Geosyntec consultants

engineers | scientists | innovators

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Sydney NSW 2000
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122073 ESA Fortis Manly 27Jun22

27 June 2022

Charlie Wyer
Fortis Development Group
L5, 30-36 Bay Street
Double Bay, NSW 2028

Via email: charlie.wyer@fortis.com.au

Dear Charlie,

Re: Acid Sulfate Soils Assessment, 34-35 South Steyne, Manly NSW

1 Introduction

Fortis Development Group (Client) commissioned Geosyntec Consultants Pty Ltd (Geosyntec) to provide an Acid Sulfate Soil (ASS) assessment for the property located at 34-35 South Steyne, Manly NSW 2095 (the site), the site location is shown in Figure 1 Attachment A. This ASS assessment has been prepared to support a Development Application for redevelopment of the site comprising a 3-level commercial building with ground floor retail over 2 levels of basement.

1.1 Objective

The objective of the ASS investigation was to assess the subsurface soil conditions to determine the potential for ASS to be present at the site and inform the preparation of an ASS management plan, if required, to facilitate the development.

1.2 Scope of works

Based on Geosyntec's understanding of the requirements, and to conduct works in accordance with the NSW Acid Sulfate Soil Manual (1998) (ASSMAC 1998) and the National Acid Sulfate Soil Guidance (Australian Government 2018), the following scope of work was completed:

- Drilling of boreholes at two (2) locations, to a maximum depth of 7m below ground level (bgl) and 3-4m below the water table.
- Collection of soil samples from fill and natural material, field screening of samples based on visual and olfactory observations and logging of the soil lithology at each location.
- ASS sampling from boreholes across the site area in accordance with Section 4.1 of the ASSMAC Acid Sulfate Soils Assessment Guidelines (1998).

- Collection of soil samples from nominal 0.5 m intervals or change of strata and logging of the soil profile by a qualified environmental engineer/scientist including any evidence of ASS.
- Eight (8) samples were pH field screened (pH-field and pH-fox) and NATA accredited laboratory analysis of 4 primary samples for Chromium Reducible Sulfur (CRS) suite based on the field screening (pH-field and pH-fox) results.

2 Soil Assessment and Sampling Works

2.1 Soil Sampling Methodology

Intrusive sampling was carried out using a drilling rig as follows:

- Ground conditions were logged with detail on stratigraphy, discolouration, staining, odours, moisture or other indicators of contamination.
- Soil samples were taken with clean disposable nitrile gloves with care taken to collect soil that had not come in contact with the auger stem. Samples were then placed in laboratory-supplied sample containers with Teflon sealed lid.
- Samples were placed in an iced Esky to cool samples to suitably low temperature for transportation to the laboratory.
- Containers were labelled with the sample number, project number and date with samples despatched under a chain of custody.
- Samples were transported to the primary laboratory, Envirolab Services in Sydney, after the completion of soil sampling activities to allow technical holding times for analysis to be achieved and to minimise any interference with the samples.

2.2 Acid Sulfate Soil Assessment Methodology

Eight (8) natural soil samples (four from each borehole, one above the water table and three below) were field screened for ASS using the pH method provided in the field screening kit provided by the laboratory. The adopted screening process is summarised below:

- pH(field) testing was conducted first, which measures existing acidity and can identify if Actual ASS (AASS) are present. This involves pH measurement of a mixture of deionised water and a subsample of soil (so that the sample is saturated and the mixture is a liquid).
- If pH(field) is <4, oxidation of sulfides is likely to have occurred previously indicating the presence of AASS. pH (field) >4 but <5 indicates acid soil conditions but not necessarily presence of AASS, with confirmatory laboratory analysis required.
- pH field oxidised (fox) testing was then conducted, which provides an indication of the presence of iron sulfides or Potential ASS (PASS). If sulfides are present a reaction will occur. This involves placement of a subsample of soil into the test container, and addition of several mL of pH adjusted peroxide, sufficient to cover the soil, and mixing.
- The reaction of the mixture was monitored for 15 minutes, with the rate of reaction recorded as slight, moderate, high or vigorous.
- Once the reaction was complete, the final pH of the mixture was recorded (pH(fox)).
- If pH(fox) is <3 and a significant reaction occurred, it strongly indicates the presence of PASS.
- The lower the pH(fox) value and the greater the difference between the pH(fox) and pH(field) values, the more indicative of the presence of PASS.
- From the eight (8) field-screened samples from each borehole, the two with the most rigorous reaction, lowest pH(fox) result and the greatest difference in pH(field) and pH(fox)

results were selected for laboratory analysis of Chromium Reducible Sulfur (CRS) suite (total four (4) samples submitted for CRS suite).

Records of the field screening are provided in Section 5.1

3 Laboratory Analysis

3.1 Analytical Schedule

Based on field screening results, samples BH1_4.2-4.4, BH1_5.5-5.7, BH2_4.2-4.4 and BH2_6.4-6.6 were selected to be analysed for the chromium reducible sulfur suite.

4 Field Observations

The key observations made during the fieldworks conducted by Hayden Davies, a Geosyntec Environmental Consultant on 21 April 2022 are summarised as follows (refer to borehole logs in Appendix C):

- The site currently contains a multi-story building, with a commercial ground floor and residential units above. A small loading dock is located at the rear of the building
- The majority of the site was covered in either concrete or asphalt hardstand.
- Fill material comprising of gravely sand, coal chitter and sand with small pebbles were encountered at both sampling locations between the depths of 0 m – 2 m bgl, with small amounts of glass, ceramic and metal fragments observed at BH1 at 1.2m bgl.
- Underlying natural geology consisted of yellow coarse-grained sand to a maximum depth of 7.2m bgl
- No odours or staining were observed during drilling works.
- Groundwater was encountered at 3.8m bgl at both sampling locations.

4.1 Assessment Criteria for Acid Sulfate Soils

ASSMACI (1998) Action Criteria (for 1 – 1000 tonnes disturbed, and more than 1000 tonnes disturbed) **Coarse Texture Soil** from Table 4.4 were adopted. The values used for acid sulfate soils assessment are presented below in Table 4.1.

Table 4.1: Adopted Acid Sulfate Soils Criteria

Type of Material		*Action Criteria 1-1000 tonnes disturbed*		*Action Criteria if more than 1000 tonnes disturbed*	
Texture range.McDonald et al. (1990)	*Approx. clay content (%<0.002 mm)*	*Sulfur trail % S oxidisable (oven-dry basis) eg S_{TOS} or S_{POS}*	*Acid trail mol H^+/tonne (oven-dry basis) eg, TPA or TSA*	*Sulfur trail % S oxidisable (oven-dry basis) eg S_{TOS} or S_{POS}*	*Acid trail mol H^+/tonne (oven-dry basis) eg, TPA or TSA*
Coarse Texture Sands to loamy sands	≤5	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	5 - 40	0.06	36	0.03	18
Fine Texture Medium to heavy clays and silty clays	≥40	0.1	62	0.03	18

Notes:
1. Red highlight represents the criteria being adopted for the site based on soil texture and estimated volume
2. SPOS – Sulfur Peroxide Oxidisable Sulfur; STOS – Sulfur Total Oxidisable Sulfur; TSA – Total Sulfidic Acidiy.
3. TPA – Total Potential Acidity.

5 Results

5.1 Field Screening Results

Sampling Location Id	Depth (m bgl)*	Geosyntec Field pH	Geosyntec Field pHfox*	pH Change	Reaction with Hydrogen Peroxide
BH1	3.6-3.8	7.9	6.42	-1.49	None
BH1	**4.2-4.4**	**8.63**	**6.51**	**-2.12**	None
BH1	**5.5-5.7**	**8.32**	**6.62**	**1.7**	None
BH1	6.5-6.7	8.13	6.68	-1.51	None
BH2	3.6-3.8	7.56	6.59	-0.97	None
BH2	**4.2-4.4**	**8.14**	**6.67**	**-1.47**	None
BH2	5.5-5.7	8.42	6.51	-1.91	None
BH2	**6.4-6.6**	**8.32**	**6.67**	**-1.35**	None

Notes

* - laboratory results are presented in Attachment C

1. A positive peroxide test (and indicator of PASS) includes effervescence (slight to high) and pH change >1 unit as stated in Section 2.2 i) ASSMAC (1998).
2. **Bold denotes samples selected for CRS suite**

5.2 Acid Sulfate Soil Results

The ASS analytical results and parameters were below the adopted assessment criteria for all samples.

6 Conclusions

Based on the findings of this investigation, ASS do not appear to be present at the site. An Acid Sulfate Soils Management Plan (ASSMP) is therefore not required for the site.

7 Closure

Should you have any queries or wish to discuss any points, please do not hesitate to contact the undersigned.

Yours sincerely,

Hayden Davies
Environmental Scientist
Geosyntec Consultants Pty Ltd

Peter Moore
Principal Engineer
Geosyntec Consultants Pty Ltd

Attachments: Attachment A – Figures
Attachment B – Photo Logs
Attachment C – Borehole Logs
Attachment D – Laboratory Transcripts / Chain of Custody

8 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd (“Geosyntec”) for use by the Client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from the Client and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

This report relates to only this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by the Client or amended in any way without prior written approval by Geosyntec.

Geosyntec’s assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigation.

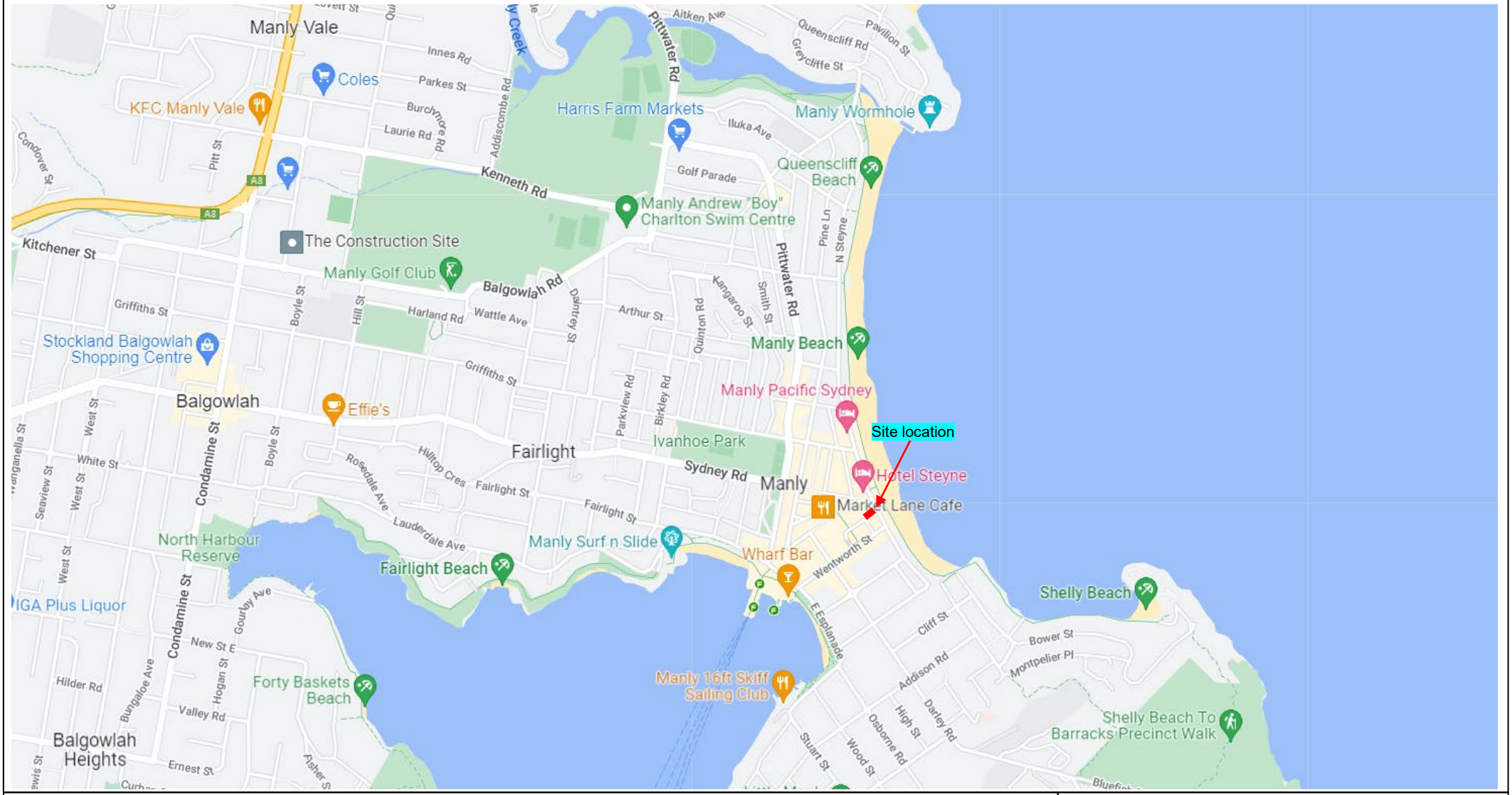
This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

Attachment A - Figures



LEGEND

Approximate Site Boundary

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmaps

Figure 1: Site Location Plan

DSI

Site: 34-35 South Steyne, Manly NSW 2095

Not to Scale

Datum: GDA 1994 MGA Zone 56 - AHD

Client: Fortis Development Group

Job Number: AU122073

Date: May 2022

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LEGEND

- Approximate Site Boundary
- Approximate Borehole Location

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmaps

Not to Scale

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 2: Site Layout Plan

DSI

Site: 34-35 South Steyne, Manly NSW 2095

Client: Fortis Development Group

Job Number: AU122073

Date: May 2022

Geosyntec consultants

Attachment B – Photo Log

Photograph Log

Client Name:	Site Location:	Project Number:	Captured Date
Fortis Development Group	34-35 South Steyne, Manly NSW	122073	21/4/22

Image 1: Soil profile of BH1

Image 2: Natural sand encountered in BH1

Image 3: Soil profile of BH2

Image 4: Natural sand encountered in BH2

Attachment C – Borehole Logs

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BH1

PROJECT NUMBER 122073
PROJECT NAME ESA Fortis Manly
CLIENT Fortis Development Group
ADDRESS 34-35 South Steyne, Manly NSW

DRILLING COMPANY EPOCA
DRILLING METHOD Solid Flight Auger
TOTAL DEPTH 7.2m
DRILLING DATE 21/4/22

COORDINATES -33.797799, 151.287868
COORD SYS GDA94-Geographic
SURFACE ELEVATION -
LOGGED BY HD
CHECKED BY

COMMENTS NO = No Odour, NS = No Staining, NAsb = No Potential Asbestos Containing Material Observed, NI = No Observed Inclusions

Depth (m)	PID	Samples	Water	Graphic Log	Material Description	Moisture	Additional Observations
					Concrete	D	
		BH1_0.2-0.4			Gravel		NO, NS, NAsb
0.5		BH1_0.5-0.7			Fill: Sand, grey/light grey, loose, coarse grained		NO, NS, NAsb
1					Fill: Coal chitter, black, loose with small black pebbles FIll: Sand dark brown, loose coarse grained		NO, NS, NAsb
1.5		BH1_1.2-1.4			Fill: Sand, dark brown with cream mixing, loose		NO, NS, NAsb Inclusions of glass, ceramic and metal pieces
2					Natural: Sand, cream/yellow, loose, coarse grained		NO, NS, NAsb
2.5							
3							
3.5			▽			W	
4							
4.5		BH1_4.2-4.4					
5							
5.5							
6							
6.5		BH1_6.5-6.7					
7							
7.5					End of hole at 7.2m target depth		

Disclaimer This bore log is intended for environmental not geotechnical purposes.

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BH2

PROJECT NUMBER 122073	**DRILLING COMPANY** EPOCA	**COORDINATES** -33.797853, 151.287943
PROJECT NAME ESA Fortis Manly	**DRILLING METHOD** Solid Flight Auger	**COORD SYS** GDA94-Geographic
CLIENT Fortis Development Group	**TOTAL DEPTH** 7m	**SURFACE ELEVATION** -
ADDRESS 34-35 South Steyne, Manly NSW	**DRILLING DATE** 21/4/22	**LOGGED BY** HD
		CHECKED BY

COMMENTS NO = No Odour, NS = No Staining, NAsb = No Potential Asbestos Containing Material Observed, NI = No Observed Inclusions

Depth (m)	PID	Samples	Water	Graphic Log	Material Description	Moisture	Additional Observations
0					Concrete	D	
		BH2_0.2-0.4			Fill: Sandy gravel, grey, loose, coarse grained		NO, NS, NAsb
0.5		BH2_0.5-0.7			Fill: Coal chitter, black, loose with small black pebbles		NO, NS, NAsb
					Fill: Sand, grey/dark brown, loose with small pebble inclusions		NO, NS, NAsb
1					Natural: Sand, cream/yellow, loose, coarse grained		NO, NS, NAsb
1.5							
2							
2.5							
3							
3.5			▽			W	
4							
		BH2_4.2-4.4					
4.5							
5							
5.5		BH2_5.5-5.7					
6							
6.5							
7							
7.5					End of hole at 7m, target depth		

Disclaimer This bore log is intended for environmental not geotechnical purposes.

Attachment D - Laboratory Transcripts / Chain of Custody

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Company:	Geosynte c	Client Project Name/Number/Site etc (ie report title):	122073 - Manly
Contact Person:	Hayden Davies		
Project Mgr:	Tyler Creese	PO No. (if applicable):	
Sampler:	H+D	Envirolab Quote No.:	
Address:		Date results required:	
		Or choose: ☑ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day	
Phone:	Mob: 0451021512	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*	
Email Results to:	Hayden.davies@geosynte c.com Tyler.creese@geosynte c.com	Additional report format: ☐ Esdat ☐ Equis	
Email Invoice to:	admin@geosynte c.com	Lab Comments:	

Sample Information					Tests Required																Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Hold	CRS															Provide as much information about the sample as you can
1	BH1 - 0.2 - 0.4		21/4/22	SO:1	X																
2	BH1 - 0.5 - 0.7		↓	↓	X																
3	BH1 - 1.2 - 1.4				X																
4	BH1 - 4.2 - 4.4					X															
5	BH1 - 6.5 - 6.7					X															
6	BH2 - 0.2 - 0.4				X																
7	BH2 - 0.5 - 0.7				X																
8	BH2 - 4.2 - 4.4					X															
9	BH2 - 5.5 - 5.7		↓	↓		X															

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	Geosynte	Received by (Company):	ECS SYD
Print Name:	Hayden Davis	Print Name:	Olivia Lee
Date & Time:	21/4/22	Date & Time:	21/04/22 1230
Signature:		Signature:	

Lab Use Only

Job number:	293800
Temperature:	5°C
Cooling:	Ice / Ice pack / None
Security seal:	Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Geosyntec
Attention	Tyler Creese, Hayden Davies

Sample Login Details

Your reference	122073-Manly
Envirolab Reference	293840
Date Sample Received	21/04/2022
Date Instructions Received	21/04/2022
Date Results Expected to be Reported	29/04/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	5
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Chromium Suite	On Hold
BH1-0.2-0.4		✓
BH1-0.5-0.7		✓
BH1-1.2-1.4		✓
BH1-4.2-4.4	✓	
BH1-6.5-6.7	✓	
BH2-0.2-0.4		✓
BH2-0.5-0.7		✓
BH2-4.2-4.4	✓	
BH2-5.5-5.7	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 293840

Client Details

Client	Geosyntec
Attention	Tyler Creese, Hayden Davies
Address	Suite 1, Level 9, 189 Kent Street, Sydney, NSW, 2000

Sample Details

Your Reference	**122073-Manly**
Number of Samples	9 Soil
Date samples received	21/04/2022
Date completed instructions received	21/04/2022

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

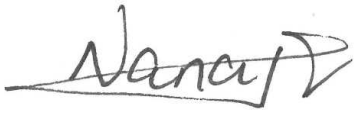
Date results requested by	29/04/2022
Date of Issue	29/04/2022

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Chromium Suite					
Our Reference		293840-4	293840-5	293840-8	293840-9
Your Reference	UNITS	BH1	BH1	BH2	BH2
Depth		4.2-4.4	6.5-6.7	4.2-4.4	5.5-5.7
Date Sampled		21/04/2022	21/04/2022	21/04/2022	21/04/2022
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	29/04/2022	29/04/2022	29/04/2022	29/04/2022
Date analysed	-	29/04/2022	29/04/2022	29/04/2022	29/04/2022
pH $_{kcl}$	pH units	8.5	8.4	8.4	8.4
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+ /t	<5	<5	<5	<5
Chromium Reducible Sulfur	%w/w	0.01	<0.005	0.008	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	9	<3	5	<3
S_{HCl}	%w/w S	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	[NT]	[NT]	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	6.4	19	14	18
s-ANC_{BT}	%w/w S	2.1	6.1	4.5	5.9
s-Net Acidity	%w/w S	<0.005	<0.005	<0.005	<0.005
a-Net Acidity	moles H^+ /t	<5	<5	<5	<5
Liming rate	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+ /t	8.6	<5	5.1	<5
Liming rate without ANCE	kg $CaCO_3$ /t	<0.75	<0.75	<0.75	<0.75
s-Net Acidity without ANCE	%w/w S	0.014	<0.005	0.0080	<0.005

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Net acidity including ANC has a safety factor of 1.5 applied. Neutralising value (NV) of 100% is assumed for liming rate. Based on National acid sulfate soils identification and laboratory methods manual June 2018. 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: Chromium Suite						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			29/04/2022	[NT]	[NT]	[NT]	[NT]	29/04/2022	[NT]
Date analysed	-			29/04/2022	[NT]	[NT]	[NT]	[NT]	29/04/2022	[NT]
pH $_{kcl}$	pH units		Inorg-068	[NT]	[NT]	[NT]	[NT]	[NT]	85	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	121	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	118	[NT]
a-Chromium Reducible Sulfur	moles H^+ /t	3	Inorg-068	<3	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity without ANCE	%w/w S	0.005	Inorg-068	<0.005	[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.

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.