

Donegal Stud Residential Subdivision Stage 16 at 36 Tir Conaill Avenue, Flat Bush

Geotechnical Completion Report

Hugh Green Limited

Reference: 773-GENZAUCK16856AE

20 February 2023

DONEGAL STUD RESIDENTIAL & COMMERCIAL/RETAIL SUBDIVISION STAGE 16 AT 36 TIR CONAILL AVENUE

Geotechnical Completion Report

Report reference number: 773-GENZAUCK16856AE

20 February 2023

PREPARED FOR

Hugh Green Limited

C/- Harrison Grierson Consultants Limited
PO Box 5760
Wellesley Street
Auckland 1051

PREPARED BY

Tetra Tech Coffey

Level 4, 25 Teed Street, Newmarket
Auckland
1023 New Zealand
p: +64 9 379 9463

NZBN 9429033691923

QUALITY INFORMATION

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1. INTRODUCTION AND DESCRIPTION OF SUBDIVISION

This Geotechnical Completion Report has been prepared for Hugh Green Limited as part of the documentation required to be submitted to Auckland Council following residential subdivisional development.

It contains our Suitability Statement, relevant test data and the Harrison Grierson Consultants Limited as-built plan set relating to Stage 16 of the Donegal Stud Residential Subdivision as follows:

Table 1: Harrison Grierson Consultants Limited As-Built Plans

Title	Reference No.	Date
Finished Contours As-Built Plan	A2111813.00-16-AB200	February 2023
Cut to Fill As-Built Plan	A2111813.00-16-AB220	February 2023

This report covers the construction period between October 2020 and December 2022 and is intended to be used for certification purposes for:

- 25 residential lots numbered Lots 1 to 25;
- 1 Commercial/Retail numbered Lot 1003;
- 1 electrical substation numbered Lot 508; and
- 2 new roads identified as Lots 505 and 506.

Stage 16 is located at 36 Tir Conaill Avenue, Flat Bush, and as can be seen on the Cut to Fill As-Built Plan, most of the lots in this residential development have been partly or totally affected by bulk earthworks with associated fill depths of approximately 2.5 metres.

2. RELATED REPORTS

Previous Tetra Tech Coffey geotechnical reports relevant to the subject land include:

- Geotechnical Investigation Report on Proposed Donegal Stud Stage 10 Residential Subdivision, 62 Thomas Road, Flat Bush, reference GENZAUCK16856AB, dated 11 May 2017;
- Geotechnical Completion Report on Donegal Stud Stage 10A Residential Subdivision, 84 Thomas Road, Flat Bush, reference GENZAUCK16856AB, dated 24 September 2018;
- Proposed MSE Block Retaining Wall at Road 6 Donegal Stud Stage 13 Residential Subdivision Flat Bush, reference GENZAUCK16856AE, dated 23 January 2020;
- Geotechnical Investigation Report on Proposed Donegal Stud Stage 14-16 at, 64 Thomas Road, Flat Bush, reference GENZAUCK16856AE, dated 8 April 2020;
- Geotechnical Completion Report on Donegal Stud Stages 13, Flat Bush, reference GENZAUCK16856AE, dated 19 January 2021;
- Geotechnical Completion Report on Donegal Stud Stages 14, Flat Bush, reference GENZAUCK16856AE, dated 27 September 2021; and,
- Geotechnical Completion Report on Donegal Stud Stages 15A & 15C, Flat Bush, reference GENZAUCK16856AE, dated 29 November 2021.

The conclusions and recommendations of the above documents (where relevant) have been referenced as part of the preparation of this report.

3. EARTHWORKS OPERATIONS

3.1. PLANT

The main items of plant used by the subdivision contractor, Dempsey Wood Civil Limited, included:

- Motor Scrapers;
- Bulldozers with Scoops;
- Bulldozers;
- Dump Trucks;
- Excavators;
- Tractor with Discs;
- Tractors;
- Front End Loaders;
- Water Trucks;
- Sheep Foot Compactors;
- Pad Foot Compactor;
- Graders; and
- Vibrating Drum Rollers.

3.2. CONSTRUCTION PROGRAMME

Bulk earthworks operations for Stage 16 were largely undertaken in conjunction with the construction of Stage 10 and Stages 13 to 15. Initially earthworks were conducted within Stage 16 to form a working compound containing site sheds, equipment, and consumables. The compound was formed by Transpower to enable the construction of a stable corridor along Koromeke Street and Dungloe Avenue for a high voltage underground power cable to be connected to a substation located on Charlestown Drive.

The construction events and fill placed during this time was discussed in detail and certified in Geotechnical Completion Report (GCR) prepared for those stages. We do not intend to reiterate those comments in this report.

More recently (2021 to 2022) earthworks were conducted within Stage 16 to remove stockpiles and to place minor depths of fill to lift ground levels to the final subgrade levels shown on the attached Harrison Grierson Consultants Limited, Final Contours Plan and to construct the associated accessways. Most of the earthworks were completed by December 2022.

4. QUALITY ASSURANCE AND CONTROLS

4.1. INSPECTIONS

During the earthworks operation engineering inspections were undertaken on a regular basis to assess compliance with NZS 4431:1989 and our project specific recommendations and specifications. Project specific inspections were required on Stage 16 for:

- Topsoil stripping;
- Undercuts to remove soft and/or unsuitable material and to confirm that adequate strength base materials had been exposed;
- Removal of existing stockpiles;
- Silt pond stripping and preparation for backfilling to ensure that all soft unsuitable material had been removed; and
- Observation of bulk cut to fill operations and compaction testing on Engineered fill.

4.2. QUALITY CONTROL CRITERIA

4.2.1. Compaction

Due to the varying soil types being used as filling, the compaction control criteria of minimum allowable shear strength and maximum allowable air voids were mainly used for quality assurance purposes.

Specification details were as follows:

Minimum Shear Strength and Maximum Air Voids Method

Table 2: Minimum Shear Strength and Maximum Air Voids Method

(a)	<u>Air Voids Percentage</u>	
	(As defined in NZS 4402)	
	General Fill	
	Average value less than	10%
	Maximum single value	12%
(b)	<u>Undrained Shear Strength</u>	
	(Measured by Pilcon shear vane - calibrated using NZGS 2001 method)	
	General fill	
	Average value not less than	140 kPa
	Minimum single value	120 kPa

Note: The average value shall be determined over any ten consecutive tests

4.3. QUALITY ASSURANCE TESTING

4.3.1. Compaction

Regular insitu density, strength and water content tests were carried out on all areas of the filling at or in excess of the frequency recommended by NZS 4431:1989.

Control tests carried out on the filling showed that on a few occasions the required compaction standards were not achieved. Results of these test failures were relayed to the site foreman and/or his staff, and to the best of our knowledge the affected areas of fill were re-worked as necessary.

In each case, further testing was carried out until compliance with the above standards was achieved except for test number 216 which was awarded a discretionary pass based on the its location being at depth within a proposed cul de sac head.

5. PROJECT EVALUATION

5.1. BEARING CAPACITY AND SETTLEMENT OF BUILDING FOUNDATIONS

Following the completion of earthworks operations, we returned to the site during November 2022 and drilled a series of hand auger boreholes at appropriate locations in order to evaluate likely foundation options for future residential building development. Typical topsoil depths on each lot were also assessed during this time period as the test sites became available.

Based on the findings of the boreholes we have assessed that at current subgrade levels, all cut, filled and undisturbed natural ground has a geotechnical ultimate bearing capacity of 300 kPa (as required by NZS 3604:2011) within the zone of influence of conventional shallow residential building foundation loads.

It should be noted that NZS 3604:2011 only allows a maximum backfill depth of 600mm over the building platform of a dwelling unless an Engineering design solution is proposed, on account of the risk of induced consolidation of the subsoils caused by the weight of the backfill.

As required by Module 4 of NZGS/MBIE guidelines “Earthquake Resistant Foundation Design” Table 5.1 we recommend that for shallow footings a strength reduction factor of 0.5 for all ultimate limit state design loads.

5.2. EXPANSIVE SOILS

Three sets of laboratory Shrink Swell Index Tests were carried out on samples selected from within the zone of likely influence of future shallow building foundations over the wider area of Stages 14 to 16, one test per stage area.

These tests were carried out in accordance with AS1289, Methods of Testing Soils for Engineering Purposes test Section 7 and were primarily intended to assess the Expansive Site Class of the site materials as defined in AS2870, “Residential Slabs and Footings – Construction”.

All test results are IANZ (International Accreditation New Zealand) endorsed and full details are included in Appendix B.

Based on the results of the laboratory tests together with our visual-tactile assessment and local knowledge, the assessed AS2870 expansive site Class is presented below in Table 3. Specific design alternatives for this site Class are presented in the Suitability Statement. Alternatively, foundation design can be undertaken in accordance with B1VM4.

On some expansive clay sites if cast on-grade floor slab construction takes place during a long dry summer, exposed building platform soils may dry out and become highly desiccated.

Over time the presence of the floor slab will cause capillary rise of moisture to the underside of the damp proof course and potentially expansive dry ground may wet up and swell, causing floor slab uplift. The effect may be very slight in some cases and extreme in others, especially if free water can reach the central underside of the slab as could occur if any subsoil drainage is discharged beneath the slab or an under-slab water pipe leaks.

Floor slab uplift usually remains unnoticed in carpeted homes but can cause distress on tile floors and in garages where cracks are more apparent. It may also rack upper storeys if non-load bearing ground floor walls are lifted and act as struts. Further, it may cause drainage problems on flat roofed houses where gutter gradients may be reversed.

Thorough soaking (in the form of low flow sprinklers for an extended period rather than flooding of the surface with a hose only once is recommended to allow for infiltration into the soil) of the exposed building platform

area a few days before hardfill placement can help to reduce this potential problem. Careful detailing of construction joints in brittle building elements can also be of benefit. Alternatively, removal and replacement of the desiccated surface layers could be undertaken.

5.3. FILL INDUCED SETTLEMENT LOTS 1 TO 25

As a result of our pre-fill inspections and quality control testing, we are of the opinion that induced differential settlements beneath or within the certified filling due to its imposed weight, should be insignificant with respect to conventional NZS 3604:2011 residential building developments.

5.4. SETTLEMENT ANALYSIS LOT 1003

As a result of our pre-fill inspections and quality control testing, we are of the opinion that induced differential settlements beneath or within the certified filling due to its imposed weight, should be insignificant with respect to light commercial/ retail building loads on lot 1003.

A machine borehole and CPTs were also put down in Lot 1003 to assess and to collect laboratory samples of the subsoils beneath the proposed future light commercial/retail area. The assessment of the subsoils has allowed for soil parameters to be assessed and to enable settlement analysis to be undertaken. Accordingly, potential magnitudes of differential settlement have been assessed in critical areas using consolidation analysis, Plaxis 2D.

The results of our analysis demonstrated that the strength of the filled and natural ground was sufficient and that under a maximum Live floor load of 10kPa, predicted magnitudes of differential settlement were within Building Code limits and perceived remedial works were not required.

The results of our laboratory testing and settlement analysis are presented in Appendix D.

5.5. LIQUEFACTION POTENTIAL

According to Guidelines Geotechnical Earthquake Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards by the New Zealand Geotechnical Society (November 2021) liquefaction susceptibility is generally assessed based on geological and compositional criteria.

With regard to geological criteria, NZGS guidance states that natural soils typically susceptible to liquefaction are young Holocene sediments. The geological units present on site are older (mid-Pleistocene) soils which would not be typically expected to liquefy based on both age and origin.

Based on this assessment, we consider the site to have very low liquefaction potential under either serviceability or ultimate limit state seismic events.

5.6. STORMWATER CONTROLS

It is important on all lots that due care is paid to the design and construction of appropriate stormwater disposal systems. These systems should serve to collect all runoff from roofs, driveways and paved areas, together with discharges from retaining wall drains and other subsoil drains and should connect directly into the public stormwater drainage network.

5.7. SERVICE TRENCHES

As is normal on all subdivisions, building developments involving foundations within the 45-degree zone of influence from pipe inverts will require engineering input. However, it is unlikely to be an issue for the Stage 15A and 15C lots based on the as-built plans provided.

5.8. ROAD SUBGRADES

Dynamic Cone Penetrometer (DCP) testing was undertaken at regular intervals on the trimmed road subgrades and the results were subsequently forwarded to HGCL for pavement design purposes.

5.9. VEGETATION COVER

Wherever practical on sloping land beyond building platform areas, all existing grass cover should be maintained and even supplemented with new plantings. Any vegetation cleared beyond the immediate area of building platforms for temporary construction purposes should be replanted replaced as soon as possible.

The contribution of appropriate vegetation cover to sediment and erosion control should not be underestimated.

5.10. TOPSOIL

Topsoil depths in likely building platform areas were checked by the drilling of a shallow borehole probe in the approximate centre of each lot. Our findings, which are indicative only and subject to variation at other locations, show that topsoil depths are likely range between 100 mm and 300 mm.

5.11. CONTRACTOR'S WORK

We have relied on the Contractor's work practices and assume that the works have been carried out in accordance with:

- (i) The approved Contract drawings and design details,
- (ii) The approved Contract specifications,
- (iii) Authorised Variations issued during the execution of the works,
- (iv) The conditions of Resource, Earthworks and Building Consents where applicable,
- (v) The relevant Tetra Tech Coffey Geotechnics reports, recommendations and site instructions,

and that all as-built information and other details provided to the Client and/or Tetra Tech Coffey (NZ) Limited are accurate and correct in all respects.

6. STATEMENT OF PROFESSIONAL OPINION AS TO THE SUITABILITY OF LAND FOR BUILDING DEVELOPMENT

I, Chris Armstrong, of Tetra Tech Coffey (NZ) Limited, Auckland, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering as defined in section 1.2.3 of NZS 4404:1989 and was retained by the Developer as the Geotechnical Engineer on Stage 16 of the Donegal Stud residential subdivision, Flat Bush.
2. The extent of preliminary investigations carried out to date are described in the Coffey Geotechnical Investigation Report, reference GENZAUCK16856AE, dated 08 April 2020. The conclusions and recommendations of that document have been re-evaluated during the preparation of this report. Details of the results of all tests carried out are appended.
3. In my professional opinion, not to be construed as a guarantee, I consider that:
 - a. The earth fills shown on the appended Harrison Grierson Consultants Limited Cut to Fill as-built plan have been placed in compliance with NZS 4431:1989 and related documents.

- b. A geotechnical ultimate bearing capacity of 300 kPa may be assumed for shallow foundation design on residential Lots 1 to 25.
- c. For Lot 1003 light commercial/retail building platform, a geotechnical ultimate bearing capacity of 300 kPa may be assumed for foundation design on for strip or pad foundation of up to 1.5 metres width.
The design floor live load should be limited to 10 kPa. In addition, any building platform earth fill and hardfill depths should be limited to 600mm (10 kPa). This is because high floor loads and large post earthworks subfloor fill depths may trigger unacceptable ground settlements beneath buildings.
Building loads, post earthworks subfloor fill depths or foundation widths beyond the limits presented above will need to be substantiated by site specific foundation investigations and analyses by a Chartered Professional Geotechnical Engineer familiar with the contents of this report.
- d. The backfilling and compaction of the stormwater and sanitary sewer trenches on this subdivision has, where possible, been carried out to appropriate standards having regard for the prevailing ground conditions and associated compaction induced pipe loadings.
- e. Nevertheless, no building development should take place within the 45-degree zone of influence of drain inverts unless endorsed by specific site investigations, foundation designs and by construction inspections undertaken by a Chartered Professional Engineer experienced in geomechanics to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of the pipe and the trench backfill.
- f. The assessed AS 2870:2011 expansive site Class for all residential and light commercial/retail lots in Stage 16 is M (Moderate).
- g. Subject to the geotechnical recommendations and expansive soil assessment associated with 3(b), 3(c), 3(d), 3(e) and 3(f) above:
 - (i) The cut, filled and original ground within residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604:2011 (that incorporates specific foundation and associated structural design on account of the expansive soils site Class) and related documents.
 - (ii) On all residential and light commercial/retail lots in Stage 16 foundation design may be carried out in accordance with AS 2870 (Class M) or alternatively, the foundation design may be carried out in accordance with NZS3604:2011 provided that in this case the minimum recommended foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 600mm.
- 4. Subject to the geotechnical limitations, restrictions and assessments associated with 3(a) and 3(c) above, the filled and original ground within Lot 1003 is suitable for the construction of conventional light commercial or retail buildings (i.e. single storey structures with or without timber mezzanine floors, comprising reinforced concrete block or tilt panel boundary walls, lightweight roofing and cladding elements fixed to timber or steel portal or truss frames with reinforced concrete floor slabs on grade) incorporating shallow strip and/or pad foundations. The minimum recommended perimeter footing depth is 600mm.
Specific site investigations, design modifications and construction inspections should be carried out as necessary by a Chartered Professional Engineer experienced in geomechanics for all buildings exceeding these limitations, but in any event, we consider it prudent for all light commercial/retail landowners to undertake site specific investigation and foundation design with a view to optimising design bearing capacities, design loads on retaining walls and final site gradients.
- 5. Road subgrades have been formed having due regard for slope stability and settlement, although CBR values will likely vary between natural and filled ground as is to be expected.

7. LIMITATIONS

The as-built plans and the professional opinion contained within this report are furnished to Auckland Council and Hugh Green Limited for their purposes alone on the express condition that they will not be relied upon by any other person. Prospective purchasers should still satisfy themselves as to any specific conditions pertaining to their particular land interest.

The appended table summarises the status of each residential lot covered by this Suitability Statement.

For and on behalf of Tetra Tech Coffey

Prepared By:



Ray Berry

Associate Engineering Geologist

Reviewed and Authorised By:



Chris Armstrong

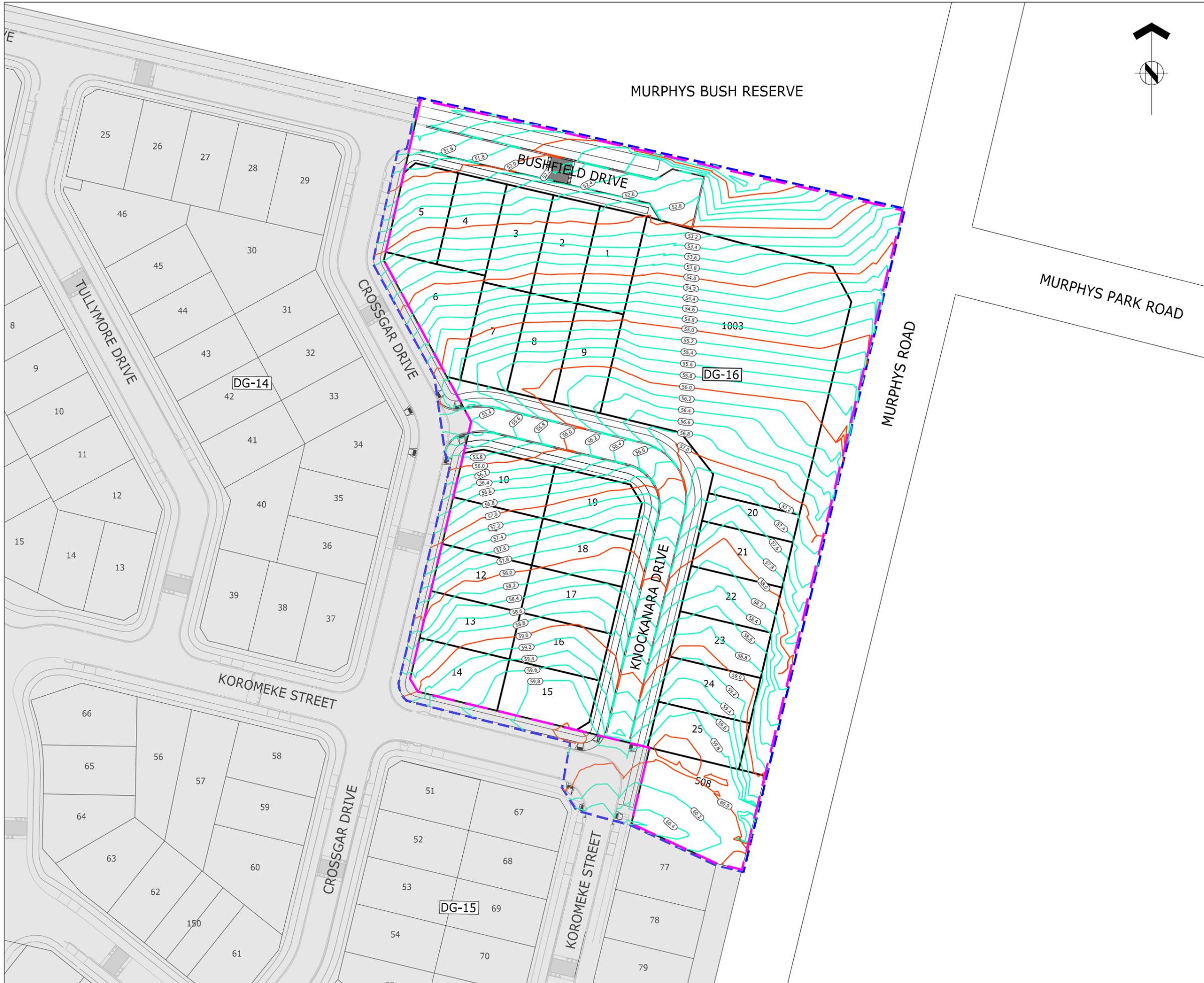
Principal Geotechnical Engineer
CMEng.NZ, CPEng

Table 3: Suitability Statement Summary

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870: 2011 Class
1	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
2	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
3	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
4	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
5	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
6	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
7	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	100	300	M
8	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	100	300	M
9	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	100	300	M
10	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
11	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
12	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
13	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	250	300	M
14	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
15	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
16	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
17	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
18	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
19	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	300	300	M
20	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	100	300	M
21	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	250	300	M

22	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	250	300	M
23	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
24	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	250	300	M
25	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M
1003	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm	200	300	M

APPENDIX A: HARRISON GRIERSON LIMITED AS-BUILT PLANS



THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF HARRISON GRIERSON CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.

- NOTES:**
- ORIGIN OF LEVELS
S 66 SO 48643
RL 54.50m
 - ORIGIN OF COORDINATES
S 66 SO 48643
5905356.71mN
1770941.22mE
 - SURVEY INFORMATION PROVIDED BY DEMPSEY WOOD CIVIL LTD AND TO THE BEST OF OUR KNOWLEDGE IS ACCURATE.

- LEGEND:**
- EARTHWORKS BOUNDARY
 - STAGE 16 BOUNDARY
 - CONTOUR MAJOR AT 1.0m INTERVALS
 - CONTOUR MINOR AT 0.2m INTERVALS

ENGINEERING APPROVAL
ENG-60397590

HUGH GREEN LIMITED

HG AUCKLAND OFFICE
LEVEL 4, 96 ST GEORGES BAY ROAD
PARNELL AUCKLAND 1052
T +64 9 917 5000
W www.harrisongrierson.com

A	AS-BUILT	WXX	10.02.23
REF	REVISIONS	BY	DATE

PROJECT:
**HUGH GREEN LIMITED
 DONEGAL STAGE 16
 36 TIR CONAILL AVENUE, FLAT BUSH**

TITLE:
**FINISHED CONTOURS
 AS-BUILT PLAN**

ORIGINATOR:	DATE:	SIGNED:	PLOT BY:
KKA	15.11.21		WXX
DRAWN:	DATE:	SIGNED:	PLOT DATE:
WXX	02.2023		15.11.21
CHECKED:	DATE:	SIGNED:	SURVEY BY:
DAS	02.2023		DEMPSEY WOOD
APPROVED:	DATE:	SIGNED:	SURVEY DATE:
DAS	02.2023		02.2023

ISSUE STATUS: **AS-BUILT**

PROJECT No:	SCALES:	A3
A2111813.00	1:500-A1 1:1000-A3	
DRAWING No:		REV

A2111813.00-16-AB200 A



NOTES:

- ORIGIN OF LEVELS
S 66 SO 48643
RL 54.50m
- ORIGIN OF COORDINATES
S 66 SO 48643
5905356.71mN
1770941.22mE
- EARTHWORKS VOLUMES :
AREA = 21,559m²
CUT VOLUME (UNADJUSTED) = 23,056m³
FILL VOLUME (UNADJUSTED) = 2,736m³
NET (UNADJUSTED) = 20,320m³
- SURVEY INFORMATION PROVIDED BY DEMPSEY WOOD CIVIL LTD AND TO THE BEST OF OUR KNOWLEDGE IS ACCURATE.

LEGEND:

- CUT CONTOURS SHOWN AT 0.5m INTERVALS
- FILL CONTOURS SHOWN AT 0.5m INTERVALS
- EARTHWORKS BOUNDARY
- STAGE 16 BOUNDARY

ENGINEERING APPROVAL
ENG-60397590

HUGH GREEN LIMITED
 HUGH GREEN GROUP

HG AUCKLAND OFFICE
 LEVEL 4, 96 ST GEORGES BAY ROAD
 PARNELL AUCKLAND 1052
 T +64 9 917 5000
 W www.harrissongrierson.com

REF	REVISIONS	WKK	DATE
A	AS-BUILT		10.02.23

HUGH GREEN LIMITED
 DONEGAL STAGE 16
 36 TIR CONAILL AVENUE, FLAT BUSH

TITLE:
**CUT AND FILL
 AS-BUILT PLAN**

ORIGINATOR:	DATE:	SIGNED:	PLOT BY:
KKA	15.11.21		WKK
DRAWN:	DATE:	SIGNED:	PLOT DATE:
WKK	02.2023		15.11.21
CHECKED:	DATE:	SIGNED:	SURVEY BY:
DAS	02.2023		DEMPSEY WOOD
APPROVED:	DATE:	SIGNED:	SURVEY DATE:
DAS	02.2023		02.2023

ISSUE STATUS: **AS-BUILT**

PROJECT No:	SCALES:	A3
A2111813.00	1:500-A1 1:1000-A3	
DRAWING No:		REV

A2111813.00-16-AB220 **A**

APPENDIX B: CLASSIFICATION TEST DATA



Report No: SSI:ETAM21S-02605

Issue No: 1

Shrink Swell Index Report

Client: Coffey Services (NZ) Limited (Auckland)
 PO Box 8261, Symonds Street
 Auckland 1150

Principal: Ray Berry
 Project No.: 773-ETAM01121AA
 Project Name: 773-GENZAUCK16856AE - DONEGAL STUD
 Lot No.: - TRN: -

James McKelvey
 Approved Signatory: James McKelvey
 (Senior Technician)

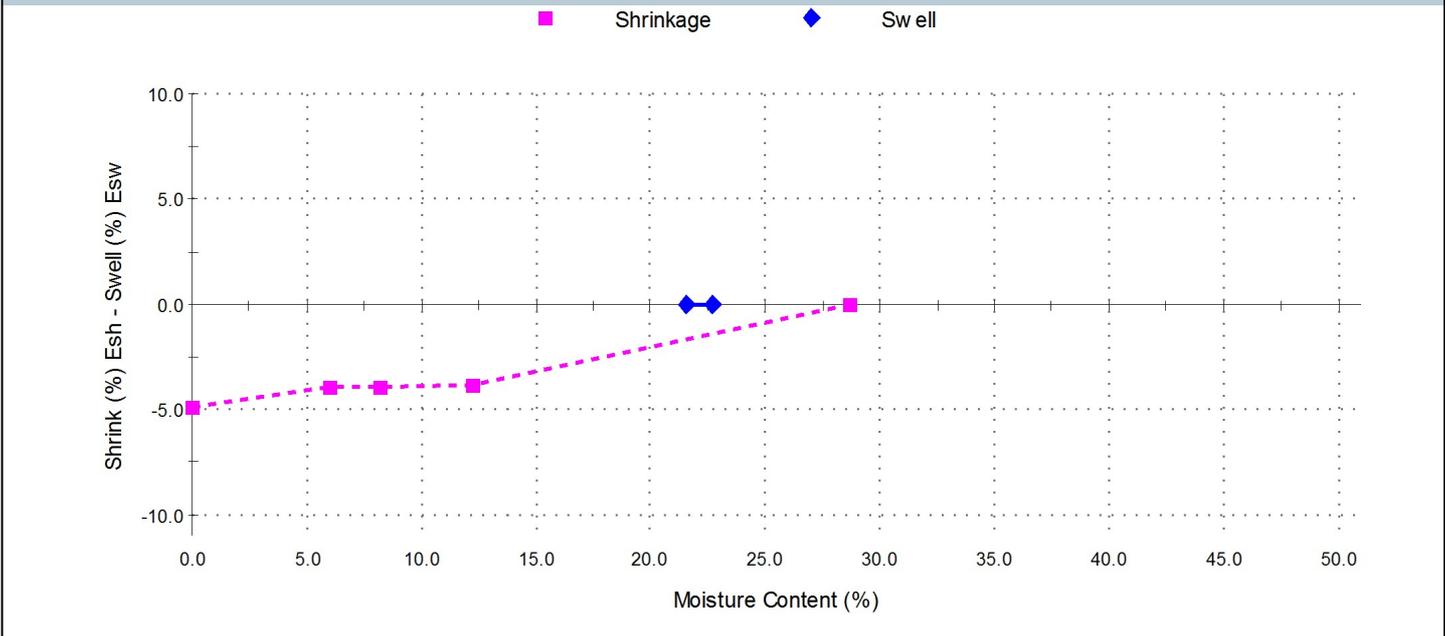
Date of Issue: 4/06/2021

Sample Details

Sample ID:	ETAM21S-02605	Sampling Method:	NZS4407: 2015 Part 2.4.8.3
Date Sampled:	27/05/2021	Material:	Undisturbed Soil
Date Submitted:	28/05/2021	Source:	In-Situ
Date Tested:	28/05/2021		
Project Location:	Greenam Drive, Flat Bush		
Sample Location:	HA01		
Borehole Number:	HA01		
Borehole Depth (m):	0.2		

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
Swell on Saturation (%):	0.0	Shrink on drying (%):	4.9
Moisture Content before (%):	21.6	Shrinkage Moisture Content (%):	28.7
Moisture Content after (%):	22.7	Est. inert material (%):	2%
Est. Unc. Comp. Strength before (kPa):	450+	Crumbling during shrinkage:	0.5%
Est. Unc. Comp. Strength after (kPa):	450+	Cracking during shrinkage:	0.5%

Shrink Swell



Shrink Swell Index - Iss (%): 2.7

Comments

Not accredited
 Work Order No : ETAM21W00723
 Tested By: JM



Report No: SSI:ETAM21S-02606

Issue No: 1

Shrink Swell Index Report

Client: Coffey Services (NZ) Limited (Auckland)
 PO Box 8261, Symonds Street
 Auckland 1150

Principal: Ray Berry
 Project No.: 773-ETAM01121AA
 Project Name: 773-GENZAUCK16856AE - DONEGAL STUD
 Lot No.: - TRN: -

James McKelvey
 Approved Signatory: James McKelvey
 (Senior Technician)

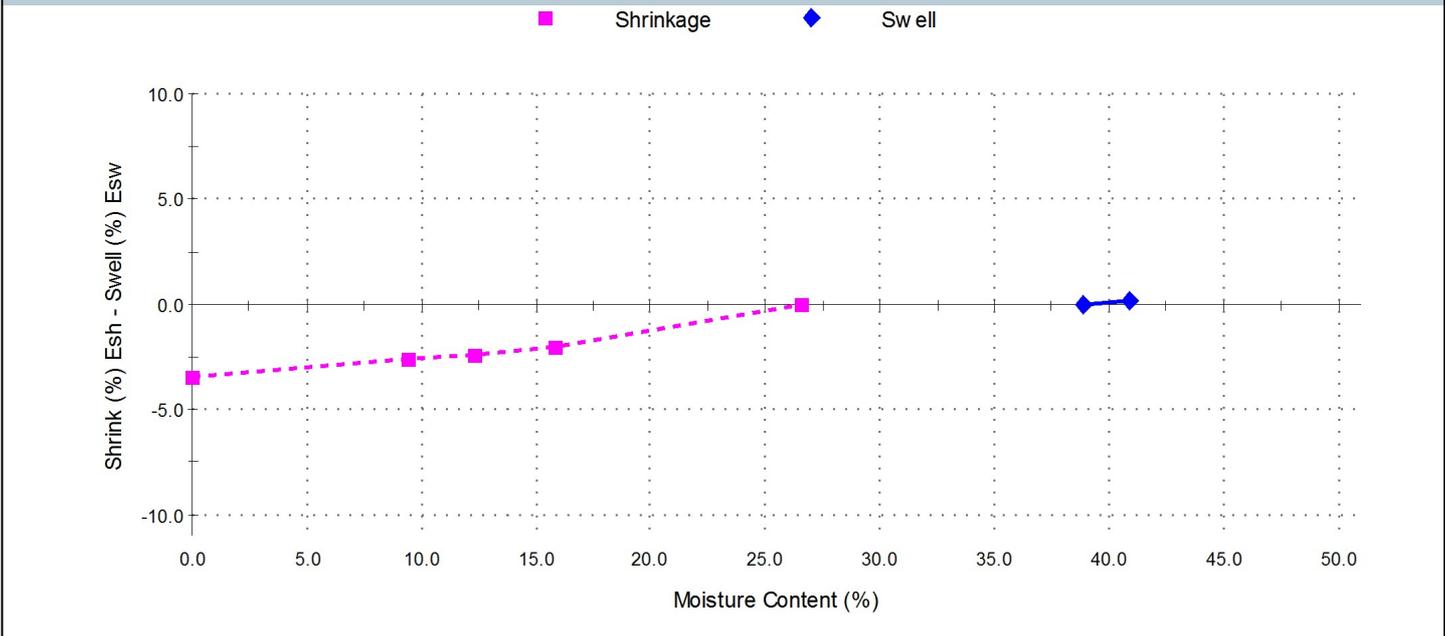
Date of Issue: 4/06/2021

Sample Details

Sample ID:	ETAM21S-02606	Sampling Method:	NZS4407: 2015 Part 2.4.8.3
Date Sampled:	27/05/2021	Material:	Undisturbed Soil
Date Submitted:	28/05/2021	Source:	In-Situ
Date Tested:	28/05/2021		
Project Location:	Greenam Drive, Flat Bush		
Sample Location:	HA33, 0.2 - 0.5 m		
Borehole Number:	HA33		
Borehole Depth (m):	0.2 - 0.5		

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
Swell on Saturation (%):	0.1	Shrink on drying (%):	3.5
Moisture Content before (%):	38.9	Shrinkage Moisture Content (%):	26.6
Moisture Content after (%):	40.9	Est. inert material (%):	1%
Est. Unc. Comp. Strength before (kPa):	350	Crumbling during shrinkage:	0.5%
Est. Unc. Comp. Strength after (kPa):	275	Cracking during shrinkage:	1.5%

Shrink Swell



Shrink Swell Index - Iss (%): 2.0

Comments

Not accredited
 Work Order No : ETAM21W00723
 Tested By: JM



Report No: SSI:ETAM21S-02607

Issue No: 1

Shrink Swell Index Report

Client: Coffey Services (NZ) Limited (Auckland)
 PO Box 8261, Symonds Street
 Auckland 1150

Principal: Ray Berry
 Project No.: 773-ETAM01121AA
 Project Name: 773-GENZAUCK16856AE - DONEGAL STUD
 Lot No.: - TRN: -

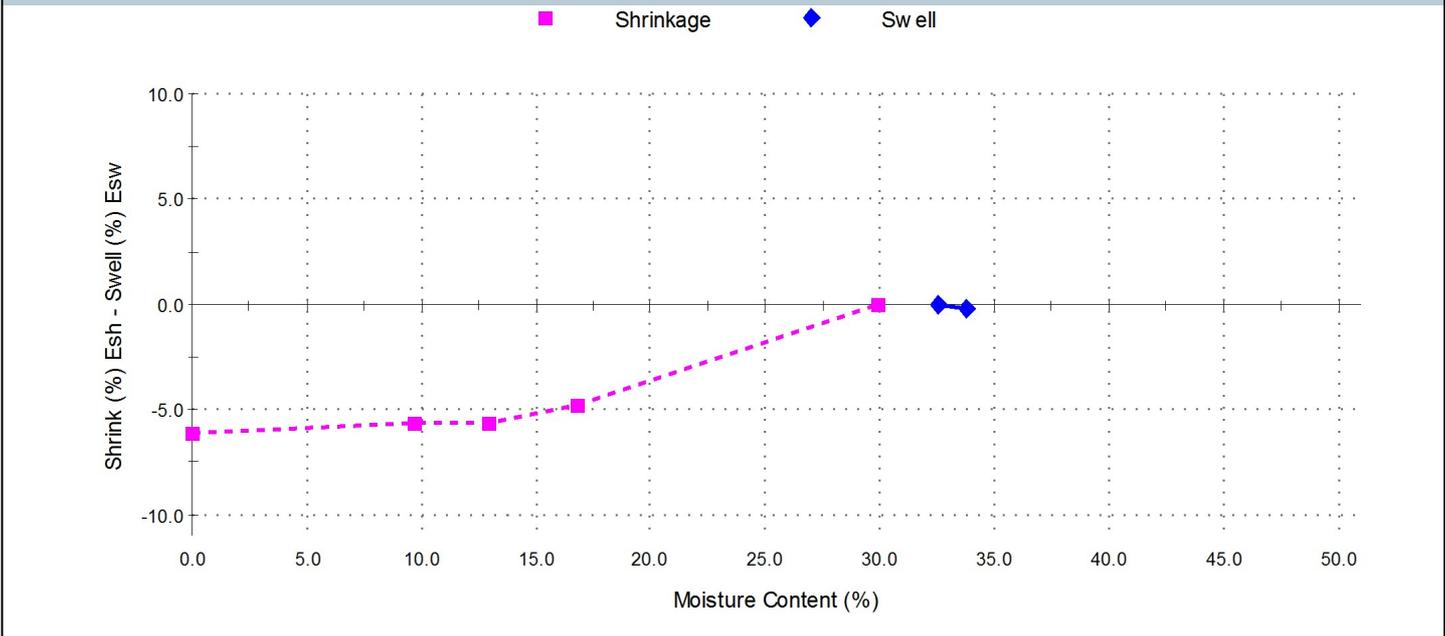

 Approved Signatory: James McKelvey
 (Senior Technician)
 Date of Issue: 4/06/2021

Sample Details

Sample ID:	ETAM21S-02607	Sampling Method:	NZS4407: 2015 Part 2.4.8.3
Date Sampled:	27/05/2021	Material:	Undisturbed Soil
Date Submitted:	28/05/2021	Source:	In-Situ
Date Tested:	28/05/2021		
Project Location:	Greenam Drive, Flat Bush		
Sample Location:	HA36, 0.3 - 0.5 m		
Borehole Number:	HA36		
Borehole Depth (m):	0.3 - 0.5		

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
Swell on Saturation (%):	-0.2	Shrink on drying (%):	6.1
Moisture Content before (%):	32.6	Shrinkage Moisture Content (%):	29.9
Moisture Content after (%):	33.8	Est. inert material (%):	15%
Est. Unc. Comp. Strength before (kPa):	275	Crumbling during shrinkage:	3%
Est. Unc. Comp. Strength after (kPa):	175	Cracking during shrinkage:	0.5%

Shrink Swell



Shrink Swell Index - Iss (%): 3.4

Comments

Not accredited
 Work Order No : ETAM21W00723
 Tested By: JM

APPENDIX C: FIELD DENSITY TEST SUMMARY SHEETS

Earthworks Fill Report

Report No: EFIL:ETAM21W01023

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM21W01023

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: DONEGAL STUD Stage 14 – 16



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}



Approved Signatory: Cesar Pura
Senior Technician
IANZ Site Number: 105
Date of Issue: 3/08/2021

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZGS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL (m)	Material Tested	Comments
									89	89	76	131						
30/07/2021	ETAM21W01023	AK	216	1.85	38.5	1.33	2.70	0	89	89	76	131	Pond Backfill	1770810	5905358	50.83	Silty CLAY	Aggregate present in fill

Comments:

Moisture contents and dry densities are corrected against oven dried moisture content testing. Probe Depth: 150mm; SG= 2.70 T/m3 (Assumed)

Form Number: K031N Issue Date: 20/09/2018

Earthworks Fill Report

Report No: EFIL:ETAM21W01023
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM21W01023

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	DONEGAL STUD Stage 14 – 16



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Cesar Pura
 Senior Technician
 IANZ Site Number: 105
 Date of Issue: 3/08/2021



SITE PLAN (NOT TO SCALE)

Earthworks Fill Report

Report No: EFIL:ETAM21W01036

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM21W01036

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: DONEGAL STUD Stage 14 – 16

 All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}



Approved Signatory: Cesar Pura
Senior Technician
IANZ Site Number: 105
Date of Issue: 3/08/2021

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZGS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL (m)	Material Tested	Comments
									63	63	90	77						
2/08/2021	ETAM21W01036	AK	217	1.84	32.7	1.39	2.70	3	63	63	90	77	Pond Backfill	1770810	5905358	50.83	Silty CLAY	Retest of Test No. 216

Comments:

Moisture contents and dry densities are corrected against oven dried moisture content testing. Probe Depth: 150mm; SG= 2.70 T/m3 (Assumed)

Form Number: K031N Issue Date: 20/09/2018

Earthworks Fill Report

Report No: EFIL:ETAM21W01036
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM21W01036

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	DONEGAL STUD Stage 14 – 16

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)

[Signature]

Approved Signatory: Cesar Pura
 Senior Technician
 IANZ Site Number: 105
 Date of Issue: 3/08/2021



SITE PLAN (NOT TO SCALE)

Earthworks Fill Report

Report No: EFIL:ETAM22W00648

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00648

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}



E. Paton
Approved Signatory: Eric Paton
Director-Testing
IANZ Site Number: 105
Date of Issue: 20/04/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):

Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
8/04/2022	ETAM22W00648	RP	218	1.70	42.1	1.20	2.65	4.4	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770794	5905226	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	219	1.76	29.3	1.36	2.65	9.0	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770813	5905222	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	220	1.84	26.2	1.45	2.65	7.0	141	UTP	UTP	UTP	Old Site Office Compound Area	1770832	5905217	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	221	1.83	21.9	1.50	2.65	10.3	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770832	5905234	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	222	1.85	31.0	1.41	2.65	3.0	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770815	5905238	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	223	1.82	32.6	1.37	2.65	3.6	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770802	5905241	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	224	1.83	29.5	1.41	2.65	5.2	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770806	5905260	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	225	1.79	26.4	1.41	2.65	9.5	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770826	5905251	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	226	1.79	29.7	1.38	2.65	6.9	130.9	130.9	120.9	99.9	Old Site Office Compound Area	1770839	5905254	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	227	1.84	28.3	1.43	2.65	5.5	102.8	UTP	UTP	UTP	Old Site Office Compound Area	1770839	5905271	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	228	1.76	30.9	1.35	2.65	7.6	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770823	5905274	59.83	Silty Clay	-
8/04/2022	ETAM22W00648	RP	229	1.87	27.3	1.47	2.65	4.3	UTP	UTP	UTP	UTP	Old Site Office Compound Area	1770815	5905275	59.83	Silty Clay	-

Comments:

Earthworks Fill Report

Report No: EFIL:ETAM22W00648
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00648

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush



ACREDITED
IANZ
TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 20/04/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W00745

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00745

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
(This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton
Approved Signatory: Eric Paton
Director-Testing
IANZ Site Number: 105
Date of Issue: 22/04/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):

Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
11/04/2022	ETAM22W00745	RP	230	1.84	26.6	1.46	2.65	6.3	UTP	UTP	UTP	UTP	Old Carpark	1770836	5905219	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	231	1.95	24.0	1.57	2.65	3.1	UTP	UTP	UTP	UTP	Old Carpark	1770814	5905223	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	232	1.90	22.5	1.55	2.65	6.5	UTP	UTP	UTP	UTP	Old Carpark	1770797	5905226	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	233	1.88	25.5	1.50	2.65	5.4	UTP	UTP	UTP	UTP	Old Carpark	1770803	5905252	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	234	1.93	33.2	1.45	2.65	0.0	UTP	UTP	UTP	UTP	Old Carpark	1770825	5905239	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	235	1.90	25.1	1.52	2.65	4.5	UTP	UTP	UTP	UTP	Old Carpark	1770840	5905236	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	236	1.79	25.7	1.42	2.65	9.7	UTP	UTP	UTP	UTP	Old Carpark	1770841	5905253	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	237	1.88	23.2	1.52	2.65	7.2	UTP	UTP	UTP	UTP	Old Carpark	1770823	5905259	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	238	1.86	27.3	1.46	2.65	4.8	UTP	UTP	UTP	UTP	Old Carpark	1770809	5905264	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	239	1.80	23.2	1.46	2.65	10.8	UTP	UTP	UTP	UTP	Old Carpark	1770820	5905279	59.83	Silty Clay	-
11/04/2022	ETAM22W00745	RP	240	1.89	27.8	1.48	2.65	2.9	UTP	UTP	UTP	UTP	Old Carpark	1770831	5905275	59.83	Silty Clay	-

Comments:

Earthworks Fill Report

Report No: EFIL:ETAM22W00745
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00745

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush



ACCREDITED
IANZ
TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 22/04/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W00747

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00747

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
(This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton
Approved Signatory: Eric Paton
Director-Testing
IANZ Site Number: 105
Date of Issue: 22/04/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
14/04/2022	ETAM22W00747	RP	241	1.80	23.8	1.45	2.65	10.7	UTP	UTP	UTP	UTP	Old Carpark	1770813	5905262	59.83	Silty Clay	-
14/04/2022	ETAM22W00747	RP	242	1.87	26.0	1.49	2.65	5.3	UTP	UTP	UTP	UTP	Old Carpark	1771821	5905242	59.83	Silty Clay	-
14/04/2022	ETAM22W00747	RP	243	1.83	33.2	1.37	2.65	2.7	155	165	160	184	Old Carpark	1770888	5905355	59.83	Silty Clay	-

Comments:

Earthworks Fill Report

Report No: EFIL:ETAM22W00747
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00747

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)

E. Paton

Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 22/04/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W00779

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00779

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: STAGE 1A2

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}




Approved Signatory: Cesar Pura
Laboratory Supervisor
IANZ Site Number: 105
Date of Issue: 29/04/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001); Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2); Water Content Testing (in accordance with NZS 4402:1986 Test 2.1);

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL (m)	Material Tested	Comments
									UTP	UTP	UTP	UTP						
26/04/2022	ETAM22W00779	RP	244	1.82	26.5	1.44	2.65	8	UTP	UTP	UTP	UTP	Refer to plan	1770890	5905360	-	Silty CLAY	0.70m below finished level
26/04/2022	ETAM22W00779	RP	245	1.97	23.7	1.59	2.65	2	UTP	UTP	UTP	UTP	Refer to plan	1770866	5905363	-	Silty CLAY	0.70m below finished level
26/04/2022	ETAM22W00779	RP	246	1.87	26.8	1.47	2.65	5	UTP	UTP	UTP	UTP	Refer to plan	1770899	5905355	-	Silty CLAY	0.70m below finished level
26/04/2022	ETAM22W00779	RP	247	1.85	30.3	1.42	2.65	4	201	UTP	201	UTP	Old Carpark	1770813	5905262	59.83	Silty CLAY	Retest of Test No. 241

Comments:
Moisture contents and dry densities are corrected against oven dried moisture content testing. Probe Depth: 150mm; SG= 2.65 T/m3 (Supplied)

Form Number: K031N Issue Date: 20/09/2018

Earthworks Fill Report

Report No: EFIL:ETAM22W00779
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00779

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	STAGE 1A2

ACCREDITED

 TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Cesar Pura
 Laboratory Supervisor
 IANZ Site Number: 105
 Date of Issue: 29/04/2022



SITE PLAN (NOT TO SCALE)

Earthworks Fill Report

Report No: EFIL:ETAM22W00795
Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00795

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton
 Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 4/05/2022

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
 Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
28/04/2022	ETAM22W00795	SC	248	1.89	27.8	1.47	2.70	4.3	UTP	UTP	UTP	UTP	Stage 16	1770896	5905356	-	Silty Clay	-
28/04/2022	ETAM22W00795	SC	249	1.89	28.2	1.47	2.70	3.8	UTP	UTP	UTP	UTP	Stage 16	1770880	5905351	-	Silty Clay	-

Comments:

Form Number: R031N Issue Date: 20/09/2018

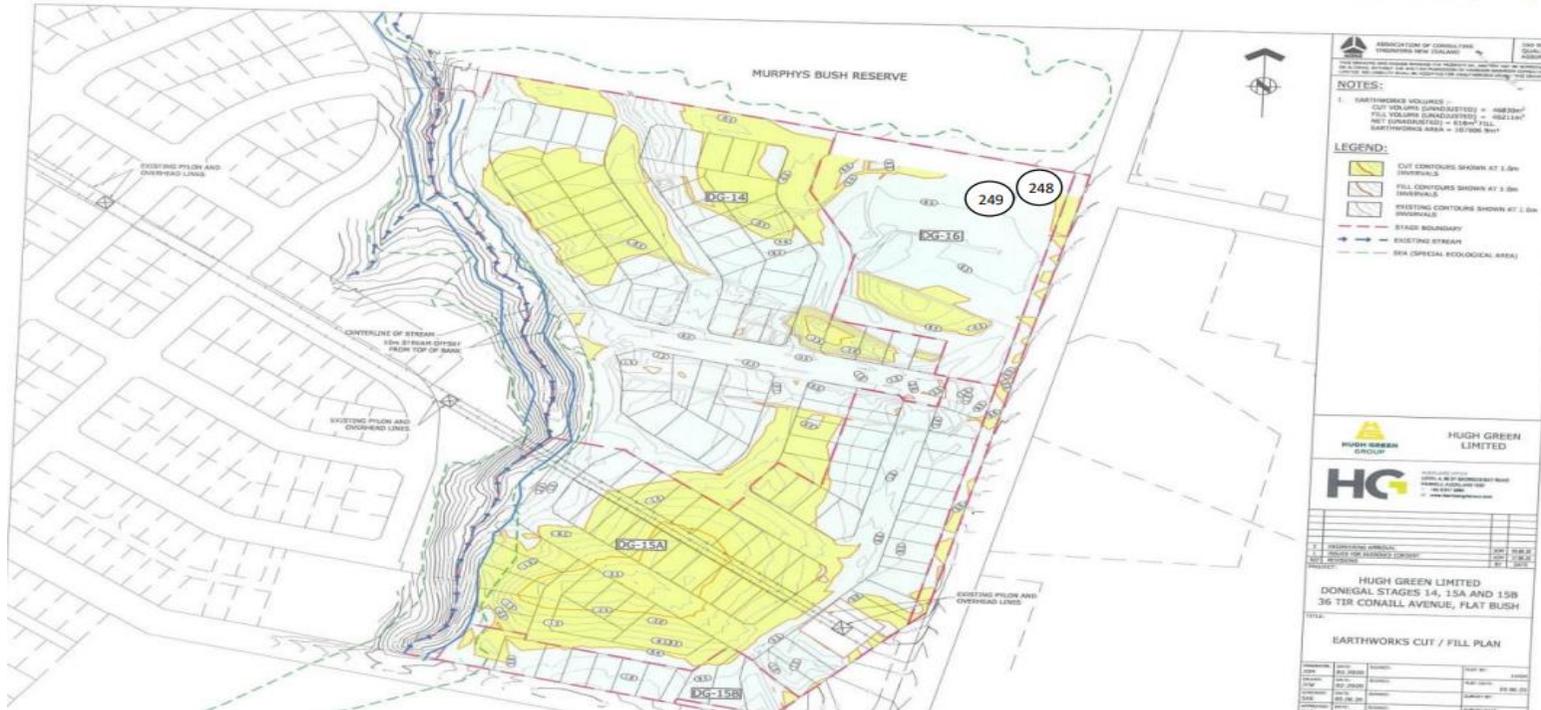
Earthworks Fill Report

Report No: EFIL:ETAM22W00795
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00795

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)

Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 4/05/2022



SITE PLAN (NOT TO SCALE)

Earthworks Fill Report

Report No: EFIL:ETAM22W00825
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00825

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton

Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 5/05/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
 Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
2/05/2022	ETAM22W00825	SC	250	1.81	28.4	1.41	2.70	7.6	UTP	UTP	UTP	UTP	Stage 16, see plan	1770883	5905361	-	Silty Clay	FL
2/05/2022	ETAM22W00825	SC	251	1.94	29.6	1.50	2.70	0.3	UTP	UTP	UTP	UTP	Stage 16, see plan	1770863	5905365	-	Silty Clay	FL

Comments:

Form Number: R031N Issue Date: 20/09/2018

Earthworks Fill Report

Report No: EFIL:ETAM22W00825
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00825

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

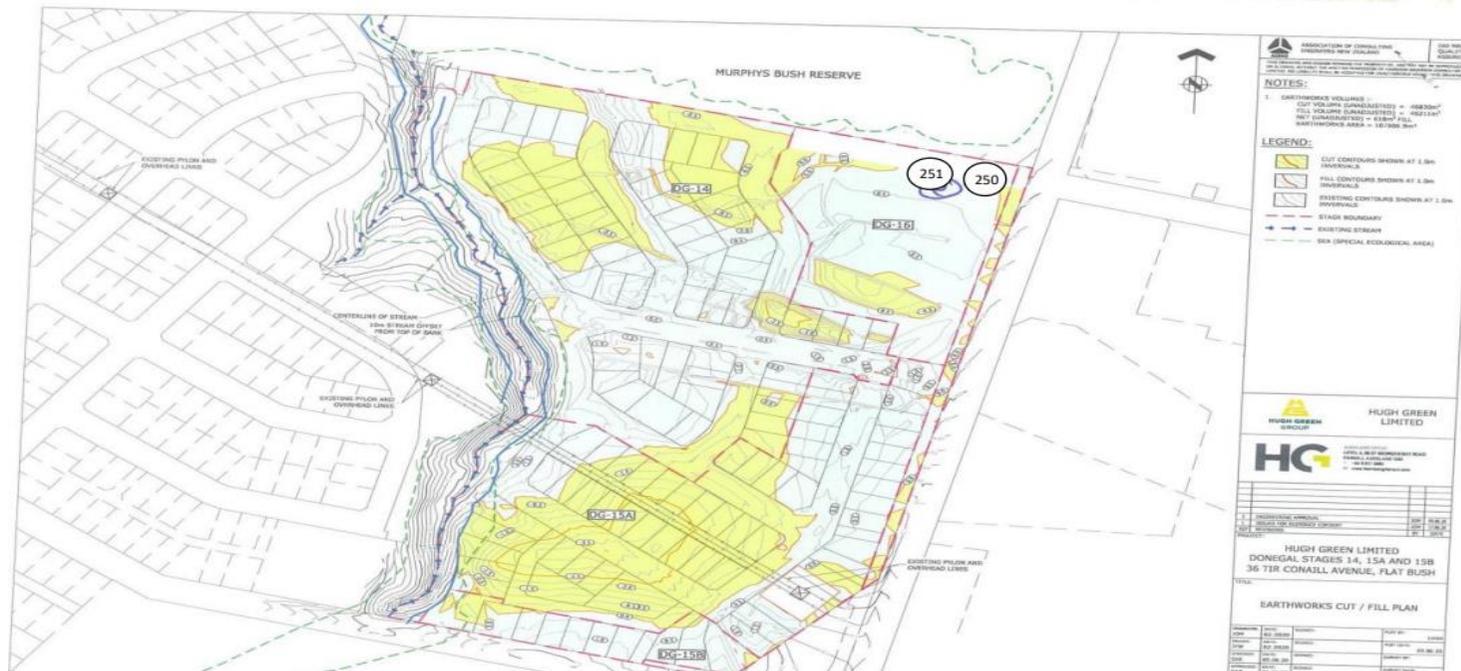
Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton

Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 5/05/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W00853

Issue No:1

This report replaces all previous issues of report no. EFIL:ETAM22W00853

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
(This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton
Approved Signatory: Eric Paton
Director-Testing
IANZ Site Number: 105
Date of Issue: 5/05/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):

Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
4/05/2022	ETAM22W00853	RP	252	1.92	28.1	1.50	2.65	1.2	UTP	UTP	UTP	UTP	Balance Lot	1770881	5905332	-	Silty Clay	Subgrade
4/05/2022	ETAM22W00853	RP	253	1.91	29.0	1.48	2.65	1.0	UTP	UTP	UTP	UTP	Balance Lot	1770855	5905339	-	Silty Clay	Subgrade
4/05/2022	ETAM22W00853	RP	254	1.82	36.3	1.33	2.65	1.2	UTP	UTP	UTP	UTP	Pond	1770815	5905353	-	Silty Clay	In Fill

Comments:

Earthworks Fill Report

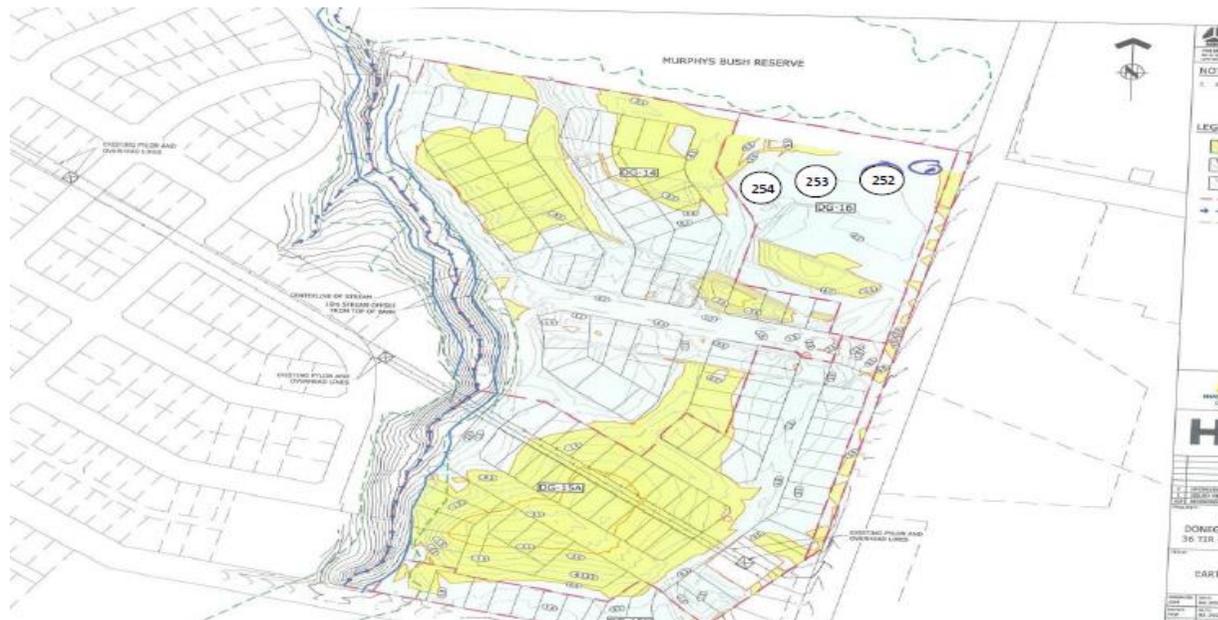
Report No: EFIL:ETAM22W00853
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00853

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton
 Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 5/05/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W00873
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00873

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



E. Paton

Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 8/05/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
 Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									168	160	188	168						
5/05/2022	ETAM22W00873	SC	255	1.84	26.9	1.45	2.70	7.3	168	160	188	168	Stage 16 Silt Pond	1770830	5905348	-	Silty Clay	500mm below FL
5/05/2022	ETAM22W00873	SC	256	1.72	25.6	1.37	2.70	14.4	188	UTP	UTP	168	Stage 16 Silt Pond	1770808	5905355	-	Silty Clay	500mm below FL

Comments:

Earthworks Fill Report

Report No: EFIL:ETAM22W00873
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W00873

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)





Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 8/05/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W01758
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01758

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Liam Walker
 Assistant Manager
 IANZ Site Number: 105
 Date of Issue: 29/09/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
 Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate)				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
22/09/2022	ETAM22W01758	RP	257	1.95	28.2	1.52	2.65	-0.2	UTP	UTP	UTP	UTP	Under Stockpile	1770874	5905246	-	Silty Clay	RL unavailable
22/09/2022	ETAM22W01758	RP	258	1.91	23.6	1.55	2.65	5.1	UTP	UTP	UTP	UTP	Under Stockpile	1770879	5905264	-	Silty Clay	RL unavailable

Comments:

Earthworks Fill Report

Report No: EFIL:ETAM22W01758
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01758

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Liam Walker
 Approved Signatory: Liam Walker
 Assistant Manager
 IANZ Site Number: 105
 Date of Issue: 29/09/2022



Earthworks Fill Report

Report No: EFIL:ETAM22W01793
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01793

Client: Tetra Tech Coffey (NZ) Limited- Auckland
Coffey House, Level 4, Teed Street
New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
{This document may not be altered or reproduced except in full. This report relates only to the positions tested.}




Approved Signatory: Liam Walker
Assistant Manager
IANZ Site Number: 105
Date of Issue: 4/10/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									UTP	UTP	UTP	UTP						
29/09/2022	ETAM22W01793	RP	259	1.90	28.3	1.48	2.65	2.4	UTP	UTP	UTP	UTP	Lot 24	1770878	5905221	59.09	Silty Clay	-
29/09/2022	ETAM22W01793	RP	260	1.88	31.9	1.42	2.65	1.0	164	182	199	178	Lot 24-25	1770860	5905221	59.03	Silty Clay	-
29/09/2022	ETAM22W01793	RP	261	1.82	29.9	1.40	2.65	5.0	UTP	UTP	UTP	UTP	Centre Lot 20	1770871	5905265	57.80	Silty Clay	-

Comments:

Form Number: R031N Issue Date: 20/09/2018

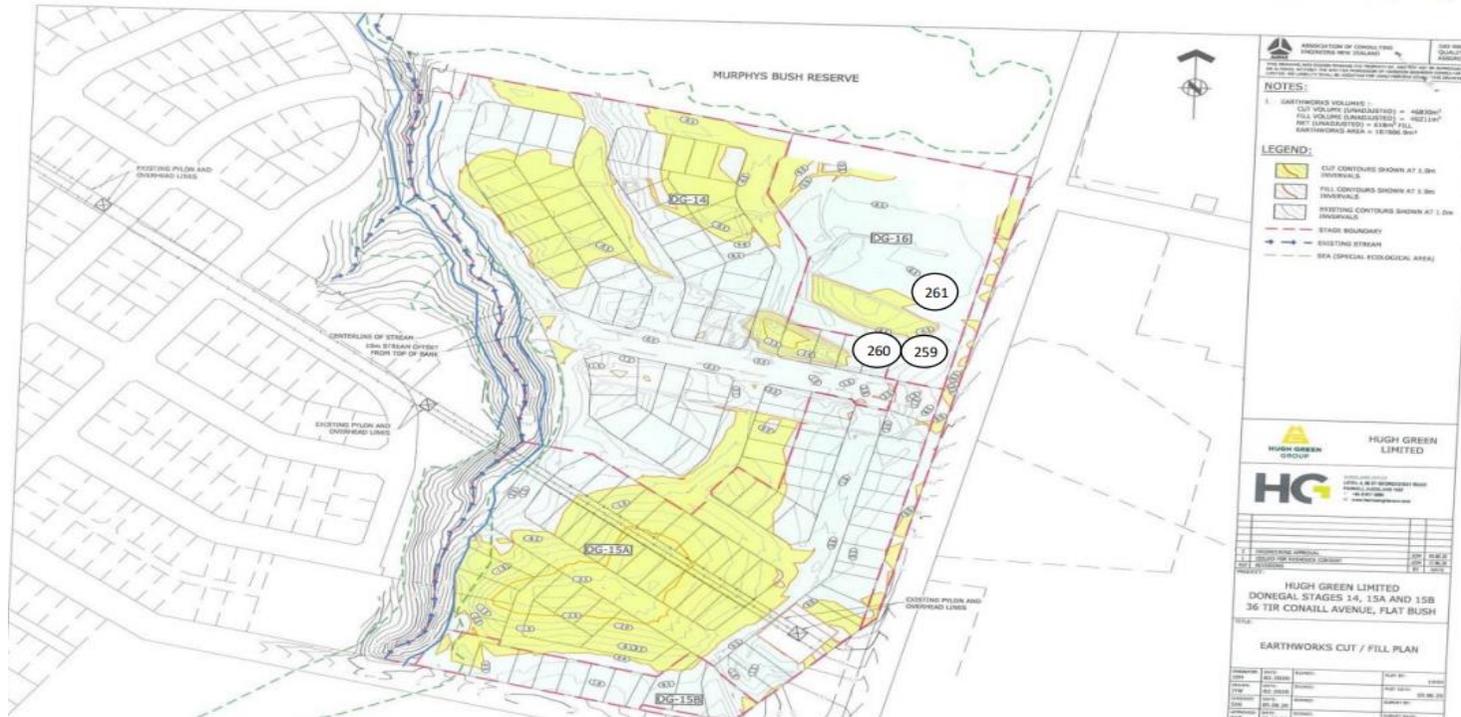
Earthworks Fill Report

Report No: EFIL:ETAM22W01793
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01793

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)

Approved Signatory: Liam Walker
 Assistant Manager
 IANZ Site Number: 105
 Date of Issue: 4/10/2022



SITE PLAN (NOT TO SCALE)

Earthworks Fill Report

Report No: EFIL:ETAM22W01928
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01928

Client: Tetra Tech Coffey (NZ) Limited- Auckland
 Coffey House, Level 4, Teed Street
 New Market Auckland 1023

Principal: Ray Berry

cc to: -

Project No.: 773-ETAM01121AA

Project Name.: 773-GENZAUCK16856AE - DONEGAL STUD

Project Location: Greenam Drive, Flat Bush



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 (This document may not be altered or reproduced except in full. This report relates only to the positions tested.)



Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 30/10/2022

Test Results

Test Methods : Shear Strength (using field Shear vane in accordance with NZS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1):
 Density Calculations (in accordance with NZS 4402:1986 Tests 4.2.7)

Date Sampled	Work Order	Tested By	Test No.	Wet Density t/m ³	Oven Water Content %	Dry Density t/m ³	Solid Density t/m ³	Air Voids %	Field Shear Strength (UTP = Unable to penetrate) kPa				Test Location	Easting	Northing	RL	Material Tested	Comments
									143	152	147	152						
25/10/2022	ETAM22W01928	SC	262	1.91	26.8	1.51	2.65	2.9	143	152	147	152	Silt Pond (Retest)	1770806	5905358	-	Silty Clay	0.5m below FL
25/10/2022	ETAM22W01928	SC	263	1.88	28.5	1.46	2.65	3.0	155	152	170	158	Silt Pond	1770792	5905365	-	Silty Clay	0.5m below FL

Comments:

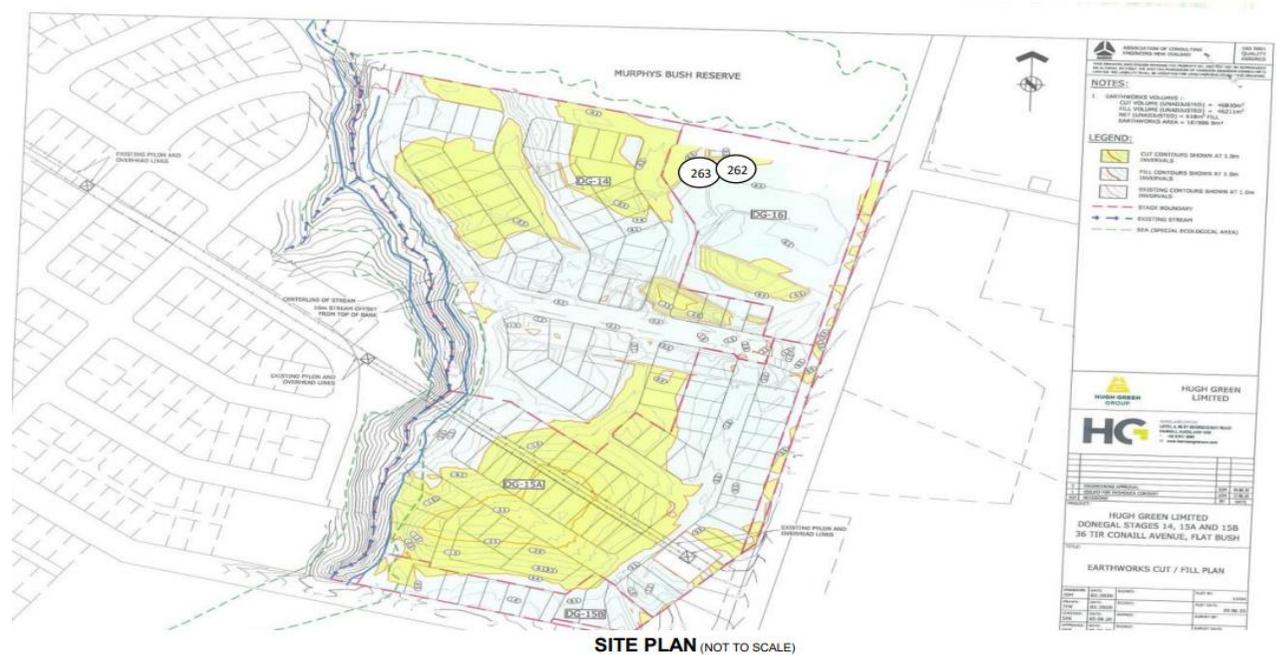
Earthworks Fill Report

Report No: EFIL:ETAM22W01928
Issue No:1
This report replaces all previous issues of report no. EFIL:ETAM22W01928

Client:	Tetra Tech Coffey (NZ) Limited- Auckland Coffey House, Level 4, Teed Street New Market Auckland 1023
Principal:	Ray Berry
cc to:	-
Project No.:	773-ETAM01121AA
Project Name.:	773-GENZAUCK16856AE - DONEGAL STUD
Project Location:	Greenam Drive, Flat Bush


 All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.
 {This document may not be altered or reproduced except in full. This report relates only to the positions tested.}

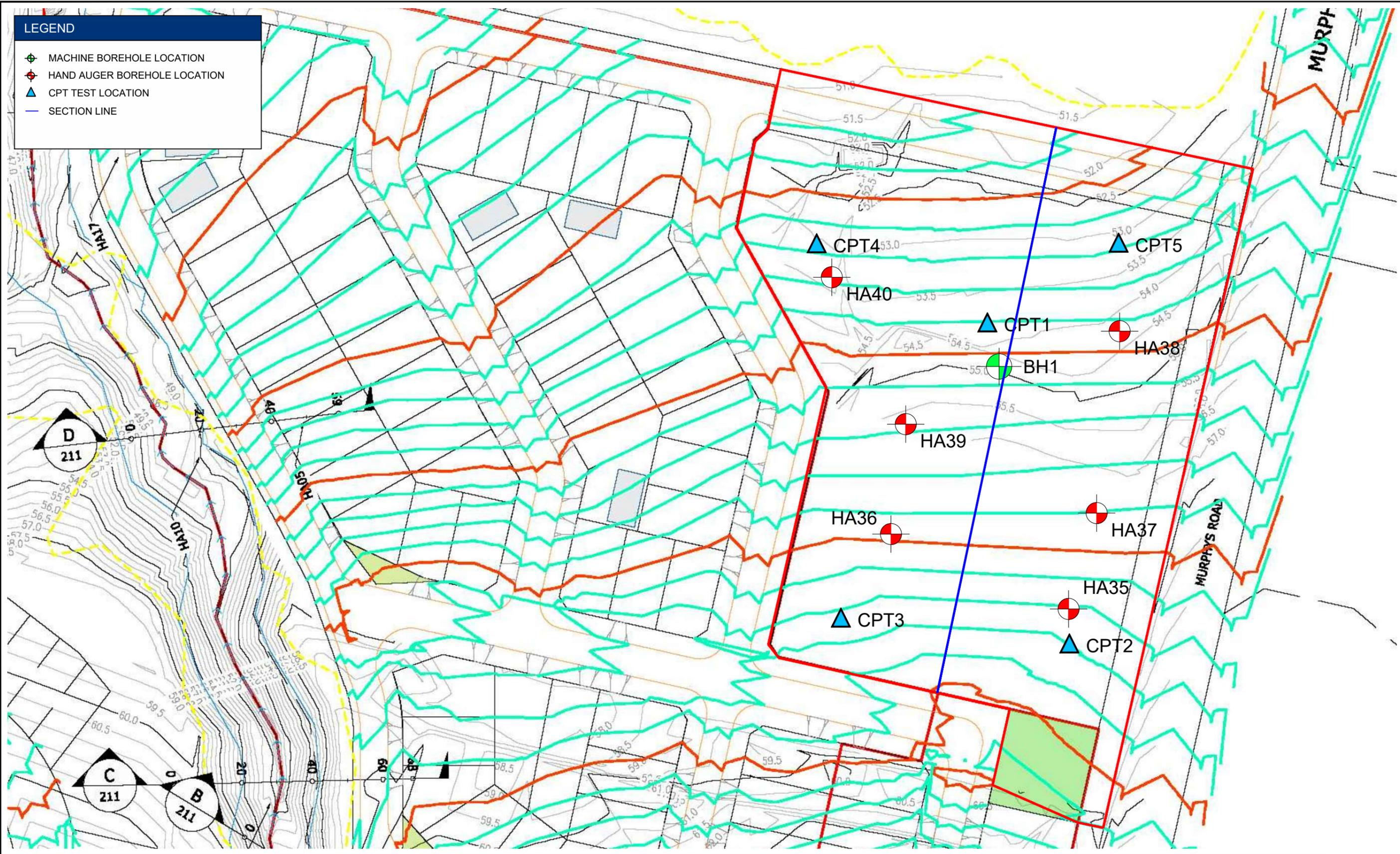

 Approved Signatory: Eric Paton
 Director-Testing
 IANZ Site Number: 105
 Date of Issue: 30/10/2022



APPENDIX D: SETTLEMENT ANALYSIS LOT 1003

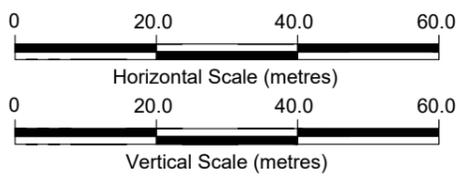
LEGEND

-  MACHINE BOREHOLE LOCATION
-  HAND AUGER BOREHOLE LOCATION
-  CPT TEST LOCATION
-  SECTION LINE



PLOT DATE: 14/06/2021 11:33:32 AM DWG FILE: C:\USERS\RAY.BERRY\DESKTOP\DONEGAL STUDDONEGAL STAGE 14-16 GPC\CAD\16856AE_STAGE 16 SP.DWG

no.	description	drawn	approved	date
A	ORIGINAL ISSUE	##	##	14/06/2021



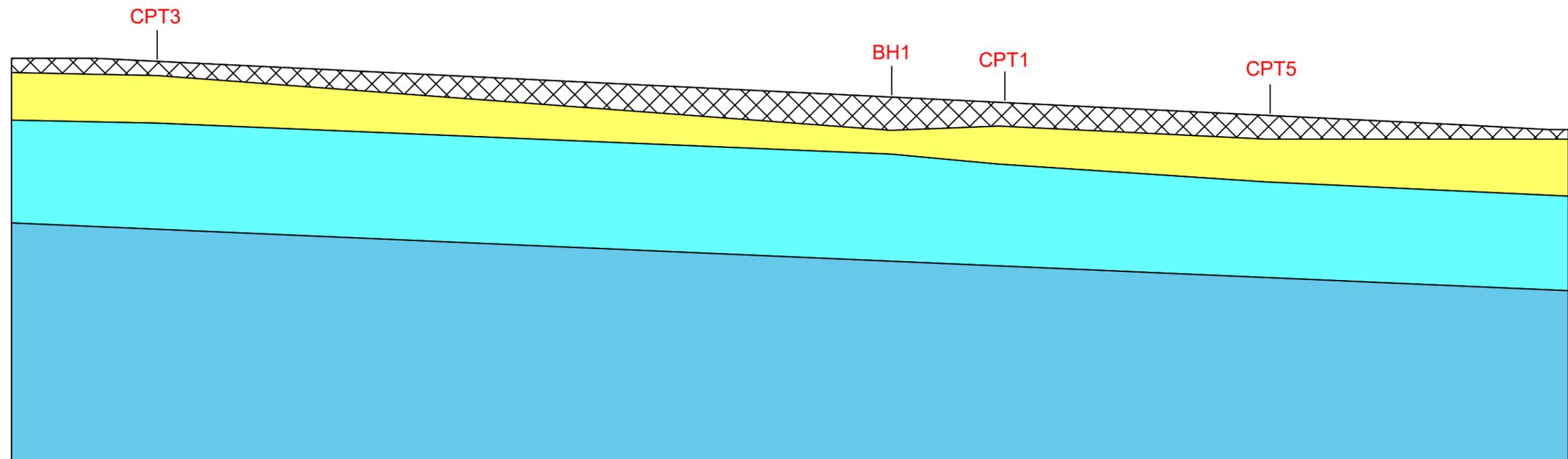
drawn	RB
approved	-
date	14/06/2021
scale	1:1000
original size	A3



client:	HUGH GREEN LIMITED		
project:	DONEGAL STUD STAGE 16 RETAIL RESIDENTIAL ZONE FLATBUSH		
title:	SITE INVESTIGATION PLAN		
project no:	GENZAUCK16856AE	figure no:	SP-1
rev:	A		

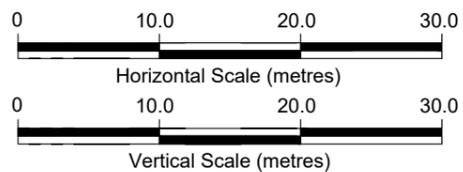
LEGEND

-  ENGINEERED FILL
-  TAURANGA GROUP SOILS
-  TRANSITION ZONE SOILS
-  BEDROCK - WAITEMATA GROUP



PLOT DATE: 14/06/2021 11:40:10 AM DWG FILE: C:\USERS\RAY.BERRY\DESKTOP\DONEGAL_STUD\DONEGAL_STAGE_14-16_GCR\CAD\16856AE_STAGE_16_GM.DWG

no.	description	drawn	approved	date
A	ORIGINAL ISSUE	##	##	14/06/2021



drawn	RB
approved	-
date	14/06/2021
scale	1:500
original size	A3



client:		HUGH GREEN LIMITED	
project:		DONEGAL STUD STAGE 16 RETAIL RESIDENTIAL ZONE FLATBUSH	
title:		GEOTECHNICAL GROUND MODEL	
project no:	GENZAUCK16856AE	figure no:	GM-1
		rev:	A

Engineering Log - Borehole

 client: **Dempsey Wood**

principal:

 project: **Donegal Stud Stage 14-16**

 location: **Refer to Site Plan**

 Borehole ID: **MH01**

sheet: 1 of 4

 project no. **GENZAUCK16856AE**

 date started: **28 May 2021**

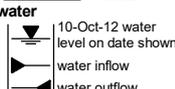
 date completed: **28 May 2021**

 logged by: **EP**

checked by:

 position: Not Specified surface elevation: Not Specified angle from horizontal: 90°
 drill model: Kubota Tractor Rig drilling fluid: Water casing diameter: HWT vane id.: 270

drilling information				material substance											
method & support	penetration	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear (kPa)	structure and additional observations				
OB CASING N	1	SPT 2, 3, 3, 4, 5, 5 N=17		0.0			Silty CLAY: low plasticity, pale brown mottled orange and pale grey, w trace fine to coarse grained angular gravel.	VSt		50 100 150 200	FILL Core Run (0.0-0.5 m): 50% recovery				
	2			1.0			NO CORE: 0.10m (0.90-1.00 m)				H	Core Run (0.5-1.0 m): 80% recovery VS 145/ 37 kPa			
	3			1.5			Silty CLAY: low plasticity, pale brown mottled orange and pale grey, w trace fine to coarse grained angular gravel.					Core Run (1.0-1.5 m): 70% recovery VS UTP			
				2.0			NO CORE: 0.15m (1.35-1.50 m)					Core Run (1.5-1.95 m): 100% recovery VS UTP			
				2.35			Silty CLAY: low plasticity, pale brown mottled orange and pale grey, w trace fine to coarse grained angular gravel. 2.0 m: becoming mottled brown 2.35 m: becoming brown flecked grey, orange, and red					Core Run (1.95-3.0 m): 55% recovery			
				3.0			PUSH TUBE SAMPLE.					Core Run (3.0-3.5 m): 100% recovery VS 169/ 37 kPa			
				4.0			SPT 1, 1, 1, 2, 2, 2 N=7					CI	Silty CLAY: medium plasticity, pale grey mottled orange. 3.95 to 4.1 m: clayey SILT, low plasticity, pale grey streaked orange 4.13 m: becoming brown streaked orange	VSSt	PUKETOKA FORMATION Core Run (3.5-4.5 m): 33% recovery
				4.5			NO CORE: 0.33m (4.17-4.50 m)					CH	Silty CLAY: high plasticity, brown, with minor organic inclusions.		Core Run (4.5-4.95 m): 100% recovery VS 111/ 28 kPa
				5.0			SPT 1, 1, 0, 1, 1, 1 N=3						5.07 to 5.15 m: pale grey mottled orange and brown		Core Run (4.95-6.0 m): 53% recovery
				5.3			NO CORE: 0.49m (5.51-6.00 m)						5.3 m: becoming dark grey, with minor organic inclusions		F
	6.0	PUSH TUBE SAMPLE.	Silty CLAY: low plasticity, green grey, with minor organic inclusions.	Core Run (6.5-6.95 m): 100% recovery											
	7.0	SPT 2, 2, 3, 4, 3, 4 N=14	CL	7.05 to 7.06 m: with some limonite	Core Run (6.95-8.0 m): 100% recovery										
	7.5	Silty CLAY: low plasticity, pale blue grey to green grey. 7.5 to 7.7 m: with green inclusions	CL	TRANSITIONAL EAST COAST BAYS FORMATION											

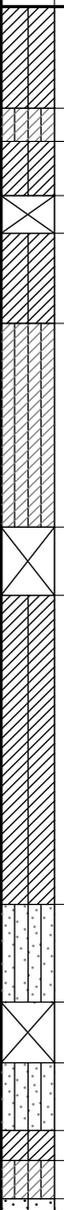
method AD auger drilling* AS auger screwing* HA hand auger W washbore OB open barrel * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	support M mud N nil C casing penetration  no resistance ranging to refusal water  10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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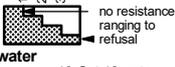
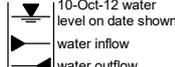
Engineering Log - Borehole

 client: **Dempsey Wood**
 principal:
 project: **Donegal Stud Stage 14-16**
 location: **Refer to Site Plan**

 Borehole ID: **MH01**
 sheet: 2 of 4
 project no: **GENZAUCK16856AE**
 date started: **28 May 2021**
 date completed: **28 May 2021**
 logged by: **EP**
 checked by:

 position: Not Specified surface elevation: Not Specified angle from horizontal: 90°
 drill model: Kubota Tractor Rig drilling fluid: Water casing diameter: HWT vane id.: 270

drilling information				material substance								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	vane shear @ peak (kPa)	structure and additional observations
OB N HQ N OB	1 2 3	Not Observable	SPT 4, 2, 3, 4, 4, 3 N=14	9.0 10.0 11.0 12.0 13.0 14.0 15.0		CL	Silty CLAY: low plasticity, pale blue grey to green grey. (continued)	VS H VD VD VD VD VD VD VD VD	50 100 150 200	VS 176/ 22 kPa VS UTP Core Run (8.0-8.45 m): 100% recovery Core Run (8.45-9.5 m): 76% recovery Core Run (9.5-9.95 m): 0% recovery Core Run (9.95-11.0 m): 100% recovery Core Run (11.0-11.45 m): 0% recovery Core Run (11.45-11.9 m): 0% recovery Core Run (11.9-13.5 m): 100% recovery Core Run (13.5-13.95 m): 0% recovery Core Run (13.95-15.0 m): 62% recovery Core Run (15.0-15.45 m): 100% recovery Core Run (15.45-16.5 m): 86% recovery		
			SPT 4, 3, 4, 6, 5, 6 Nc=21			ML Clayey SILT: low plasticity, pale grey to green grey, with minor fine grained sand. CL Silty CLAY: low plasticity, grey to green grey. NO CORE: 0.25m (9.25-9.50 m) CL Silty CLAY: low plasticity, grey to green grey. 9.95 m: with minor fine grained sand ML Clayey SILT: non plastic, green grey, with minor fine grained sand.						
			SPT 3, 2, 4, 6, 7, 8 Nc=25			NO CORE: 0.45m (11.45-11.90 m) CH Silty CLAY: high plasticity, grey, with trace organic inclusions. 13.25 m: no organics 13.4 to 13.45 m: clayey SILT, non plastic, very dense, green to green grey, with minor fine grained sand						
			SPT 3, 2, 3, 2, 4, 6 N=15			ML Sandy SILT: non plastic, green to green grey, with trace clay, with trace fine to medium grained. 14.05 m: becoming pale grey mottled green grey, with trace organic inclusions/organic veins NO CORE: 0.40m (14.60-15.00 m)						
			SPT 1, 2, 3, 3, 4, 4 N=14			ML Sandy SILT: non plastic, green to green grey, with trace clay, with trace fine to medium grained. CL Silty CLAY: low plasticity, pale grey streaked orange, with trace fine grained sand. ML Clayey SILT: low plasticity, grey to green grey, with						

method AD auger drilling* AS auger screwing* HA hand auger W washbore OB open barrel * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	support M mud N nil C casing penetration  no resistance ranging to refusal water  10-Oct-12 water level on date shown water inflow water outflow	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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CDF_0_9_07_LIBRARY\GLB rev:AU Log COF BOREHOLE: NON CORED MH01 - 28.05.2021.GPJ <<DrawingFile>> 31/05/2021 13:36

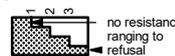
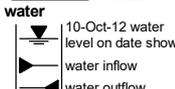
Engineering Log - Borehole

 client: **Dempsey Wood**
 principal:
 project: **Donegal Stud Stage 14-16**
 location: **Refer to Site Plan**

 Borehole ID: **MH01**
 sheet: 3 of 4
 project no: **GENZAUCK16856AE**
 date started: **28 May 2021**
 date completed: **28 May 2021**
 logged by: **EP**
 checked by:

 position: Not Specified surface elevation: Not Specified angle from horizontal: 90°
 drill model: Kubota Tractor Rig drilling fluid: Water casing diameter: HWT vane id.: 270

drilling information				material substance			
method & support	penetration	samples & field tests	water	RL (m)	depth (m)	material description	structure and additional observations
OB	1 2 3	SPT 3, 5, 6, 8, 10, 13 N=37	Not Observable		17.0	some fine grained sand. 15.73 to 15.88 m: with trace fine to medium grained angular SILTSTONE gravel SILTY SAND: fine - medium grained, non plastic, green to green grey. <i>(continued)</i> NO CORE: 0.10m (16.40-16.50 m) SILTY SAND: fine - medium grained, non plastic, dark green to green grey, with occasional grey coloured bands.	TRANSITIONAL EAST COAST BAYS FORMATION Core Run (16.5-16.95 m): 100% recovery Core Run (16.95-17.5 m): 100% recovery
					18.0	Borehole MH01 continued as cored hole	
					19.0		
					20.0		
					21.0		
					22.0		
					23.0		

method AD auger drilling* AS auger screwing* HA hand auger W washbore OB open barrel * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit	support M mud N nil C casing penetration  water 	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid limit	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense
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Engineering Log - Cored Borehole

 client: **Dempsey Wood**
 principal:
 project: **Donegal Stud Stage 14-16**
 location: **Refer to Site Plan**

 Borehole ID: **MH01**
 sheet: 4 of 4
 project no: **GENZAUCK16856AE**
 date started: **28 May 2021**
 date completed: **28 May 2021**
 logged by: **EP**
 checked by:

 position: Not Specified surface elevation: Not Specified angle from horizontal: 90°
 drill model: Kubota Tractor Rig drilling fluid: Water casing diameter: HWT

drilling information		material substance				rock mass defects					
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
							VL L M H VH EH			30 100 300 1000 3000	particular general
			17.0		started coring at 17.30m						
			18.0		SILTSTONE: grey to green grey. 17.37 to 17.39 m: silty SAND, medium dense, green grey to grey 17.50 to 17.53 m: SANDSTONE, fine to medium grained, grey, slightly to moderately weathered, low strength NO CORE: 0.18 m SILTSTONE: grey to green grey.	MW		SPT 9, 13, 13, 20, 17/65mm N=R			EAST COAST BAYS FORMATION ROCK PT, 10°, PL, SO, CN PT, 3°, PL, RO, CN PT, 4°, PL, RO, CN
			19.0		NO CORE: 0.80 m						
			20.0		SILTSTONE: grey to green grey.			SPT 15, 35/50mm Nc=R			
			20.0		Borehole MH01 terminated at 19.95 m Target depth						
			21.0								
			22.0								
			23.0								

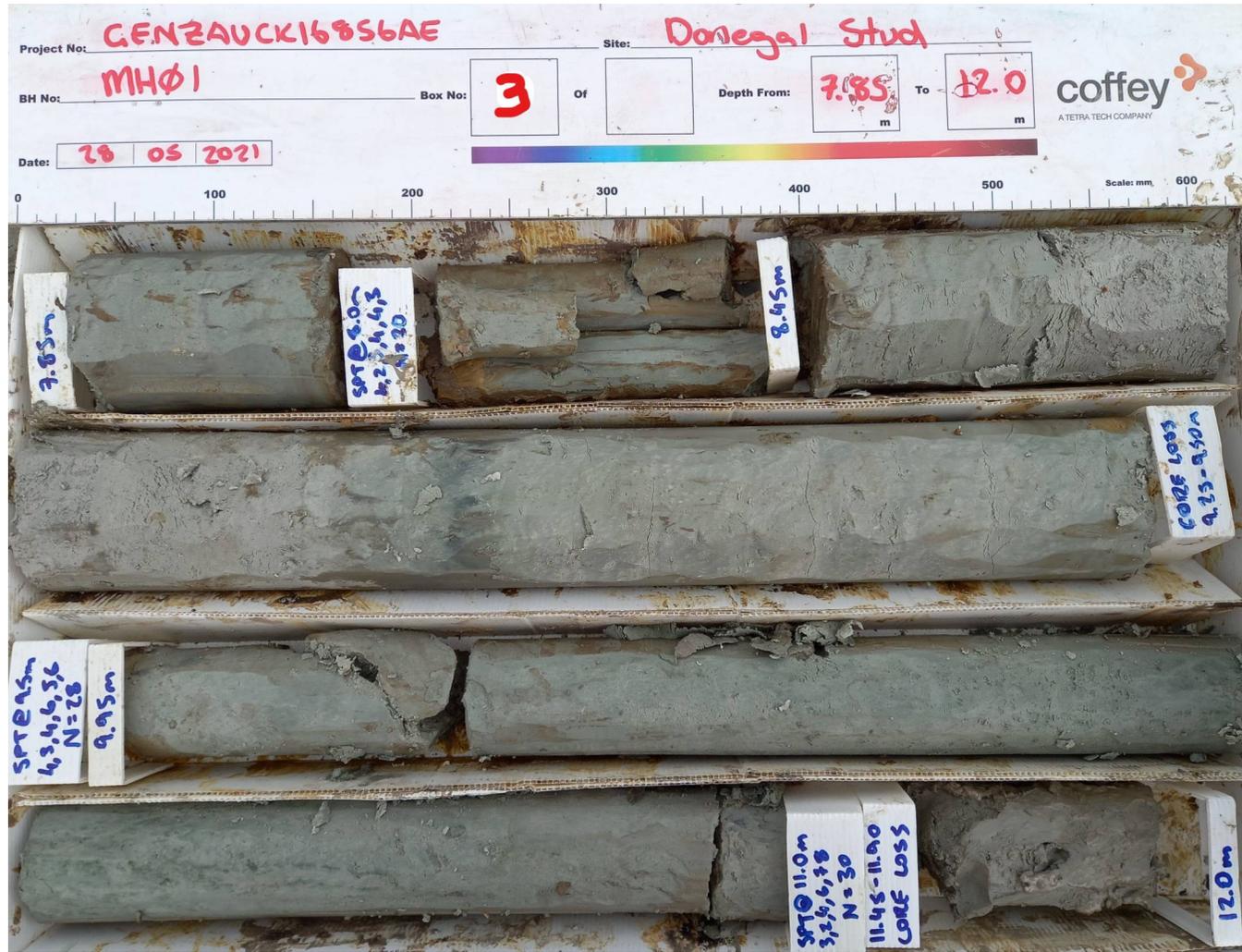
CDF_0_9_07_LIBRARY\GLB rev:AU Log COF BOREHOLE: CORED MH01 - 28.05.2021.GPJ <-DrawingFile>> 31/05/2021 13:38

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLCNMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) OB open barrel	support C casing M mud N none water  10/10/12, water level on date shown  water inflow  complete drilling fluid loss  partial drilling fluid loss  water pressure test result (lugeons) for depth interval shown	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run & RQD  barrel withdrawn RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam roughness VR very rough RO rough SO smooth POL polished SL slickensided	planarity PL planar CU curved UN undulating ST stepped IR irregular coating CN clean SN stained VN veneer CO coating
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MH01 0.00 - 3.95 m

drawn	EP		client:	Dempsey Wood		
approved	31/05/2021		project:	Donegal Stud Stage 14-16 Refer to Site Plan		
date	31/05/2021		CORE PHOTOGRAPH MH01			
scale	N.T.S.		project no:	GENZAUCK16856AE	fig no:	FIGURE 1
original size	A4				rev:	



MH01 7.85 - 12.00 m

drawn	EP		client:	Dempsey Wood		
approved	31/05/2021		project:	Donegal Stud Stage 14-16 Refer to Site Plan		
date	31/05/2021		CORE PHOTOGRAPH MH01			
scale	N.T.S.		project no:	GENZAUCK16856AE	fig no:	FIGURE 3
original size	A4				rev:	



MH01 12.00 - 16.00 m

drawn	EP		client:	Dempsey Wood		
approved	31/05/2021		project:	Donegal Stud Stage 14-16 Refer to Site Plan		
date	31/05/2021		CORE PHOTOGRAPH MH01			
scale	N.T.S.		project no:	GENZAUCK16856AE	fig no:	FIGURE 4
original size	A4		rev:			

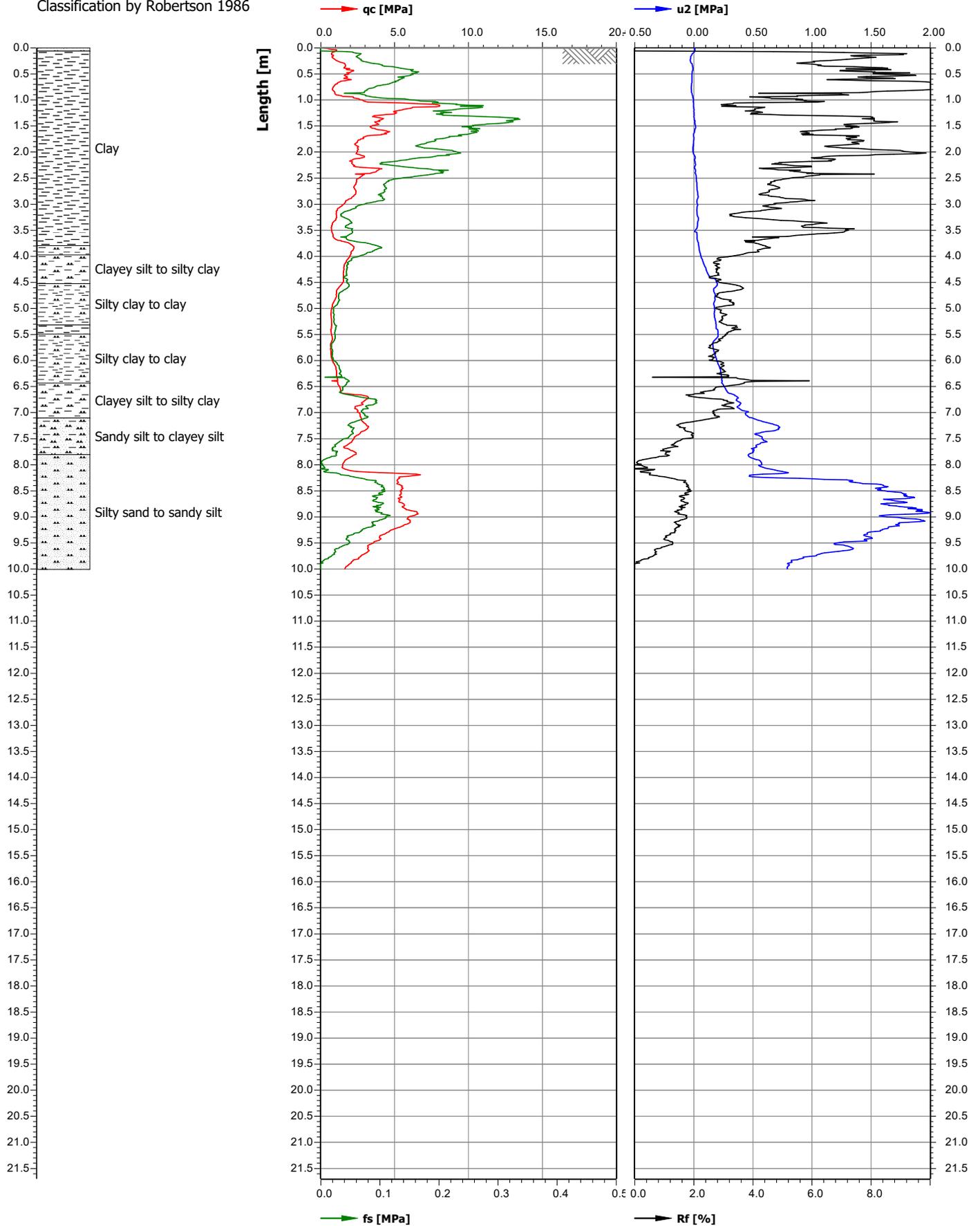


MH01 16.00 - 19.95 m

drawn	EP		client:	Dempsey Wood		
approved	31/05/2021		project:	Donegal Stud Stage 14-16 Refer to Site Plan		
date	31/05/2021		CORE PHOTOGRAPH MH01			
scale	N.T.S.		project no:	GENZAUCK16856AE	fig no:	FIGURE 5
original size	A4		rev:			

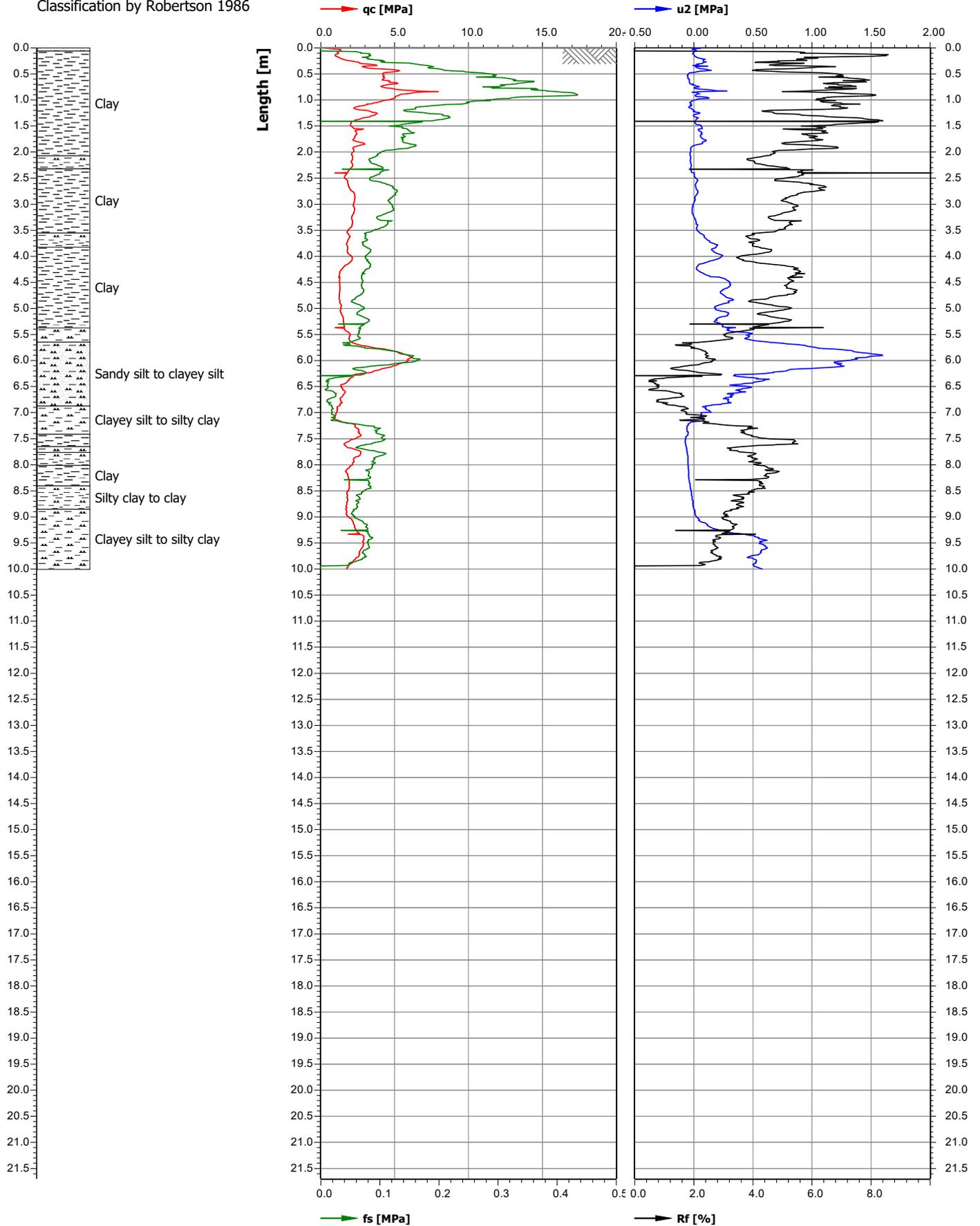
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	Test name	CPT01		Cone name	S10CFIIP.1920	
Test location name	Client	Coffey		Net surface area quotient of ...	0.800/0.000	Nominal surface area of cone...
X coordinate [m]/Y coordinat...	Project contractors			Fig. no.:		
Z value [m]	Project engineer			Scale	1:100	Page
Remarks1						1/1

Classification by Robertson 1986



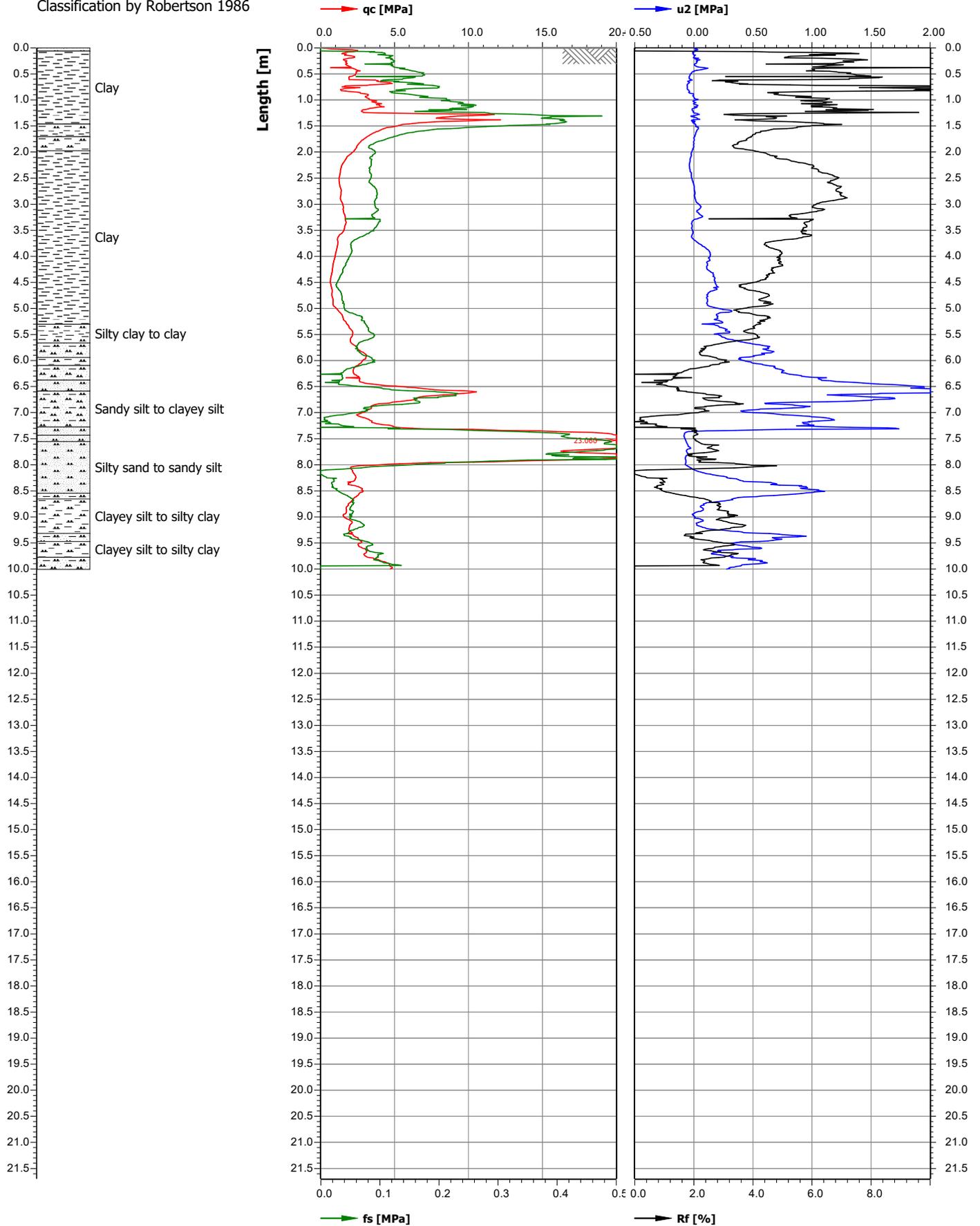
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	Test name	CPT02		Cone name	S10CFIIP.1920	
Test location name	Client	Coffey		Net surface area quotient of ...	0.800/0.000	Nominal surface area of cone...
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Z value [m]	Project engineer			Scale	1:100	Page
Remarks1						1/1

Classification by Robertson 1986



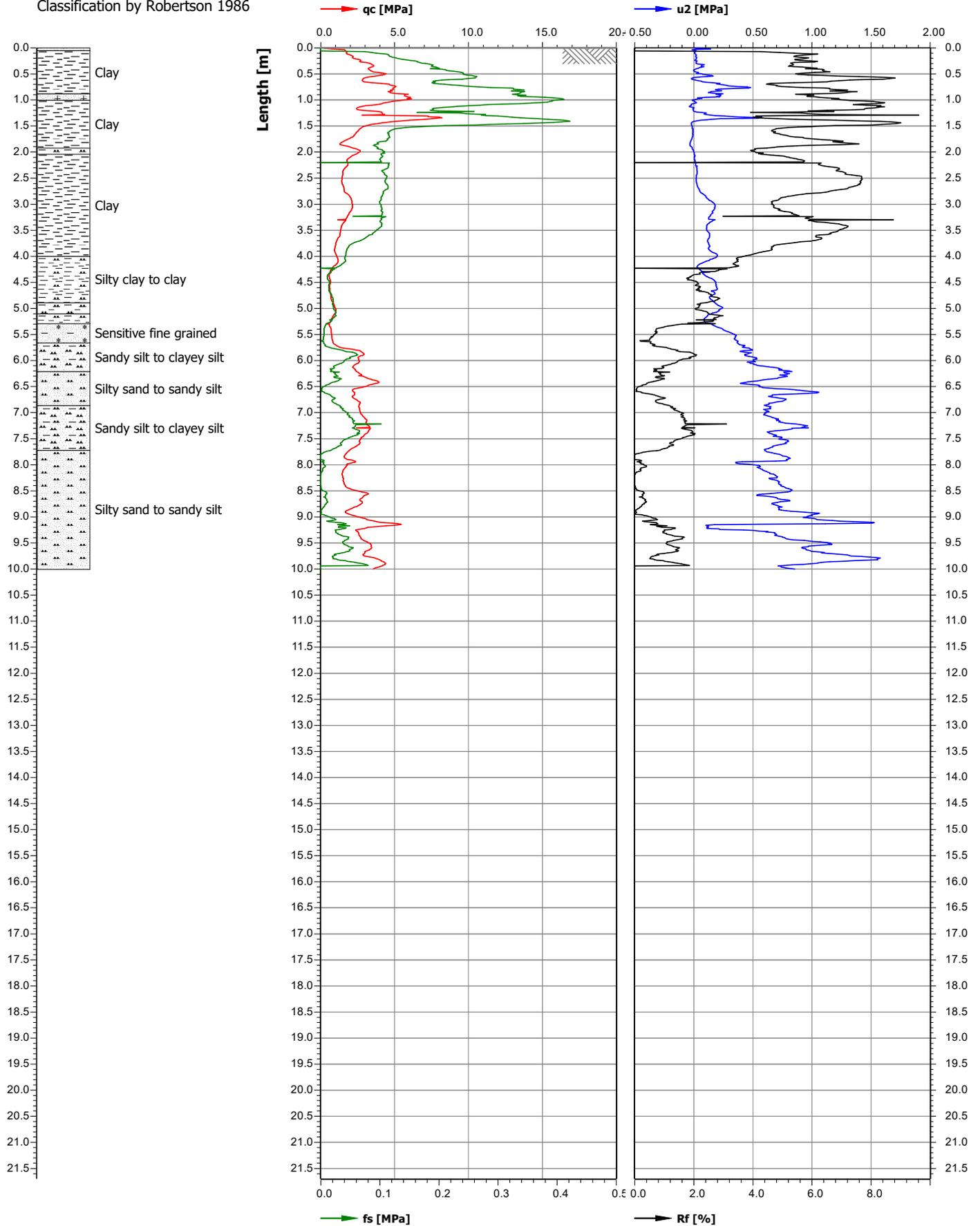
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	Test name	CPT03		Cone name	S10CFIIP.1920	
Test location name	Client	Coffey		Net surface area quotient of ...	0.800/0.000	Nominal surface area of cone...
X coordinate [m]/Y coordinat...	Project contractors			Fig. no.:		
Z value [m]	Project engineer			Scale	1:100	Page
Remarks1						1/1

Classification by Robertson 1986



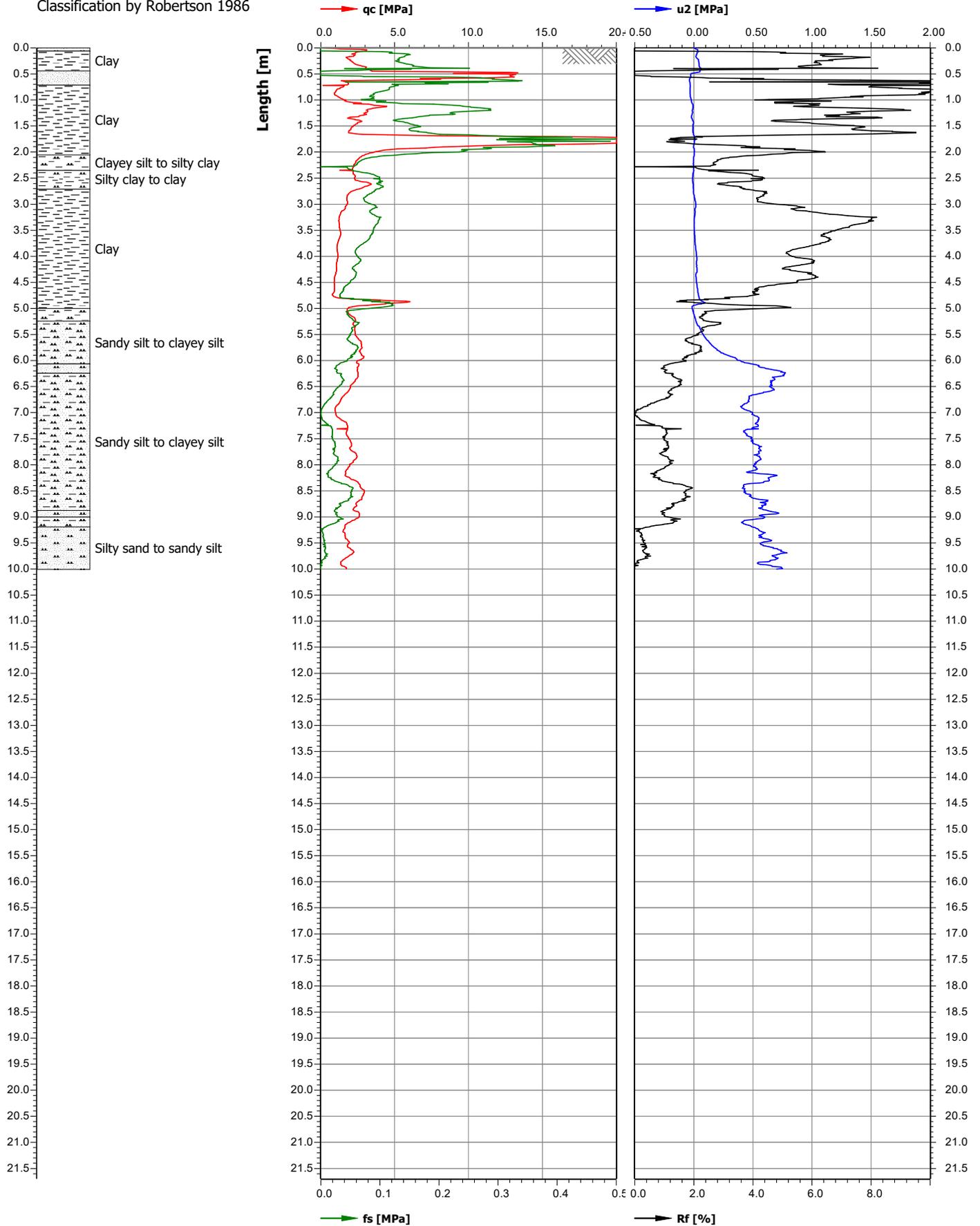
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	Test name	CPT04		Cone name	S10CFIIP.1920	
Test location name	Client	Coffey		Net surface area quotient of ...	0.800/0.000	Nominal surface area of cone...
X coordinate [m]/Y coordinat...	Project contractors	0.00/0.00		Fig. no.:		
Z value [m]	Project engineer	0.00		Scale	1:100	Page
Remarks1						

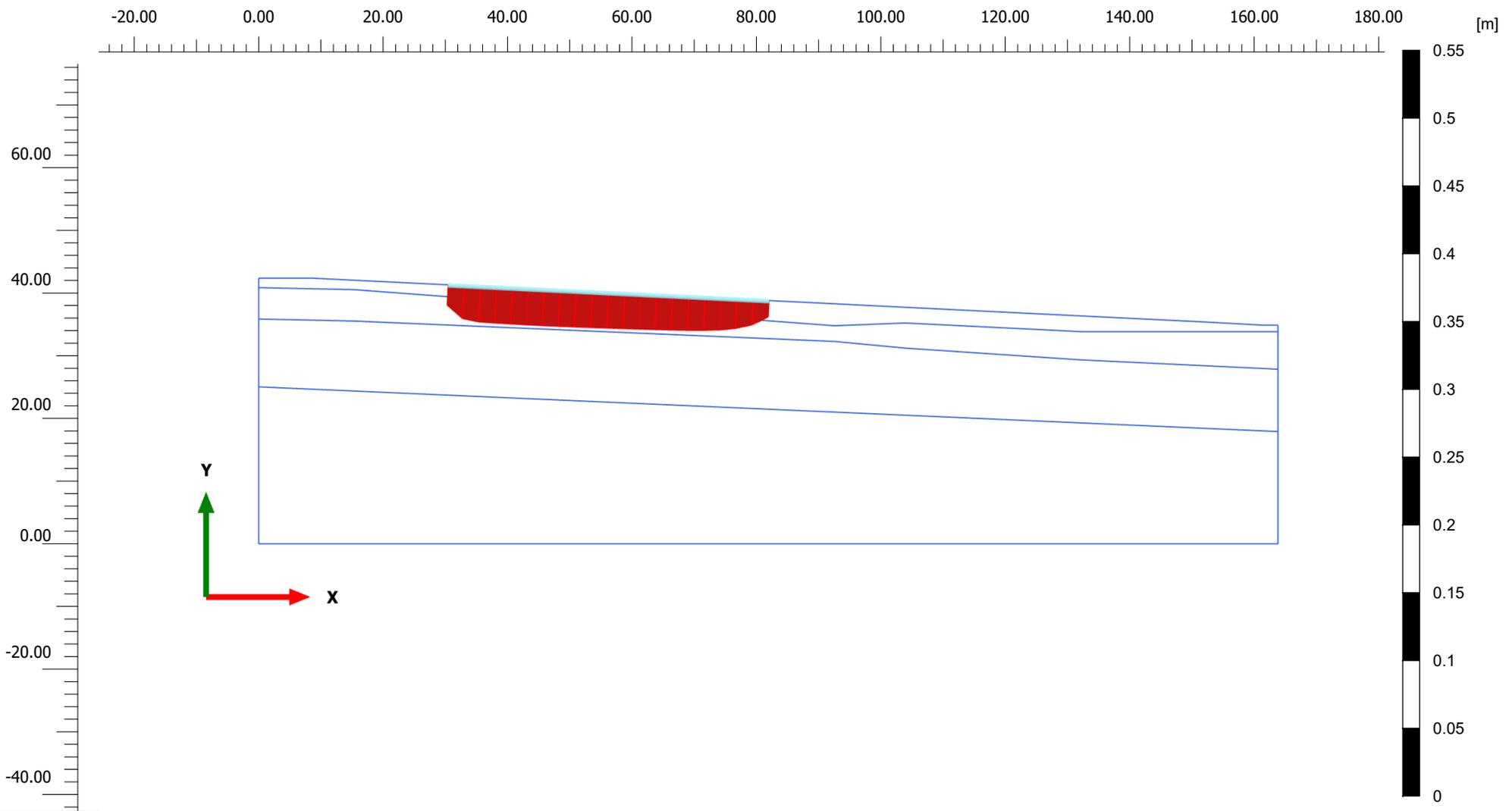
Classification by Robertson 1986



 SPECIALIST DRILLING ENGINEERS	Project name	Coffey140MurphyRd		Date investigation	28/05/2021	
	Test name	CPT05		Cone name	S10CFIIP.1920	
Test location name	Client	Coffey		Net surface area quotient of ...	0.800/0.000	Nominal surface area of cone...
X coordinate [m]/Y coordinat...	Project contractors			Fig. no.:		
Z value [m]	Project engineer			Scale	1:100	Page
Remarks1						1/1

Classification by Robertson 1986





Total displacements u_y (scaled up 200 times) (Time 0.4331 day)

Maximum value = -0.01268 m

Minimum value = -0.02842 m

<i>Project description</i>		<i>Date</i>	
Donegal Stud Stage 16_Settlement Analysis		29/06/2021	
<i>Project filename</i>	<i>Step</i>	<i>Company</i>	
Donegal Stud Stage 16_Se ...	177	Tetra Tech, Inc.	