sandstone/Dolomite: yellow, red, tabular, thinly laminated	LS	MW		4
15	16	Slate/Sandstone: red, yellow tabular, thinly laminated	LS	MW		4
16	17	Slate/Sandstone: red, yellow tabular, thinly laminated	L/MS	MW		4/5
17	18	Slate: red, tabular, thinly laminated	L/MS	MW		4/5
18	19	Slate: red, tabular, thinly laminated	MS	SW	defects stained surfaces	5
19	20	Slate: red, tabular, thinly laminated	MS	SW	defects stained surfaces	5

Location	Grey Gully South					
Number	BH2		Borehole angle	90		
Date	16/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	1m up slope of BH1 - Trial Anchor Test 2m.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.3	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.3	0.8	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
0.8	1.5	Slate: red, tabular, thinly laminated	LS	MW	Boulder near surface	4
1.5	2	Slate: red, tabular, thinly laminated	VLS	HW	MP fines	3

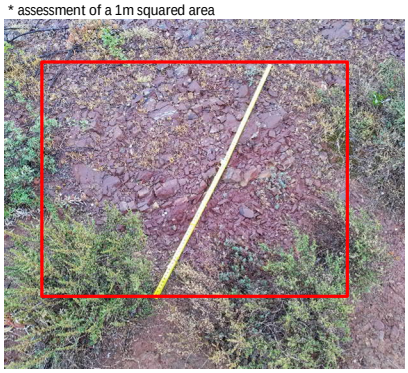
Location	Grey Gully South					
Number	BH3		Borehole angle	90		
Date	16/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	1m up slope of BH2 - Trial Anchor Test 7m (5 m decoupled).		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.3	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.3	0.8	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
0.8	3	Slate: red, tabular, thinly laminated	LS	H/MW	Bedrock	4
3	4	Slate: red, tabular, thinly laminated	VLS	X/HW	Weak zone	3
4	5	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
5	6	Slate: red, tabular, thinly laminated	LS	MW	Bedrock	4
6	7	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2

Note adjustments to depth of bedrock unit to be made given location of drilling and proposed structure location.
Refer to site classification note for further descriptions. All boreholes met intended depths.

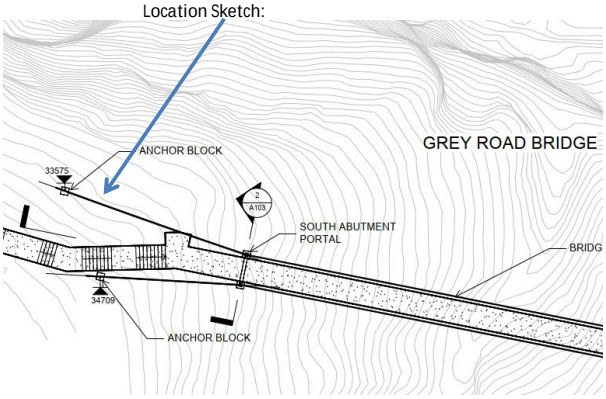
Client	Aspect Studio
Project	Coastal Walk Way - Bridge Foundation Investigation
Project Number	ADL2022-0050 Rev0
Topic	Existing Slope - Rock Mass Mapping
Author	John Slade
Date	21/02/2022

Window Map Location: Grey Gully South Window Map Lower batter mapping

* assessment of a 1m squared area



Location Sketch:



Rock Mass Classification

Fracture Frequency (per m)	Block Size (m)	Average GSI	RQD%	Joint Sets	Joint Roughness	Joint Alteration	Joint Water
22	0.1 x 0.12 x 0.15	80 to 90	10	3+	St, Ro	stained <1mm	none

Defect Characteristics

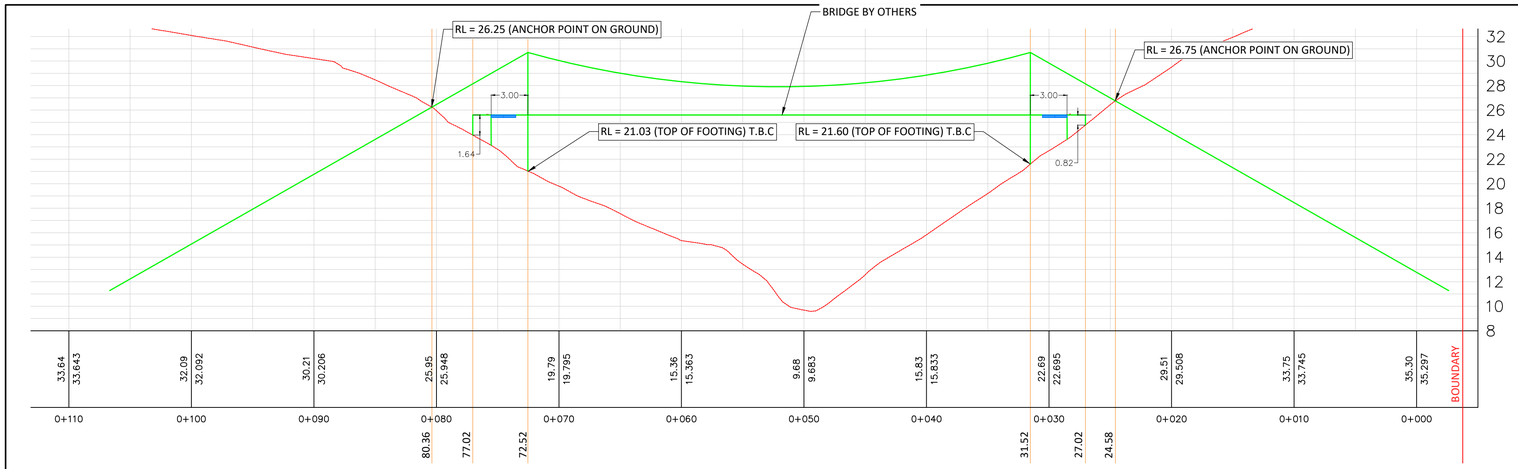
Type	Dip	Dip Direction	Infill Type	Infill (mm)	Persistence (m)	Planarity	Roughness	Spacing (m)
Bed parting	15	282	Veneer	<1	0.3	St	Ro	0.1
Joint	80	185	Veneer	<1	0.7	St	Ro	0.2
Cleavage	75	95	Stain	<1	0.5	Ir	Ro	0.15

Rock Classification

Rock Type	Rock Fabric	Average Intact Rock Strength Is(50)	Average Weathering
Slate	Laminated	>0.3 <1	MW

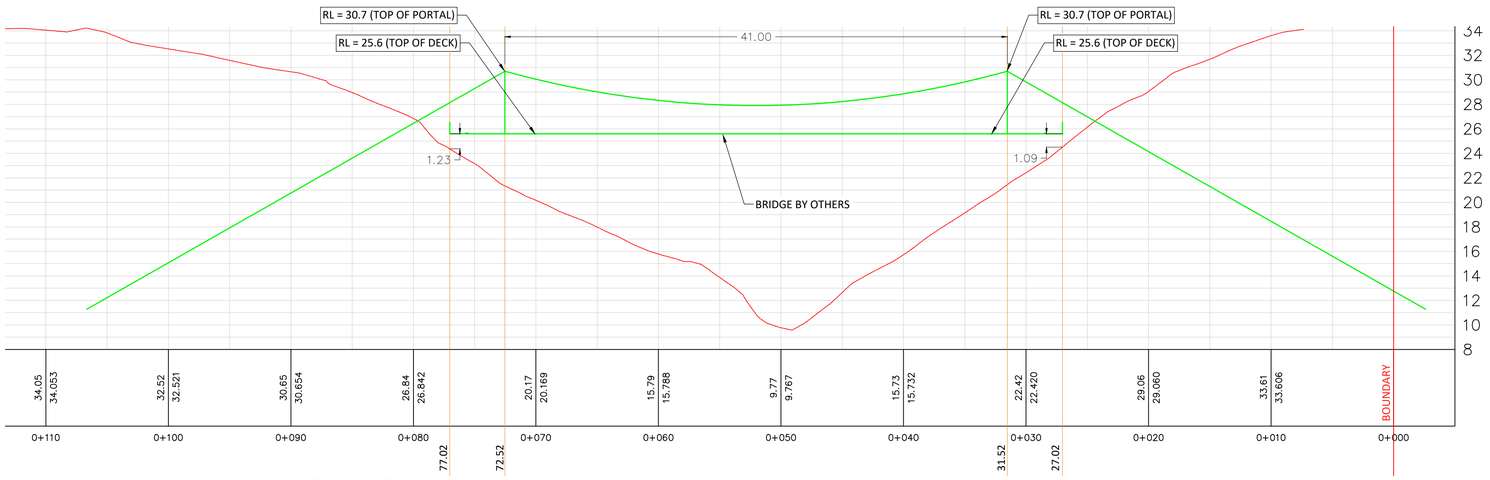
Comment:
Lower slope profile. Inclined bedding planes to the west, subvertical joints and subvertical cleavage.
View looking west at southern Grey Gully





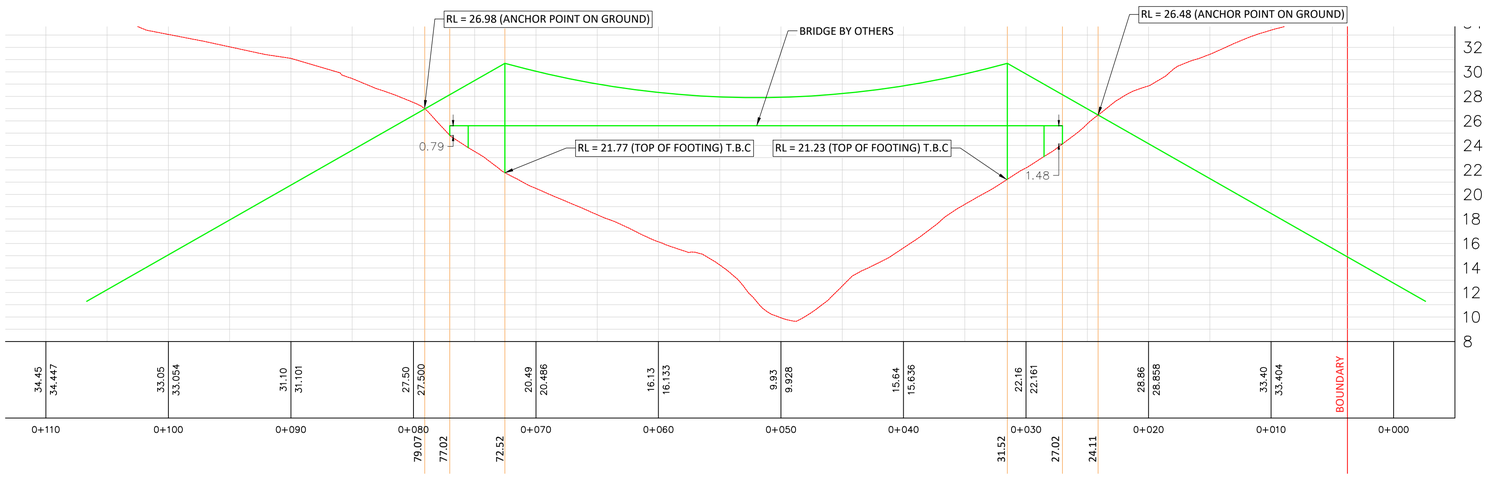
LONGITUDINAL SECTION - BRIDGE 2 WEST EDGE

SCALE: H 1:250
V 1:250



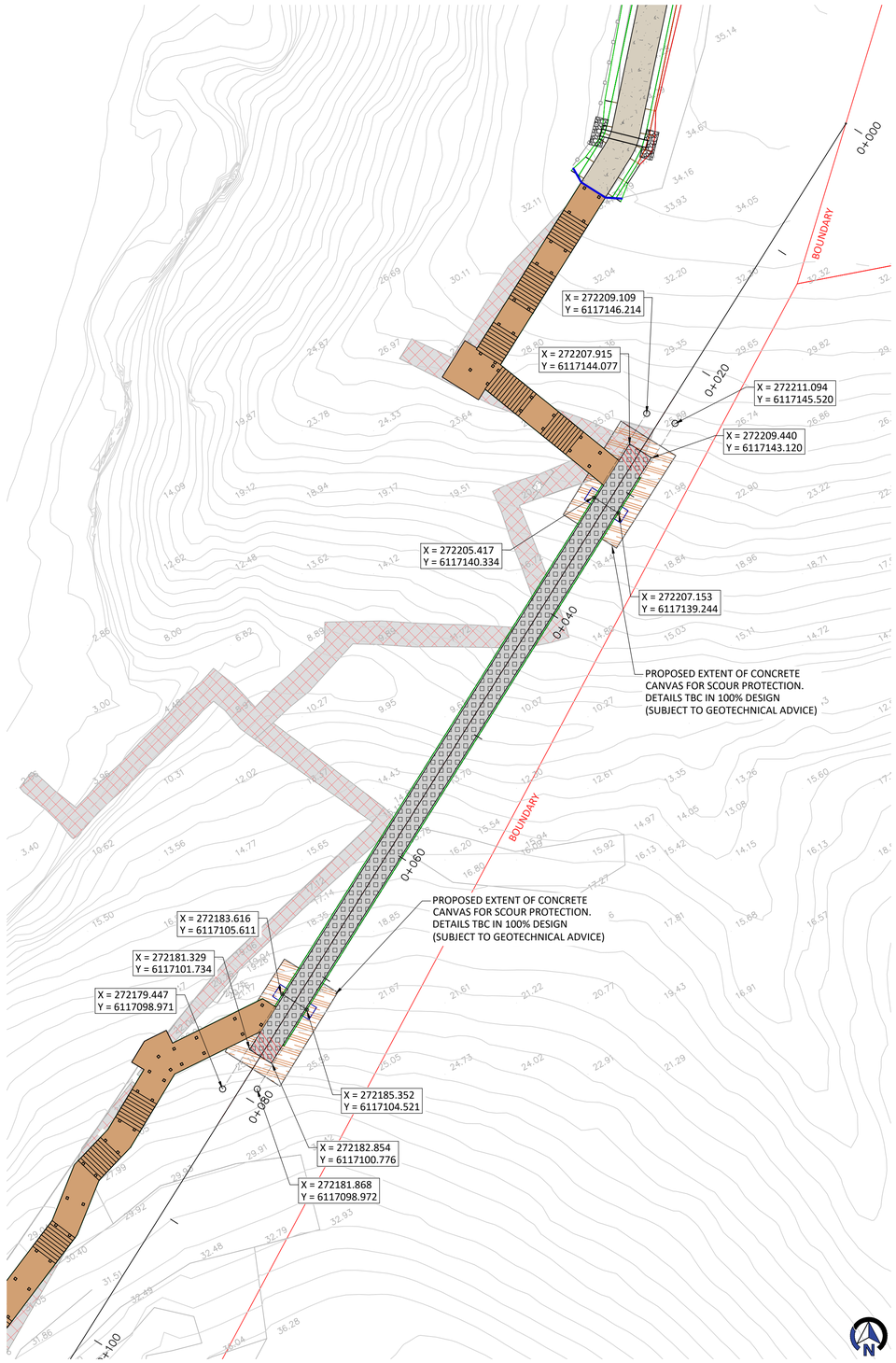
LONGITUDINAL SECTION - BRIDGE 2 CENTRE LINE

SCALE: H 1:250
V 1:250



LONGITUDINAL SECTION - BRIDGE 2 EAST EDGE

SCALE: H 1:250
V 1:250



NOTE: BRIDGE FOOTINGS TBC IN 100% DESIGN ISSUE SUBJECT TO GEOTECHNICAL INVESTIGATOINS

BRIDGE 2 KURNABINNA GULLY PLAN

SCALE: 1:200

NOTE:
1. FOR GENERAL NOTES REFER TO DRAWING J0439-CIV-DRG-1001
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3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL, SERVICES AND OTHER CONSULTANTS DRAWINGS.
4. REFER STRUCTURAL DRAWINGS FOR DETAILS OF BOARD WALK AND SUSPENSION BRIDGE.

SCALE 1 : 250
0 5 10 15 20 25 m

10mm AT A1

REVIEW

CLIENT:	REV:	DATE:	DESCRIPTION:	IVR:	APR'D:
ASPECT Studios™					
	B	18/02/2022	ISSUED FOR 90% DD		JCA
	A	08/02/2022	ISSUED FOR REVIEW		JCA

TITLE:	NAME:
DRAFTER	ESA
DRAFTING CHECK	TM
DESIGNER	JSH
DESIGN CHECK	JCA
PROJECT MANAGER	JSH

MARION COSTAL WALKWAY UPGRADE
CELL 6: KURNABINNA GULLY
HALLETT COVE, SA 5158
BRIDGE 02 - ELEVATIONS

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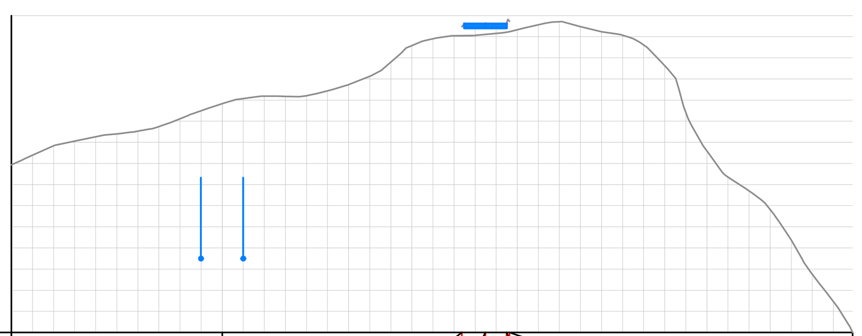
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REVISION: B

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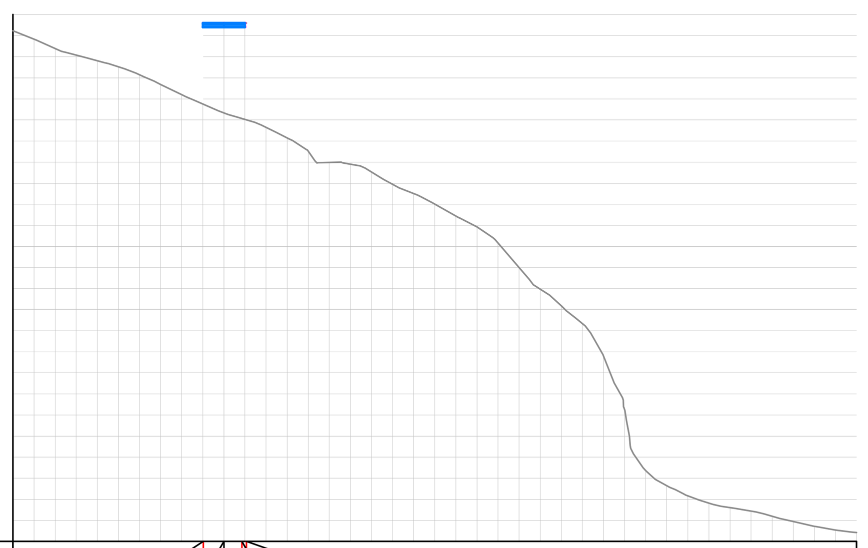
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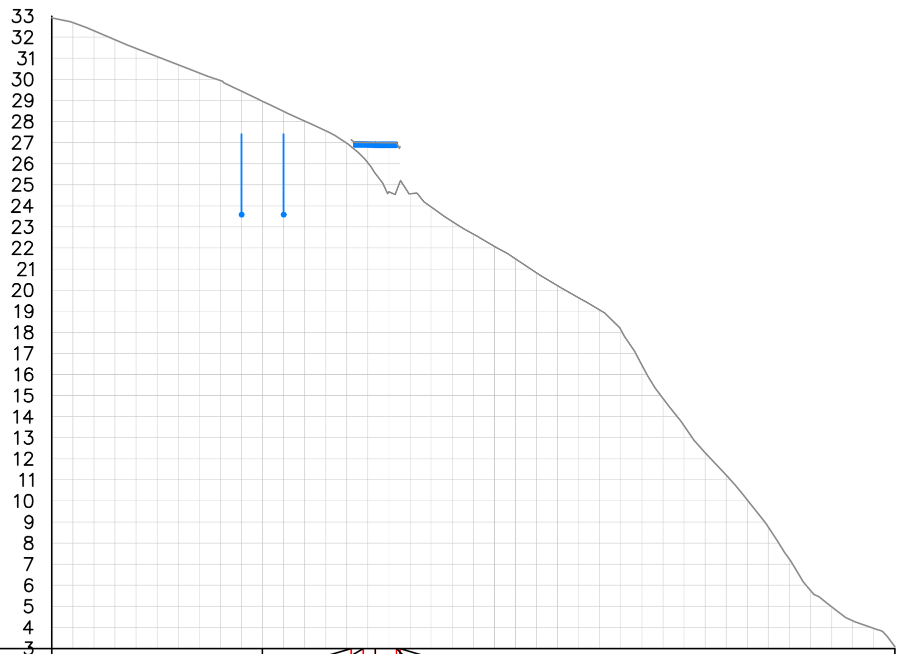
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EXISTING ELEVATIONS	23.94 24.40 24.84 25.05 25.26 25.40 25.53 25.74 26.12 26.50 26.83 27.07 27.18 27.17 27.20 27.44 27.73 28.13 28.80 29.58 29.91 30.05 30.06 30.16 30.33 30.56 30.71 30.48 30.24 30.07 29.60 28.64 26.43 24.59 23.35 22.70 21.81 20.37 18.75 17.46
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OFFSET	0.00 11.37 12.49 13.49 13.63

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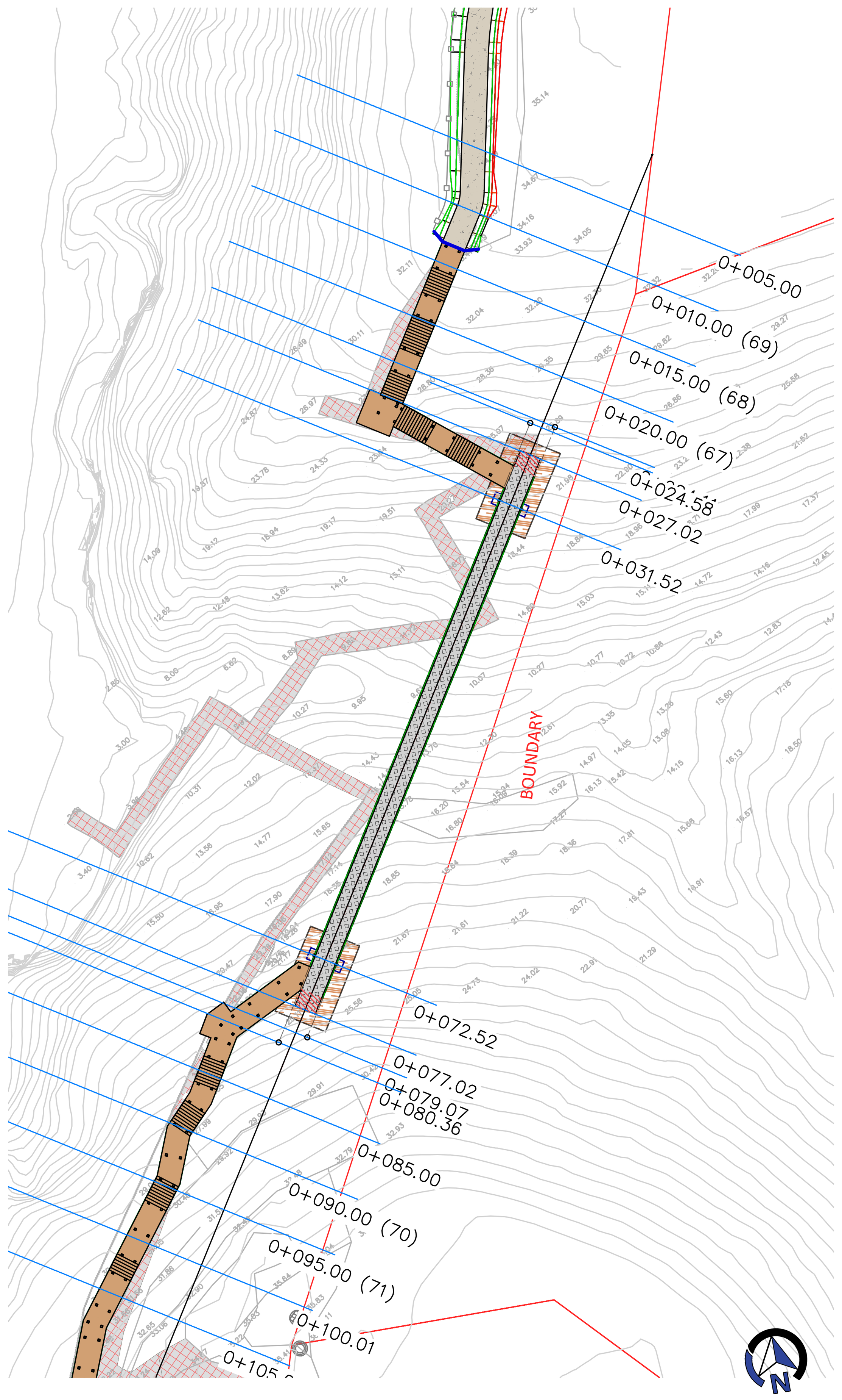


PROPOSED ELEVATIONS	25.60 25.60 25.60 25.60
EXISTING ELEVATIONS	25.23 24.84 24.39 24.07 23.81 23.52 23.14 22.69 22.19 21.75 21.34 21.03 20.65 20.15 19.52 18.98 18.90 18.53 17.95 17.50 17.01 16.45 15.92 15.17 14.00 12.98 12.18 11.34 9.81 7.25 4.37 3.65 3.16 2.82 2.61 2.44 2.20 1.94 1.72 1.54 1.42
LEVEL DIFFERENCE	3.86 4.26 4.53 4.59
OFFSET	−0.97 0.00 0.85 1.08

0+085.00



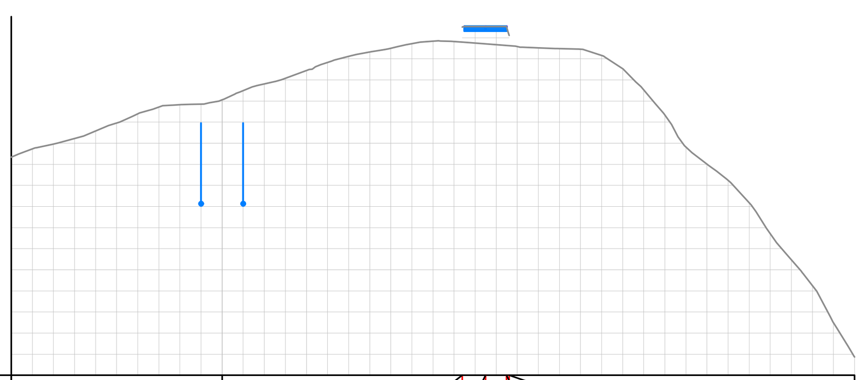
PROPOSED ELEVATIONS	27.14 27.01 27.00 26.99 26.81
EXISTING ELEVATIONS	32.93 32.69 32.31 31.88 31.47 31.08 30.69 30.30 29.95 29.44 28.96 28.48 28.02 27.56 26.97 26.04 24.65 24.57 23.95 23.26 22.66 22.08 21.49 20.82 20.21 19.64 19.06 18.13 16.44 14.86 13.57 12.28 11.23 10.05 8.75 7.23 5.75 4.98 4.32 3.96 3.08
LEVEL DIFFERENCE	0.33 0.71 1.47 2.28 1.68
OFFSET	0.00 4.21 4.79 5.36 6.36 6.52



BRIDGE 2 KURNABINNA KEY PLAN

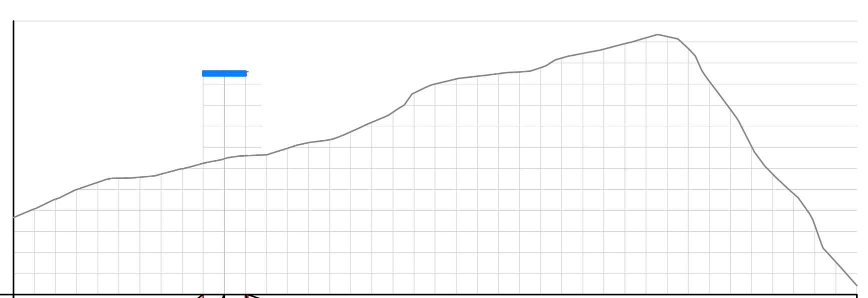
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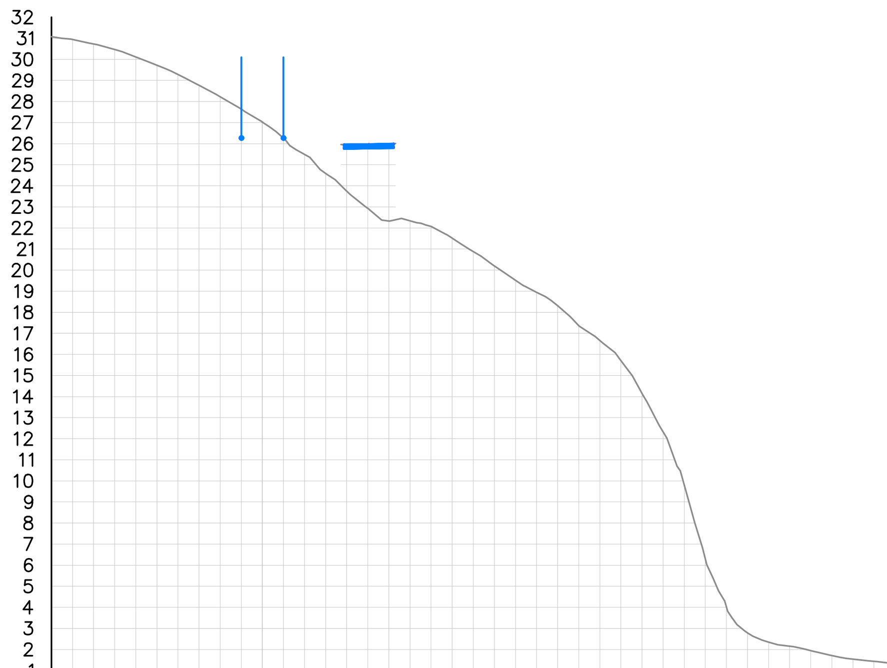
PROPOSED ELEVATIONS	32.51 32.53 32.53 32.11
EXISTING ELEVATIONS	26.35 26.73 26.96 27.22 27.59 27.96 28.39 28.71 28.82 28.86 29.06 29.50 29.81 30.07 30.45 30.83 31.12 31.32 31.50 31.72 31.84 31.82 31.75 31.67 31.58 31.52 31.49 31.45 31.16 30.54 29.52 28.35 26.83 26.01 25.24 24.19 22.71 21.47 20.25 18.49 16.87
LEVEL DIFFERENCE	0.71 0.81 0.89 0.49
OFFSET	0.00 11.39 12.49 13.49 13.62

0+031.52



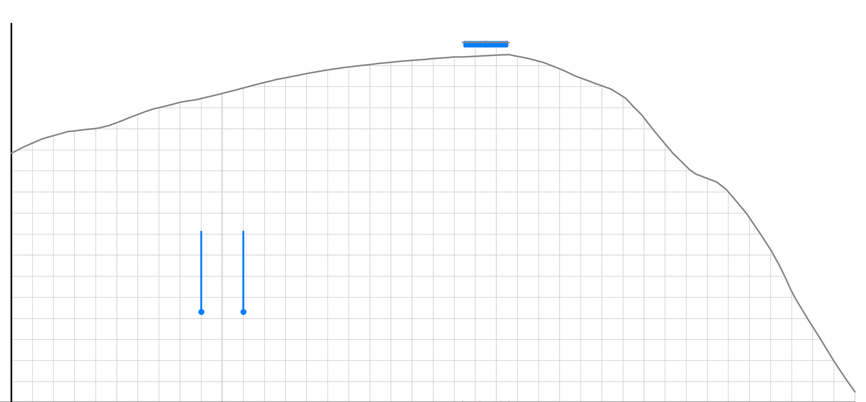
PROPOSED ELEVATIONS	25.60 25.60 25.60 25.60
EXISTING ELEVATIONS	18.67 19.07 19.53 19.99 20.34 20.53 20.58 20.72 20.98 21.24 21.45 21.60 21.65 21.96 22.22 22.36 22.74 23.20 23.67 24.57 25.00 25.25 25.38 25.50 25.57 25.78 26.24 26.46 26.66 26.92 27.20 27.26 26.69 25.13 23.80 22.06 20.73 19.79 18.30 16.55 15.43
LEVEL DIFFERENCE	4.36 4.15 4.00 3.99
OFFSET	−1.00 0.00 1.00 1.12

0+080.36



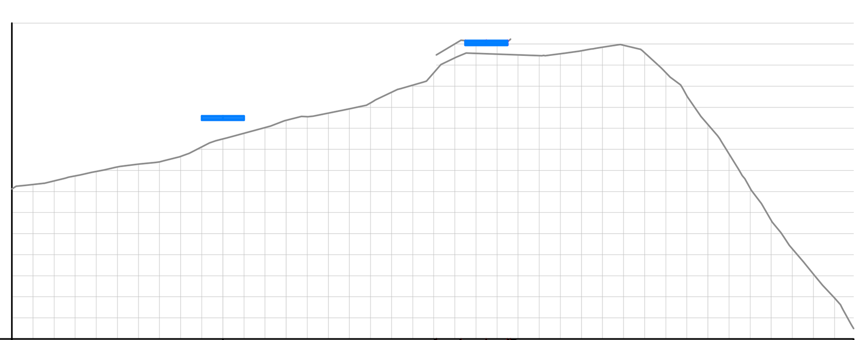
PROPOSED ELEVATIONS	25.95 25.97 25.99 26.00
EXISTING ELEVATIONS	31.07 30.94 30.73 30.47 30.11 29.71 29.28 28.77 28.23 27.64 27.03 26.27 25.49 24.58 23.75 22.92 22.33 22.34 22.07 21.51 20.87 20.19 19.52 18.94 18.31 17.36 16.66 15.71 14.15 12.33 9.83 6.30 4.03 2.79 2.35 2.15 1.95 1.71 1.54 1.43 1.32
LEVEL DIFFERENCE	1.93 3.08 3.62 3.61
OFFSET	0.00 3.72 5.05 6.22 6.32

0+015.00



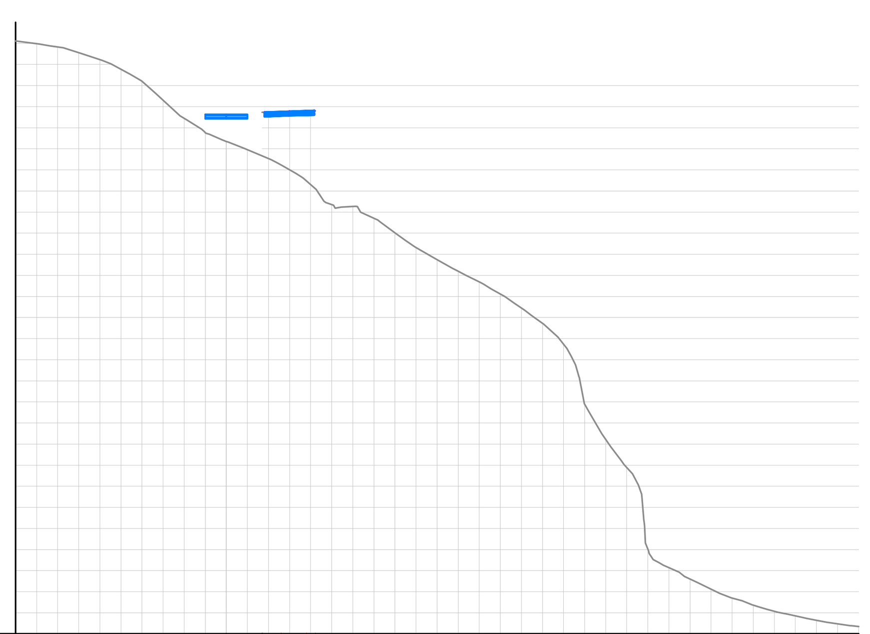
PROPOSED ELEVATIONS	34.10 34.12 34.12 34.08
EXISTING ELEVATIONS	28.84 29.33 29.68 29.91 30.02 30.29 30.68 31.01 31.25 31.44 31.68 31.94 32.20 32.42 32.62 32.79 32.94 33.05 33.16 33.25 33.33 33.41 33.44 33.50 33.44 33.21 32.85 32.41 32.04 31.53 30.52 29.28 28.22 27.65 27.01 25.78 24.26 22.29 20.60 18.98 17.51
LEVEL DIFFERENCE	0.69 0.66 0.61 0.56
OFFSET	0.00 11.40 12.22 13.22 13.60

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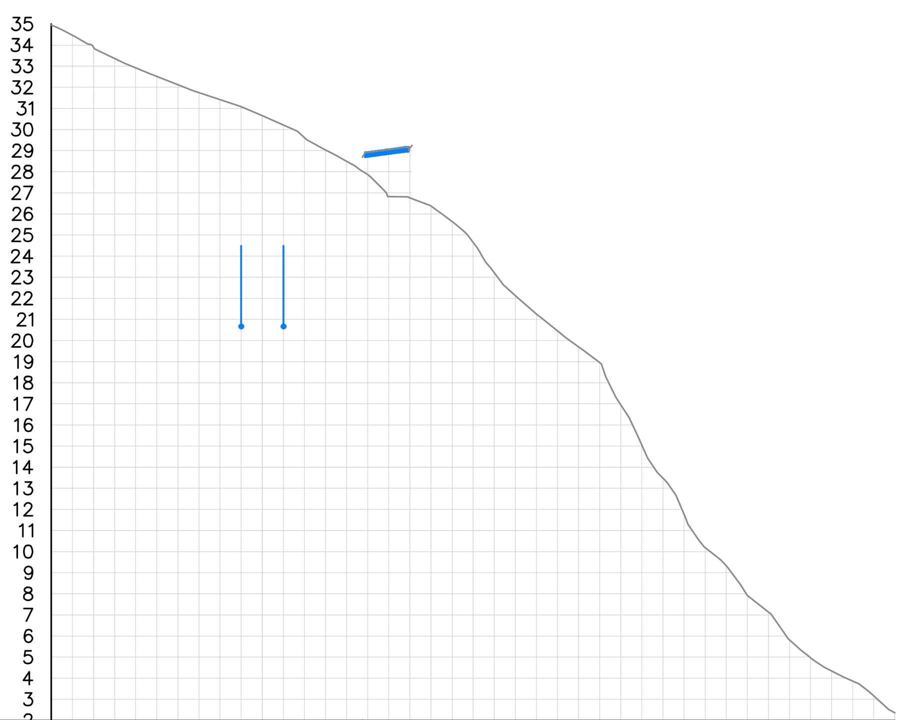
PROPOSED ELEVATIONS	28.48 29.18 29.16 29.16 29.23
EXISTING ELEVATIONS	22.12 22.34 22.51 22.74 22.95 23.17 23.30 23.40 23.67 24.12 24.49 24.76 25.04 25.39 25.55 25.72 25.93 26.21 26.71 27.05 27.65 28.35 28.56 28.53 28.49 28.46 28.54 28.68 28.86 28.94 28.58 27.65 26.54 25.17 23.79 22.15 20.63 19.28 18.07 16.95
LEVEL DIFFERENCE	0.69 0.71 0.61 0.65 0.73
OFFSET	0.00 10.13 11.29 12.49 13.49 13.64

0+077.01



PROPOSED ELEVATIONS	25.73 25.74 25.79 25.81
EXISTING ELEVATIONS	29.11 28.98 28.83 28.56 28.23 27.77 27.20 26.30 25.44 24.77 24.35 23.96 23.54 23.01 22.31 21.35 21.26 20.71 20.02 19.32 18.75 18.20 17.68 17.11 16.45 15.73 14.74 11.90 10.22 8.89 5.02 4.14 3.60 3.11 2.70 2.36 2.08 1.85 1.65 1.48 1.35
LEVEL DIFFERENCE	2.06 2.50 3.30 3.71
OFFSET	0.00 1.70 2.60 3.80 4.23

0+090.00



PROPOSED ELEVATIONS	28.68 29.04 29.15 29.25
EXISTING ELEVATIONS	34.94 34.46 33.89 33.36 32.92 32.52 32.12 31.75 31.42 31.09 30.65 30.22 29.61 29.03 28.49 27.87 26.82 26.76 26.37 25.64 24.66 23.22 22.13 21.26 20.46 19.71 18.96 16.96 15.05 13.48 11.77 10.20 9.33 7.92 7.14 5.82 4.97 4.34 3.86 3.16 2.37
LEVEL DIFFERENCE	0.66 2.06 2.34 2.53
OFFSET	0.00 4.75 5.90 6.78 7.11

NOTE:
1. FOR GENERAL NOTES REFER TO DRAWING J0439-CIV-DRG-1001
2. ALL DIMENSIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION.
3. ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ARCHITECTURAL, SERVICES AND OTHER CONSULTANTS DRAWINGS.
4. REFER STRUCTURAL DRAWINGS FOR DETAILS OF BOARD WALK AND SUSPENSION BRIDGE.

10mm AT A1

VERTICAL AND HORIZONTAL SCALE 1 : 100

0 1 2 3 4 5 10 m

DD

CLIENT:	REV:	DATE:	DESCRIPTION:	IVR:	APR'D:
ASPECT Studios™	A	25/02/2022	ISSUED FOR REVIEW		JCA

TITLE:	NAME:
DRAFTER	ESA
DRAFTING CHECK	TM
DESIGNER	JSH
DESIGN CHECK	JCA
PROJECT MANAGER	JSH

MARION COSTAL WALKWAY UPGRADE
CELL 6: KURNABINNA GULLY
HALLETT COVE, SA 5158
BRIDGE 02 - CROSS SECTIONS

www.innovis.com.au
INNOVIS Agile Outcomes

SCALE:	DATE:	PHASE:	SHT SIZE:
1:100	24/02/2022	DD	A1
DRAWING NUMBER: J0439-CIV-DRG-1068-2			REVISION: A

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PRINT DATE:

FILE LOCATION:



View looking east at borehole locations at and above the eastern anchor point of Kurnabinna North

Client:	Aspect Studio
Project:	Coastal Walk Way - Bridge Foundation Investigation
Description:	Borehole Location Plan – Kurnabinna North
Project No:	ADL2022-0050 Rev0
Date:	15/02/2022

CMW Geosciences



View looking north at the overall slope of Kurnabinna North and structure locations marked in blue.

Client:	Aspect Studio
Project:	Coastal Walk Way - Bridge Foundation Investigation
Description:	General View - Kurnabinna North
Project No:	ADL2022-0050 Rev0
Date:	15/02/2022

CMW Geosciences

Borehol Logs

Client: Aspect Studio
Project: Coastal Walk Way - Bridge Foundation Investigation
Description: Borehole Logs
Project No: ADL2022-0050 Rev0
Drill Rig: Marini dachs with a 3" DTH
Water used: none

Location	Kurnabinna North					
Number	BH1		Borehole angle	50		
Date	18/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	2m from eastern boundary, 5m above anchor		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	**Unit**
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	0.4	Silty Clay: CI, medium plasticity, red, grey, white with fine to coarse angular gravels. Calcareous mottle.	NA	NA	Colluvial soil	1
0.4	2	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
2	3	Slate: red, tabular, thinly laminated	VLS	HW		3
3	4	Slate: red, tabular, thinly laminated	L/MS	MW	Bedrock	4
4	5	Slate/Quartzite: yellow white	M/HS	MW	Stained to <1mm veneer on defects	4
5	6	Slate/Quartzite: yellow white	M/HS	MW	Stained defects	5
6	7	Slate: red, tabular, thinly laminated	M/HS	MW	Stained defects	5
7	8	Slate: red, tabular, thinly laminated	HS	MW	Stained defects	5
8	9	Slate: red, tabular, thinly laminated	HS	S/MW	Stained defects	5
9	10	Slate: red, tabular, thinly laminated	HS	S/MW	Stained defects	5
10	11	Slate: red, tabular, thinly laminated	HS	S/MW	Stained defects	5
11	12	Slate/Sandstone: yellow, red, tabular, thinly laminated	LS	H/MW	trace clay fines	4
12	13	Slate/Sandstone: yellow, red, tabular, thinly laminated	LS	H/MW	trace clay fines	4
13	14	Slate: red, yellow tabular, thinly laminated	MS	H/MW	trace clay fines	5
14	15	Slate: red, tabular, thinly laminated	LS	H/MW	trace clay fines	5
15	16	Slate: red, yellow tabular, thinly laminated	LS	H/MW	trace clay fines	5
16	17	Slate: red, yellow tabular, thinly laminated	MS	MW		5
17	18	Slate/Sandstone: yellow, red, tabular, thinly laminated	HS	SW		5
18	19	Slate: red, tabular, thinly laminated	HS	SW	veneer	5
19	20	Slate: red, tabular, thinly laminated	HS	SW	veneer	5

Location	Kurnabinna North					
Number	BH2		Borehole angle	90		
Date	18/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	1m up slope of BH1 - Trial Anchor Test 2m.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	0.4	Silty Clay: CI, medium plasticity, red, grey, white with fine to coarse angular gravels. Calcareous mottle.	NA	NA	Colluvial soil	1
0.4	2	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2

Location	Kurnabinna North					
Number	BH3		Borehole angle	90		
Date	18/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	1m up slope of BH2 - Trial Anchor Test 4m.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	0.4	Silty Clay: CI, medium plasticity, red, grey, white with fine to coarse angular gravels. Calcareous mottle.	NA	NA	Colluvial soil	1
0.4	2	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
2	4	Slate: red, tabular, thinly laminated	VLS	HW		3

Location	Kurnabinna North					
Number	BH4		Borehole angle	90		
Date	18/02/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	1m up slope of BH3 - Trial Anchor Test 6m (4m decoupled).		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.2	Top soil: sandy silt, low plasticity, brown, fine to medium sand with rootlets.	NA	NA	Colluvial soil	0
0.2	0.4	Silty Clay: CI, medium plasticity, red, grey, white with fine to coarse angular gravels. Calcareous mottle.	NA	NA	Colluvial soil	1
0.4	2	Clayey Gravel: fine to coarse angular gravels (laminated slate), red, medium plasticity fines, <PL,	D to VD	RS/XW	Residual soil	2
2	4	Slate: red, tabular, thinly laminated	VLS	HW		3
4	5	Slate: red, tabular, thinly laminated	LS	HW	Bedrock	4
4	5	Slate/Quartzite: yellow white	M/HS	MW	Stained to <1mm veneer on defects	4
5	6	Slate/Quartzite: yellow white	M/HS	MW	Stained defects	5

Note adjustments to depth of bedrock unit to be made given location of drilling and proposed structure location.
Refer to site classification note for further descriptions. All boreholes met intended depths.



View looking south at borehole locations above the western anchor point of Kurnabinna South

Client:	**Aspect Studio**
Project:	**Coastal Walk Way - Bridge Foundation Investigation**
Description:	**Borehole Location Plan – Kurnabinna South**
Project No:	**ADL2022-0050 Rev0**
Date:	**15/02/2022**

CMW Geosciences



View looking north at the overall slope of Kurnabinna South and structure locations marked in blue.

Client:	**Aspect Studio**
Project:	**Coastal Walk Way - Bridge Foundation Investigation**
Description:	**General View - Kurnabinna South**
Project No:	**ADL2022-0050 Rev0**
Date:	**15/02/2022**

CMW Geosciences

ATTACHMENT A - ESTIMATE OF COSTS AND FEES

Client: Aspect Studio
Project: Coastal Walk Way - Bridge Foundation Investigation
Description: Borehole Logs
Project No: ADL2022-0050 Rev0
Drill Rig: Marini dachs with a 3" DTH
Water used: none

Location	Kurnabinna South					
Number	BH1		Borehole angle	50		
Date	8/03/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	approx. 6m vert. above anchor. 3m to fence. perpend to slope.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	**Unit**
0	0.5	Silty Gravel: fine to coarse angular gravels (laminated slate), red, low plasticity fines, <PL,	VD	RS	Residual soil	2
0.5	1.2	Slate: red, tabular, thinly laminated	VLS	HW	very low strength rock	3
1.2	2	Slate: red, tabular, thinly laminated	LS	H/MW	bedrock with clay defects.	4
2	3	Slate: red, tabular, thinly laminated	MS	SW	Bedrock with 1mm veneer defects.	5
3	4	Slate: red, tabular, thinly laminated	L/MS	MW	Fissile	4
4	5	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
5	6	Slate: red, tabular, thinly laminated	L/MS	SW	Fissile	4
6	7	Slate: red, tabular, thinly laminated	L/MS	SW	Stained to <1mm veneer on defects	4
7	8	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
8	9	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
9	10	Slate: red, tabular, thinly laminated	L/MS	SW	Stained to <1mm veneer on defects	5
10	11	Slate: red, tabular, thinly laminated	LS	H/MW	bedrock with clay defects.	4
11	12	Slate: red, tabular, thinly laminated	L/MS	SW	Stained to <1mm veneer on defects	5
12	13	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
13	14	Slate: red, tabular, thinly laminated	L/MS	H/MW	bedrock with clay defects.	4
14	15	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
15	16	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
16	17	Slate: red, tabular, thinly laminated	L/MS	H/MW	bedrock with clay defects.	4
17	18	Slate/Sandst: red, yellow, tabular, thinly laminated	L	HW	bedrock with clay defects.	4
18	19	Slate/Sandst: red, yellow, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
19	20	Slate/Sandst: red, yellow, tabular, thinly laminated	L/MS	H/MW	19.8 to 20.0m band of LS rock.	4

Location	Kurnabinna South					
Number	BH2		Borehole angle	90		
Date	8/03/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	0.7m up slope of BH1. 1m trial anchor.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.5	Silty Gravel: fine to coarse angular gravels (laminated slate), red, low plasticity fines, <PL,	VD	RS	Residual soil	2
0.5	1	Slate: red, tabular, thinly laminated	VLS	HW	very low strength rock	3

Location	Kurnabinna South					
Number	BH3		Borehole angle	90		
Date	8/03/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	0.7m up slope of BH2. adjusted to 1.5m trial anchor.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.5	Silty Gravel: fine to coarse angular gravels (laminated slate), red, low plasticity fines, <PL,	VD	RS	Residual soil	2
0.5	1.2	Slate: red, tabular, thinly laminated	VLS	HW	very low strength rock	3
1.2	2	Slate: red, tabular, thinly laminated	LS	H/MW	bedrock with clay defects.	4

Location	Kurnabinna South					
Number	BH4		Borehole angle	90		
Date	8/03/2022		Northing			
Engineer	JVS		Easting			
Method	percussion		mRL			
Groundwater	not encountered		Comment	0.7m up slope of BH3. 5m trial anchor. 3m debonded.		
Depth From	**Depth To**	**Subsurface Condition**	**Strength**	**Weathering**	**Comment**	
0	0.6	Silty Gravel: fine to coarse angular gravels (laminated slate), red, low plasticity fines, <PL,	VD	RS	Residual soil	2
0.6	1.2	Slate: red, tabular, thinly laminated	VLS	HW	very low strength rock	3
1.2	2	Slate: red, tabular, thinly laminated	LS	H/MW	bedrock with clay defects.	4
2	3	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
3	4	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5
4	5	Slate: red, tabular, thinly laminated	MS	SW	Stained to <1mm veneer on defects	5

Note adjustments to depth of bedrock unit to be made given location of drilling and proposed structure location.
Refer to site classification note for further descriptions. All boreholes met intended depths.

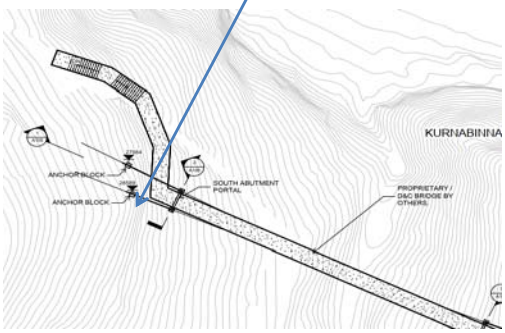
Client	Aspect Studio
Project	Coastal Walk Way - Bridge Foundation Investigation
Project Number	ADL2022-0050 Rev0
Topic	Existing Slope - Rock Mass Mapping
Author	John Slade
Date	21/02/2022

Window Map **Location:** Kurnabinna South **Window Map** Lower batter mapping

* assessment of a 1m squared area



Location Sketch:



Rock Mass Classification

Fracture Frequency (per m)	Block Size (m)	Average GSI	RQD%	Joint Sets	Joint Roughness	Joint Alteration	Joint Water
9	0.2x0.15x0.1	40 to 50	90	3	Ro, St	<1mm veneer	none

Discontinuity Characteristics

Type	Dip	Dip Direction	Infill Type	Infill (mm)	Persistence (m)	Planarity	Roughness	Spacing (m)
Bed parting	0.1	300	Veneer	<1	0.3	St	Ro	0.1
Joint	81	31	Veneer	<1	0.7	St	Ro	0.2
Cleavage	78	128	Stain	<1	0.5	Ir	Ro	0.1

Rock Classification

Rock Type	Rock Fabric	Average Intact Rock Strength Is(50)	Average Weathering
Slate	Laminated	>1 <3	M/SW

Comment:

Lower slope profile. Horizontal fractures and subvertical collumnar fractures within basaltic unit.
View looking west at southern Kurnabinna

