

Bayview Golf Club

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



ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



CIVIL



PROJECT
MANAGEMENT



P2309440JR03V01

April 2023

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Abbreviations

AASS – Actual acid sulfate soil

AHD – Australian height datum

ANS – Non-sulfuric acidic soil

ASS – Acid sulfate soil

ASSMP – Acid sulfate soil management plan

BGC – Bayview Golf Course

BH – Borehole

MA – Martens and Associates Pty Ltd

MBGL – Metres below ground level

MW – Monitoring well

NATA – National Association of Testing Authorities

PASS – Potential acid sulfate soil

RAP – Remediation action plan

SPOCAS – Suspension peroxide combined acidity and sulfur

TPA – Titratable peroxide acidity

TSA – Titratable sulfidic acidity

1 Introduction

This acid sulfate soil management plan (ASSMP), prepared on behalf of Bayview Golf Club, documents the environmental risks and appropriate management of acid sulfate soils (ASS). Variations to this plan should be undertaken with consultation from suitably qualified environmental consultants.

1.1 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, 2017a and b, MA, 2021) have not been considered as part of this current ASS assessment.

1.2 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.

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

1.3 Acid Sulfate Soil Definition

1.3.1 Acid sulfate soils

ASS are natural soils of Holocene or Pleistocene age, generally found in coastal (tidal) and inland (freshwater) environments. In general, they are found in areas less than 5 meters above sea level in swamps, marshes and floodplains. These soils contain iron sulfides, which when exposed to air, oxidise to generate sulfuric acid.

ASS are classified as either actual ASS (AASS) or potential ASS (PASS). AASS are those that have been exposed to air, become oxidised and produce sulfuric acid. PASS are in an anaerobic (low oxygen) environment, usually waterlogged soils that have the potential to produce sulfuric acid if exposed to air.

The impacts of ASS can in some instances cause severe short and long term economic and environmental impacts to the surrounding environment. These impacts could include:

- Increased soil acidity.
- Decreased nutrients in soil.
- Mobilising heavy metals, making water and soil toxic.
- Potential to contaminate groundwater.
- Potential to corrode infrastructure.
- Acidic runoff can affect aquatic ecosystems and can kill aquatic life.

1.3.2 Non-sulfuric acidity

Non-sulfuric acidic soil (ANS) are common in residual soil through leaching of the soil profile. It is also common in areas where organic acids occur, including ASS areas.

These acids are not ASS and are not considered a risk due to their generally weak acids and low mobility. No guidelines for ANS are available and site management of spoil should be undertaken in line with erosion and sediment control guidelines, within the sites construction environment management plan.

Soils are identified in this ASSMP as being ANS by the following criteria:

- Low soluble sulfur ($S_{KCl} < 0.03\%$).
- No reportable oxidisable sulfur (S_{Cr} or S_{POS}).
- No visual or reported jarosite or similar acid producing iron/aluminium hydrosulfate minerals (S_{RAS} or S_{NAS}).

2 Site Description

Site details are summarised in Table 1.

Table 1: Site details.

Item	Description Detail
Site address	<u>Bayview Golf Club</u> 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	<p>The NSW Office of Environment and Heritage's (OEH) information system indicates the site topography to comprise as follows:</p> <p><u>North, north east and north east portion</u></p> <ul style="list-style-type: none"> 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 %. <p><u>Eastern portion</u></p> <ul style="list-style-type: none"> 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. <p><u>South east portion</u></p> <ul style="list-style-type: none"> 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. <p>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.</p>
Typical slopes, elevation	Slopes are generally low (<2%) and elevation generally ranges from approximately 1 to 2 mAHD.

Item	Description Detail
Expected geology and soils	<p>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.</p> <p>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).</p> <p>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.</p>
Drainage	<p>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.</p> <p>The site generally drains generally centrally to an inlet which ultimately connects to Winnereremy Bay, Pittwater, located approximately 260 m north east of the site.</p>
Vegetation	<p>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 Winnereremy Bay.</p>

3 Acid Sulfate Soil Assessment Summary

A recent ASS assessment was conducted in conjunction with a geotechnical assessment by MA in 2023 (MA, 2023). We note that prior to the most recent assessment, MA completed ASS assessments in 2017 and 2021 for the site to inform proposed site earthworks associated with flood mitigation measure and drainage work. Results from these previous assessments were reviewed and considered (where relevant) in the MA (2023) assessment.

Key findings of the MA (2023) assessments are:

1. Laboratory analysis indicated 9 of the 13 samples tested are PASS and 6 of the 12 samples have TPA, TSA or S_{pos} above the Acid Sulfate Soil Manual Advisory Committee (ASSMAC, 1998) action criteria for samples located within Bayview Golf Club.
2. Laboratory results indicated that little to no acid neutralising capacity remained in the soil profile.
3. Suggested liming rates are highly variable ranging from 0.75 to 65 kg / tonne of disturbed soil.
4. Due to the variability of the site, elevations, proposed works and excavation depths, and the variability of laboratory testing results, ASS risk at each green was evaluated individually.
5. It was determined that proposed works at the third green will require a management plan (ASSMP) to address potential ASS risk.
6. 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 require further ASS management.

4 Acid Sulfate Soil Management Plan

4.1 Overview and Objective

This management plan has been prepared to address risks associated with risk of acid generation by PASS exposure during site works for the third green. Provided the management plan is implemented, acidic soil conditions should not restrict the proposed development. The works will fall under a low to medium treatment category as per Table 4.5 in ASMAC (1998).

The objective of the ASSMP is to provide recommendations for appropriate management of ASS so that earthworks are undertaken to minimise or negate ASS risks, specifically risks from PASS.

4.2 Receptors

Possible ecological, human and built environment receptors include:

- Site vegetation and aquatic biota in dams.
- Site visitors and workers.
- Downstream vegetation and aquatic biota
- Golf course drainage and infrastructure

4.3 Guidelines/Standards

This investigation was undertaken in general accordance with the principles of the following:

- 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.

4.4 Training and Awareness

All project personnel, subcontractors and consultants will receive training in their personal environmental obligations during inductions and toolbox talks. All project personnel will undergo a general project induction prior to commencing work with the Contractor. This will include an ASS component to reinforce the importance of management and the measures that will be implemented to address ASS and PASS issues.

4.5 Mitigation Strategies

Mitigation strategies have been reviewed and assessed for site relevancy. These strategies are summarised and assessed in Table 2.

Table 2 Mitigation strategies.

Strategy	Details	Application to Site
Avoidance	Avoid areas containing ASS	No – Proposed earthworks for the third green are finalised and will intercept PASS.
Minimisation	Modification of site design to minimisation disturbance	No – Proposed earthworks for the third green are finalised and will intercept PASS.
Neutralisation	Neutralisation and reuse within the project	Yes – this option will be the best option for ASS soils. Due to the size of the development, soils on site will be treated and neutralised, before validated for reuse onsite, where applicable. <i>In-situ</i> neutralisation treatment of ASS will occur on site. This is to provide additional precaution and preventative measures of potential acid generation and impact to downstream receptors. <i>In-situ</i> neutralisation mitigation strategies may include lime gabions in the water course and triggers for additional remediation based on groundwater monitoring.
Hydraulic Separation	-	No – other management strategies will be more appropriate due to cost, volume and encountered soil types.
Strategic Reburial	Burial in ponds and dams	No – Works aim to increase the water holding capacity of ponds or dams on site.
	Burial via consolidation	Yes – areas of ASS may be reburied below the groundwater level within 24 hours of excavation to prevent oxidation of PASS.
	Treatment and neutralisation	Yes – material can be mixed with adequate levels of lime to neutralise acid generation as it is produced. This is the most appropriate method to minimise ASS risks for the site.
Leachate from treatment	Collection and treatment of leachate from treatment areas prior to discharge	Yes – leachate can be collected and treated using lime before discharge to the onsite dam. Treatment is to follow strategies listed in this ASSMP.
Groundwater and surface water monitoring	Ongoing monitoring of groundwater trends	Yes – monitoring groundwater and surface water can give an indication of potential risks from the mobilisation of ASS. Where a trigger value is breached, investigation into management options is required.

4.6 Approach

The approach for managing excavated soils at the third green should be undertaken with lime treatment, for future site reuse or disposal at an appropriate waste facility post treatment in accordance with NSW EPA (2014).

4.7 Acid Base Accounting

Acid base accounting (ABA) is the comparison of the amount of acidity with the acid neutralising capacity (ANC) to provide the net acidity of the soil. The following equation outlines acid base accounting:

$$\text{Net acidity} = \text{potential acidity} + \text{existing acidity} - \text{ANC}$$

Laboratory analysis undertaken during the ASS assessments indicate that three results returned ANC greater than the laboratory limit of reporting, between 0.26% and 5.1%. This indicates that the natural soil profile has very low to non-existent ANC (buffering). All soil is to be treated assuming residual ANC is not available.

4.8 PASS Treatment Plan

Due to the volume of ASS soil being moved on the project, the project is regarded as being a low to medium treatment category as per ASSMAC Table 4.5.

Lime treatment is to be used where PASS are disturbed and either reused or disposed of off-site. The rate of lime application for proposed works at the third green should be at 12 kg/tonne (rates adopted based 100% lime purity).

When calculating the mass of lime to be applied, a soil bulk density factor is to be used. Where no site specific testing of bulk density is undertaken, a value of 1.5 kg / m³ is adopted.

All liming works are to be undertaken using agricultural lime (calcium carbonate). Lime purity will impact on liming rates (i.e. 90% purity will require liming at 110% of the liming rate). Where the purity of the lime has not been certified, it must be analysed prior to use. The general process for treatment of PASS is detailed in Table 3 with further details in following sections. It is the responsibility of site supervisors to manage mitigation measures.

Table 3: Treatment of PASS Material

Stage	Management and Mitigation Measures
1 – Establish treatment areas	<p>Establish treatment areas near source of PASS to be treated and these areas should be isolated from creeks and waterways. Areas are to be formed with drainage controls and bunded, to prevent water flow in to the area and to retain any generated leachate. The location of treatment areas is to be determined by the site supervisor.</p> <p>Guard layer to be formed at base of areas. Layer to comprise undisturbed <i>in-situ</i> material or other non-PASS (may be previously treated material) soil. Guard layer to be treated with lime at rate of 5kg/m².</p>
2 – Excavation and stockpiling ASS	<p>Previous investigations indicate that estuarine clays (typically dark grey in colour) at varying depths are susceptible of being PASS. These soils should be excavated and stockpiled separately from other materials.</p> <p>Stockpiling of untreated soil should not exceed time frames shown in Table 4.</p> <p>Soil excavated is to be tested at a rate of 1 sample per 500 m³ using the chromium reducible sulfur method. If the material is ASS (i.e. total sulfuric acidity greater than 18 moles), then it is to be treated as outlined below.</p> <p>All excavated ASS materials shall be spread out at approximately 300 mm thickness, within the treatment area.</p>
4 – Apply lime	ASS soil is to be treated by thoroughly mixing with fine agricultural lime at 12 kg / tonne. Lime to be incorporated into material being treated using rotary hoe or similar.
5 – Treatment validation	Treatment material must be sampled and tested for validation to confirm adequacy of treatment.
6 - Retreatment	Where validation of treatment indicates failure additional mixing for lime or addition of extra lime to be undertaken. Repeat validation step and retreatment until validation successful.
7 - Placement	Once material is treated and validated material may be used on site

Table 4: Recommended maximum periods for stockpiling untreated ASS

Type of Material Texture Range	Duration of Stockpiling	
	Approx. Clay Content (%)	Short Term
Course texture Sands to loamy sands	≤5	18 hours
Medium Texture Sandy loams to light clays)	5-40	70 hours

Note: Stockpiling time frames are based on Table 4 of Queensland ASS Technical Manual.

4.9 Leachate Control

Leachate may form and discharge from ASS material during stockpiling and treatment. Management of the leachate is required to ensure risk of discharge of acidified leachate to the environment is minimised.

Leachate collected from treatment areas is to be directed through lime chipped lined drainage channels to retention ponds. Leachate collection ponds are to be assigned to accommodate storm runoff generated by a 1 year ARI, 72 hour duration storm event and are to only

receive runoff from the treatment area. Ponds are to be lined with compacted clay or a HDPE liner.

Disposal of water from ponds is to be carried out only following treatment and testing to design criteria to meet discharge criteria (Daily visual inspections of the construction site will be undertaken to identify ASS concerns. Documented weekly inspections shall be undertaken.). Where water pH does not meet design criteria adopted, treatment to adjust pH using calcium hydroxide solution, shall be undertaken.

Discharge of water, into Cahill Creek shall be permitted only once analysis to confirm water quality parameters are acceptable.

4.10 Groundwater

Groundwater is not anticipated to be impacted for the proposed works at the third green, therefore no potential environmental harm via groundwater flow are unlikely to occur and works can proceed. However, should groundwater be encountered during excavation works, MA should be notified to assess ASS risk and provide ASS management measures.

4.11 Verification and Monitoring

The adequacy of the treatment of ASS material shall be verified by soil sampling and laboratory testing. The following monitoring (Table 5) should be carried out to confirm acceptable neutralisation of excavated PASS and leachate / water (if required).

Table 5: Recommended monitoring of excavated PASS soil and leachate.

Soil and Leachate			
Issue	Monitoring Task	Frequency / Timing	Performance Criteria
Stockpile Management	Visual inspection of stockpiles for evidence of ASS affected seepage shall be conducted.	Daily during construction and following rainfall.	No signs of ASS affected seepage from stockpile (e.g. no iron staining, oily films or very clear ponded water).
Neutralisation of ASS Material	Sample treated soil for validation testing by the laboratory.	One composite sample (comprising 4 sub-samples of the same soil profile) per 250 m ³ of treated soil. Composite to be sourced from same treatment pad.	Field pH $pH_{ox} > 5.5$ 1 in ten samples tested for Chromium Suite $pH_{Ca} > 5.5$ and TAA: $< 18 \text{ MH}^+ / \text{t}$

Soil and Leachate			
Issue	Monitoring Task	Frequency / Timing	Performance Criteria
Water affected by ASS (i.e. seepage water from treatment ponds, water in new excavations) if required	Test water for pH, dissolved and total (for surface waters) Aluminium (Al) and iron (Fe), dissolved oxygen (DO), electrical conductivity (EC), soluble chloride and sulfate.	Prior to discharge.	In the absence of baseline criteria, the Australian and New Zealand Government (ANZG) Guidelines For Fresh & Marine Water Quality (2018).

Daily visual inspections of the construction site will be undertaken to identify ASS concerns. Documented weekly inspections shall be undertaken.

4.12 Record Keeping and Reporting

Monthly reporting of ASS management and water monitoring (if required) is to be reported to the site manager. Six monthly compliance tracking reporting shall be prepared by a suitably qualified person, demonstrating that the requirements of this ASSMP have been achieved.

Complete records of all treatment and any further testing undertaken shall be maintained by the construction contractor. Records should include as a minimum:

- o Stockpile number and volume.
- o Location of stockpiles and leachate treatment areas.
- o Number of soil and groundwater tests, test results and test certificates.
- o Register of all Aglime delivered to site and location of use, including rate of application.
- o Laboratory results detailing verification of treatment.
- o Location of reuse or disposal dockets.

Records should be made available to regulators if requested (if off-site disposal is undertaken, a waste classification assessment is required and records of the quantity of material taken off-site should be kept).

At the conclusion of all works, a summary report of the Ass works shall be prepared by a suitably qualified consultant and provided to the Principal for their records.

4.13 ASS Management Plan Review

This ASSMP shall be reviewed and updated as further assessment and construction designs become available. At a minimum, the ASSMP shall be reviewed every 6 months.

5 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 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.

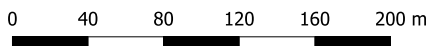
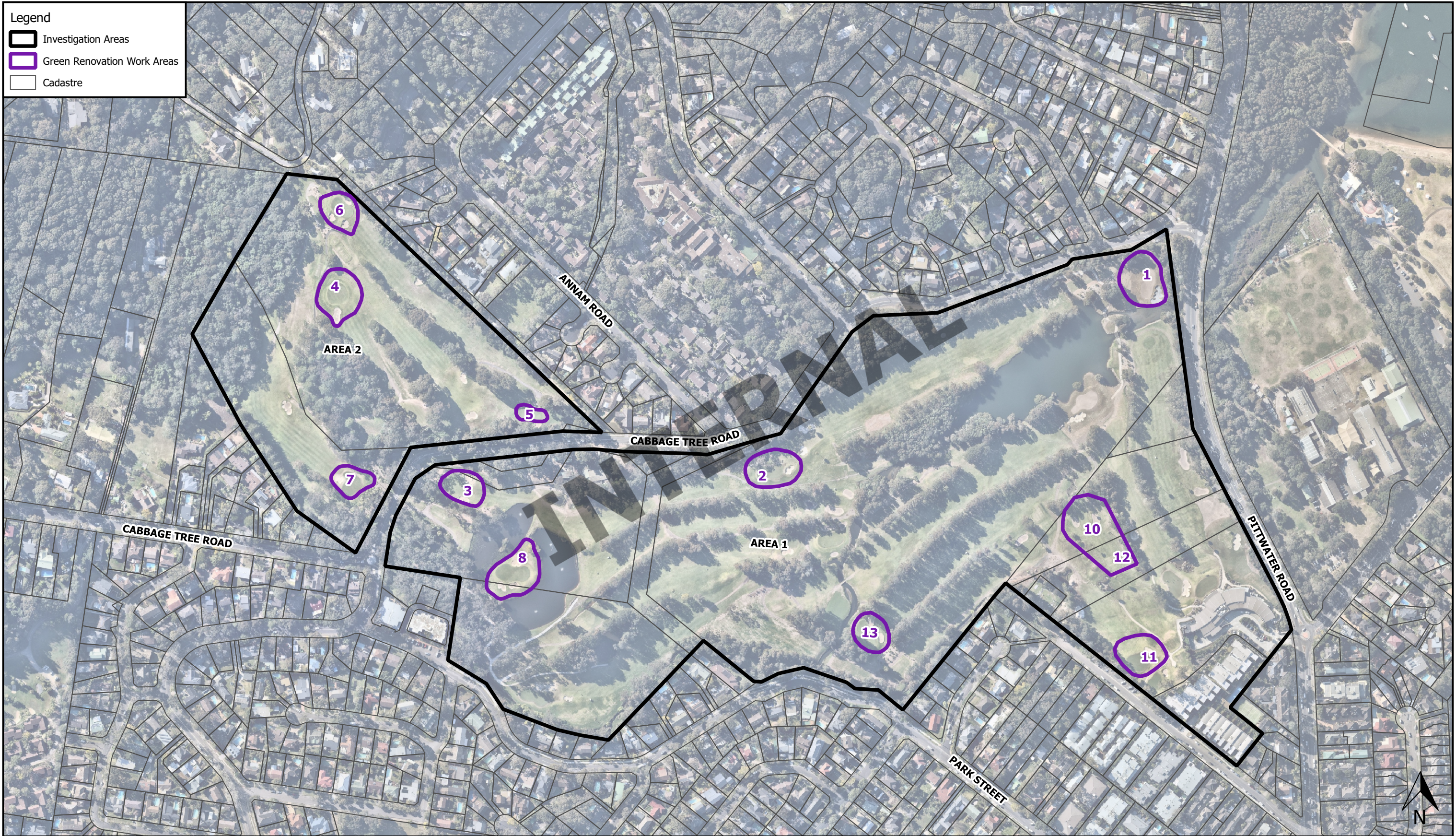
6 References

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- MA (2023), *Acid Sulfate Soil Assessment: Bayview Golf Course, Cabbage Tree Road, Bayview, NSW*, REF P2309440JR02V01, (**MA, 2023**).
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7 Attachment A – Site Plans

Legend

- Investigation Areas
- Green Renovation Work Areas
- Cadastre



1:4000 @ A3
 Viewport
 Notes:
 - Aerial from Nearmap (2021)
 - Cadastre from NSW DFSI Clip and Ship (2023)

Map Title / Figure:
Site Layout



0 40 80 120 160 200 m

1:4000 @ A3

Viewport

Notes:
 - Aerial from Nearmap (2021)
 - Cadastre from NSW DFSI Clip and Ship (2023)

Map Title / Figure:
Borehole Location Plan

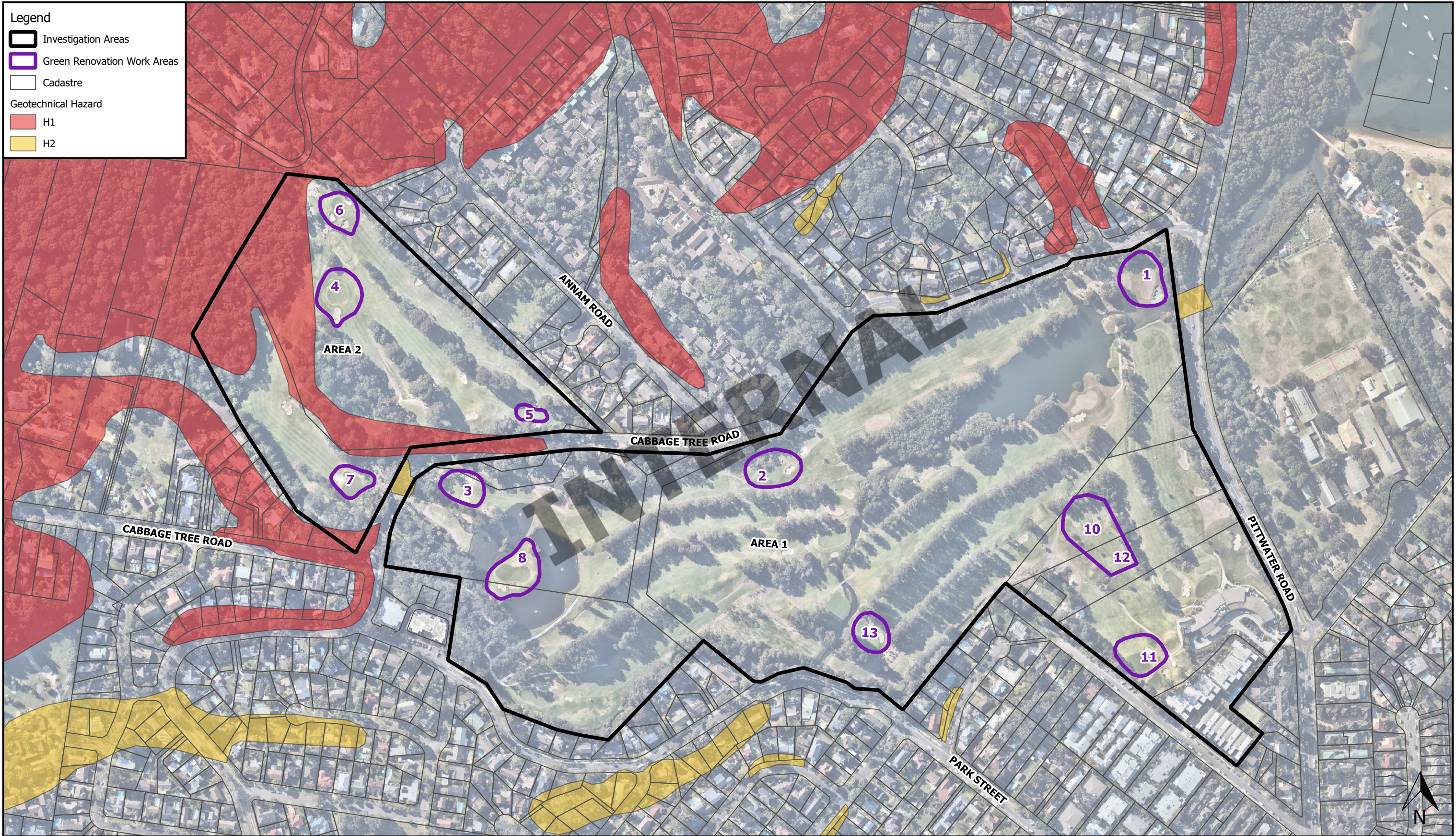
GE02	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date

Legend

- Investigation Areas
- Green Renovation Work Areas
- Cadastre

Geotechnical Hazard

- H1
- H2



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

Map Title / Figure:
Geotechnical Hazard Identification

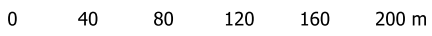
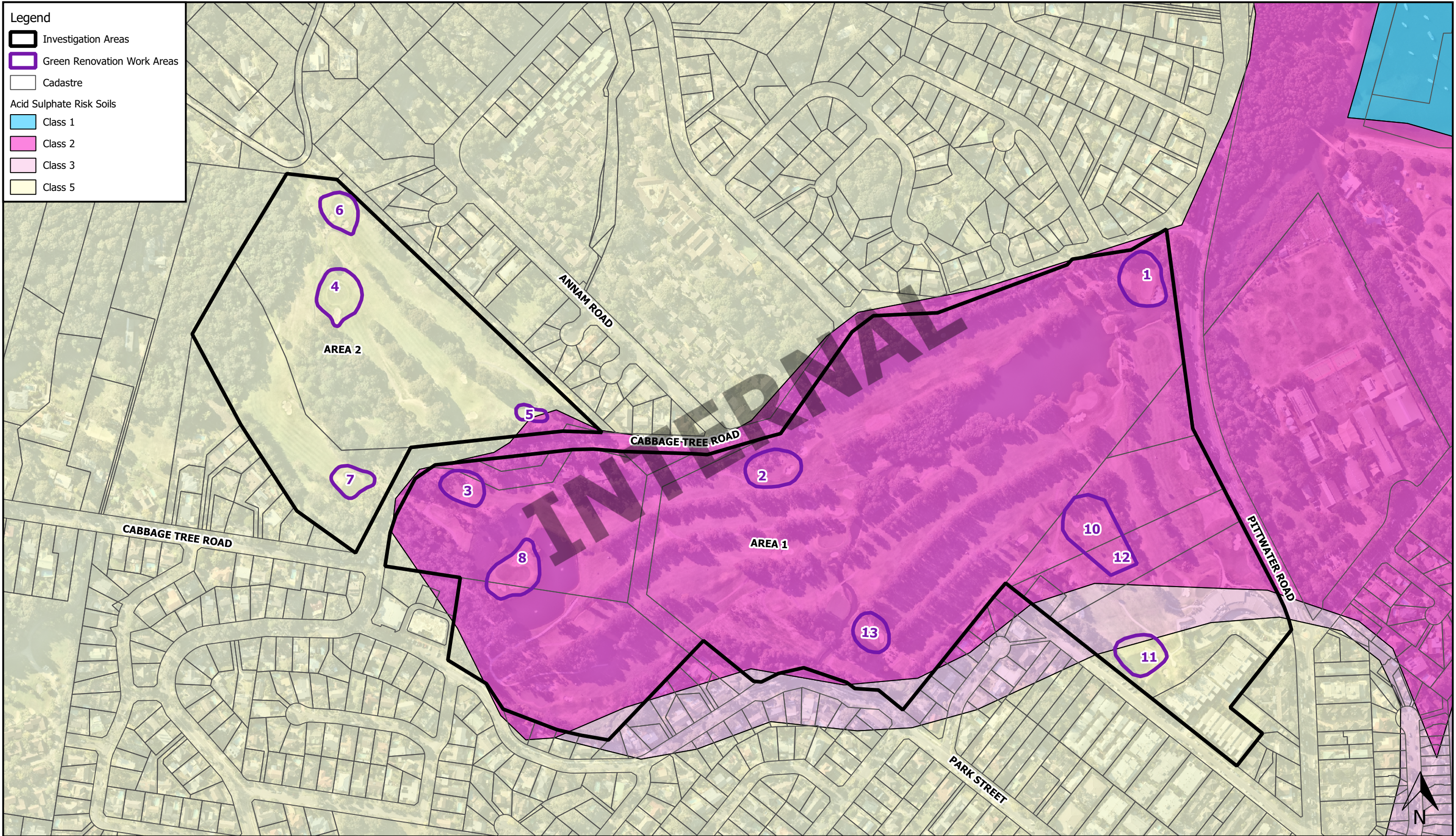
GE03	Map
Cabbage Tree Road, Bayview, NSW	Site
Geotechnical and Acid Sulphate Soils Assessment	Project
Geotechnical Assessment Reporting	Sub-Project
Bayview Golf Club	Client
31/03/2023	Date

Legend

- Investigation Areas
- Green Renovation Work Areas
- Cadastre

Acid Sulphate Risk Soils

- Class 1
- Class 2
- Class 3
- Class 5



1:4000 @ A3

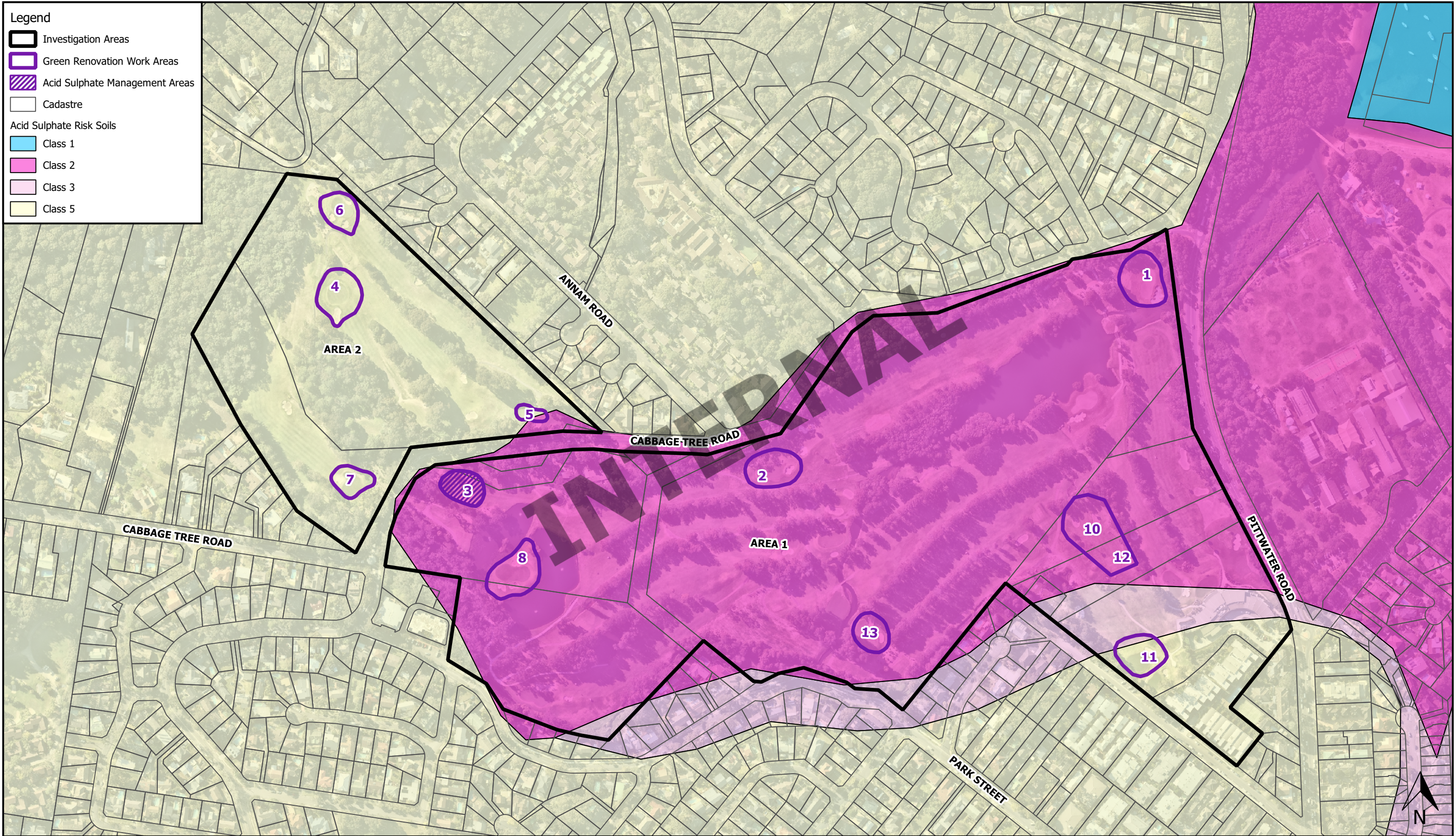
Viewport

- Notes:
- Aerial from Nearmap (2021)
 - Cadastre from NSW DFSI Clip and Ship (2023)
 - Acid Sulphate Soils from NSW DPIE (2020)

Map Title / Figure:

Pittwater Acid Sulphate Risk Map

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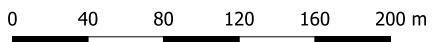


Legend

- Investigation Areas
- Green Renovation Work Areas
- Acid Sulphate Management Areas
- Cadastre

Acid Sulphate Risk Soils

- Class 1
- Class 2
- Class 3
- Class 5



1:4000 @ A3

Viewport

- Notes:**
- Aerial from Nearmap (2021)
 - Cadastre from NSW DFSI Clip and Ship (2023)
 - Acid Sulphate Soils from NSW DPIE (2020)

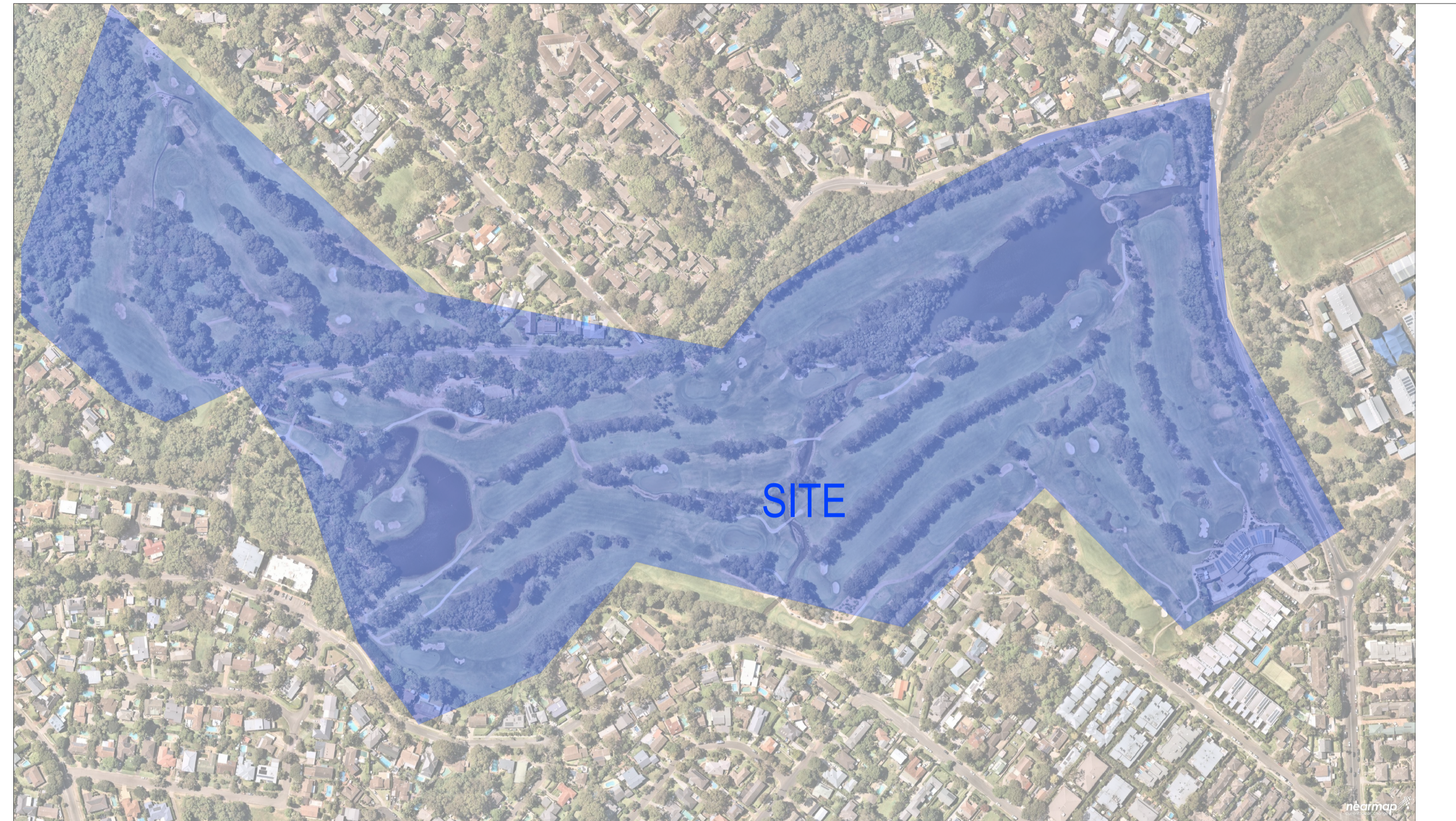
Map Title / Figure:
Acid Sulphate Management Areas

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

8 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	1 ST GREEN DETAIL PLAN
C112	2 ND GREEN DETAIL PLAN
C113	3 RD GREEN DETAIL PLAN
C114	4 TH GREEN DETAIL PLAN
C115	5 TH GREEN DETAIL PLAN
C116	6 TH GREEN DETAIL PLAN
C117	7 TH GREEN DETAIL PLAN
C118	8 TH GREEN DETAIL PLAN
C119	10 TH GREEN DETAIL PLAN
C120	11 TH GREEN DETAIL PLAN
C121	12 TH GREEN DETAIL PLAN
C122	13 TH GREEN DETAIL PLAN
C130	TYPICAL SEDIMENT & EROSION CONTROL DETAILS



LOCALITY PLAN
1825 PITTWATER ROAD, MONA VALE NSW, 2103, AUSTRALIA

BEFORE YOU DIG AUSTRALIA



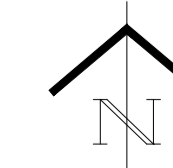
IMPORTANT: THE CONTRACTOR IS TO MAINTAIN A CURRENT SET OF "BEFORE YOU DIG AUSTRALIA" DRAWINGS ON SITE AT ALL TIMES.

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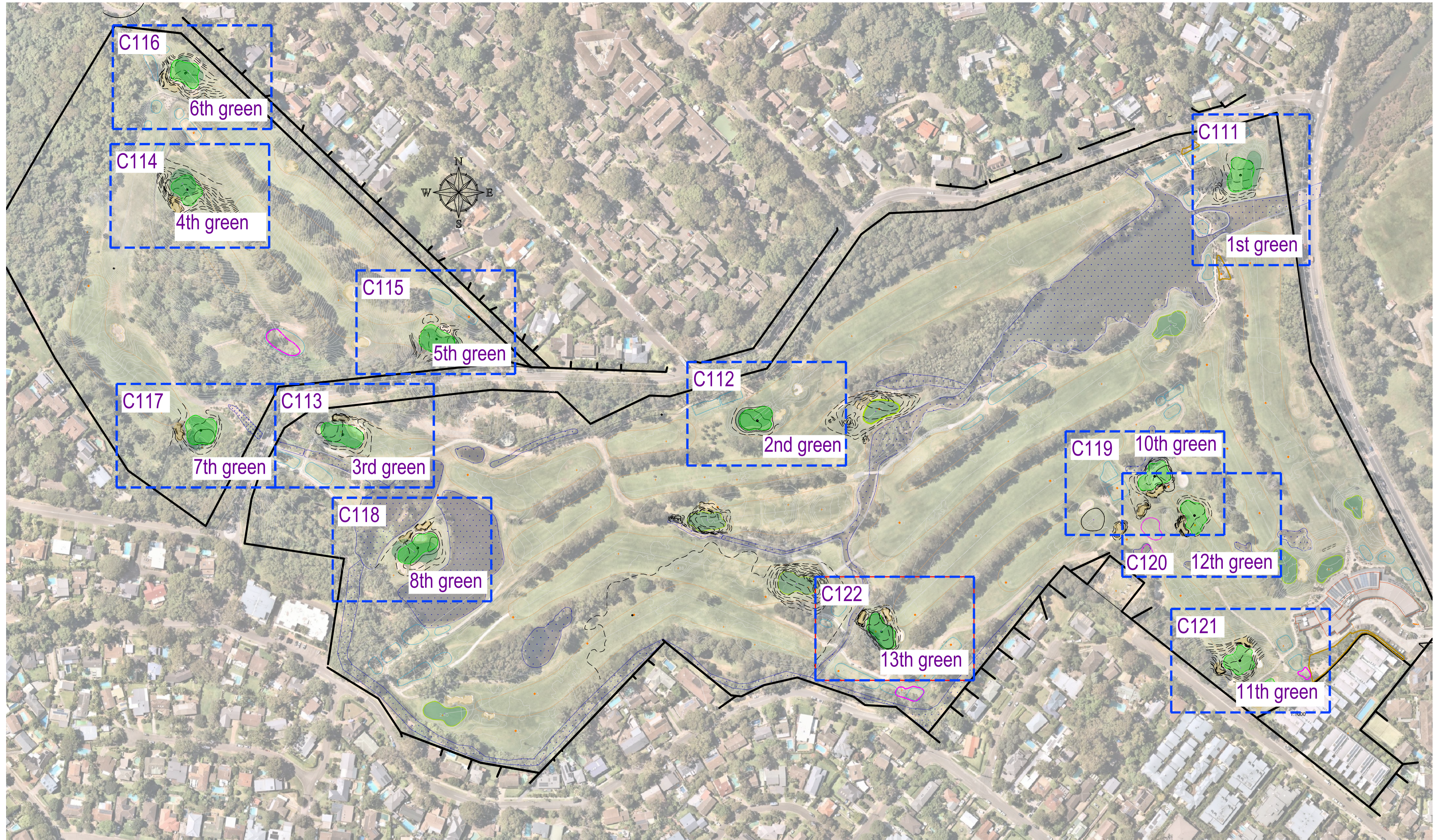
SEDIMENT AND EROSION CONTROL
MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

TITLE PAGE & LOCALITY PLAN

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SHEET No: C100
REV: A



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**SEDIMENT AND EROSION CONTROL
MANAGEMENT**

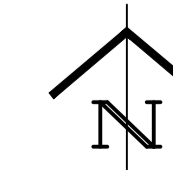
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ZONE MAP AREAS & GENERAL WORKS

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JOB NUMBER:
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SCALE @ A1
NTS
C110

REV
A

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	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
v	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
Existing Surface	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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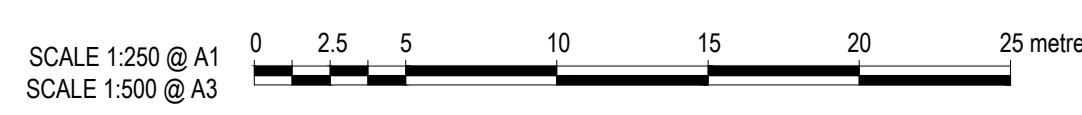
SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

1ST GREEN DETAIL PLAN

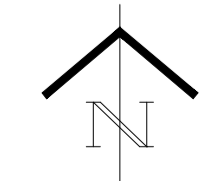
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SCALE @ A1
1:250

SHEET No
C111

REV
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	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
v	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
Existing Surface	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

ISSUE FOR DEVELOPMENT APPLICATION

SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

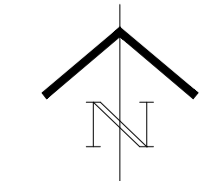
2ND GREEN DETAIL PLAN

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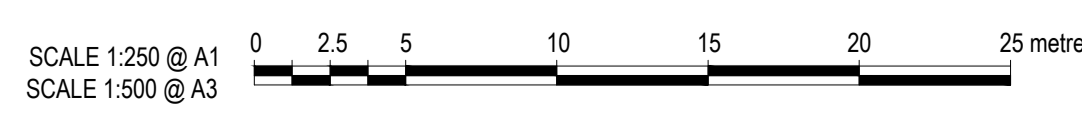
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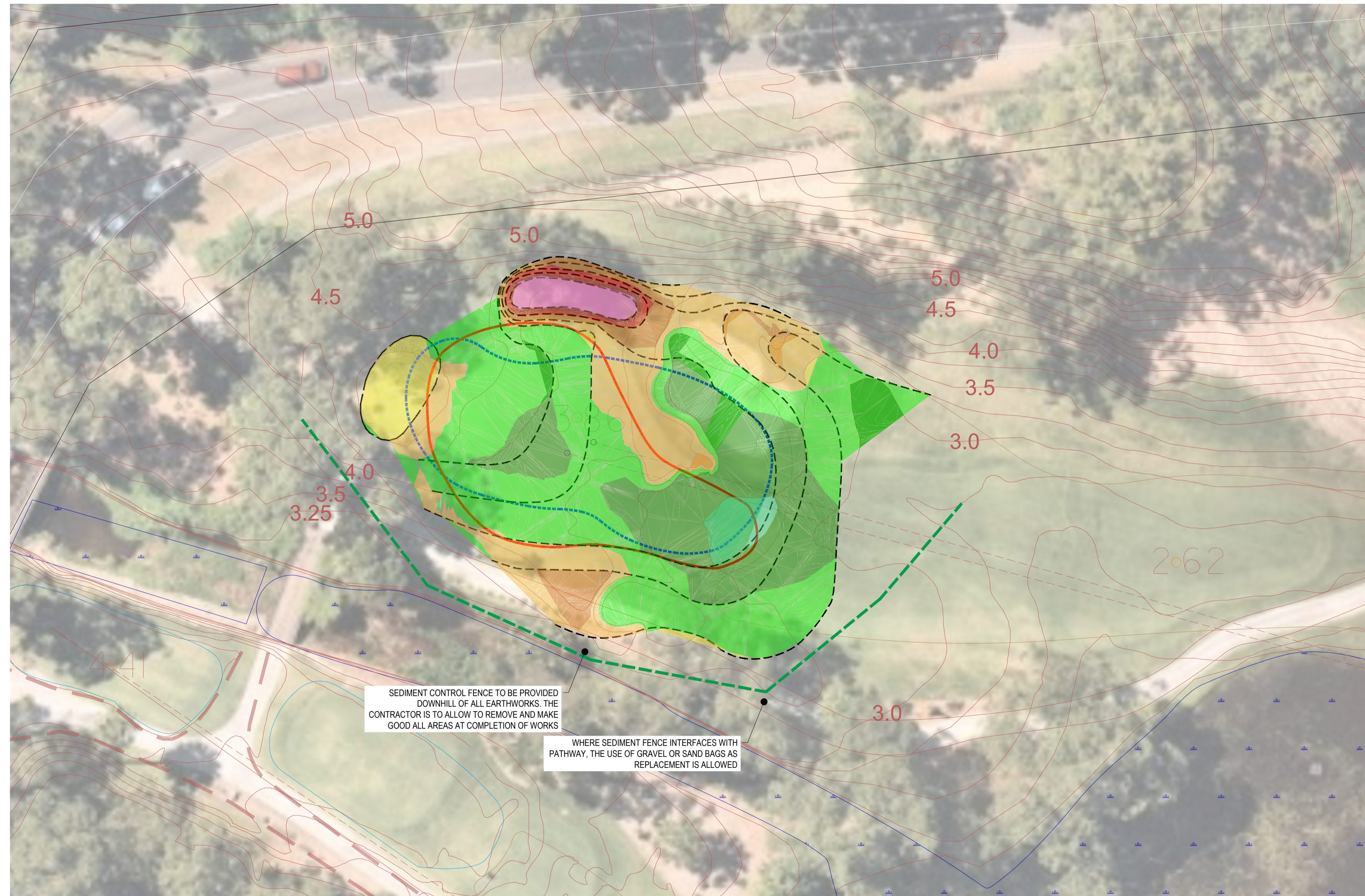
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LEGEND

- 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
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	0.75 1.00
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	1.25 1.50



CUT AND FILL VOLUMES

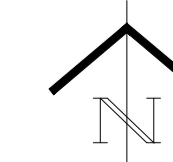
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	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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

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3RD GREEN DETAIL PLAN

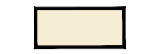





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1:250
SHEET No
C113

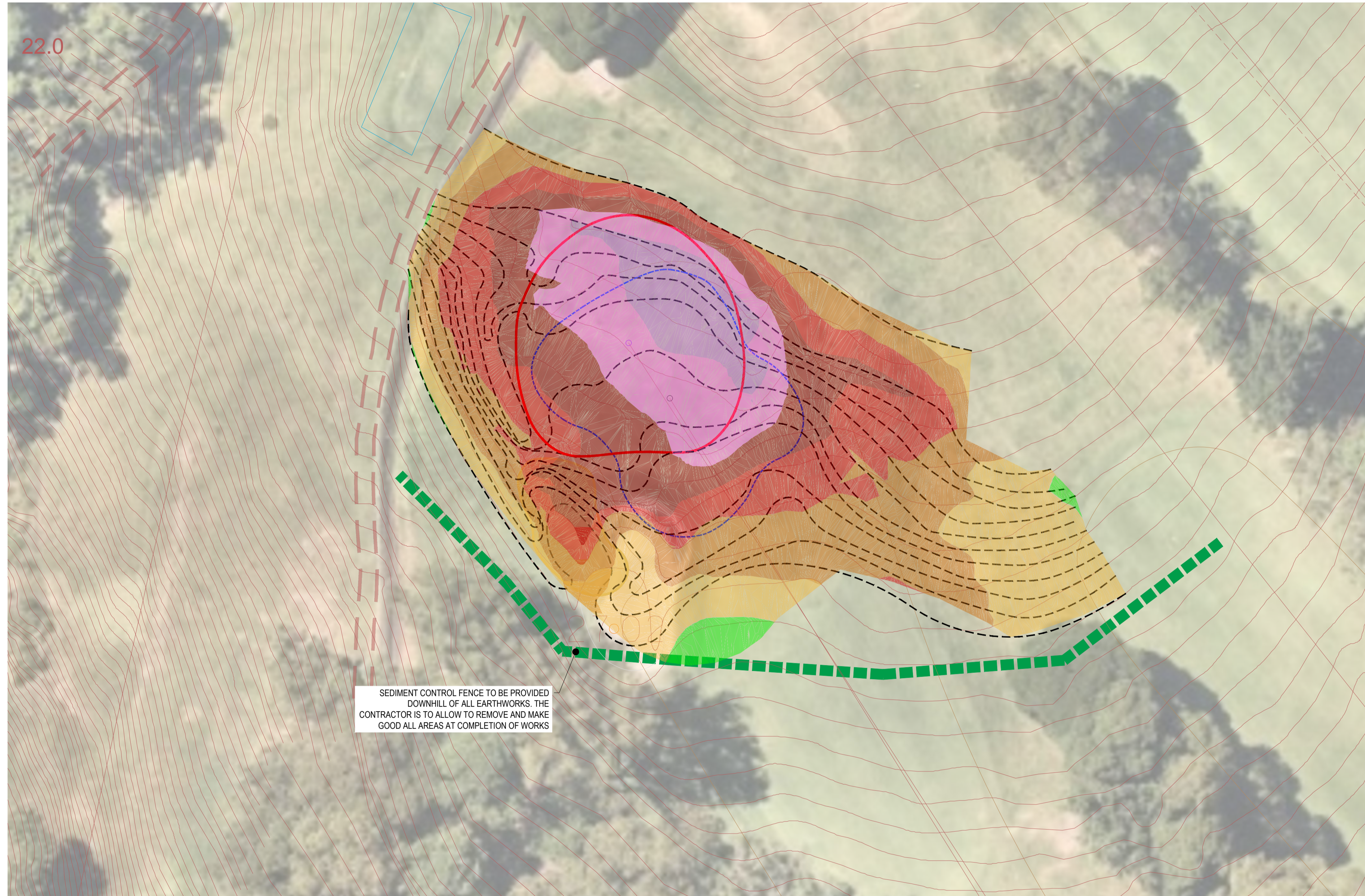
REV
B

LEGEND

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

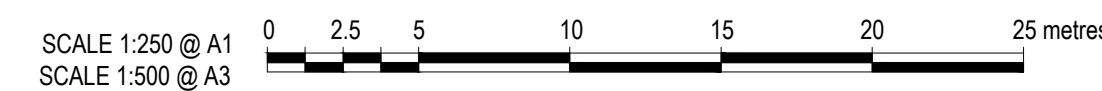
CUT & FILL LEGEND

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



CUT AND FILL VOLUMES

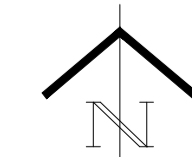
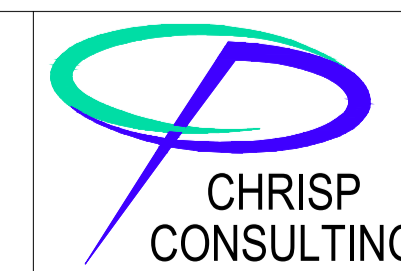
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	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161



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4TH GREEN DETAIL PLAN

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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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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
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5TH GREEN DETAIL PLAN

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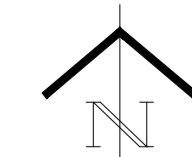
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SHEET No
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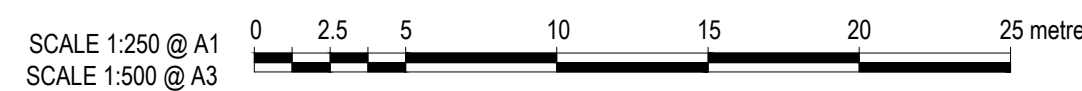
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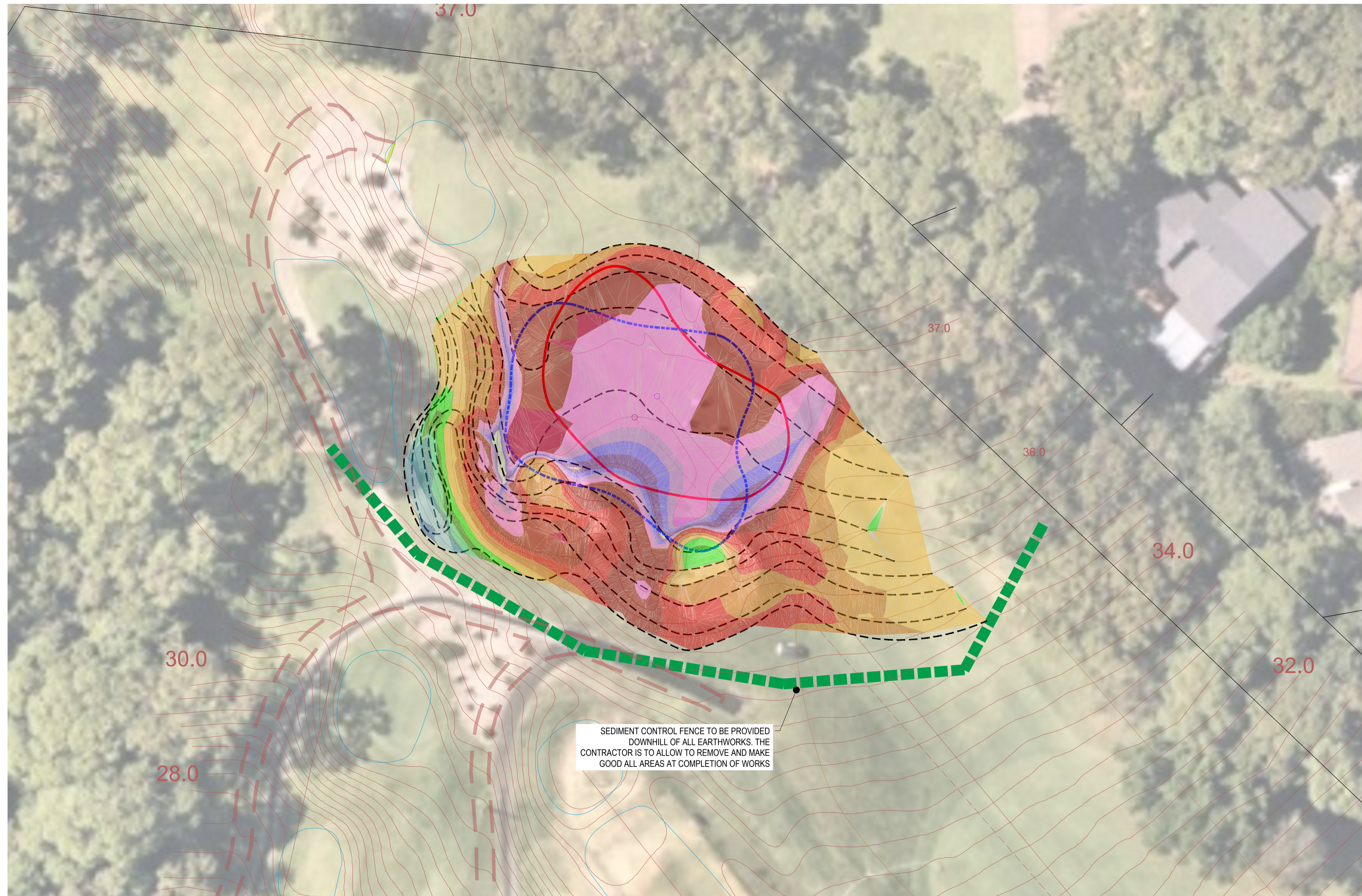


LEGEND

- 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
	-0.001	0.000
	0.001	0.25
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	1.25	1.50



CUT AND FILL VOLUMES

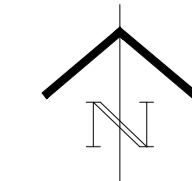
Assessment Surfaces	Volumes m3	Hole											TOTAL m3	
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	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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

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6TH GREEN DETAIL PLAN

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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	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
v	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
Existing Surface	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
BAYVIEW GOLF CLUB

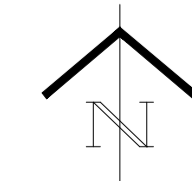
7TH GREEN DETAIL PLAN

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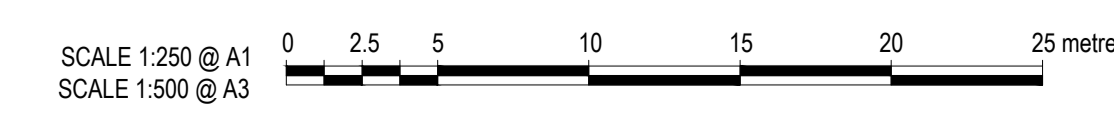
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REV	DATE	REVISION DESCRIPTION
A	27.02.2023	ISSUE FOR REVIEW AND COMMENT
B	28.02.2023	CUT & FILL COLOURS ADDED AND UPDATED QUANTITIES

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



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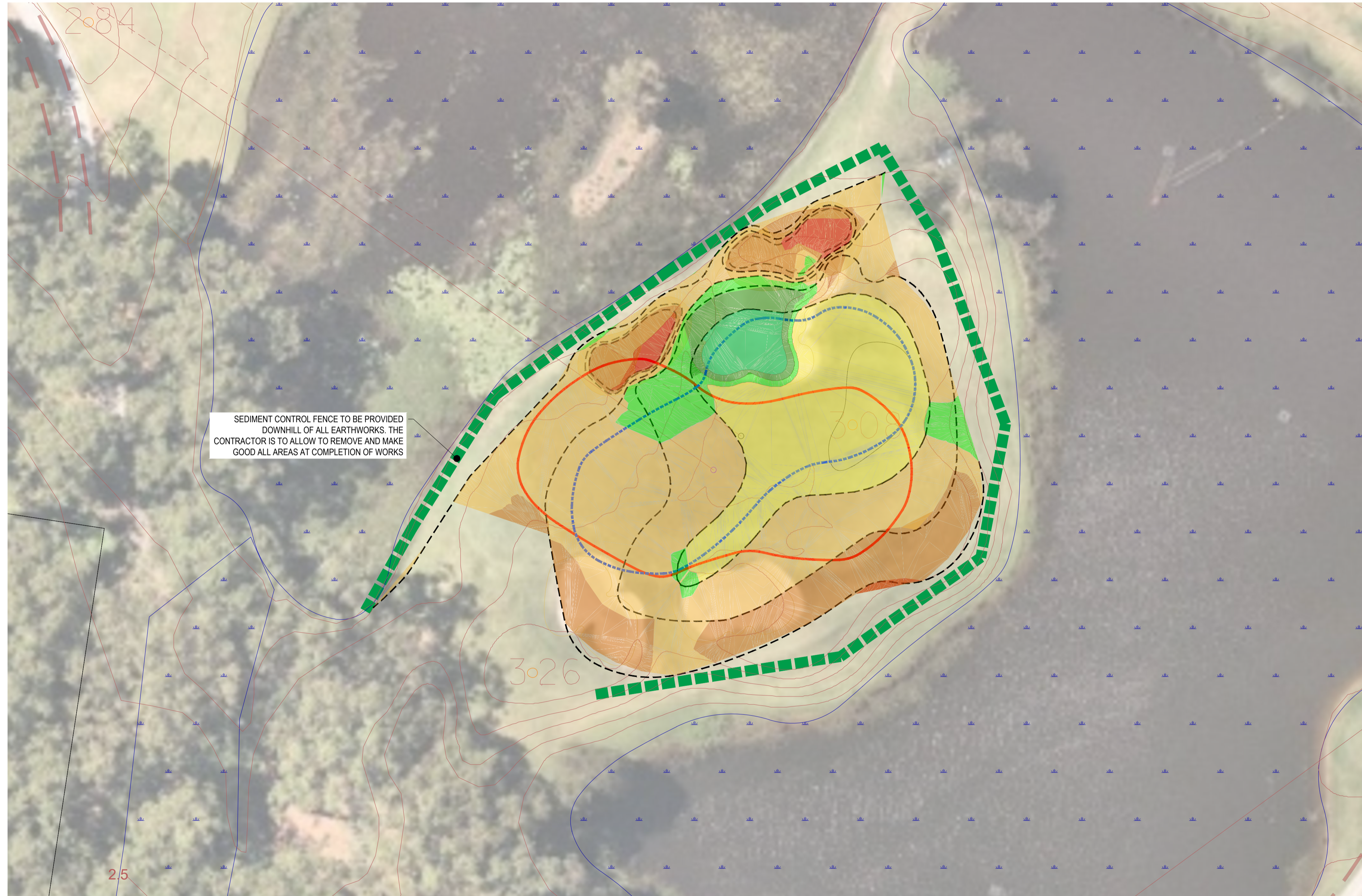
THIS TEXT TO BE PRINTED IN COLOUR

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
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	1.25 1.50



CUT AND FILL VOLUMES

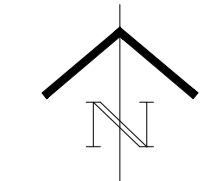
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Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161

ISSUE FOR DEVELOPMENT APPLICATION

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

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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8TH GREEN DETAIL PLAN

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

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

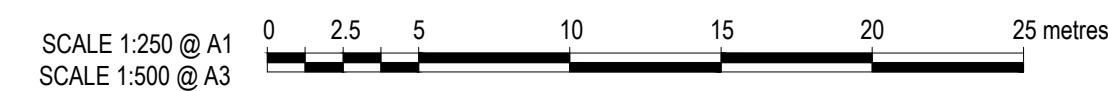
CUT & FILL LEGEND

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CUT AND FILL VOLUMES

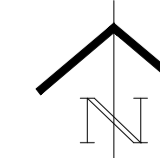
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Final Surface v Existing Surface	Cut	26	40	102	1230	35	1026	103	193	5	1060	0	6	3826
	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
	Balance	435	109	86	-1227	164	-988	22	-149	544	-1053	470	426	-1161



ISSUE FOR DEVELOPMENT APPLICATION

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DESIGN CHECK	AL
APPROVED	CP



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10TH GREEN DETAIL PLAN

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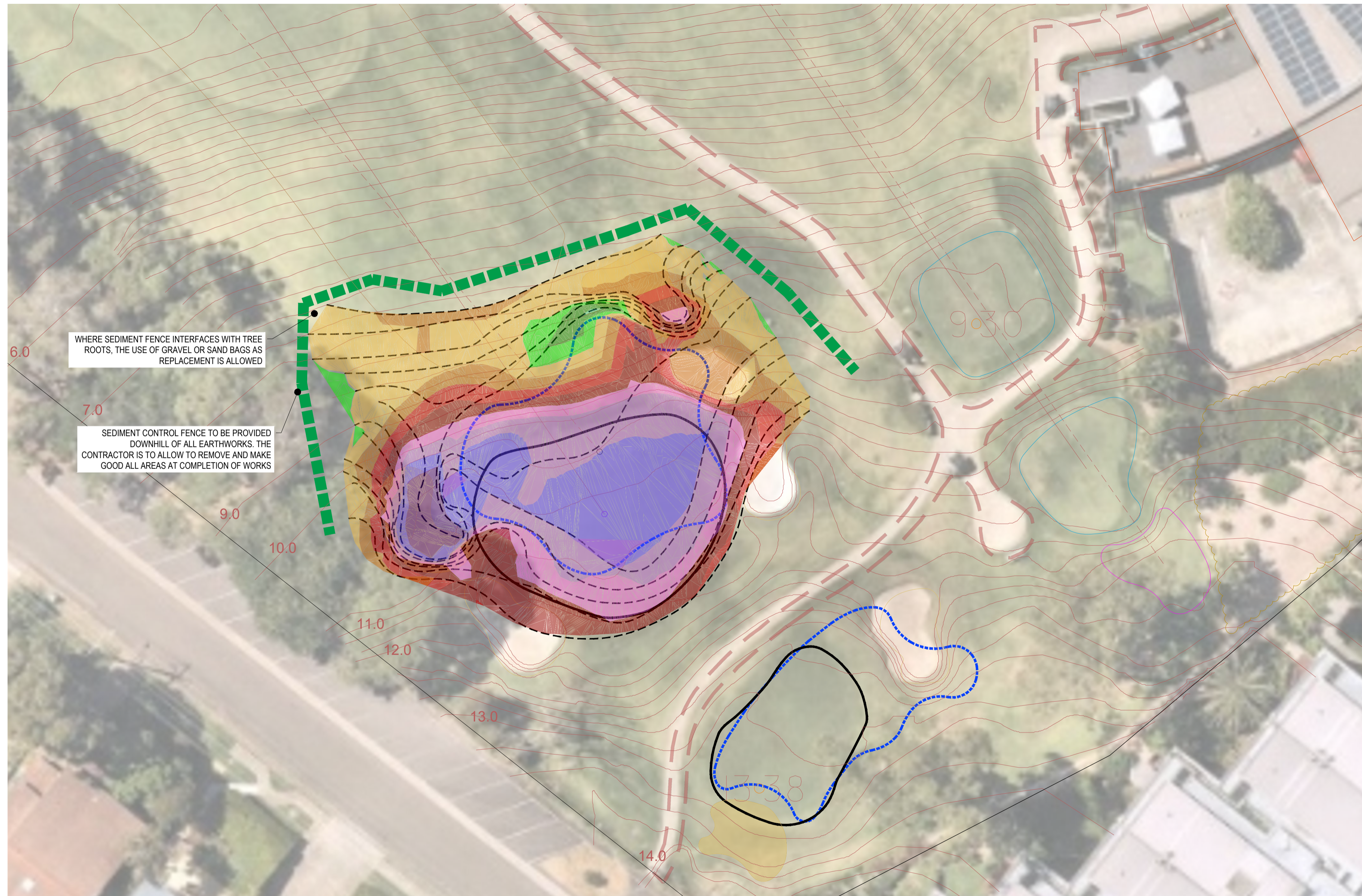
JOB NUMBER: 23003	SCALE @ A1 1:250	SHEET No C119	REV B
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LEGEND

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

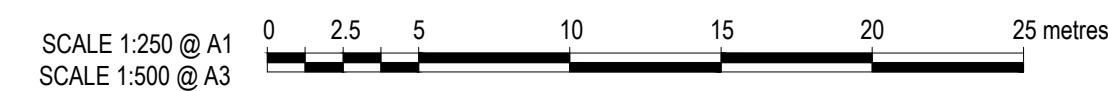
CUT & FILL LEGEND

FROM	TO
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	-1.50 -1.25
	-1.25 -1.00
	-1.00 -0.75
	-0.75 -0.50
	-0.50 -0.25
	-0.25 -0.001
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	0.001 0.25
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	1.25 1.50



CUT AND FILL VOLUMES

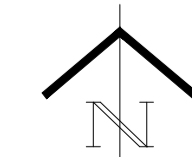
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ISSUE FOR DEVELOPMENT APPLICATION

REV	DATE	REVISION DESCRIPTION
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DESIGNED	CP
DRG CHECK	CP
DESIGN CHECK	AL
APPROVED	CP



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JOB NUMBER: 23003	SCALE @ A1 1:250	SHEET No C120	REV B
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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
	-0.001	0.000
	0.001	0.25
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	0.75	1.00
	1.00	1.25
	1.25	1.50



CUT AND FILL VOLUMES

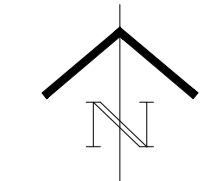
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v	Fill	461	149	188	3	199	38	125	44	549	7	470	432	2665
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ISSUE FOR DEVELOPMENT APPLICATION

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

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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12TH GREEN DETAIL PLAN

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JOB NUMBER: 23003	SCALE @ A1 1:250	SHEET No C121	REV B
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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 |
| | -0.001 | 0.000 |
| | 0.001 | 0.25 |
| | 0.25 | 0.50 |
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| | 1.00 | 1.25 |
| | 1.25 | 1.50 |



CUT AND FILL VOLUMES

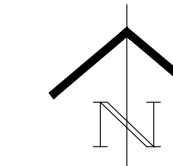
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SCALE 1:250 @ A1
SCALE 1:500 @ A3

ISSUE FOR DEVELOPMENT APPLICATION

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DESIGN CHECK	AL
APPROVED	CP



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SEDIMENT AND EROSION CONTROL MANAGEMENT

CLIENT
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13TH GREEN DETAIL PLAN

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JOB NUMBER: 23003	SCALE @ A1 1:250	SHEET No C122	REV B
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EROSION AND SEDIMENT CONTROL

GENERAL INSTRUCTIONS

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

- THE SOIL EROSION POTENTIAL ON THIS SITE SHALL BE MINIMISED. HENCE WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE :
 - INSTALL SEDIMENT FENCES, TEMPORARY CONSTRUCTION EXIT AND SANDBAG KERB INLET SEDIMENT TRAP.
 - 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

- DURING WINDY CONDITIONS, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
- FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

FENCING

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

OTHER MATTERS

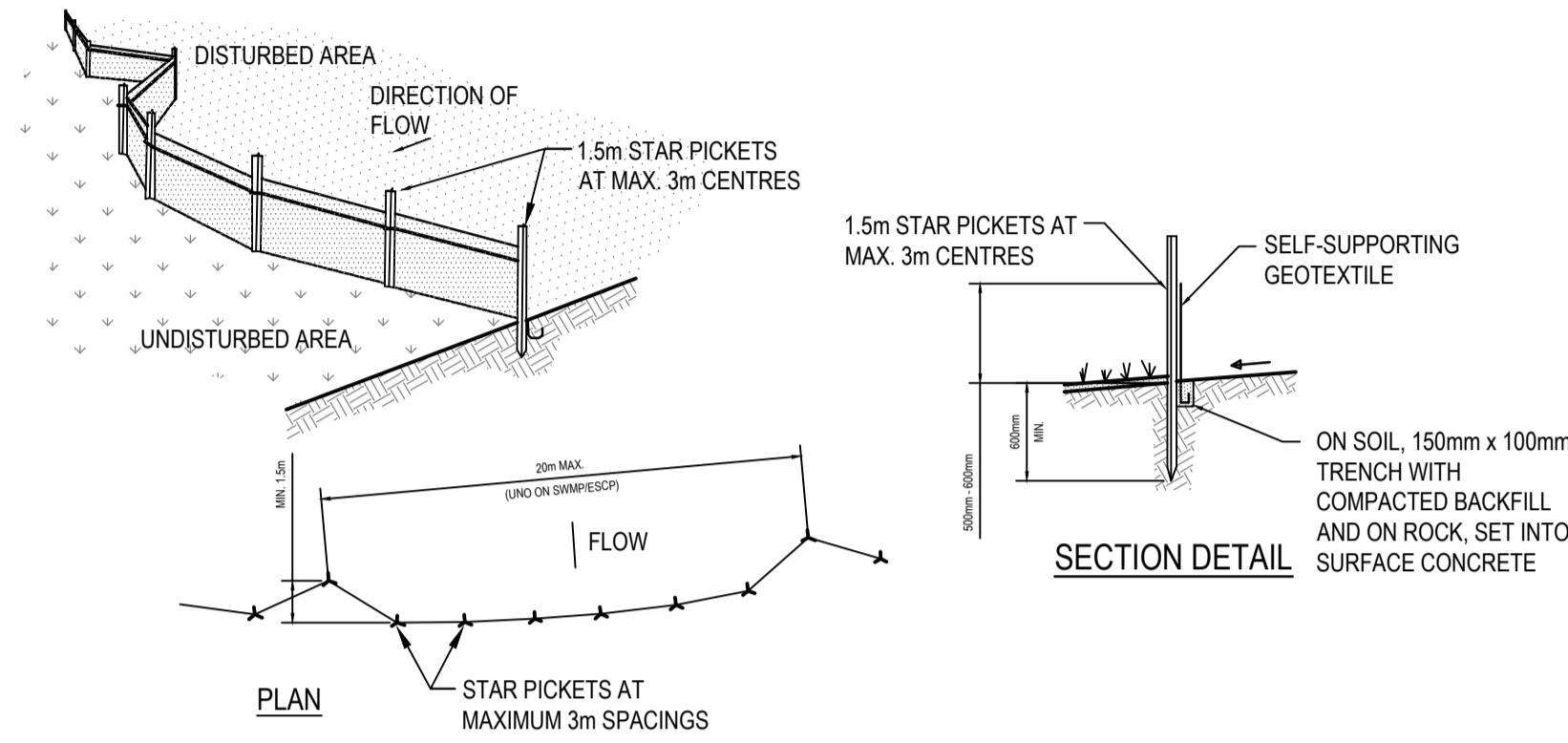
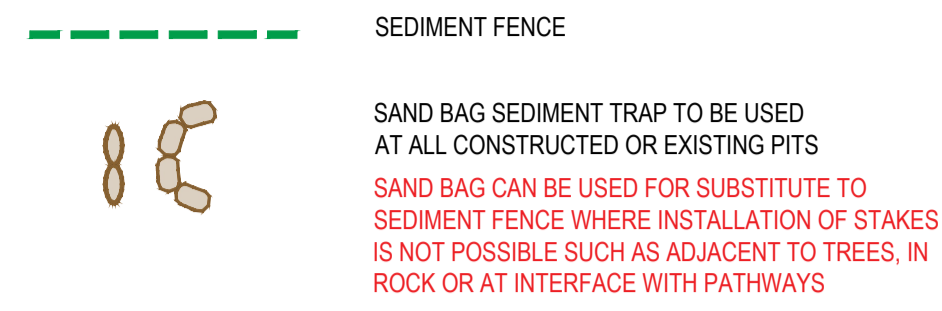
- ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
- RECEPTORS FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER ARE TO BE EMPTIED AS NECESSARY. DISPOSAL OF WASTE SHALL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

SITE INSPECTION & MAINTENANCE

- 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.

- 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



CONSTRUCTION NOTES

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

SEDIMENT CONTROL FENCE

N.T.S.

ISSUE FOR DEVELOPMENT APPLICATION

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SEDIMENT AND EROSION CONTROL MANAGEMENT

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TYPICAL SEDIMENT & EROSION CONTROL DETAILS

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