Bayview Golf Club

Acid Sulfate Soil Assessment: Green Renovation Works Bayview Golf Course, Cabbage Tree Road, Bayview, NSW

P2309440JR02V01
April 2023

martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to complete an Acid Sulfate Soil Assessment in accordance with the scope of services set out in the contract/quotation between Martens & Associates Pty Ltd and Bayview Golf Club (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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Contents

1 Introduction

1.1 Overview and Scope of Work

This report, prepared by Martens and Associates (MA), on behalf of Bayview Golf Club, documents the findings of an acid sulfate soil (ASS) assessment undertaken for proposed green renovation works at Bayview Golf Course, Cabbage Tree Road, Bayview, NSW (the site). The investigation area is shown on Figure 1, Attachment A.

The objectives of the ASS assessment were:

- Preliminary ASS assessment of the site (desktop assessment).
- Field investigations and targeted laboratory testing of soils.
- Determine if an ASS management plan (ASSMP) is required.

1.2 Previous Assessments

In 2017 and 2021, MA completed ASS assessments for the site to inform proposed site development plans which including earthworks for flood mitigation measures and drainage works. Laboratory results from these assessments (MA, 2017, MA, 2021) have been considered as part of this current ASS assessment where necessary.

1.3 Proposed Development

From the plans provided by the client (CC, 2023), we understand that the proposed development is to upgrade 12 greens, requiring varying amounts of cut and fill across the works areas. It is understood that the maximum proposed excavation depth is 1.75 mbgl. An assessment of maximum excavation at each green, soil strata at depth of excavation and ASS considerations is presented in Table 4 in Section 6.3 of this report.

The most recent proposed development plans are provided in Attachment B.

1.4 Guidelines

This investigation was undertaken in general accordance with the following guidelines:

- Acid Sulfate Soil Management Advisory Committee (1998), *Acid Sulfate Soil Manual*. Referred to as ASSMAC (1998)

- Qld Natural Resources, Mines and Energy (2004) Acid Sulfate Soils Laboratory Methods Guidelines.

2 Site Description

Site Details are summarised in Table 1.

Table 1: Site details.

Item	Description / Detail
Site address	Bayview Golf Club 1825 Pittwater Rd, Mona Vale NSW 2103
Legal Identifier	Lot 1 DP 662920 Lot 1 DP 19161 Lot 5 DP 45114 Lot 191 DP 1039481 Lot A DP 339874 Lot 150 DP 1003518 Lot 191 DP 1039481 Lots 1, 2 and 3 DP 986894 Lot 300 DP 1139238
Approximate Area	Approximately 38.42 Ha (Six Maps, 2021).
Local Government Area	Northern Beaches Council (formerly Pittwater Council).
Site description	The site is developed and vegetated for golf course purposes. Cabbage Tree Road bounds the site to the north, Parkland Road borders the site to the west.
Topography	The NSW Office of Environment and Heritage's (OEH) information system indicates the site topography to comprise as follows: North, north east and north east portion o Terrain disturbed by human activity, with local relief < 2 m. o Disturbed ground landscaped to include berms, cut faces, embankments, mounds, pits and trenches. Slopes levelled to < 3 %. Eastern portion o Flooded valleys infilled with alluvium and surrounded by steep to precipitous Hawkesbury sandstone slopes. o Gently undulating alluvial floodplain with slopes < 3 %. Elevation is < 10 m. South east portion o Gently undulating plains and rolling undulating rises of broad, level to very gently inclined, swales and dunes. o Elevation and local relief is usually < 20 m. o Isolated steep rises with slopes up to 35 % are present. There are depressions and swamps at northern and eastern portion of the site where water gets collected during the rainfall events. The Cahill creek inside the site runs from northern to eastern portion of the site.
Typical slopes, elevation	Slopes are generally low (<2%) and elevation generally ranges from approximately 1 to 2 mAHD.
Expected geology and soils	The published geological map covering this area indicates that the development area is predominantly underlain by Quaternary deposits: silty to peaty quartz sand, silt, and clay with ferruginous and humic cementation in places and common shell layers.

Item	Description / Detail
	The north western portion is indicated to be underlain by Hawkesbury sandstone: medium to coarse grained quartz sandstone, very minor shale and laminite lenses (Sydney 1:100 000 Geological Sheet 9130, 1st edition). The Sydney 1:100,000 Soil Landscape Map 9130 (Soil Conservation Service of NSW) indicates the majority of the site as being part of the Erina erosional landscape, consisting of undulating to rolling rises and low hills. Soils are moderately deep to deep. The eastern corner of the site is mapped as being part of the Deep Creek fluvial landscape, consisting of level to gently undulating alluvial floodplains draining the Hawkesbury Sandstone local relief.
Drainage	Depressions and swamps in the northern and eastern portions of the site collect water during rainfall events. Cahill Creek flows from the northern to the eastern portion of the site. The site generally drains generally centrally to an inlet which ultimately connects to Winnererremy Bay, Pittwater, located approximately 260 m north east of the site.
Vegetation	Predominantly grass on fairways, edges of fairways have trees (typically Casuarinas and Melaleucas). Mangroves on perimeter of some areas of the inlet which connects to Winnererremy Bay.

3 Preliminary Assessment

3.1 Acid Sulfate Soil Risk Map Classification

The Pittwater Council ASS risk map classifies the northwest portion of the site as typically Class 5 land, with a band of class 2 in the southeast corner. We note that this area is outside of the proposed development footprint.

The majority of the main golf course (including the greens proposed for upgrade works) is classified as Class 2 land, with a band of Class 3 land in the southern-most portion of the site.

Site location relating to ASS risk is presented in Figure 2 Attachment A.

3.2 Geomorphic Setting

The likelihood of ASS occurrence at a site is a function of various geomorphic parameters, in particular those listed in ASSMAC (1998). Each is an indicator that ASS are likely to be present onsite.

Table 2: Geomorphic features indicative of acid sulfate soils.

Geomorphic Feature	Present on site? Area of proposed development footprint
Holocene sediments	Yes
Soil horizons less than 5 m AHD	Yes
Marine / estuarine sediments or tidal lakes	Yes
Coastal wetland; backwater swamps; waterlogged or scaled areas; inter-dune swales or coastal sand dunes (i.e. deep excavation is required)	Yes
Dominant vegetation is mangroves, reeds, rushes and other swamp or marine tolerant species.	Not currently. Remanent mangroves and acid tolerant species (Casuarinas and Melaleucas).[1]
Geologies containing sulfide bearing material / coal deposits or former marine shales/sediments	Possible[2]
Deep older (Holocene or Pleistocene) estuarine sediments > 10 mBGL (if deep excavation or drainage is proposed)	No

Notes:
[1] May have been present prior to golf course development.
[2] Possibly in fill materials.

3.3 Preliminary Conclusion

As the site is predominantly mapped as Class 2 and some of the geomorphic features listed are either present or may formerly have been on-site, indicating that the geomorphic site setting is indicative of potential ASS (PASS) or ASS, an intrusive investigation, with laboratory testing of soils, is required.

4 ASS Assessment Criteria

4.1 Action Criteria

Samples were selected for peroxide oxidation combined acidity and sulfate (sPOCAS) analysis and assessed using Table 4.4 of ASSMAC (1998). The proposed development excavation works at each green (treated as separate locations) have been assessed as generating less than 1000 tonnes of disturbed soil and therefore the analytical results are assessed against the following criteria:

- Sulfur Trail - Oxidisable sulfur (S_{POS}) is > 0.03, 0.06, 0.1% for coarse, medium and fine textured soils respectively; or
- Acid Trail - TPA or TSA is > 18, 36, 62 mol H^+/tonne for coarse, medium and fine textured soils respectively.

If this criteria is exceeded, a detailed management plan and development consent is required.

5 Field Investigations

Site investigation works were undertaken on 1 March, 2023 which included excavation of 18 boreholes (BH101a to BH112b) to a maximum of 1.6 mBGL, and collection of soil samples for laboratory testing.

Generally, a minimum of one borehole was excavated at each green with the exception of the 13th green, which had minimal proposed excavation. Data from previous ASS investigations (MA, 2017 and MA 2021) will be used to assess ASS risk at this location if excavation depth changes.

A summary of sampling completed at each green is provided in Table 3

Table 3: Testing and Saple Summary

Green Number	Samples collected
1	BH101a 0.1 – 0.3, BH101a 0.6 – 0.8, BH101a 1.2 – 1.4, BH101b 0.2 – 0.4, BH101b 0.7 – 0.9, BH101b 1.4 – 1.5
2	BH102 0.2 – 0.4, BH102 0.6 – 0.8, BH102 1.0 – 1.2
3	BH103 0.1 – 0.3, BH103 0.3 – 0.5, BH103 0.6 – 0.7
4	BH104 0.1 – 0.3, BH104 0.5 – 0.7, BH104 1.0 – 1.2
5	BH105a 0.1 – 0.2, BH105a 0.4 – 0.6, BH105a 0.7 – 0.9, BH105b 0.0 – 0.2, BH105b 0.6 – 0.8, BH105b 1.0 – 1.2
6	BH106 0.2 – 0.4, BH106 0.4 – 0.6
7	BH107a 0.1 – 0.3, BH107b 0.5 – 0.7, BH107a 1.0 -1.2, BH107b 0.2 – 0.4, BH107b 0.5 – 0.7, BH107b 1.0 – 1.2
8	BH108 0.1 – 0.4, BH108 0.8 – 1.0, BH108 1.3 – 1.5
10	BH110 0.1 – 0.3, BH110 0.7 – 0.9, BH110 1.1 – 1.4
11	BH111a 0.2 – 0.4, BH111a 0.7 – 0.9, BH111a 1.0 – 1.2, BH111b 0.1 – 0.3, BH111b 0.5 – 0.7, BH111b 1.0 – 1.2
12	BH112b 0.2 – 0.4, BH112b 0.5 – 0.7, BH112 1.1 – 1.3
13	Nil [1]

Notes:
1 No borehole undertaken at green 13 due to limited proposed excavation.

Soil sampling was completed in general accordance with guidance outlined in the ASSMAC (1998) guidelines. Based on our understanding of the proposed development (outlined in Section 1.3), excavation works are expected to extend to up to a maximum depth of 1.75 mBGL.

Site testing locations are shown in Attachment A.

5.1 Sub-Surface Conditions

Intrusive investigations generally encountered fill and alluvial soils comprising silt, sandy silt, clayey silt, sand, silty sand and clayey sand to investigation depths of 1.6 mBGL. Residual soil (clay and sandy clay) was encountered beneath overlying fill and / or alluvium to investigation depths of 1.6 mBGL where encountered.

Borehole logs are provided in Attachment C.

5.2 Groundwater

Saturated soils were encountered in the southeast portion of the site below depths ranging from 0.8 – 1.3 mBGL. Based on saturated soil depths and the existing 0.25 m contour site plan, a permanent water table is expected beneath the main golf course at a level of the order of 0.1 to 0.5 mAHD.

6 Laboratory Analysis

6.1 Soil Sampling Regime

13 samples taken from BH101a – BH112b were selected for laboratory analysis for Suspension Peroxide Oxidation Combined Acidity and Sulphur (sPOCAS).

6.2 Soil Analytical Results

sPOCAS laboratory results are summarised in Table 4, with laboratory analytical documentation provided in Attachment D.

Table 4: ASS Analytical Results

Borehole number	Sample Depth	Material	pH_F	pH_{Fox}	ΔpH	TPA[1]	TSA[2]	S_{POS}[3]
Criteria (F, M, C)			**≤4.0**	**<3.5 or**	**>1 pH unit change**	**>18 >36 >62**	**>18 >36 >62**	**>0.03 >0.06 >0.10**
BH101a	1.2-1.4	Silty CLAY	8.7	7.6	**1.0**	<5	<5	**0.11**
BH101b	1.0-1.2	Silty CLAY	8.9	7.6	0.7	<5	<5	**0.06**
BH102	1.4-1.5	Sandy CLAY	6.2	5.2	**1.0**	<5	<5	0.05
BH105a	0.7-0.9	Silty CLAY	6.6	6.9	0.3	<5	<5	0.02
BH105b	1.0-1.2	Silty CLAY	4.3	3.9	0.4	<5	<5	0.01
BH107a	1.0-1.2	Clayey SAND	5.5	3.9	**1.6**	<5	<5	0.01
BH107b	1.0-1.2	Silty CLAY	6.4	5.6	0.8	<5	<5	**0.07**
BH108	0.8-1.0	Sandy CLAY	5.7	5.4	0.3	<5	<5	0.03
	1.3-1.5	Clayey SAND	5.6	**2.8**	**2.8**	**160**	**160**	**0.26**
BH110	0.7-0.9	Silty SAND	6.1	3.6	**2.5**	<5	<5	0.01
	1.1-1.4	Sandy silty CLAY	4.4	**2.4**	**2.0**	**820**	**800**	**1.3**
BH111a	1.0-1.2	Silty CLAY	6.3	5.0	**1.3**	<5	<5	0.07
BH112b	1.1-1.4	Clayey SAND	8.7	5.2	**3.5**	<5	<5	**0.28**

Notes:
1 Titratable Peroxide Acidity (Moles H+/tonne); 2 Titratable Sulfidic Acidity (Moles H+/tonne); 3 Oxidisable sulfur (%); Highlighted/bold values exceed ASSMAC action criteria.

6.3 Discussion and Conclusion

Table 5 provides a summary of the assessment findings relative to each green proposed for upgrade works.

Table 5: Results summary.

Green number	Maximum Excavation Depth	End Excavation Strata	Sample	ASS Consideration
1	0.75	Fill	BH101a 1.2-1.4, BH101b 1.0-1.2	PASS material not reached by excavation.
2	0.25	Fill	BH102 1.4-1.5	PASS material not encountered.
3	1.25	Inferred Alluvium	BH108 1.3-1.5	Inferred profile from nearby BH108 – PASS material highly likely to be exposed by excavation. **Management plan required**
4	1.25	Residual Soil	-	Residual soil at elevation not considered an ASS risk.
5	0.75	Residual Soil	BH105a 0.7-0.9, BH105b 1.0-1.2	PASS material not encountered.
6	1.75	Inferred Residual Soil	-	Residual soil at elevation not considered an ASS risk.
7	0.75	Fill	BH107a 1.0-1.2, BH107b 1.0-1.2	PASS material not reached by excavation.
8	0.75	Alluvium	BH108 0.8-1.0	PASS material not reached by excavation.
10	0.25	Fill	BH110 0.7-0.9 BH110 1.1 – 1.4	PASS material not reached by excavation.
11	1.75	Alluvium	BH111a 1.0-1.2	Laboratory indication of PASS likely a result of natural soil pH levels, not considered an ASS risk.
12	-	Fill	BH112b 1.1-1.4	PASS material not reached by excavation.
13	0.25	Inferred Fill	-	Inferred profile indicates PASS material not reached by excavation.

In light of the results of this assessment we make the following conclusions and recommendations:

- Laboratory results indicate that 9 of the 13 samples tested are PASS and 6 of the 12 samples have TPA, TSA or S_{pos} above the ASSMAC (1998) action criteria.

- Laboratory results indicated that little to no acid neutralising capacity remained in the soil profile.

- Suggested liming rates (as outlined in the laboratory documentation) are highly variable ranging from 0.75 to 65 kg / tonne of disturbed soil.

Due to the variability of the site, elevations, proposed works and excavation depths, and the variability of laboratory testing results, each green has been evaluated individually.

A management plan (ASSMP) is required for the third green to address risks associated with PASS during site works. The works will fall under a low to medium treatment category as per Table 4.5 in ASMAC (1998).

Other greens are unlikely to intercept PASS at proposed depth of excavation, and / or have been assessed to have a negligible acid generation risk and low liming rate. If proposed excavation depths are changed, MA should be consulted to confirm new excavation depths to not required further ASS management.

Provided the ASSMP is implemented for works associated with the third green, acidic soil conditions should not restrict the proposed development.

7 Limitations

The recommendations presented in this report include specific issues to be addressed during the design and construction phases of the project. In the event that any of the recommendations presented in this report are not implemented, the general recommendations may become inapplicable and Martens & Associates Pty Ltd accept no responsibility whatsoever for the performance of the works undertaken where recommendations are not implemented in full and properly tested, inspected and documented.

Occasionally, sub-surface conditions between and below the completed boreholes or other tests may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact Martens & Associates Pty Ltd.

8 References

Acid Sulfate Soil Management Advisory Committee (1998) *Acid Sulfate Soil Manual*.

Chrisp Consulting (2023), Sediment and Erosion Control Management, Bayview Golf Club Job No. 23003, drawing No. C100, C110 to C122, Revision B, dated 22 February 2023 (CC, 2023).

Martens and Associates (2017), *Acid Sulfate Soil Assessment: Proposed Flood Mitigation Earthworks, Bayview Golf Course, Cabbage Tree Road, Bayview, NSW, Report reference no.* P1706099JR04V01, dated 29 November 2017 (MA, 2017).

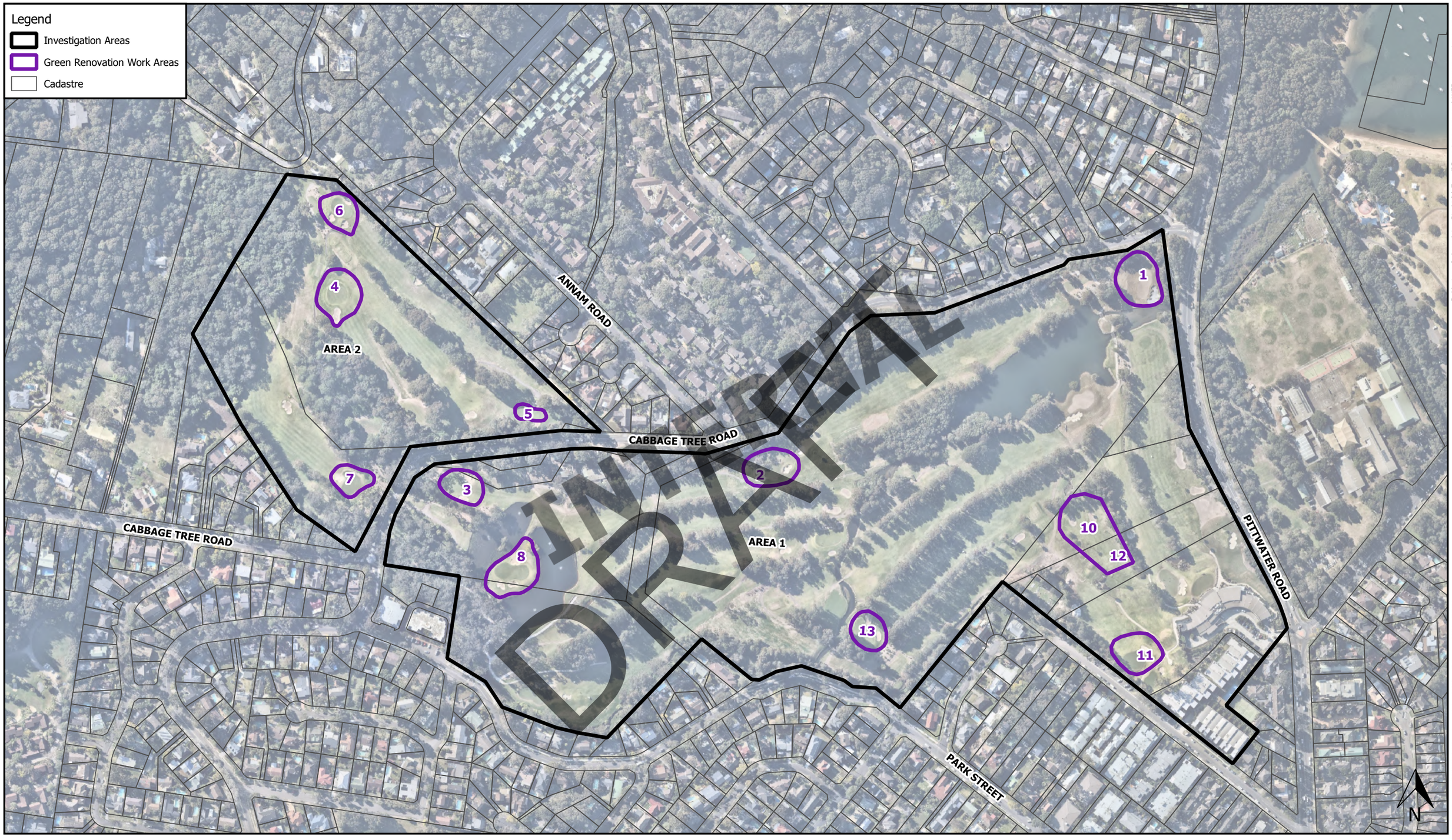
Martens and Associates (2021), *Acid Sulfate Soil Assessment: Stormwater Harvesting and Irrigation Wworks, Bayview Golf Course, Cabbage Tree Road, Bayview, NSW, Report reference no.* P2108584JR02V01, dated 17 October 2021 (MA, 2021).

Northern Beaches Council (2015) *Development Control Plan, Amendment 19.*

NSW Department of Mineral Resources (1983), *Sydney 1:100,000 Geological Sheet 9130.*

Qld Natural Resources, Mines and Energy (2004) *Acid Sulfate Soils Laboratory Methods Guidelines*.

9 Attachment A – Site Plans



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Viewport

Notes:
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- Cadastre from NSW DFSI Clip and Ship (2023)

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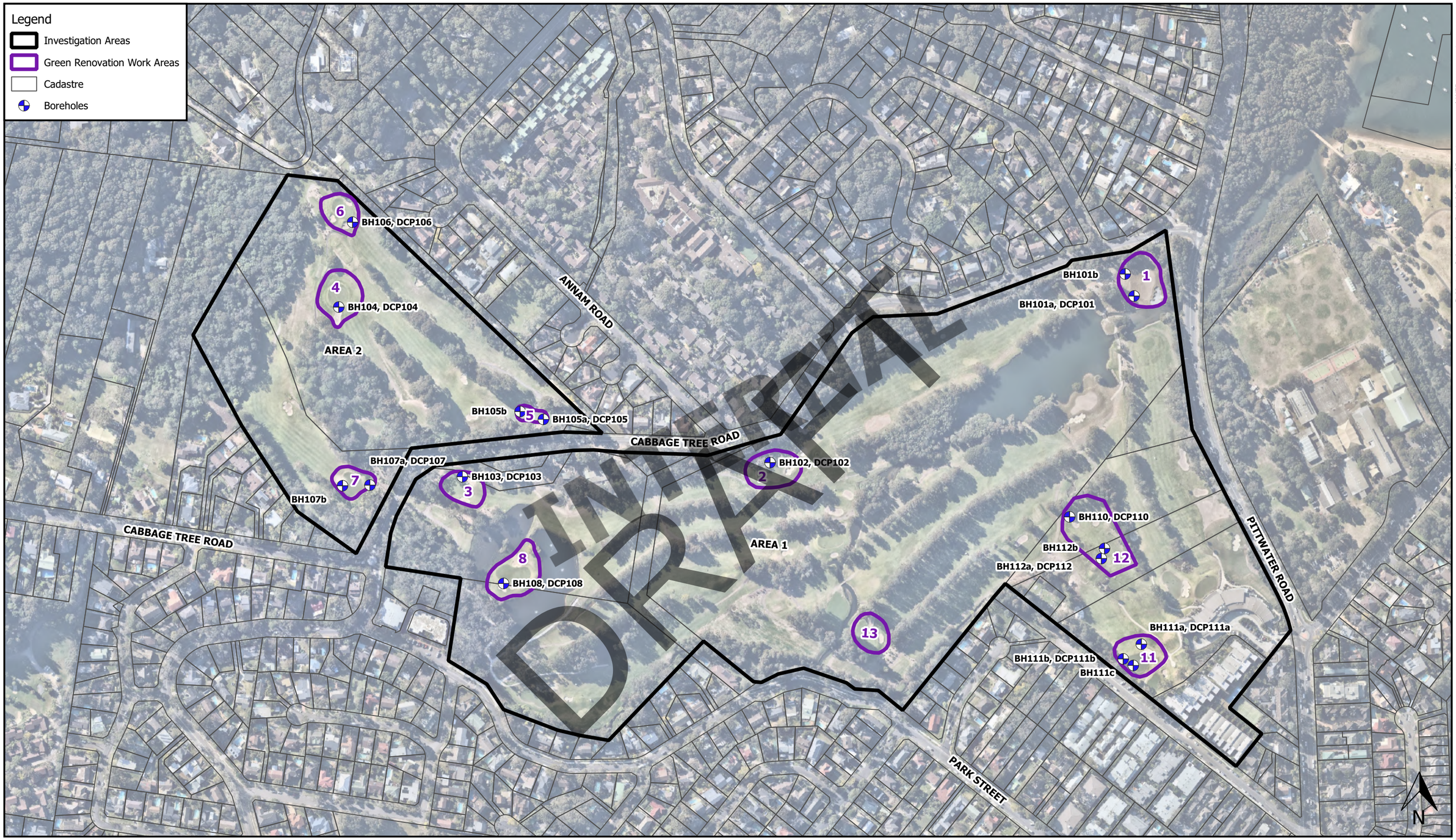
Map Title / Figure:
Site Layout

GE01	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date



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Viewport

Notes:
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- Cadastre from NSW DFSI Clip and Ship (2023)

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Map Title / Figure:

Borehole Location Plan

GE02	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date

Legend

- Investigation Areas
- Green Renovation Work Areas
- Cadastre

Geotechnical Hazard

- H1
- H2

ANNAM ROAD

AREA 2

AREA 1

CABBAGE TREE ROAD

CABBAGE TREE ROAD

PITTWATER ROAD

PARK STREET

1 2 3 4 5 6 7 8 10 11 12 13

N

0 40 80 120 160 200 m

1:4000 @ A3

Viewport

Notes:
- Aerial from Nearmap (2021)
- Cadastre from NSW DFSI Clip and Ship (2023)
- Geotechnical hazard areas from Pittwater Local Environmental Plan LEP 2014

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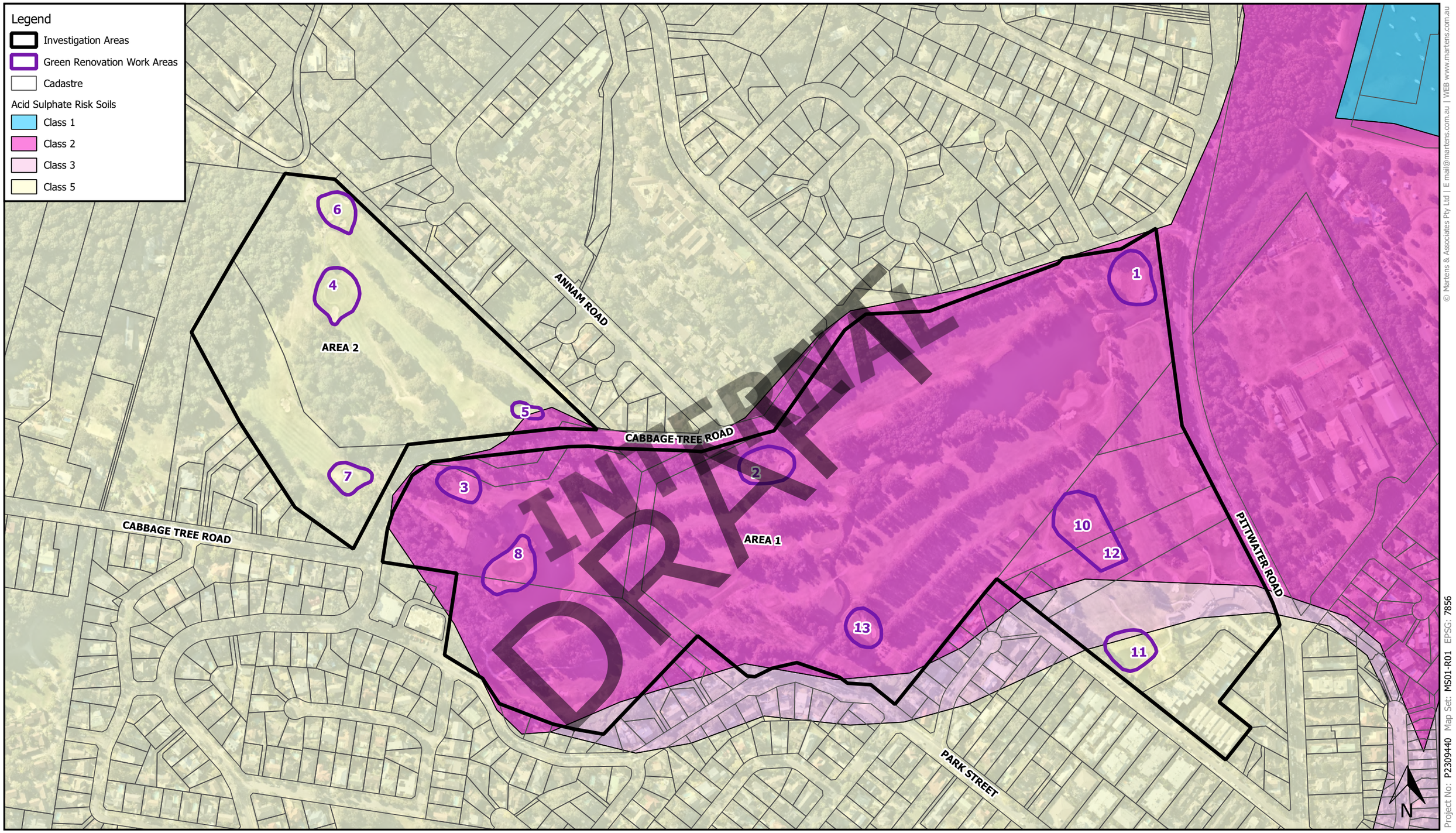
Map Title / Figure:

Geotechnical Hazard Identification

GE03	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date

Project No: P2309440 Map Set: MS01-R01 EPSG: 7856



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Viewport

Notes:
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- Cadastre from NSW DFSI Clip and Ship (2023)
- Acid Sulphate Soils from NSW DPIE (2020)

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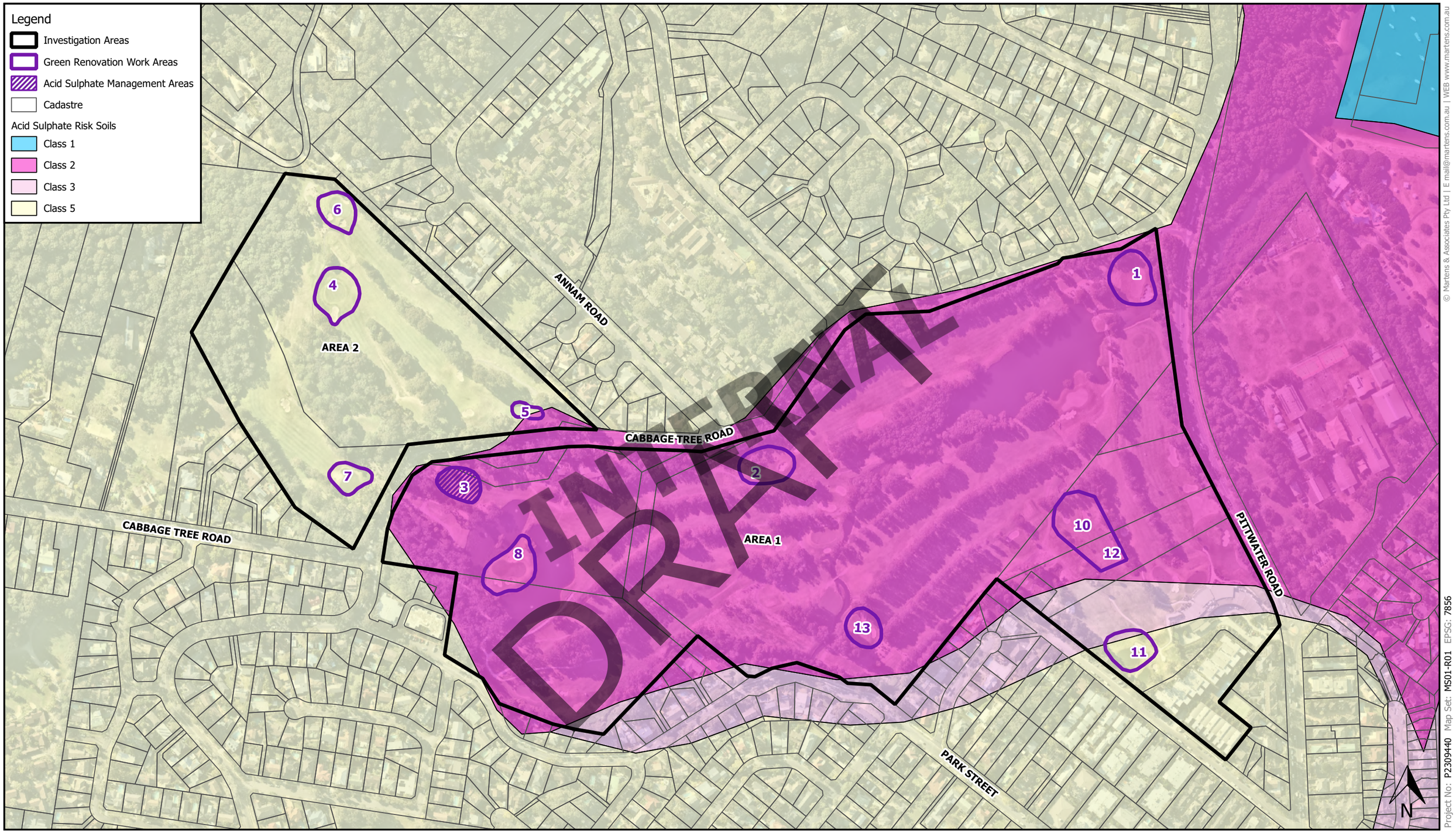
Map Title / Figure:

Pittwater Acid Sulphate Risk Map

GE04	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date



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Viewport

Notes:
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- Acid Sulphate Soils from NSW DPIE (2020)

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Map Title / Figure:

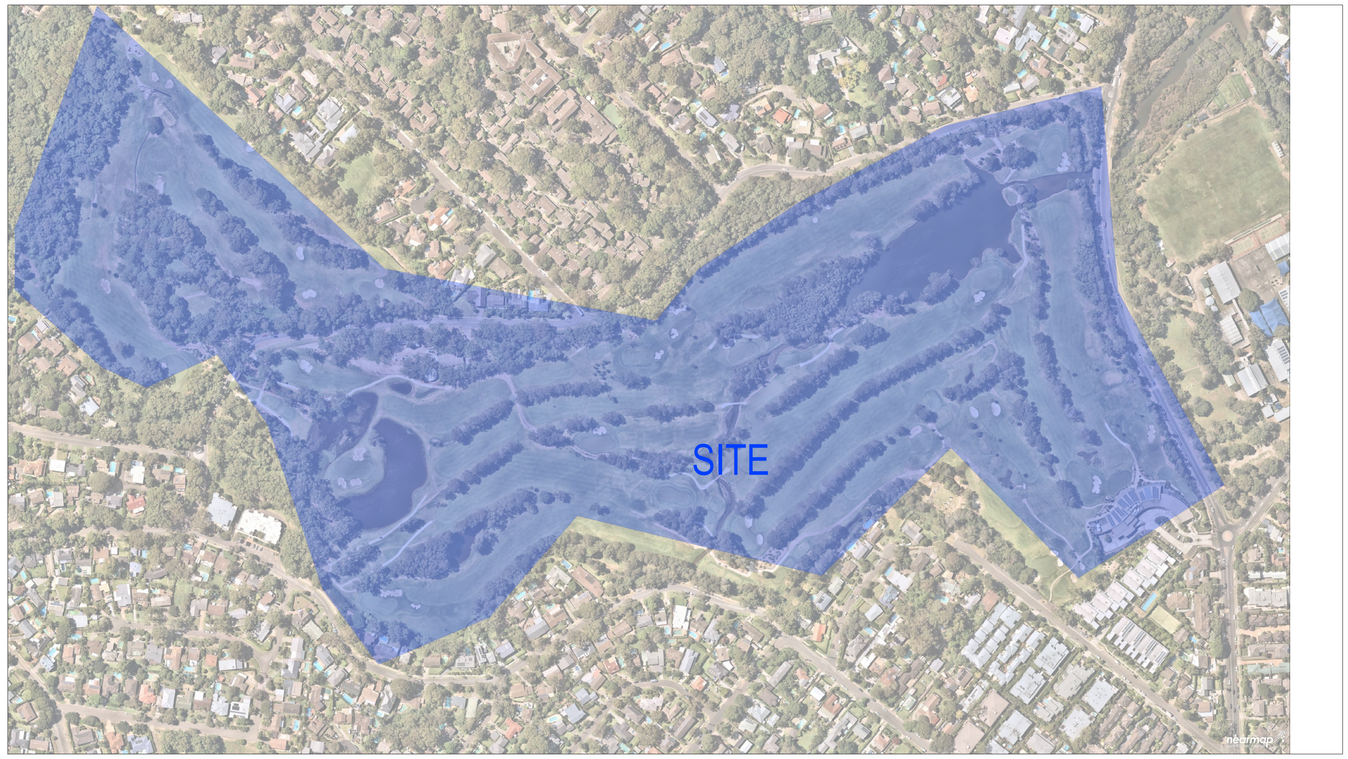
Acid Sulphate Management Areas

GE05	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date

10 Attachment B – Proposed Plans

SEDIMENT & EROSION CONTROL MANAGEMENT
BAYVIEW GOLF CLUB

DRAWING LIST	
DRAWING No.	DRAWING TITLE
C100	TITLE PAGE & LOCALITY PLAN
C110	ZONE MAP AREAS & GENERAL WORKS
C111	1ST GREEN DETAIL PLAN
C112	2ND GREEN DETAIL PLAN
C113	3RD GREEN DETAIL PLAN
C114	4TH GREEN DETAIL PLAN
C115	5TH GREEN DETAIL PLAN
C116	6TH GREEN DETAIL PLAN
C117	7TH GREEN DETAIL PLAN
C118	8TH GREEN DETAIL PLAN
C119	10TH GREEN DETAIL PLAN
C120	11TH GREEN DETAIL PLAN
C121	12TH GREEN DETAIL PLAN
C122	13TH GREEN DETAIL PLAN
C130	TYPICAL SEDIMENT & EROSION CONTROL DETAILS



LOCALITY PLAN

1825 PITTWATER ROAD, MONA VALE NSW, 2103, AUSTRALIA

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IMPORTANT: THE CONTRACTOR IS TO MAINTAIN A CURRENT SET OF "BEFORE YOU DIG AUSTRALIA" DRAWINGS ON SITE AT ALL TIMES.

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REV	DATE	REVISION DESCRIPTION
A	27.02.2023	ISSUE FOR REVIEW AND COMMENT

TITLE	NAME
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DRG CHECK	CP
DESIGN CHECK	AL
APPROVED	CP

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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT

BAYVIEW GOLF CLUB

TITLE PAGE & LOCALITY PLAN

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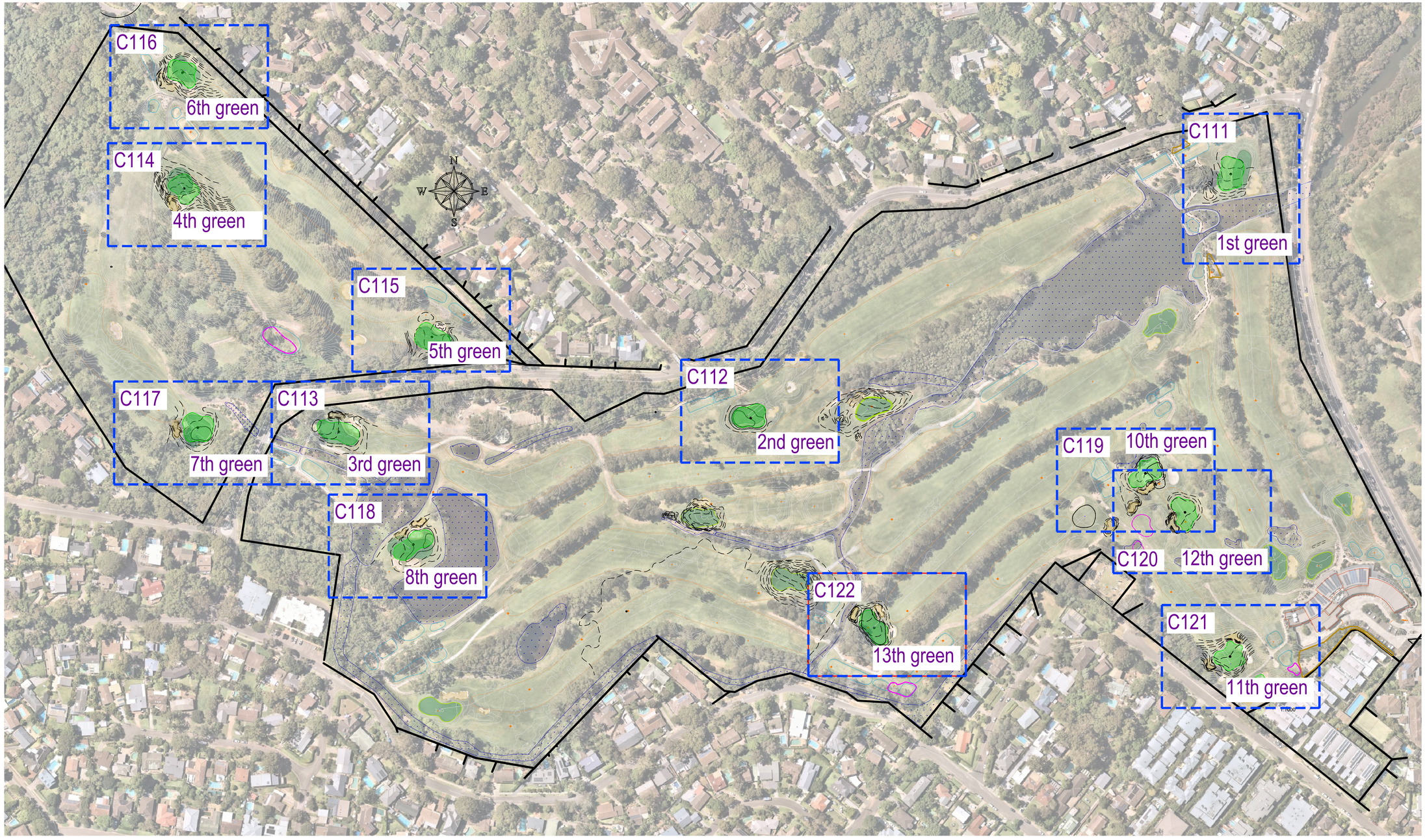

ISSUE FOR DEVELOPMENT APPLICATION

REV	DATE	REVISION DESCRIPTION
A	27.02.2023	ISSUE FOR REVIEW AND COMMENT

TITLE	NAME
DRAWN	DI
DESIGNED	CP
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DESIGN CHECK	AL
APPROVED	CP

BAYVIEW GOLF CLUB

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Turramurra
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N

SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

ZONE MAP AREAS & GENERAL WORKS

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	NTS	C110	A

THIS TEXT TO BE PRINTED IN COLOUR

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

	FROM	TO
	-2.00	-1.75
	-1.75	-1.50
	-1.50	-1.25
	-1.25	-1.00
	-1.00	-0.75
	-0.75	-0.50
	-0.50	-0.25
	-0.25	-0.001
	-0.000	0.000
	0.001	0.25
	0.25	0.50
	0.50	0.75
	0.75	1.00
	1.00	1.25
	1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole												TOTAL m3
		1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3
0 2.5 5 10 15 20 25 metres

THIS TEXT TO BE PRINTED IN COLOUR

ISSUE FOR DEVELOPMENT APPLICATION

REV	DATE	REVISION DESCRIPTION
A	27.02.2023	ISSUE FOR REVIEW AND COMMENT
B	28.02.2023	CUT & FILL COLOURS ADDED AND UPDATED QUANTITIES

TITLE	NAME
DRAWN	DI
DESIGNED	CP
DRG CHECK	CP
DESIGN CHECK	AL
APPROVED	CP

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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

1ST GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C111	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

	FROM	TO
	-2.00	-1.75
	-1.75	-1.50
	-1.50	-1.25
	-1.25	-1.00
	-1.00	-0.75
	-0.75	-0.50
	-0.50	-0.25
	-0.25	-0.001
	-0.000	0.000
	0.001	0.25
	0.25	0.50
	0.50	0.75
	0.75	1.00
	1.00	1.25
	1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

2ND GREEN DETAIL PLAN

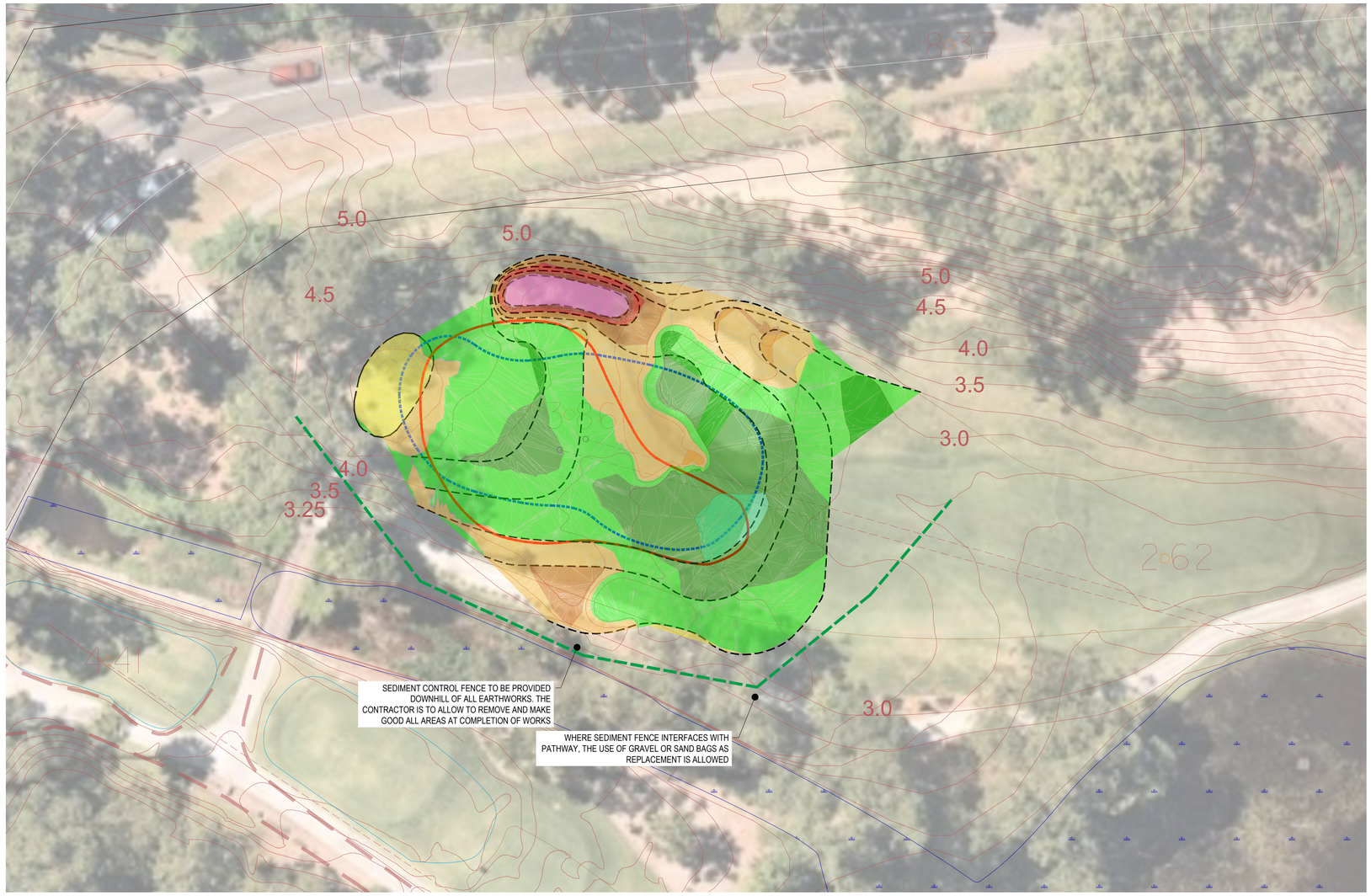
JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C112	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50



CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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3RD GREEN DETAIL PLAN

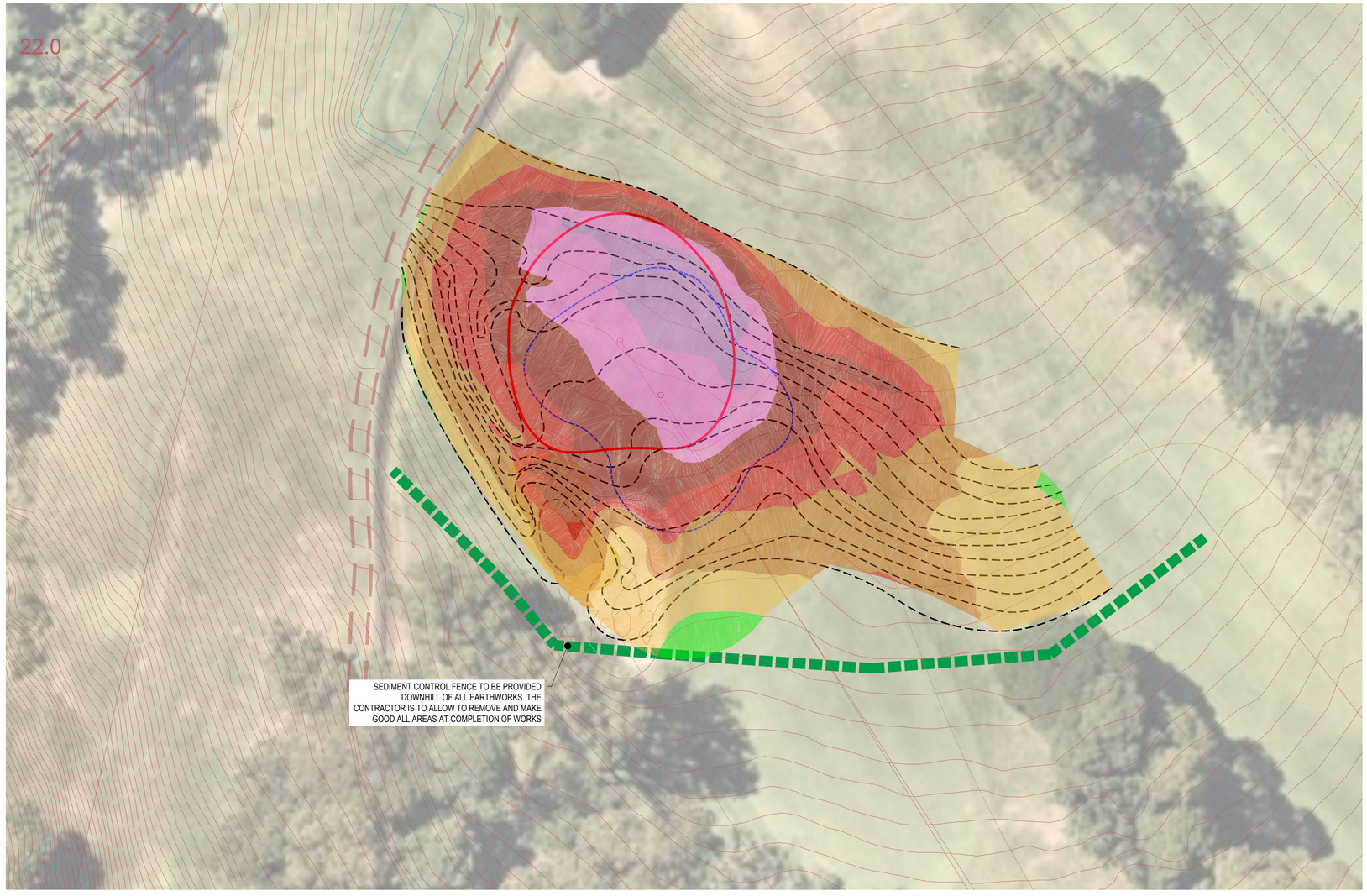
JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C113	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50



CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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4TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C114	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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5TH GREEN DETAIL PLAN

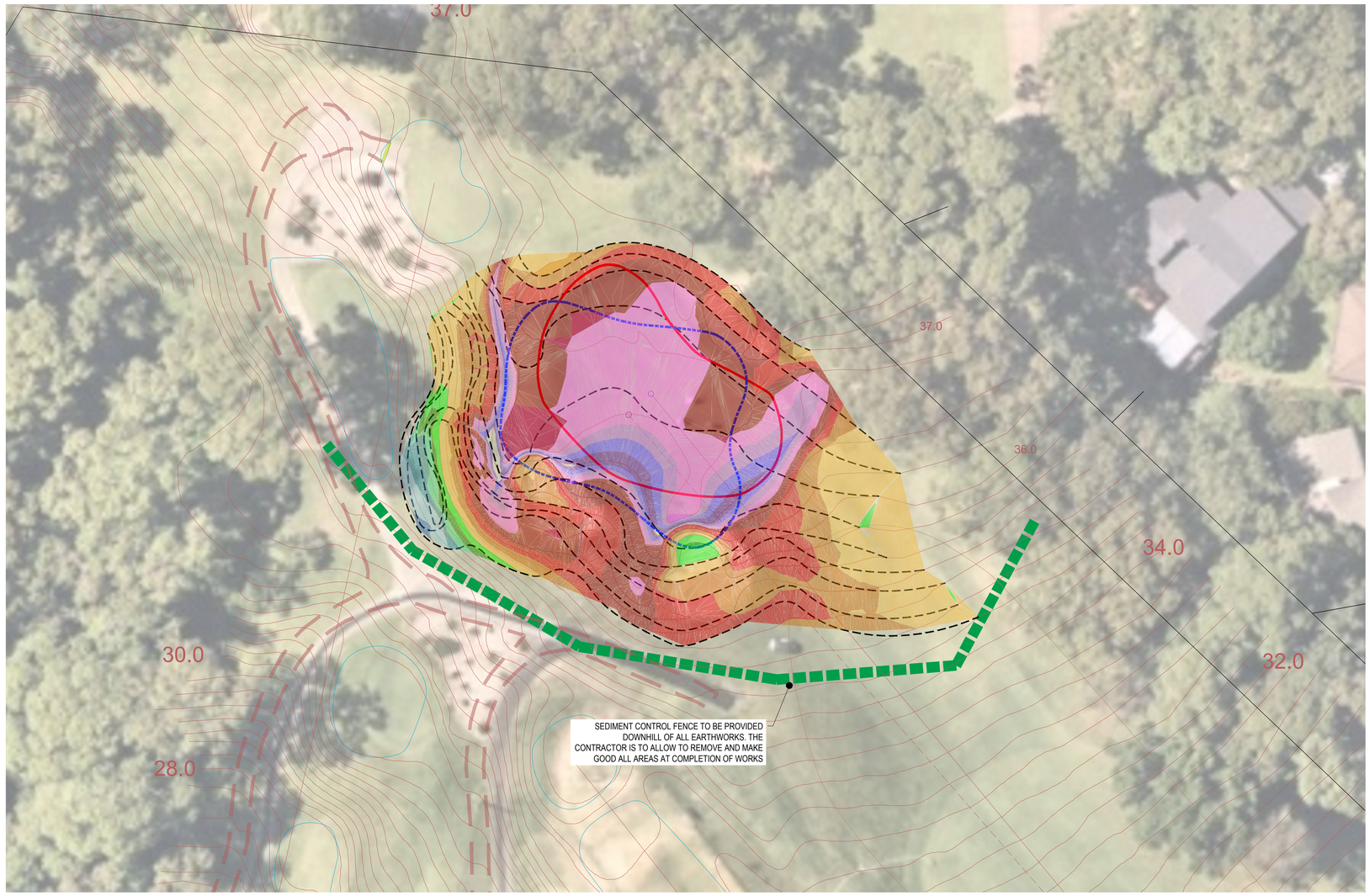
JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C115	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50



CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole												TOTAL m3
		1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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6TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C116	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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7TH GREEN DETAIL PLAN

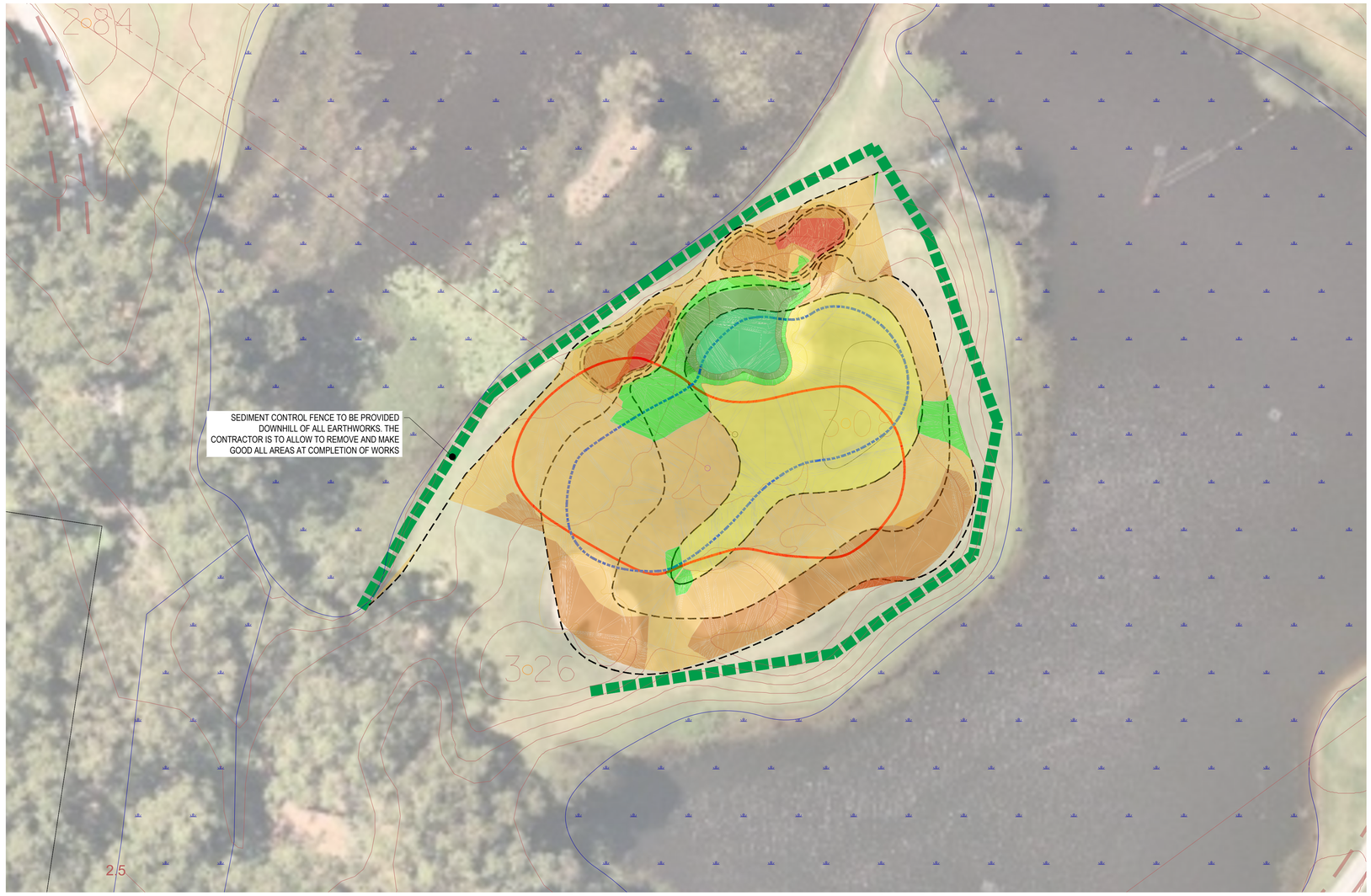
JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C117	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50



CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
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	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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8TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C118	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

	FROM	TO
	-2.00	-1.75
	-1.75	-1.50
	-1.50	-1.25
	-1.25	-1.00
	-1.00	-0.75
	-0.75	-0.50
	-0.50	-0.25
	-0.25	-0.001
	-0.000	0.000
	0.001	0.25
	0.25	0.50
	0.50	0.75
	0.75	1.00
	1.00	1.25
	1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3
0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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10TH GREEN DETAIL PLAN

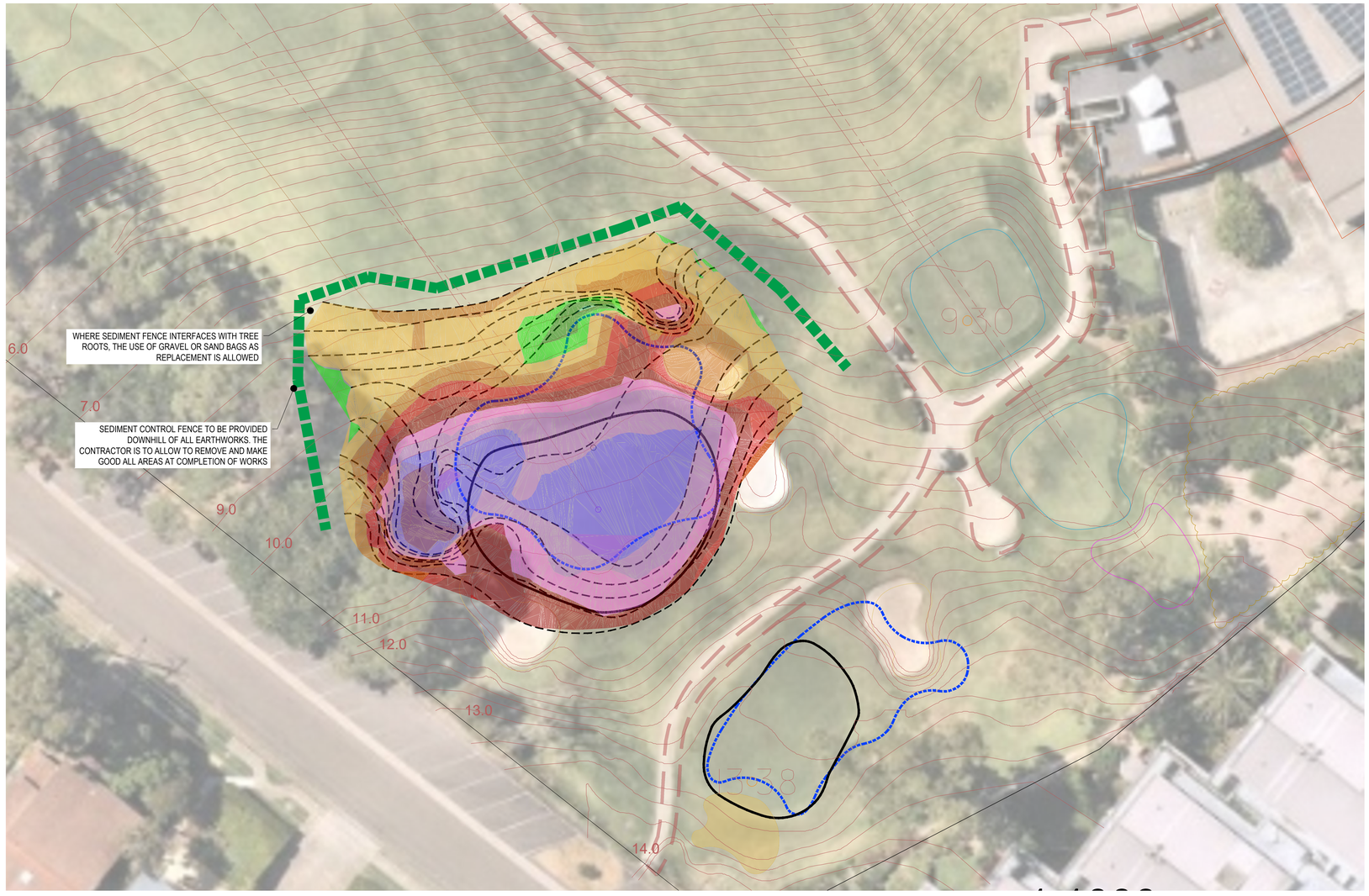
JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C119	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

	FROM	TO
	-2.00	-1.75
	-1.75	-1.50
	-1.50	-1.25
	-1.25	-1.00
	-1.00	-0.75
	-0.75	-0.50
	-0.50	-0.25
	-0.25	-0.001
	-0.000	0.000
	0.001	0.25
	0.25	0.50
	0.50	0.75
	0.75	1.00
	1.00	1.25
	1.25	1.50



CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole												TOTAL m3
		1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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11TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C120	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

FROM	TO
-2.00	-1.75
-1.75	-1.50
-1.50	-1.25
-1.25	-1.00
-1.00	-0.75
-0.75	-0.50
-0.50	-0.25
-0.25	-0.001
-0.000	0.000
0.001	0.25
0.25	0.50
0.50	0.75
0.75	1.00
1.00	1.25
1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole 1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	TOTAL m3
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

THIS TEXT TO BE PRINTED IN COLOUR

REV	DATE	REVISION DESCRIPTION
A	27.02.2023	ISSUE FOR REVIEW AND COMMENT
B	28.02.2023	CUT & FILL COLOURS ADDED AND UPDATED QUANTITIES

TITLE	NAME
DRAWN	DI
DESIGNED	CP
DRG CHECK	CP
DESIGN CHECK	AL
APPROVED	CP

ISSUE FOR DEVELOPMENT APPLICATION

BAYVIEW GOLF CLUB

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Turramurra
New South Wales, Australia 2074
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N

SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

12TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C121	B

LEGEND

- PROPOSED SANDTRAP
- EXISTING GREEN
- PROPOSED GREEN
- EXISTING CONTOUR
- PROPOSED CONTOUR
- SEDIMENT FENCE

CUT & FILL LEGEND

	FROM	TO
	-2.00	-1.75
	-1.75	-1.50
	-1.50	-1.25
	-1.25	-1.00
	-1.00	-0.75
	-0.75	-0.50
	-0.50	-0.25
	-0.25	-0.001
	-0.000	0.000
	0.001	0.25
	0.25	0.50
	0.50	0.75
	0.75	1.00
	1.00	1.25
	1.25	1.50

CUT AND FILL VOLUMES

Assessment Surfaces	Volumes m3	Hole												TOTAL m3
		1st	2nd	3rd	4th	5th	6th	7th	8th	10th	11th	12th	13th	
Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

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ISSUE FOR DEVELOPMENT APPLICATION

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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

13TH GREEN DETAIL PLAN

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	1:250	C122	B

EROSION AND SEDIMENT CONTROL

GENERAL INSTRUCTIONS

1. THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE ENGINEERING PLANS, AND ANY OTHER PLANS OR WRITTEN INSTRUCTIONS THAT MAY BE ISSUED AND RELATING TO DEVELOPMENT AT THE SUBJECT SITE.

2. THE SITE SUPERINTENDENT WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS INSTRUCTED IN THIS SPECIFICATION.

3. ALL BUILDERS AND SUB-CONTRACTORS WILL BE INFORMED OF THEIR RESPONSIBILITIES IN MINIMISING THE POTENTIAL FOR SOIL EROSION AND POLLUTION TO DOWNSLOPE LANDS AND WATERWAYS.

CONSTRUCTION SEQUENCE

4. THE SOIL EROSION POTENTIAL ON THIS SITE SHALL BE MINIMISED. HENCE WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE :

   a. INSTALL SEDIMENT FENCES, TEMPORARY CONSTRUCTION EXIT AND SANDBAG KERB INLET SEDIMENT TRAP.
   b. UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

5. DURING WINDY CONDITIONS, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.

6. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

FENCING

7. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.

8. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.

9. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.

10. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.

OTHER MATTERS

11. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.

12. RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER ARE TO BE EMPTIED AS NECESSARY. DISPOSAL OF WASTE SHALL BE IN A MANNER APPROVED BY THE SITE SUPERINTENDENT.

SITE INSPECTION & MAINTENANCE

13. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AFTER RAINFALL EVENTS TO ENSURE THAT THEY OPERATE EFFECTIVELY. REPAIR AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED.

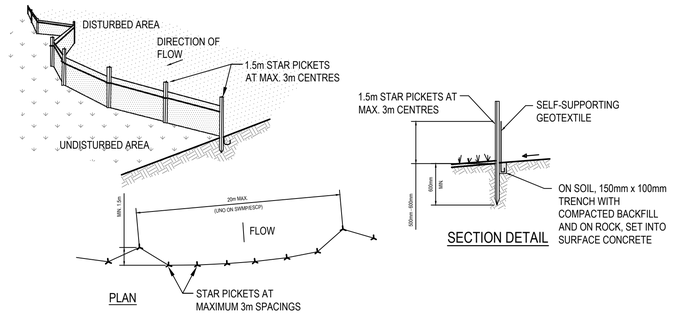
1. ALL STRIPPED TOPSOIL AND EARTHWORKS IS TO BE RELOCATED ON SITE AT THE DISCRETION OF THE CLIENT AND ARBORIST. FOR MATERIAL WHICH CANNOT BE RE-USED ON SITE, IT IS TO BE STOCKPILED AND REMOVED FROM SITE

SEDIMENT & EROSION CONTROL LEGEND

SEDIMENT FENCE

SAND BAG SEDIMENT TRAP TO BE USED AT ALL CONSTRUCTED OR EXISTING PITS

SAND BAG CAN BE USED FOR SUBSTITUTE TO SEDIMENT FENCE WHERE INSTALLATION OF STAKES IS NOT POSSIBLE SUCH AS ADJACENT TO TREES, IN ROCK OR AT INTERFACE WITH PATHWAYS



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCE AS CLOSE AS POSSIBLE TO PARALLEL TO THE CONTOURS OF THE SITE.
2. DRIVE 1.5m LONG STAR PICKETS INTO GROUND, 3 METERS APART.
3. DIG A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.
4. BACKFILL TRENCH OVER BASE OF FABRIC.
5. FIX SELF-SUPPORTING GEOTEXTILE TO UPSLOPE SIDE OF POSTS WITH WIRE TIES OR AS RECOMMENDED BY GEOTEXTILE MANUFACTURER.
6. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.

SEDIMENT CONTROL FENCE

N.T.S.

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REV	DATE	REVISION DESCRIPTION
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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT

BAYVIEW GOLF CLUB

TYPICAL SEDIMENT & EROSION CONTROL DETAILS

JOB NUMBER:	SCALE @ A1	SHEET No	REV
23003	NTS	C110	A

11 Attachment C – Borehole Logs

CLIENT	Bayview Golf Club	COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH101a**
PROJECT	Geotechnical and ASS Investigation	LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW	GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT	Hand Push Tube	LONGITUDE	151.30031	RL SURFACE	1.05 m	DATUM AHD
EXCAVATION DIMENSIONS	Ø100 mm x 1.60 m depth	LATITUDE	-33.66725	ASPECT	S	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				1.05				CL	FILL: Silty Sandy CLAY; low plasticity; dark brown; trace rootlets, inferred poorly - moderately compacted.			FILL
			0.2		0.1-0.3/S/1 D 0.10-0.30 m					M (=PL)		
			0.4									
				0.50								
				0.55				SP	FILL: Silty Clayey SAND; fine grained; grey, inferred poorly - moderately compacted.			
			0.6		0.6-0.8/S/1 D 0.60-0.80 m							
PT	H	Inflow	0.8							W		
				1.00								
			1.0	0.05				CI-CH	Silty CLAY; medium to high plasticity; brown.			ALLUVIUM
			1.2		1.2-1.4/S/1 D 1.20-1.40 m					M (>PL)	St	
			1.4									
			1.6	*1.60*					Hole Terminated at 1.60 m (Target depth reached)			
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH101b**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.30029	RL SURFACE	1.79 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.60 m depth	LATITUDE	-33.66699	ASPECT	S	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				1.79				SC	FILL: Clayey SAND; fine grained; brown, inferred poorly to moderately compacted.			FILL
			0.2		0.2-0.4/S/1 D 0.20-0.40 m					M		
			0.4	*0.40* 1.39					Gravels.			
			0.6	*0.60* 1.19				CI	Silty CLAY; medium plasticity; brown, red; trace sand; trace charcoal.			ALLUVIUM
PT	H	Not Encountered			0.7-0.9/S/1 D 0.70-0.90 m					M (<PL)		
			1.0									
			1.2									
				1.30 0.49				CI-CH	Silty CLAY; medium to high plasticity; dark grey; organic smell.			
			1.4		1.4-1.5/S/1 D 1.40-1.50 m					M (=PL)	St	
			1.6	*1.60*					Hole Terminated at 1.60 m (Target depth reached)			
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH102**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.296019	RL SURFACE	1.85 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.60 m depth	LATITUDE	-33.668715	ASPECT	E	SLOPE 5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT		Not Encountered	0	1.85				SP	FILL: Clayey SAND; fine to medium grained; grey, brown; trace rootlets, moderately compacted.	M		FILL
			0.2		0.2-0.4/S/1 D 0.20-0.40 m							
			0.4									
			0.6		0.6-0.8/S/1 D 0.60-0.80 m							
			0.8									
			1.0	1.00 0.85	1.0-1.2/S/1 D 1.00-1.20 m			CI	Sandy CLAY; medium plasticity; grey - brown.			ALLUVIUM
	H		1.2							M (<PL)	VSt	
			1.4									
			1.6	1.60					Hole Terminated at 1.60 m (Target depth reached)			
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH103**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.292353	RL SURFACE	3.99 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 0.70 m depth	LATITUDE	-33.668813	ASPECT	S	SLOPE 10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	3.99	0.1-0.2/S/1 D 0.10-0.20 m			SP	FILL: Clayey SAND; fine to medium grained; red - brown, yellow - brown; trace rootlets.	M		FILL
			0.4		0.3-0.5/S/1 D 0.30-0.50 m							
				0.50 3.49				CH	Silty CLAY; high plasticity; grey, brown, red, black.			ALLUVIUM
			0.6		0.6-0.7/S/1 D 0.60-0.70 m					M (<PL)	F - St	
				0.70					Hole Terminated at 0.70 m			
			0.8									
			1.0									
			1.2									
			1.4									
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH104**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29091	RL SURFACE	28.55 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.30 m depth	LATITUDE	-33.6671	ASPECT	S	SLOPE 10%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	28.55	0.1-0.3/S/1 D 0.10-0.30 m			SP	FILL: Clayey SAND; fine to medium grained; dark grey, brown, yellow - brown; trace rootlets.	M		FILL
			0.4		0.5-0.7/S/1 D 0.50-0.70 m							
			0.6									
			0.8	*0.80* 27.75				CH	Silty CLAY; high plasticity; dark grey; trace gravels.			RESIDUAL SOIL
			1.0		1.0-1.2/S/1 D 1.00-1.20 m					M (<PL)	St	
			1.2	*1.30*					Hole Terminated at 1.30 m (Target depth reached)			
			1.4									
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH105a**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.2932	RL SURFACE	8.43 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 0.90 m depth	LATITUDE	-33.66803	ASPECT	SE	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	8.43	0.1-0.2/S/1 D 0.10-0.20 m			SP	FILL: Clayey SAND; fine grained; grey, brown; trace rootlets.	M		FILL
			0.4	*0.40* 8.03	0.4-0.6/S/1 D 0.40-0.60 m			CL-CI	Silty Sandy CLAY; low to medium plasticity; brown, black.	M (<PL)		ALLUVIUM
			0.6	*0.70* 7.73	0.7-0.9/S/1 D 0.70-0.90 m			CI	Silty CLAY; medium plasticity; dark brown, black.	M (<PL)	VSt	RESIDUAL SOIL - ALLUVIUM
			0.8	*0.90*					Hole Terminated at 0.90 m			0.90: Push Tube refusal on white clay.
			1.0									
			1.2									
			1.4									
			1.6									
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH105b**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29301	RL SURFACE	8.77 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.30 m depth	LATITUDE	-33.66811	ASPECT	SE	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	8.77	0.0-0.2/S/1 D 0.00-0.20 m			SC	FILL: Clayey SAND; fine grained; grey - brown; trace rootlets.			FILL
				0.30 8.47					FILL: Crushed IRONSTONE / SANDSTONE; red, yellow - brown; medium grained.			
			0.4									
			0.6		0.6-0.8/S/1 D 0.60-0.80 m							
			0.8	*0.90* 7.87				CI	Silty CLAY; medium plasticity; dark brown; black.		VSt	RESIDUAL SOIL - ALLUVIUM
			1.0		1.0-1.2/S/1 D 1.00-1.20 m							
			1.2	*1.30*					Hole Terminated at 1.30 m (Target depth reached)			
			1.4									
			1.6									
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH106**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29111	RL SURFACE	36.02 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 0.60 m depth	LATITUDE	-33.66641	ASPECT	SE	SLOPE 15%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	*DEPTH* RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	36.02	0.2-0.4/S/1 D 0.20-0.40 m			SP	FILL: Silty Clayey SAND; fine to medium grained; brown, grey, red, yellow; trace rootlets; trace crushed ironstone.	M		FILL
			0.4		0.4-0.6/S/1 D 0.40-0.60 m							
			0.6	*0.60*					Hole Terminated at 0.60 m			0.60: Push Tube refusal on fill.
			0.8									
			1.0									
			1.2									
			1.4									
			1.6									
			1.8									

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH107a**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29096	RL SURFACE	3.32 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.40 m depth	LATITUDE	-33.6687	ASPECT	S	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0	3.32				SP	FILL: Clayey SAND; fine to medium grained; brown, grey - brown; trace rootlets.			FILL
					0.1-0.3/S/1 D 0.10-0.30 m					M		
			0.2									
			0.4	*0.40* 2.92				GP	FILL: Crushed IRONSTONE; trace clay.			
					0.5-0.7/S/1 D 0.50-0.70 m							
			0.6									
				0.70 2.62				SP-SC	FILL: Clayey SAND; fine grained; pale grey, grey - brown.			
			0.8							M		
					1.0-1.2/S/1 D 1.00-1.20 m							
			1.0									
			1.2									
			1.4	*1.40*					Hole Terminated at 1.40 m (Target depth reached)			
			1.6									
			1.8									

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH107b**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Narrabeen Formation	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29092	RL SURFACE	4.21 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.30 m depth	LATITUDE	-33.66888	ASPECT	S	SLOPE <7%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				4.21				SP	FILL: Clayey SAND; fine to medium grained; grey - brown; trace rootlets.			FILL
			0.2		0.2-0.4/S/1 D 0.20-0.40 m					M		
			0.4	*0.40* 3.81				CI	FILL: Silty CLAY; medium plasticity; grey - brown, brown; trace crushed ironstone.			
PT	H				0.5-0.7/S/1 D 0.50-0.70 m					M (<PL)		
			0.8	*0.80* 3.41				CI-CH	Silty CLAY; medium to high plasticity; dark grey - black; trace sand.			ALLUVIUM
		Inflow	1.0		1.0-1.2/S/1 D 1.00-1.20 m					M (=PL)	St - VSt	
			1.2	*1.30*								
									Hole Terminated at 1.30 m (Target depth reached)			
			1.4									
			1.6									
			1.8									

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Engineering Log - BOREHOLE

CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH108**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29282	RL SURFACE	2.57 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	LATITUDE	-33.66988	ASPECT	S	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				2.57				CL	FILL: Silty CLAY; low plasticity; brown, black - brown.			FILL
			0.2		0.1-0.4/S/1 D 0.10-0.40 m					M (<PL)		
			0.4	*0.40* 2.17				CI	Sandy CLAY; medium plasticity; dark grey; trace rootlets.			ALLUVIUM
PT	H		0.6								St to F	
			0.8		0.8-1.0/S/1 D 0.80-1.00 m							
			1.0	*1.00* 1.57				SP-SC	Clayey SAND; medium grained; grey - dark grey.			
		Inflow	1.2							W		
			1.4		1.3-1.5/S/1 D 1.30-1.50 m							
				1.50					Hole Terminated at 1.50 m (Target depth reached)			
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH110**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29958	RL SURFACE	1.44 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	LATITUDE	-33.669306	ASPECT	NE	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H		0.0	1.44				CL	FILL: Silty Sandy CLAY; low plasticity; dark brown, black.	M (<PL)		FILL
					0.1-0.3/S/1 D 0.10-0.30 m							
			0.2									
				0.30								
				1.14				SM	FILL: Silty SAND; fine grained; grey, yellow.			
			0.4									
			0.6							M		
					0.7-0.9/S/1 D 0.70-0.90 m							
			0.8									
				1.00								
			1.0	0.44				CI	Sandy Silty CLAY; medium plasticity; dark grey, black; trace rootlets.			ALLUVIUM
					1.1-1.4/S/1 D 1.10-1.40 m							
		Inflow	1.2							M (=PL)	F	
			1.4	*1.50*								
									Hole Terminated at 1.50 m (Target depth reached)			
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH111a**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.30041	RL SURFACE	8.78 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	LATITUDE	-33.67059	ASPECT	N	SLOPE 15%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0	8.78				CL	FILL: Silty Sandy CLAY; low plasticity; dark brown; trace rootlets.	M (<PL)		FILL
			0.2		0.2-0.4/S/1 D 0.20-0.40 m							
			0.4									
			0.6									
				0.70 8.08	0.7-0.9/S/1 D 0.70-0.90 m			SM	FILL: Silty SAND; fine to medium grained; grey, yellow.	M		
			0.8									
				1.00 7.78	1.0-1.2/S/1 D 1.00-1.20 m			CH	Silty CLAY; high plasticity; dark grey - black.	M (<PL)	St to VSt	ALLUVIUM
			1.2									
			1.4	*1.40* 7.38				CI-CH	Silty CLAY; medium to high plasticity; grey, red, brown.			RESIDUAL SOIL
				1.50					Hole Terminated at 1.50 m (Target depth reached)			
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH111b**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.30026	RL SURFACE	10.77 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.30 m depth	LATITUDE	-33.67059	ASPECT	N	SLOPE 15%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
PT	H	Not Encountered	0.2	10.77	0.1-0.3/S/1 D 0.10-0.30 m			CL	FILL: Silty Sandy CLAY; low plasticity; dark grey.	M (<PL)		FILL
				0.30 10.47				SM	FILL: Silty Clayey SAND; fine to medium grained; grey.			
			0.4									
					0.5-0.7/S/1 D 0.50-0.70 m					M		
			0.6									
			0.8									
			1.0	*1.00* 9.77	1.0-1.2/S/1 D 1.00-1.20 m			CI	Silty CLAY; medium plasticity; dark grey, brown - red; trace shells.	M (<PL)	VSt to St	ALLUVIUM
			1.2	*1.30*					Hole Terminated at 1.30 m			1.30: Push Tube Refusal.
			1.4									
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH111c**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.30031	RL SURFACE	11.07 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.40 m depth	LATITUDE	-33.6708	ASPECT	N	SLOPE 15%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				11.07				CL	FILL: Silty Sandy CLAY; low plasticity; dark grey.	M (<PL)		FILL
			0.2									
				0.40								
			0.4	10.67				SM	FILL: Silty Clayey SAND; fine to medium grained; grey.			
PT	H	Not Encountered	0.6							M		
			0.8									
				1.00								
			1.0	10.07				CI	Silty CLAY; medium plasticity; dark grey, brown - red; trace shells.			ALLUVIUM
			1.2							M (<PL)	S to VSt	
				1.40								
			1.4						Hole Terminated at 1.40 m			1.40: Push tube refusal.
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH112a**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29995	RL SURFACE	1.19 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	LATITUDE	-33.66973	ASPECT	N	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				1.19				SM	FILL: Silty SAND; fine grained; grey, yellow, brown; trace rootlets.			FILL
			0.2									
				0.30								
				0.89				SP	FILL: SAND; fine grained; grey - yellow; trace silt and clay.			
			0.4									
			0.6							M		
PT	H		0.8									
			1.0									
				1.20								
			1.2	-0.01				SP	Clayey SAND; fine to medium grained; brown.			ALLUVIUM
		Inflow									F	
			1.4									
				1.50								
									Hole Terminated at 1.50 m (Target depth reached)			
			1.6									
			1.8									

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CLIENT	Bayview Golf Club		COMMENCED	01/03/2023	COMPLETED	01/03/2023	**REF BH112b**
PROJECT	Geotechnical and ASS Investigation		LOGGED	BC / WX	CHECKED	RE	Sheet 1 OF 1
SITE	Bayview Golf Course, Bayview, NSW		GEOLOGY	Quaternary Deposits	VEGETATION	Grass	PROJECT NO. P2309440
EQUIPMENT		Hand Push Tube	LONGITUDE	151.29999	RL SURFACE	1.21 m	DATUM AHD
EXCAVATION DIMENSIONS		Ø100 mm x 1.50 m depth	LATITUDE	-33.66963	ASPECT	N	SLOPE <5%

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USCS / ASCS CLASSIFICATION	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
				1.21				CL	FILL: Silty Sandy CLAY; low plasticity; dark brown; trace rootlets.			FILL
			0.2		0.2-0.4/S/1 D 0.20-0.40 m							
			0.4	*0.40* 0.81				SP	FILL: SAND; fine grained; yellow, brown; trace silt and clay.			
PT	H				0.5-0.7/S/1 D 0.50-0.70 m					M		
			0.6									
			0.8									
			1.0									
				1.10 0.11	1.1-1.3/S/1 D 1.10-1.30 m			SC	Clayey SAND; fine to medium grained; grey, dark grey.			ALLUVIUM
		Inflow	1.2								F	
			1.4	*1.50*					Hole Terminated at 1.50 m (Target depth reached)			
			1.6									
			1.8									

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Engineering Log - BOREHOLE

12 Attachment D – Laboratory Analytical Documentation

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customerservice@envirolab.com.au
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CERTIFICATE OF ANALYSIS 317873

Client Details

Client	Martens & Associates Pty Ltd
Attention	William Xu
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P2309440-Bayview Golf Club**
Number of Samples	15 Soil
Date samples received	03/03/2023
Date completed instructions received	03/03/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	10/03/2023
Date of Issue	10/03/2023

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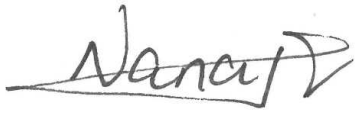
Results Approved By
Jenny He, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

sPOCAS + %S w/w						
Our Reference		317873-1	317873-2	317873-3	317873-4	317873-5
Your Reference	UNITS	BH101a	BH101b	BH102	BH105a	BH105b
Depth		1.2-1.4	1.0-1.2	1.4-1.5	0.7-0.9	1.0-1.2
Date Sampled		01/03/2023	01/03/2023	01/03/2023	01/03/2023	01/03/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	10/03/2023	10/03/2023	10/03/2023	10/03/2023	10/03/2023
Date analysed	-	10/03/2023	10/03/2023	10/03/2023	10/03/2023	10/03/2023
pH $_{kcl}$	pH units	8.7	8.9	6.2	6.6	4.3
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	22
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	0.04
pH $_{Ox}$	pH units	7.6	7.6	5.2	6.9	3.9
TPA pH 6.5	moles H^+ /t	<5	<5	<5	<5	45
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	0.07
TSA pH 6.5	moles H^+ /t	<5	<5	<5	<5	23
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	0.04
ANC_E	% $CaCO_3$	1.3	5.1	[NT]	0.26	[NT]
a-ANC_E	moles H^+ /t	260	1,000	[NT]	52	[NT]
s-ANC_E	%w/w S	0.42	1.6	[NT]	0.08	[NT]
S_{KCl}	%w/w S	0.02	0.01	0.009	0.006	0.006
S_P	%w/w	0.13	0.07	0.06	0.02	0.02
S_{POS}	%w/w	0.11	0.06	0.05	0.02	0.01
a-S_{POS}	moles H^+ /t	70	39	30	12	9
Ca_{KCl}	%w/w	0.19	0.28	0.24	0.10	0.15
Ca_P	%w/w	0.68	2.0	0.15	0.12	0.12
Ca_A	%w/w	0.49	1.7	<0.005	0.020	<0.005
Mg_{KCl}	%w/w	<0.005	0.010	0.030	0.015	0.043
Mg_P	%w/w	0.008	0.073	0.022	0.019	0.034
Mg_A	%w/w	<0.005	0.063	<0.005	<0.005	<0.005
S_{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]	0.008
S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	<0.005
a-S_{NAS}	moles H^+ /t	[NT]	[NT]	[NT]	[NT]	<5
s-S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	<0.01
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	<5	<5	30	<5	33
s-Net Acidity	%w/w S	<0.01	<0.01	0.05	<0.01	0.05
Liming rate	kg $CaCO_3$ /t	<0.75	<0.75	2.3	<0.75	2.4
s-Net Acidity without -ANCE	%w/w S	0.11	0.06	0.05	0.02	0.05
a-Net Acidity without ANCE	moles H^+ /t	70	39	30	12	33
Liming rate without ANCE	kg $CaCO_3$ /t	5.3	3.0	2.3	0.88	2.4

sPOCAS + %S w/w						
Our Reference		317873-6	317873-7	317873-8	317873-9	317873-10
Your Reference	UNITS	BH107a	BH107b	BH108	BH110	BH110
Depth		1.0-1.2	1.0-1.2	1.3-1.5	0.7-0.9	1.1-1.4
Date Sampled		01/03/2023	01/03/2023	01/03/2023	01/03/2023	01/03/2023
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	10/03/2023	10/03/2023	10/03/2023	10/03/2023	10/03/2023
Date analysed	-	10/03/2023	10/03/2023	10/03/2023	10/03/2023	10/03/2023
pH $_{kcl}$	pH units	5.5	6.4	5.6	6.1	4.4
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5	26
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	0.04
pH $_{Ox}$	pH units	3.9	5.6	2.8	3.6	2.4
TPA pH 6.5	moles H^+ /t	<5	<5	160	<5	820
s-TPA pH 6.5	%w/w S	<0.01	<0.01	0.25	<0.01	1.3
TSA pH 6.5	moles H^+ /t	<5	<5	160	<5	800
s-TSA pH 6.5	%w/w S	<0.01	<0.01	0.25	<0.01	1.3
ANC_E	% $CaCO_3$	[NT]	[NT]	[NT]	[NT]	[NT]
a-ANC_E	moles H^+ /t	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_E	%w/w S	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	<0.005	0.01	0.03	<0.005	0.1
S_P	%w/w	0.01	0.08	0.29	0.01	1.4
S_{POS}	%w/w	0.01	0.07	0.26	0.01	1.3
a-S_{POS}	moles H^+ /t	6	42	160	6	840
Ca_{KCl}	%w/w	0.06	0.19	0.1	0.04	0.04
Ca_P	%w/w	0.04	0.17	0.10	0.04	0.04
Ca_A	%w/w	<0.005	<0.005	0.006	<0.005	0.008
Mg_{KCl}	%w/w	0.008	0.010	<0.005	<0.005	<0.005
Mg_P	%w/w	0.007	0.012	0.005	<0.005	0.005
Mg_A	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
S_{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]	0.092
S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	<0.005
a-S_{NAS}	moles H^+ /t	[NT]	[NT]	[NT]	[NT]	<5
s-S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]	<0.01
Fineness Factor	-	1.5	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	8	42	160	6	870
s-Net Acidity	%w/w S	0.01	0.07	0.26	0.01	1.4
Liming rate	kg $CaCO_3$ /t	<0.75	3.2	12	<0.75	65
s-Net Acidity without -ANCE	%w/w S	0.01	0.07	0.26	0.01	1.4
a-Net Acidity without ANCE	moles H^+ /t	8.2	42	160	6.0	870
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	3.2	12	<0.75	65

sPOCAS + %S w/w			
Our Reference		317873-11	317873-12
Your Reference	UNITS	BH111a	BH112b
Depth		1.0-1.2	1.1-1.3
Date Sampled		01/03/2023	01/03/2023
Type of sample		Soil	Soil
Date prepared	-	10/03/2023	10/03/2023
Date analysed	-	10/03/2023	10/03/2023
pH $_{kcl}$	pH units	6.3	8.7
TAA pH 6.5	moles H^+ /t	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01
pH $_{Ox}$	pH units	5.0	5.2
TPA pH 6.5	moles H^+ /t	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01
TSA pH 6.5	moles H^+ /t	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01
ANC_E	% $CaCO_3$	[NT]	[NT]
a-ANC_E	moles H^+ /t	[NT]	[NT]
s-ANC_E	%w/w S	[NT]	[NT]
S_{KCl}	%w/w S	0.007	0.07
S_P	%w/w	0.08	0.36
S_{POS}	%w/w	0.07	0.28
a-S_{POS}	moles H^+ /t	43	180
Ca_{KCl}	%w/w	0.25	0.27
Ca_P	%w/w	0.20	0.37
Ca_A	%w/w	<0.005	0.10
Mg_{KCl}	%w/w	0.011	0.022
Mg_P	%w/w	0.012	0.035
Mg_A	%w/w	<0.005	0.013
S_{HCl}	%w/w S	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	[NT]	[NT]
s-S_{NAS}	%w/w S	[NT]	[NT]
Fineness Factor	-	1.5	1.5
a-Net Acidity	moles H^+ /t	43	180
s-Net Acidity	%w/w S	0.07	0.28
Liming rate	kg $CaCO_3$ /t	3.2	13
s-Net Acidity without -ANCE	%w/w S	0.07	0.28
a-Net Acidity without ANCE	moles H^+ /t	43	180
Liming rate without ANCE	kg $CaCO_3$ /t	3.2	13

Method ID	Methodology Summary
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on National acid sulfate soils identification and laboratory methods manual June 2018. Ideally samples should be received in the laboratory at <4oC. Please refer to SRA for sample temperature on receipt. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL results reported.

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			10/03/2023	1	10/03/2023	10/03/2023		10/03/2023	[NT]
Date analysed	-			10/03/2023	1	10/03/2023	10/03/2023		10/03/2023	[NT]
pH $_{kcl}$	pH units		Inorg-064	[NT]	1	8.7	8.9	2	98	[NT]
TAA pH 6.5	moles H^+/t	5	Inorg-064	<5	1	<5	<5	0	105	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
pH $_{Ox}$	pH units		Inorg-064	[NT]	1	7.6	7.4	3	90	[NT]
TPA pH 6.5	moles H^+/t	5	Inorg-064	<5	1	<5	<5	0	121	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
TSA pH 6.5	moles H^+/t	5	Inorg-064	<5	1	<5	<5	0	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	1	1.3	1.5	14	[NT]	[NT]
a-ANC_E	moles H^+/t	5	Inorg-064	<5	1	260	300	14	[NT]	[NT]
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	1	0.42	0.47	11	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	1	0.02	0.02	0	[NT]	[NT]
S_P	%w/w	0.005	Inorg-064	<0.005	1	0.13	0.16	21	[NT]	[NT]
S_{POS}	%w/w	0.005	Inorg-064	<0.005	1	0.11	0.14	24	[NT]	[NT]
a-S_{POS}	moles H^+/t	5	Inorg-064	<5	1	70	89	24	[NT]	[NT]
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	1	0.19	0.18	5	[NT]	[NT]
Ca_P	%w/w	0.005	Inorg-064	<0.005	1	0.68	0.77	12	[NT]	[NT]
Ca_A	%w/w	0.005	Inorg-064	<0.005	1	0.49	0.59	19	[NT]	[NT]
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	1	<0.005	<0.005	0	[NT]	[NT]
Mg_P	%w/w	0.005	Inorg-064	<0.005	1	0.008	0.009	12	[NT]	[NT]
Mg_A	%w/w	0.005	Inorg-064	<0.005	1	<0.005	0.006	18	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	1	[NT]	[NT]		[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	1	[NT]	[NT]		[NT]	[NT]
a-S_{NAS}	moles H^+/t	5	Inorg-064	<5	1	[NT]	[NT]		[NT]	[NT]
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	1	[NT]	[NT]		[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	<1.5	1	1.5	1.5	0	[NT]	[NT]
a-Net Acidity	moles H^+/t	5	Inorg-064	<5	1	<5	<5	0	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	1	<0.01	<0.01	0	[NT]	[NT]
Liming rate	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	1	<0.75	<0.75	0	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	1	0.11	0.14	24	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
a-Net Acidity without ANCE	moles H^+/t	5	Inorg-064	<5	1	70	89	24	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	1	5.3	6.7	23	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	10/03/2023	10/03/2023		[NT]	[NT]
Date analysed	-			[NT]	11	10/03/2023	10/03/2023		[NT]	[NT]
pH $_{kcl}$	pH units		Inorg-064	[NT]	11	6.3	6.3	0	[NT]	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-064	[NT]	11	<5	<5	0	[NT]	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	[NT]	11	<0.01	<0.01	0	[NT]	[NT]
pH $_{Ox}$	pH units		Inorg-064	[NT]	11	5.0	5.0	0	[NT]	[NT]
TPA pH 6.5	moles H^+ /t	5	Inorg-064	[NT]	11	<5	<5	0	[NT]	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	[NT]	11	<0.01	<0.01	0	[NT]	[NT]
TSA pH 6.5	moles H^+ /t	5	Inorg-064	[NT]	11	<5	<5	0	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	[NT]	11	<0.01	<0.01	0	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-064	[NT]	11	0.007	0.007	0	[NT]	[NT]
S_P	%w/w	0.005	Inorg-064	[NT]	11	0.08	0.06	29	[NT]	[NT]
S_{POS}	%w/w	0.005	Inorg-064	[NT]	11	0.07	0.06	15	[NT]	[NT]
a-S_{POS}	moles H^+ /t	5	Inorg-064	[NT]	11	43	36	18	[NT]	[NT]
Ca_{KCl}	%w/w	0.005	Inorg-064	[NT]	11	0.25	0.24	4	[NT]	[NT]
Ca_P	%w/w	0.005	Inorg-064	[NT]	11	0.20	0.14	35	[NT]	[NT]
Ca_A	%w/w	0.005	Inorg-064	[NT]	11	<0.005	<0.005	0	[NT]	[NT]
Mg_{KCl}	%w/w	0.005	Inorg-064	[NT]	11	0.011	0.011	0	[NT]	[NT]
Mg_P	%w/w	0.005	Inorg-064	[NT]	11	0.012	0.011	9	[NT]	[NT]
Mg_A	%w/w	0.005	Inorg-064	[NT]	11	<0.005	<0.005	0	[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	[NT]	11	1.5	1.5	0	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-064	[NT]	11	43	37	15	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	[NT]	11	0.07	0.06	15	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-064	[NT]	11	3.2	2.8	13	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	[NT]	11	0.07	0.06	15	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-064	[NT]	11	43	37	15	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$ /t	0.75	Inorg-064	[NT]	11	3.2	2.8	13	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

POCAS_S_%SWW:Sample 317873-3,5,6 and 11 have been observed CaKCl>CaP and/or MgKCl>MgP, this may be considered acceptable due to heterogeneity.

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CERTIFICATE OF ANALYSIS 317873-A

Client Details

Client	Martens & Associates Pty Ltd
Attention	Ben Cornish
Address	Suite 201, 20 George St, Hornsby, NSW, 2077

Sample Details

Your Reference	**P2309440-Bayview Golf Club**
Number of Samples	additional analysis
Date samples received	03/03/2023
Date completed instructions received	13/03/2023

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	20/03/2023
Date of Issue	20/03/2023

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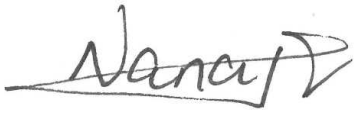
Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

sPOCAS + %S w/w		
Our Reference		317873-A-15
Your Reference	UNITS	BH08
Depth		0.8-1.0
Date Sampled		01/03/2023
Type of sample		Soil
Date prepared	-	20/03/2023
Date analysed	-	20/03/2023
pH $_{kcl}$	pH units	5.7
TAA pH 6.5	moles H^+ /t	<5
s-TAA pH 6.5	%w/w S	<0.01
pH $_{Ox}$	pH units	5.4
TPA pH 6.5	moles H^+ /t	<5
s-TPA pH 6.5	%w/w S	<0.01
TSA pH 6.5	moles H^+ /t	<5
s-TSA pH 6.5	%w/w S	<0.01
ANC_E	% $CaCO_3$	[NT]
a-ANC_E	moles H^+ /t	[NT]
s-ANC_E	%w/w S	[NT]
S_{KCl}	%w/w S	<0.005
S_P	%w/w	0.03
S_{POS}	%w/w	0.03
a-S_{POS}	moles H^+ /t	17
Ca_{KCl}	%w/w	0.01
Ca_P	%w/w	0.12
Ca_A	%w/w	0.11
Mg_{KCl}	%w/w	<0.005
Mg_P	%w/w	0.014
Mg_A	%w/w	0.014
S_{HCl}	%w/w S	[NT]
S_{NAS}	%w/w S	[NT]
a-S_{NAS}	moles H^+ /t	[NT]
s-S_{NAS}	%w/w S	[NT]
Fineness Factor	-	1.5
a-Net Acidity	moles H^+ /t	19
s-Net Acidity	%w/w S	0.03
Liming rate	kg $CaCO_3$ /t	1.4
s-Net Acidity without -ANCE	%w/w S	0.03
a-Net Acidity without ANCE	moles H^+ /t	19
Liming rate without ANCE	kg $CaCO_3$ /t	1.4

Method ID	Methodology Summary
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on National acid sulfate soils identification and laboratory methods manual June 2018. Ideally samples should be received in the laboratory at <4oC. Please refer to SRA for sample temperature on receipt. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate The recommendation that the SHCL concentration be multiplied by a factor of 2 to ensure retained acidity is not underestimated, has not been applied in the SHCL results reported.

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/03/2023	[NT]	[NT]	[NT]	[NT]	20/03/2023	[NT]
Date analysed	-			20/03/2023	[NT]	[NT]	[NT]	[NT]	20/03/2023	[NT]
pH $_{kcl}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	100	[NT]
TAA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pH $_{Ox}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	97	[NT]
TPA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	111	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TSA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-ANC_E	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{POS}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{POS}	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	<1.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
a-Net Acidity without ANCE	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.