Preliminary Phase 2 Report for Development of Land to the South of Thorpe Road, Weeley, Essex

Report No: 212518B

November 2021

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Report Title: PRELIMNARY PHASE 2 REPORT FOR DEVELOPMENT OF LAND TO THE SOUTH OF THORPE ROAD, WEELEY, ESSEX

Report No: 212518B

Report Status: Final

Report Date: November 2021

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Document Production Record

Document	Name	Signature	Date	Position
Prepared by	Rachel Foord	[redacted]	10.11.21	Director
Reviewed by	E J Murray		11.11.21	Consultant
Approved by	Rachel Foord		19.11.21	Director

Document Revision Record

Issue Number	Date	Details of Revision
1	10.11.21	Draft
2	19.11.21	Final

Document Issue Record

Report Status	Date of Issue	Issued to	Type of Report
Final	22.11.21	Client	Electronic
	22.11.21	File	Original

PRELIMNARY PHASE 2 REPORT FOR DEVELOPMENT OF LAND TO THE SOUTH OF THORPE ROAD, WEELEY, ESSEX

Contents

1. Introduction and Objectives

2. Site Reconnaissance

3. Summary of Site Work

4. Geology

5. Preliminary Engineering Assessment and Recommendations
5.1 Soil Profile
5.1.1 Made Ground
5.1.2 Topsoil
5.1.3 Ancient Disturbed Ground
5.1.4 Cover Sand
5.1.5 KGCA1
5.1.6 KGCA2
5.1.7 KGCA3
5.1.8 Thames Group
5.2 Ground Contamination Observations
5.3 Groundwater Conditions
5.4 Excavations
5.5 Structural Foundations
5.6 Building Near Trees
5.7 Ground Floor Slabs
5.8 Chemical Attack on Concrete

6. Further Considerations
6.1 Contamination
6.2 Road Pavement Design
6.3 Geotechnical Parameters
6.4 Further Investigation

References
Web Pages

General Notes

Appendices
Appendix (i) Figures
Appendix (ii) Exploratory Hole Logs

Appendix (iii) Laboratory Test Results – Materials Properties
Appendix (iv) Plots

PRELIMNARY PHASE 2 REPORT FOR DEVELOPMENT OF LAND TO THE SOUTH OF THORPE ROAD, WEELEY, ESSEX

1. INTRODUCTION AND OBJECTIVES

1.1 This report has been prepared on instructions given by the Client, Rose Builders Limited (Riverside House, Riverside Avenue East, Lawford, Essex, CO11 1US).

1.2 The site under consideration lies to the south of Thorpe Road and north of the railway line, on the eastern side of Weeley, Essex as shown on Figure 1, Appendix (i). As shown on Figure 2, Appendix (i), the area under consideration is irregular in shape, covers approximately 20ha and comprises several open fields along with a small rectangular wooded area to the south and part of the complex of buildings associated with Ash Farm in the north west. The site is at and around National Grid Reference 615010 222130 (Reference 1).

1.3 Outline proposals are for a mixed-use development at the site to include houses with private gardens, landscaping and estate roads. A pre-school and primary school with playing field and employment areas, are also shown in the north west of the site on the Proposed Block Plan included as Figure 3, Appendix (i). Apart from a new footbridge over the railway line, no development is proposed in the far south of the site in proximity to the railway line as these areas are designated as public open space and for water management features. The foundations to the footbridge are to be designed by others.

1.4 The site has been the subject of several intrusive investigations and studies as detailed below:

Murray Rix Limited Report on a Phase 1 Desk Study and Risk Assessment for a Proposed Residential Development at Land South of Thorpe Road, Weeley, Essex. Report Reference 16-2518r(a) dated March 2017. (Revised from Murray Rix Limited Report 15-2518r dated June 2016 which covered a slightly smaller area).

Compass Geotechnical Factual Report on a Borehole Investigation for the Proposed Railway Crossing, Weeley, Essex. Report reference 192518F dated June 2020.

Compass Geotechnical Report on an initial ground investigation and geological assessment for a Proposed Residential Development at Land to the South of Thorpe Road, Weeley, Essex, Report Reference 19-2518i dated October 2020.

Compass Geotechnical Gas Monitoring Report, Land to the South of Thorpe Road, Weeley, Essex. Report Reference: 202518L dated 5th January 2021.

Compass Geotechnical Report on a supplementary ground investigation and geological assessment for a proposed residential development at land to the south of Thorpe Road, Weeley, Essex, Report Reference 19-2518iS dated January 2021.

Compass Geotechnical Revised report on a supplementary ground investigation and geological assessment for a proposed residential development at land to the south of Thorpe Road, Weeley, Essex, Report Reference 19-2518iS Rev 1 dated April 2021.
Compass Geotechnical Groundwater Observations at Land to the South of Thorpe Road, Weeley Essex, Report reference 19-2518L dated April 2021.
Compass Geotechnical Letter Report on Percolation Tests Land to the South of Thorpe Road, Weeley. Report reference 212518P dated 31st August 2021.

1.5 The current report presents a summary of the works carried out to date and an assessment of likely ground conditions and foundation solutions across the site. Where necessary, recommendations are made for additional investigation in specific areas of the site. (See Sections 5 and 6).

1.6 The investigations, assessments and reporting has been carried out in general accordance with the following:

BS 5930:2015+A1:2020. Code of Practice for Ground Investigations.
BS 10175:2011+A2:2017. Investigation of potentially contaminated sites – Code of practice.
BS 8485:2015+A1:2019. Code of practice for the design of protective measures for methane and carbon dioxide ground gasses for new buildings.
BS 8576:2013. Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs).
BS EN ISO 14688-1:2018. Geotechnical investigation and testing – Identification and classification of a soil – Part 1: Identification and description.
BS EN ISO 14688-2:2018. Geotechnical investigation and testing – Identification and classification of a soil – Part 2: Principles for a classification.
BS EN ISO 22476-2:2005+A1:2011. Geotechnical investigation and testing – Field testing – Part 2: Dynamic Probing.
BS EN ISO 22476-3:2005+A1:2011. Geotechnical investigation and testing – Field testing – Part 3: Standard Penetration Test.
BS EN ISO 14689:2018. Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description.
BS EN ISO 22475-1:2006. Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution.
BS 1377-9:1990. Soils for civil engineering purposes – Part 9 In-situ tests.
BS EN 1997-1:2004+A1:2013 Eurocode 7: Geotechnical design – Part 1: General Rules.
NA to BS EN 1997-1:2004+A1:2013. UK National Annex to Eurocode 7: Geotechnical design – Part 1: General Rules.
BS EN 1997-2:2007. Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing.
NA to BS EN 1997-2:2007. UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing.

2. SITE RECONNAISANCE

2.1 As shown on Figure 2, Appendix (i), the area under consideration is irregular in shape and comprises part of a number of gently undulating large open fields along with a small wooded area close to the southern boundary and the existing premises of Ash Farm.

A railway line, in cutting, runs through the south eastern part of the site and forms part of the southern boundary to the south western section. The southern boundary to the south eastern section of the site is formed by Weeley Brook which flows in an easterly direction.

The main part of the site is divided in two by a track and dry ditch, with occasional oak trees, which run approximately east west through the centre. To the north of the track and dry ditch are four fields separated by tree lined boundaries and hedges. To the south of the track is a large open field known as Barrack Field which is crossed by two paths, one running south south east from the track to a small rectangular area of woodland, through the woodland and continuing across the railway line and through further fields beyond; and a second track running north west from the northern end of the woodland to the housing estate adjacent to the western boundary. A strip of land approximately 80m wide in the south eastern corner adjacent to the railway line has been left fallow.

Further fields are present to the south of the railway line and a number of trees were noted as present in the field to the east and around the perimeter of the western field. Weeley Brook forms the southern boundary to these two fields and flows in open ditch with piped sections beneath the field accesses. In the woods to the west of the track and south of the railway line was a sign noting a pump sewer.

The premises of Ash Farm present in the north west of the site include a concrete covered farm yard and numerous barns. Amongst the buildings, particularly along the north eastern boundary with the adjoining Council offices, were a variety of stored materials including machinery, bricks, blocks, wood, scaffolding, alkathene pipes, pallets, scrap metal, containers and a curtain sided lorry trailer. The concrete hard standing to the south of the barns was being used for temporary storage of buildings materials. In the fields to the west of the barns were several trailers, tractors and other farm machinery along with several empty disused metal fuel tanks, and to the south west of the barns was a large heap of old tyres.

A number of overhead electricity cables cross the site.

2.2 The site is surrounded by various land uses including housing (north, north east, north west and west), two fishing lakes thought to be associated with former gravel workings beyond (south east), an equestrian centre (east) with grassed show jumping

areas and fields, Council offices (north) and various fields. Adjacent to the far south western corner is a further small field which contains a small sewage works.

2.3 The site slopes down to the south east towards the railway line.

3. SUMMARY OF SITE WORK

3.1 The following table presents a summary of the various exploratory holes carried out to date and on which the assessments contained in this report are made.

Table 1 Summary of Exploratory Holes

Exploratory Hole Reference	Type/Technique	Maximum Depth (m)	Location	Date
TP1 to TPG	Trial Pits	4.50	TPA south TPB to G north	January 2020
WS1 to WS4	Windowless sample holes	6.00	Either side of railway line in south of site	May 2020
WS5 to WS22	Windowless sample holes and dynamic probing. Installation of gas and groundwater monitoring points	8.00	Main section of site	May and June 2020
WS23 to WS30	Windowless sample holes and dynamic probing	9.00	North west of site	December 2020
A1, A2, B1, B2, C1, C2, D1 and D2	Percolation Tests	1.75	North west of site	August 2021

3.2 For completeness, all the exploratory hole logs from the various phases of investigation are included in Appendix (ii) and the laboratory test results are presented in Appendix (iii). The logs and probing results include references to the original reports to which they relate. A plan showing the location of the exploratory holes is presented as Figure 4, Appendix (i).

3.3 In addition to the foregoing, two further inspections were undertaken at the site to record the near surface materials exposed in the 113 open archaeological trenches in March 2021.

4. GEOLOGY

4.1 The British geological map of the area (Reference 2) shows a simplified interpretation of the geology of the site, comprising Cover Sand to the north west and deposits of the Kesgrave Catchment Subgroup (KGCA) to the south east with the division between the two deposits running approximately diagonally halfway across the site north east to south west. In the south of the site the drift deposits are indicated as absent with the Thames Group present at the surface.

4.2 The investigations undertaken to date suggest that the ground conditions at the site are more complex than indicated by the published geological map.

The upper deposits were found to be highly variable and represent changing fluvial and aeolian depositional environments during the Quaternary period around 2 million years ago. The upper deposits encountered at the site suggest a degree of geological re-working during and post deposition.

Where considered possible a tentative distinction has been drawn between the aeolian (Cover Sand) and the upper fluvial deposits of the Kesgrave Catchment Subgroup (KGCA). However, where it is not thought possible to distinguish between the Cover Sand and the underlaying Kesgrave Catchment Subgroup, due to a high degree of re-working in the geological past the near surface deposits have been classified as KGCA1.

In order to simplify the geological interpretation of the site, the Kesgrave Catchment Subgroup has been sub divided into three basic but distinct lithologies KGCA1, KGCA2 and KGCA3 each representing a distinct change in depositional environment over geological time. KGCA1 comprises predominately orange brown and yellowish brown clayey sands and gravels. KGCA2 comprises light grey slightly sandy slightly gravelly clay and KGCA3 comprises sands and gravels, locally slightly clayey.

Reference should be made to the geological assessment reports (detailed in Section 1.4) for a full description of the materials encountered and the rationale for the distinctions made between the different lithologies.

5. PRELIMINARY ENGINEERING ASSESSMENT AND RECOMMENDATIONS

5.1 Soil Profile

Table 5.1 overleaf presents a summary of the lithologies encountered in the various exploratory holes at the site.

5.1.1 Made Ground

The investigations encountered a variable thickness of made ground in three locations (WS9, WS12 and WS14) in the central and eastern sections of the site. Observations made in the archaeological trenches, particularly in Barrack Field, indicated the presence of features including ditches, pits, drainage features and brick walls (possibly associated with buildings) along with disturbed and made ground. It is thus thought that locally more made ground is present and to greater depth than indicated by the exploratory holes. It is understood that further archaeological evaluation works have been undertaken which should indicate the extent of such features which may influence the proposed foundations locally.

5.1.2 Topsoil

Topsoil, between 0.22 and 0.42m thick, was encountered in the majority of the exploratory hole positions with the exception of WS9, WS12 and WS14 (where made ground was revealed).

5.1.3 Ancient Disturbed Ground

Beneath the topsoil of WS20 deposits of orange brown, yellowish brown and blueish grey clay were found to 3.80m depth which are uncharacteristic of the strata encountered below other areas of the site. From examination of the materials, the consistency of the cohesive materials varies from very firm to stiff. These uncharacteristic deposits do not have the appearance of recent made ground nor the appearance of the surrounding natural deposits and have been classified as Ancient Disturbed Ground based on the available information. The lateral extent of this deposit has not been identified and further investigation around the area of WS20 may be required to establish the extent and nature of the deposit.

5.1.4 Cover Sand

Underlying the topsoil/made ground, natural and variable deposits thought to represent Cover Sand were encountered mainly over the northern part of the site. These deposits comprise predominantly slightly silty slightly sandy clays with occasional silty fine sand. Very rare to rare flint gravels, probably representing a reworking of the strata in the geological past, were noted in a number of the recovered samples. The thickness of the Cover Sand was variable extending, where present, to depths below ground level of between 0.50m (WS17) and 1.68m (WS7). The geological assessment shows a general thinning towards the centre and west of the site with localised absence in and around the south and north west.

Table 5.1 Summary of Ground Conditions

Deposit	Depth Top Range (mBGL)	Depth Base Range (mBGL)	Thickness Range (m)	Locations
Made Ground	0.00	0.52 – 0.79	0.52 – 0.79	WS9, WS12, WS14 (lateral extent not established)
Topsoil	0.00	0.22 – 0.42	0.22 – 0.42	All positions except WS9, WS12, WS14
Ancient Disturbed Ground	0.39	3.80	3.41	WS20 (lateral extent not established)
Cover Sand	0.25 – 0.91	0.50 – 1.68	0.15 – 1.36	TPB, TPC, TPF, TPG, WS7, WS8, WS10, WS11, WS15, WS16, WS17, WS19, WS21, WS22, WS23, WS24, WS25, WS26, WS29
KGCA1	0.28 – 2.00	0.57 – 5.40	0.20 – 4.58	TPB, TPC, TPD, TPE, TPF, TPG, WS6, WS8, WS10, WS11, WS12, WS13, WS14, WS15, WS16, WS17, WS18, WS19, WS22, WS23, WS24, WS25, WS26, WS27, WS28, WS29, WS30
KGCA2	0.29 – 5.20	0.45 – 6.10	0.06 – 2.78	TPA, TPB, TPC, TPD, TPE, TPF, TPG, WS1, WS5, WS6, WS7, WS8, WS9, WS10, WS11, WS12, WS13, WS14, WS15, WS16, WS17, WS18, WS19, WS21, WS25, WS26, WS27, WS30
KGCA3	0.37 – 6.10	1.46 – 7.80	0.14 – 5.50	TPB, TPC. TPD, TPE, TPF, TPG, WS1, WS2, WS5, WS6, WS7, WS8, WS9, WS11, WS12, WS13, WS14, WS15, WS16, WS17, WS18, WS19, WS21, WS22, WS25, WS26, WS27, WS30
Thames Group	0.22 – 7.80	Not proved	Not proved	Top of Thames Group proved or inferred from DP test in TPA, WS1, WS2, WS3, WS4, WS5, WS6, WS7, WS8, WS9, WS10, WS11, WS12, WS13, WS14, WS15, WS16, WS18, WS19, WS20, WS21, WS22, WS26, WS27, WS29, WS30

Table 5.2 below summarises the result of a single in-situ test in the Cover Sand. From detailed examination of the materials, the consistency of the cohesive materials ranges widely from very soft to very stiff.

Table 5.2 Summary of In-situ Tests – Cover Sand

Parameter (units)	Results	Classification	Comments
Undrained Shear Strength (kPa)	50 based on SPT	Medium strength	Single result only
SPT N Value	10		

5.1.5 KGCA1

The upper layer of the Kesgrave Catchment Subgroup comprises orange brown and yellowish brown clayey sands and gravels and sandy gravelly clays, sandy clays and gravelly sands. Gravels are identified predominantly as flint and quartz. Given the highly variable nature of KGCA1 deposits across the site, it is thought that there has been some natural reworking of KGCA1 in the geological past.

KGCA1 was encountered in most of the exploratory holes. There appears to be a general thickening of the KGCA1 deposits to the north and west typically of 1.38 to 4.68m with the thickest deposit of 4.68m found at WS27 in the north west between 0.32m and 5.00m depth.

The results of the in-situ testing in the clays and sands of KGCA1 are summarized in Table 5.3 below and plots of SPT N value against depth and assessed undrained shear strength against depth are presented in Appendix (iii).

Table 5.3 Summary of In-situ Tests – KGCA1

Parameter (units)	Results	Classification	Comments
Undrained Shear Strength (kPa)	35 to 55 based on SPT	Medium strength	3 results
SPT N Value	7 – 151 (general range) 7 – 11 (cohesive deposits) 20 – 151 (granular deposits)		Medium dense to very dense

5.1.6 KGCA2

The middle layer of the Kesgrave Catchment Subgroup comprises light grey occasionally mottled orange brown slightly gravelly slightly sandy clays. Gravels are identified predominantly as flint and quartz.

KGCA2 was encountered in most of the exploratory holes with a general thinning of the KGCA2 deposits to the west and east of the site (typically 0.15 to 0.8m) with thicker deposits (1.22 to 2.78m) aligned approximately north west to south east thought to represent a channel infilled with clays during a lower energy depositional regime. The thickest deposit of 2.78m was found at TPE towards the north of the site between 1.52m and 4.30m depth. Towards the south of the site KGCA2 deposits were found at shallower depths due the surface topography over the southern sections of the site. The KGCA2 deposits in the north west of the site are generally thinner and found at deeper depths than found elsewhere.

The results of the in-situ testing in the clays and sands of KGCA2 are summarized in Table 5.4 below and plots of SPT N value against depth and assessed undrained shear strength against depth are presented in Appendix (iii).

Table 5.4 Summary of Geotechnical Parameters – KGCA2

Parameter (units)	Results	Classification	Comments
Undrained Shear Strength (kPa)	25 to 100 (typical) based on SPT	Low to High strength (generally medium)	
SPT N Value	5 – 56 (general range) 5 – 20 typical (cohesive deposits)		Higher results influenced by underlying granular deposits
Water Content (%)	19.2		
Liquid Limit (%)	35	CL/CI Soils Low Shrinkability	
Plastic Limit (%)	14		
Plasticity Index (%)	21		
Modified Plasticity Index (%)	18		
Soluble Sulphate Content SO_4 (g/l)	<0.010	AC-1	
pH Value	8.1		

Where the deposits of the KGCA2 are relatively thin the SPT results may be influenced by the underlying more granular materials.

5.1.7 KGCA3

The lower layer of the Kesgrave Catchment Subgroup comprises yellowish brown and pale brown occasionally slightly clayey fine to coarse sands and gravels of flint and quartz. KGCA3 was encountered in the majority of the exploratory holes and in general the sands and gravels of KGCA3 thin to the south of the site, with thicker deposits to the west and east. These deposits would appear to represent a more dynamic depositional regime and the thickest deposit of 5.50m was found at WS13

between 2.50m and 8.00m depth, however, the full depth was not proved. Similar to KGCA2 these deposits are present at shallower depths in the south of the site.

The results of the in-situ testing in the granular deposits of KGCA3 are summarized in Table 5.5 below and plots of SPT N value against depth are presented in Appendix (iii).

Table 5.5 Summary of Geotechnical Parameters – KGCA3

Parameter (units)	Results	Classification	Comments
SPT N Value	4 – 131 (general range) 10 – 40 typical		Loose to very dense Medium dense to dense
Soluble Sulphate Content SO_4 (g/l)	<0.010	AC-1	
pH Value	8.6		

5.1.8 Thames Group

Underlying the deposits of the Kesgrave Catchment Subgroup are the natural deposits of yellowish brown becoming greyish brown occasionally closely fissured clay of the Thames Group. The Thames Group was encountered in most of the deeper windowless sample holes but will underlie the entire site. In general, the Thames Group was found at deeper depths towards the north WS18 5.80m BGL (inferred from dynamic probe results) and north west, 5.40m BGL (WS29) to 7.80m BGL (WS26) (inferred from dynamic probe results) and shallower to the south TPA 1.10m BGL consistent with the topography of the site.

The results of the in-situ testing in the clays of the Thames Group are summarized in Table 5.6 below and plots of SPT N value against depth and assessed undrained shear strength against depth are presented in Appendix (iii). The in-situ testing shows an overall increase in strength with depth as would normally be expected.

Table 5.6 Summary of Geotechnical Parameters – Thames Group

Parameter (units)	Results	Classification	Comments
Undrained Shear Strength (kPa)	19 to 90 (typical) based on SPT	Low to High strength (generally low to medium)	
SPT N Value	4 – 58 (general range) 4 – 20 typical (cohesive deposits)		
Water Content (%)	29.6 – 40.3		

Parameter (units)	Results	Classification	Comments
Liquid Limit (%)	84 – 96	CV and CE Soils High Shrinkability	
Plastic Limit (%)	28 – 31		
Plasticity Index (%)	54 – 67		
Modified Plasticity Index (%)	N/A		
Soluble Sulphate Content SO_4 (g/l)	<0.010 – 0.33	AC-1	See Section 5.8
Total Potential Sulphate as SO_4 (%)	0.033 – 1.4	AC-4 at depth	
pH Value	7.8 – 8.7		

5.2 Ground Contamination Observations

No visual or olfactory evidence of significant contamination was noted during the investigations to date, although some localized made ground was encountered particularly in the central and eastern areas of the site.

See also Section 6.

5.3 Groundwater Conditions

Groundwater levels have been monitored on a regular basis over a 12 month period in eight locations in the main part of the site (WS15 to WS22). The monitoring has indicated seasonal changes in the groundwater regime with relatively shallow water levels particularly in the winter months in WS16, WS20 and WS22. Typically, the water table was around or less than 1.5 to 2m bgl. A summary of the groundwater monitoring results is given in Table 5.7 below.

Table 5.7 Groundwater Monitoring Results

Position	Depth to Groundwater										
	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Mar-21	Apr-21	May-21	Jun-21
WS15	1.97	2.03	2.19	2.28	2.17	2.13		0.68	1.23	1.47	1.67
WS16	1.58	1.63	1.80	1.95	2.18	2.13		0.32	0.77	1.07	1.42
WS17	2.02	2.05	2.22	2.41	2.45	2.44	2.21	0.70	1.20	1.56	1.73
WS18	2.47	2.50	2.62	2.74	2.60	2.53	2.13	1.25	2.02	2.10	2.11
WS19	1.74	1.78	1.86	1.87	1.45	1.28	1.00	1.07	1.35	1.35	1.36
WS20	1.06	0.91	0.93	0.97	0.96	0.85	0.19	0.02	0.60	0.30	0.56
WS21	1.40	1.42	1.52	1.58	1.55	1.43	0.88	0.83	0.96	0.94	1.00
WS22	0.90	0.90	1.03	0.84	0.99	0.80	0.31	0.11	0.45	0.32	0.57

5.4 Excavations

Random falls and collapse of vertical excavation faces can be expected in the natural materials dependent on the depth of excavation, the length of time excavations stand open, and the incidence of any groundwater entries.

Consideration should be given to providing at least intermittent to close support in deepened vertical sided excavations where personnel are required to enter. The adequacy of all excavation support should be continually inspected by experienced personnel. In the more granular strata it may be possible to control groundwater entries by sump and pump techniques.

5.5 Structural Foundations

It is understood that the main part of the site (east and central area) is to be developed with traditional 2 storey houses. A primary school with associated pre-school and sports pitches are to be built in the north west of the site along with three commercial units and a few more houses. The area adjacent to the railway line in the south of the site is to be used for swales and public open space along with a new footbridge over the railway line. The design of the foundations to the footbridge are to be undertaken by others.

As discussed in Section 5, the ground conditions at the site are highly variable both laterally and vertically. In the following discussion on foundations the site has been zoned into four main areas (Zones 1 to 4) to allow formulation of appropriate foundation solutions. The zoning is illustrated on Figure 5, Appendix (i) and at this stage, in the absence of further investigation, should only be considered preliminary.

North West and Central West Areas, Central Eastern Area Around WS9 – Zone 1

The near surface deposits in this area comprise predominantly granular (gravelly) deposits of KGCA1 with SPT N values often in excess of 40 and the majority greater than 20. Based on a characteristic angle of shearing resistance of 33° a presumed bearing resistance of around 200kPa would be considered appropriate for a strip foundation 0.6m wide bearing at around 1.0m bgl. Under these conditions settlements should be within acceptable limits. In proximity to the water table a reduced bearing resistance of around 150kPa should be adopted.

South Eastern Area and Around WS12 – Zone 2

In these areas, highlighted in yellow on Figure 5, Appendix (i), the ground conditions typically comprise clays of the Cover Sand, KGCA1 or KGCA2 over medium dense granular deposits (KGCA3). In this area the upper clays are relatively poor and foundations should be carried down to bear in the medium dense granular deposits (KGCA3) at around 1.50 to 1.75m bgl. Based on a characteristic angle of shearing resistance of 33° a presumed bearing resistance of up to 300kPa would be considered appropriate for a strip foundation 0.6m wide bearing at around 1.5m bgl. Under these conditions settlements should be within acceptable limits. In proximity to the water table a lower bearing resistance of around 150 to 200kPa should be adopted.

These areas lie wholly within the Barrack Field where a number of archaeological features are present along with localized made ground and where the groundwater can be relatively shallow during the winter months. If traditional shallow foundations are to be adopted careful consideration will need to be given to the timing of

excavations in these areas and the impact of any archaeological constraints as well as possible collapse of excavation sides.

North Eastern Section – Zone 3

The deposits in the north eastern part of the site are variable and appear to change rapidly both laterally and vertically. Similar to the south eastern area there are often reasonably compact granular materials at depth (1.6 to 1.7m bgl) beneath weaker cohesive deposits. Based on the available information it is considered that a presumed bearing resistance of between 120 to 200kPa would be appropriate in this area for a standard 0.6m wide strip foundation bearing at around 1.6m bgl. However, some further checks in this area would be considered appropriate to confirm the ground conditions, the strength of the soils present and to allow a full assessment of foundation solutions for this area particularly in light of the shallow groundwater recorded over the winter months.

Central South and South Western Areas – Zone 4

The deposits in these areas comprise predominantly cohesive strata of KGCA1, KGCA2 and locally clays of the Thames Group. The in-situ testing carried out in the boreholes suggests the clays are relatively weak and presumed bearing values of between 65 and 120kPa would be considered appropriate for a standard strip foundation 0.6m wide bearing in these materials at around 1.0m depth. Depending on proposed loadings strip foundations may not be appropriate in these cohesive deposits and consideration may need to be given to alternative foundation solutions such as a raft/reinforced foundation or a piled foundation with piles taken down to bear in the clays of the Thames Group at depth. If a piled foundation is to be considered, some deeper boreholes will be required to confirm the geotechnical parameters of the Thames Group at depth to allow a cost-effective design of piles. A driven cfa or bored pile would prove acceptable, although the advice of a specialist contractor should be sought particularly given the shallow nature of the groundwater at times and the sloping nature of the southern part of the site.

These areas also lie wholly within the Barrack Field where a number of archaeological features are present along with localized made ground and where the groundwater can be relatively shallow during the winter months. Careful consideration will need to be given to the timing of excavations in these areas and the impact of any archaeological constraints on foundation design.

5.6 Building Near Trees

The site is crossed by a number of field boundaries and hedges which include some mature trees, in addition there is a copse at the southern end of the site which extends towards the railway line. Where foundations are to bear wholly in granular deposits which are reasonably thick there should be no requirement to deepen foundations to guard against swelling/shrinkage phenomena. However, where cohesive deposits are present then foundations within influencing distance of tress may need to be deepened in accordance with NHBC Standards (Reference 5). It may

also be necessary to provide heave precautions such as the placement of compressible material on the inside faces of external foundations. It should be noted that the plasticity of the cohesive deposits varies across the site; the clays of the Thames Group are of high shrinkability whereas the KGCA2 deposits are of low shrinkability (based on the modified plasticity index and few results).

If piled foundations are to be adopted on weak cohesive materials, then consideration may need to be given to sleeving of piles within influencing distance of trees and the potential for uplift particularly given the shrinkable nature of the clays of the Thames Group. Heave precautions may need to be placed on the underside of ground beams and on the internal faces of external ground beams.

5.7 Ground Floor Slabs

Over much of the site, ground bearing floor slabs are likely to prove acceptable. However, in proximity to trees on cohesive soils, floor slabs are probably best constructed as suspended over an appropriate void in accordance with NHBC Standards (Reference 5).

5.8 Chemical Attack on Concrete

Only a limited number of laboratory determinations of soluble sulphate content have been undertaken to date on samples of the natural soils present at the site. Reported concentrations of soluble sulphate were generally low within the KGCA2 and KGCA3 deposits (<0.010 – 0.014g/l SO_4) in association with alkaline pH values. It is likely that on these deposits the ACEC class for the site would be AC-1. In accordance with BRE Special Digest 1 (Reference 6) the site has been classed as 'natural ground' the groundwater regime is considered 'mobile' as some permeable strata are present on site and shallow groundwater has been recorded.

Within the strata of the Thames Group, the reported concentrations of soluble sulphate were slightly higher with results between <0.010 and 0.33g/l SO_4 in association with alkaline pH values. These results also suggest an ACEC class of AC-1 for the clays of the Thames Group. However, due to the possible presence of pyrite within the clays of the Thames Group, total potential sulphate concentrations have also been determined. Reported results were between 0.033 and 1.4% SO_4 with the higher concentrations reported from samples at depth. The elevated total potential sulphate concentrations indicate a reclassification to AC-4 for the clays at depth. However, Reference 6 indicates that such a reclassification may not be necessary if there is likely to be little disturbance of the ground such as by the use of a piled foundation rather than an open excavated foundation.

6. FURTHER CONSIDERATIONS

6.1 Contamination

The Phase 1 Desk Study Report identified a number of possible sources of contamination at the site. The risks associated with ground gases have already been assessed and there is no requirement to install gas protection measures within the new structures. The south western corner of the site close to the sewage works is not being developed, similarly no development is proposed in proximity to the railway line and no further assessment of these areas is considered necessary.

In line with the recommendations of the Phase 1 Desk Study, contamination sampling should be undertaken in and around the various buildings and yards associated with Ash Farm in the north west of the site as potential sources of contamination were identified. Much of this area is currently covered by hard standing and buildings which will limit the scope of any investigation at this stage and further works may be required once the site has been cleared. Prior to any demolition and clearance work an asbestos survey of the barns and buildings should be carried out by a specialist contractor at an early stage.

No further sources of contamination were identified during the investigations and studies carried out to date and it is understood that the fields have only been used for grazing in recent years. However, Waste Acceptance Criteria (WAC) testing and classification of materials for muckaway purposes will be required particularly where made ground has been identified. Such testing will also provide a check on conditions over the main part of the site and will help to confirm the validity of the assumptions made.

6.2 Road Pavement Design

It is recommended that DCP tests are carried out along the proposed road alignments to provide information for the design of road pavements particularly as the strata below the site are highly variable. The DCP test provides a continuous CBR profile from ground surface to depths of up to 2m bgl and could also be used to help delineate the boundaries between the foundation zones discussed in Section 5.5.

6.3 Geotechnical Parameters

The investigations to date were mainly to establish the extent of the various lithologies at the site and to assess suitability for soakaways and as such only limited laboratory testing has been carried out. Some further sampling and testing is recommended to confirm the strength and plasticity of the clays in which foundations may bear and the sulphate content of the deposits for the design of structural concrete.

6.4 Further Investigations

As discussed in Section 5.5, further geotechnical investigation is recommended in the north eastern section of the site where the ground conditions are particularly variable, near to Ash Farm in the north west and elsewhere to better define the extent of the various zones.

If piles are to be considered in the Central South and South Western Areas then a number of deep boreholes will be required to provide geotechnical information at depth for the design of piles. It is anticipated that piles would bear in the clays of the Thames Group which has been proved to a depth of 6m bgl locally.

The potential for contamination in the area of Ash Farm also needs to be investigated at this stage as discussed in Section 6.1.

R. Foord BSc, MSc, MCSM, CGeol, FGS

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6. BRE Special Digest 1:2005 Third Edition Concrete in Aggressive Ground. BRE Construction Division.

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New information, improved practices, changes in legislation, or changes in guidelines from Statutory Bodies may necessitate a re-interpretation of the report in whole or part after its original submission.

The report and/or opinion will be prepared and written for the specific purposes and/or development stated in the document and in relation to the nature and extent of proposals made available to us at the time of writing. The recommendations should not be used for other schemes on or adjacent to the site.

The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. Conditions between exploratory holes have been interpolated, however soil conditions are highly variable and may differ from the interpolation. There may be conditions, appertaining to the site, which may not be revealed by the investigation, and which may not be taken into account in the report.

The accuracy of the results reported will depend on the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristic of the strata as a whole. Where such measurements are critical, the technique of the investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the company where necessary.

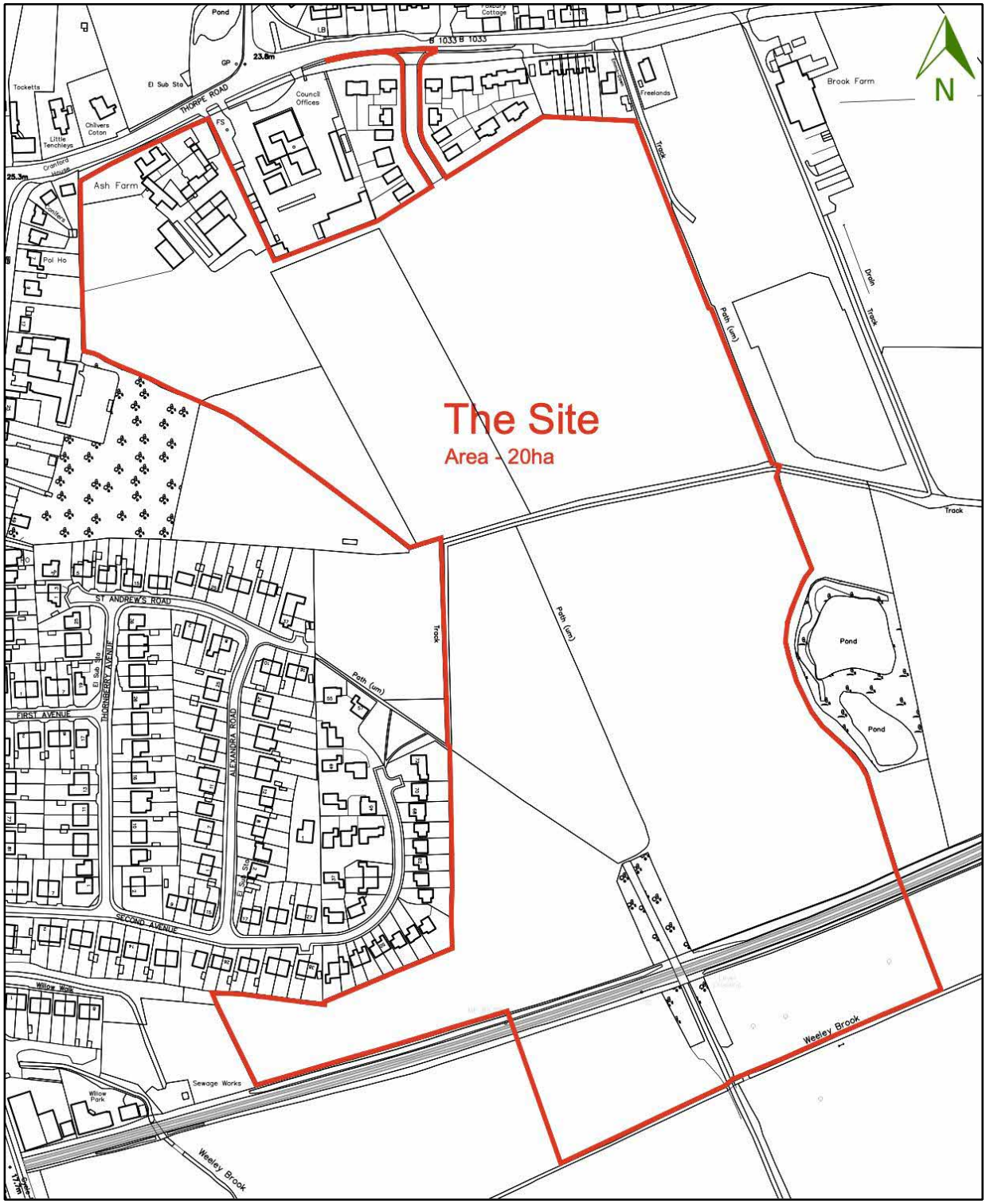
The economic viability of the proposal referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to the geotechnical considerations hence its evaluation will be outside the scope of the report.

Where any data supplied by the Client or from other sources, including previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by Compass Geotechnical Limited for inaccuracies in the data supplied by any other party.

The investigation does not include the identification of Japanese Knotweed. Any such survey should be undertaken by a specialist.

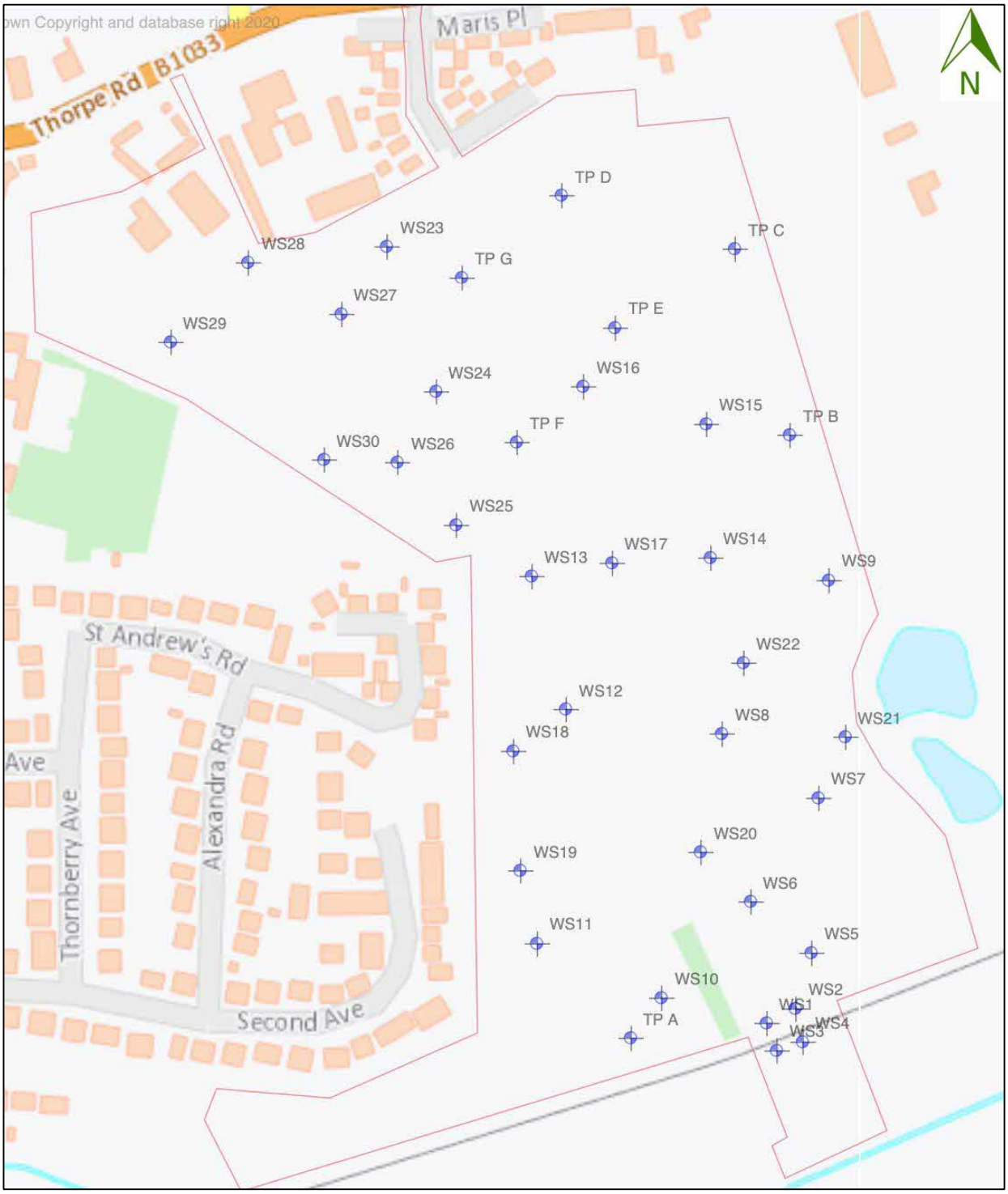
Appendix (i)
Figures

Base map reproduced with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown Copyright Licence No: AL100034022.	Figure 1	Site Location
	Date	November 2021
	Not to Scale	



Extract from ADP Site Location Plan Drawing No: 1102.L.001 Draft Dated 02/03/2017	Figure 2	Site Location Plan
	Date	November 2021
	Not to Scale	

Extract from Arcady Architects Proposed Block Plan Drawing Number 21/12/-- dated August 2021.	Figure 3	Proposed Block Plan
	Date	November 2021
	Not to Scale	



Base map reproduced with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown Copyright Licence No: AL100034022.	Figure 4	Borehole and Trial Pit Locations
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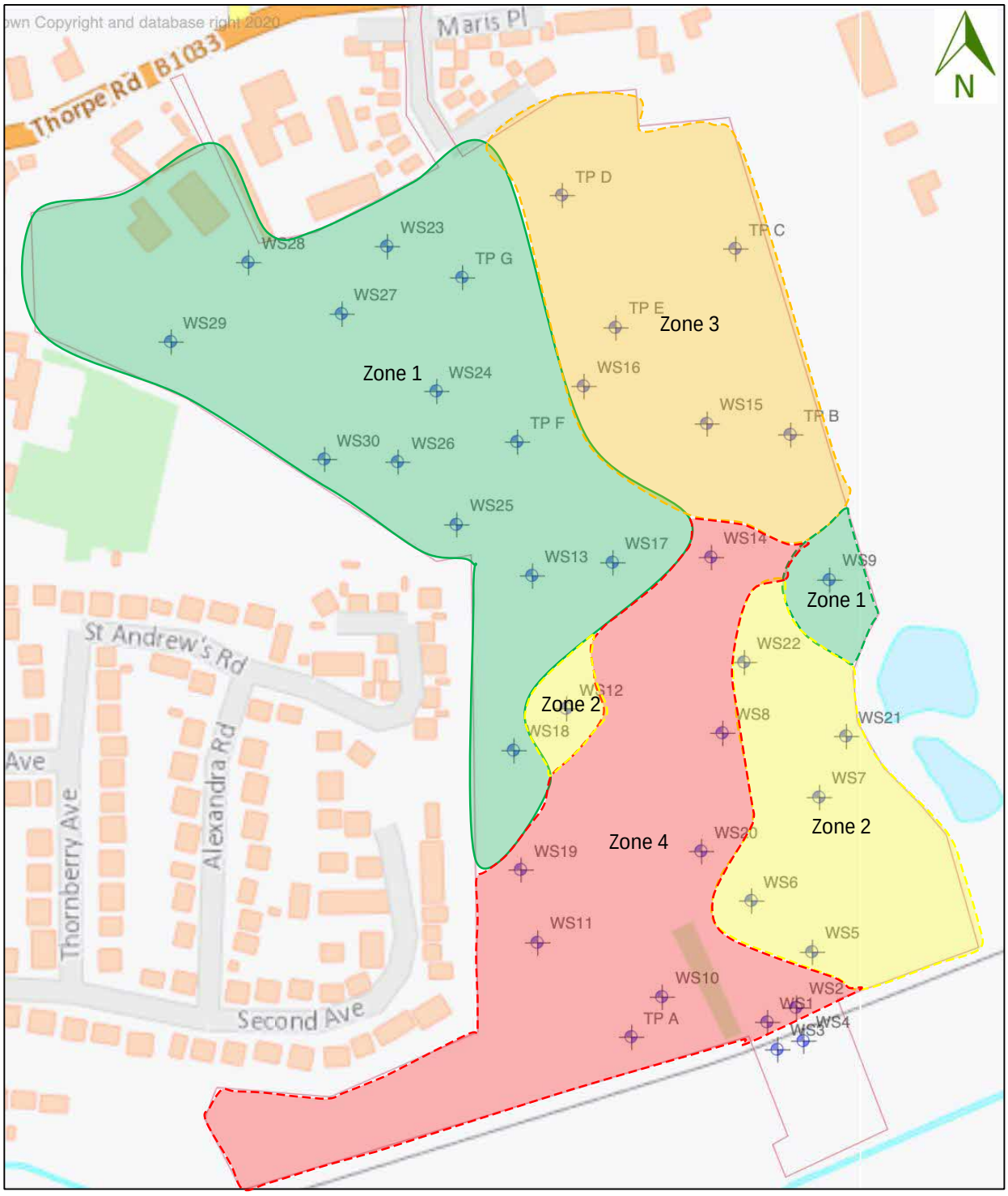


Base map reproduced with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown Copyright Licence No: AL100034022.	Figure 5	Zones 1 to 4 Foundation Solutions
	Date	November 2021
	Not to Scale	

Appendix (ii)
Exploratory Hole Logs

Windowless Sample Hole and Dynamic Probing Logs

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.33	
				0.84	
				1.48	
				3.25	
				4.18	
				6.00	

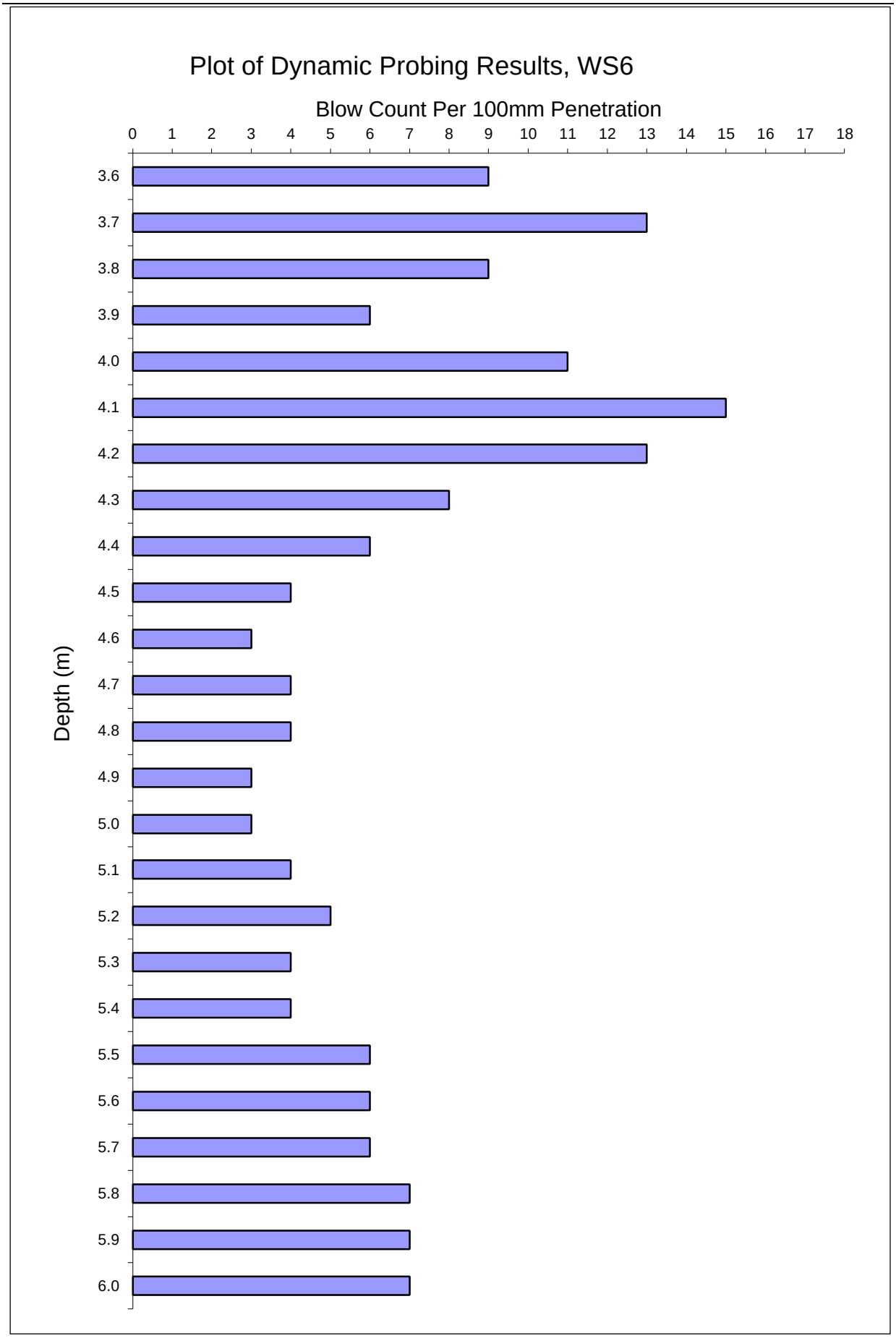
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.37	
				1.56	
				4.57	
				6.45	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.42	
				1.00	
				3.83	
				6.45	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.22	
				1.00	
				3.81	
				6.45	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.29	
				0.54	
				1.66	
				1.86	
				2.00	
				3.00	
				3.24	
				4.75	
				5.00	

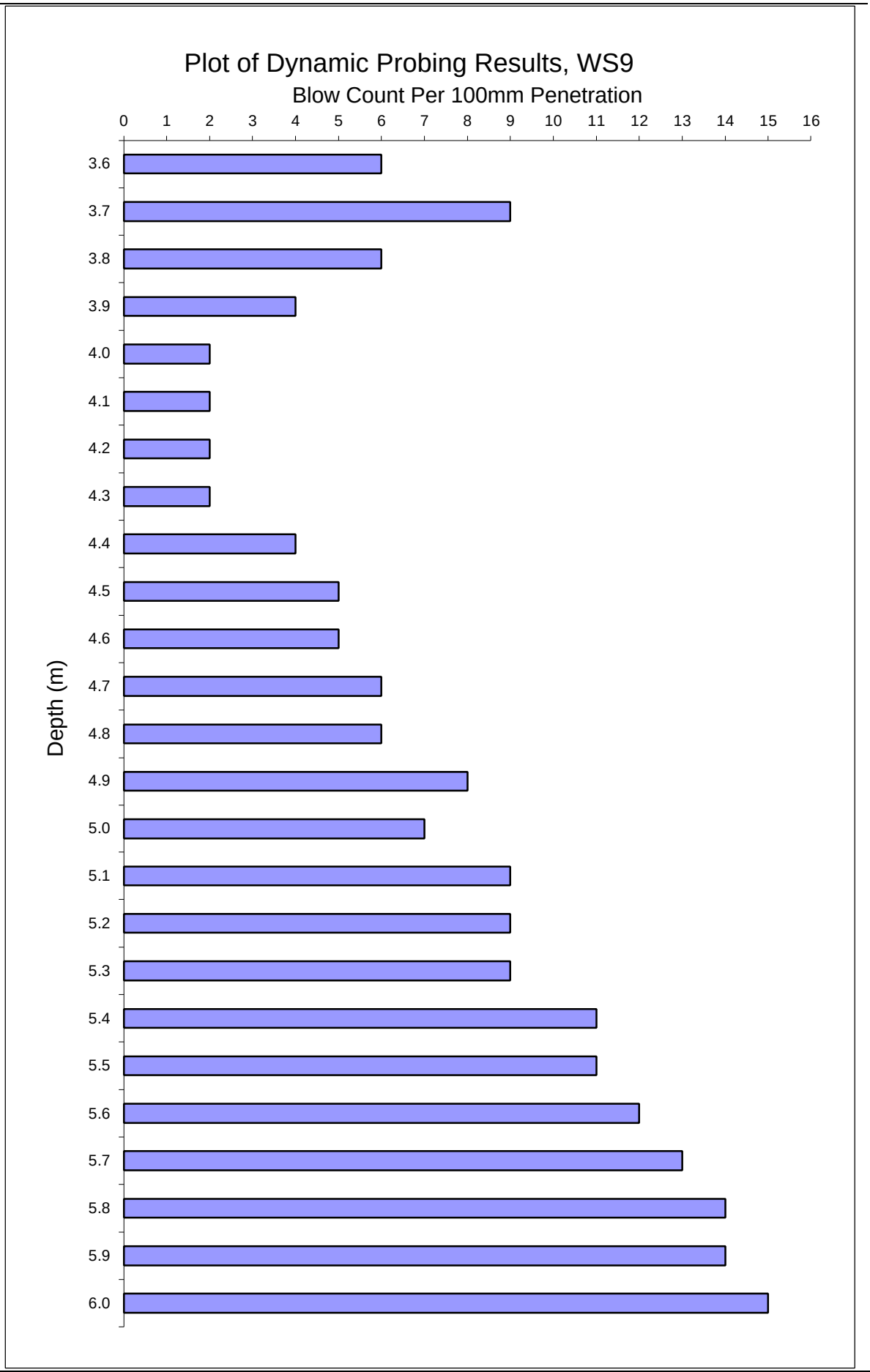
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.28	
				0.57	
				1.35	
				1.78	
				2.00	
				4.40	
				6.00	


Plot of Dynamic Probing Results, WS6
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Depth (m)
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.32	
				1.68	
				1.74	
				2.17	
				2.84	
				4.45	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.25	
				1.06	
				1.28	
				2.93	
				3.09	
				3.75	
				5.45	

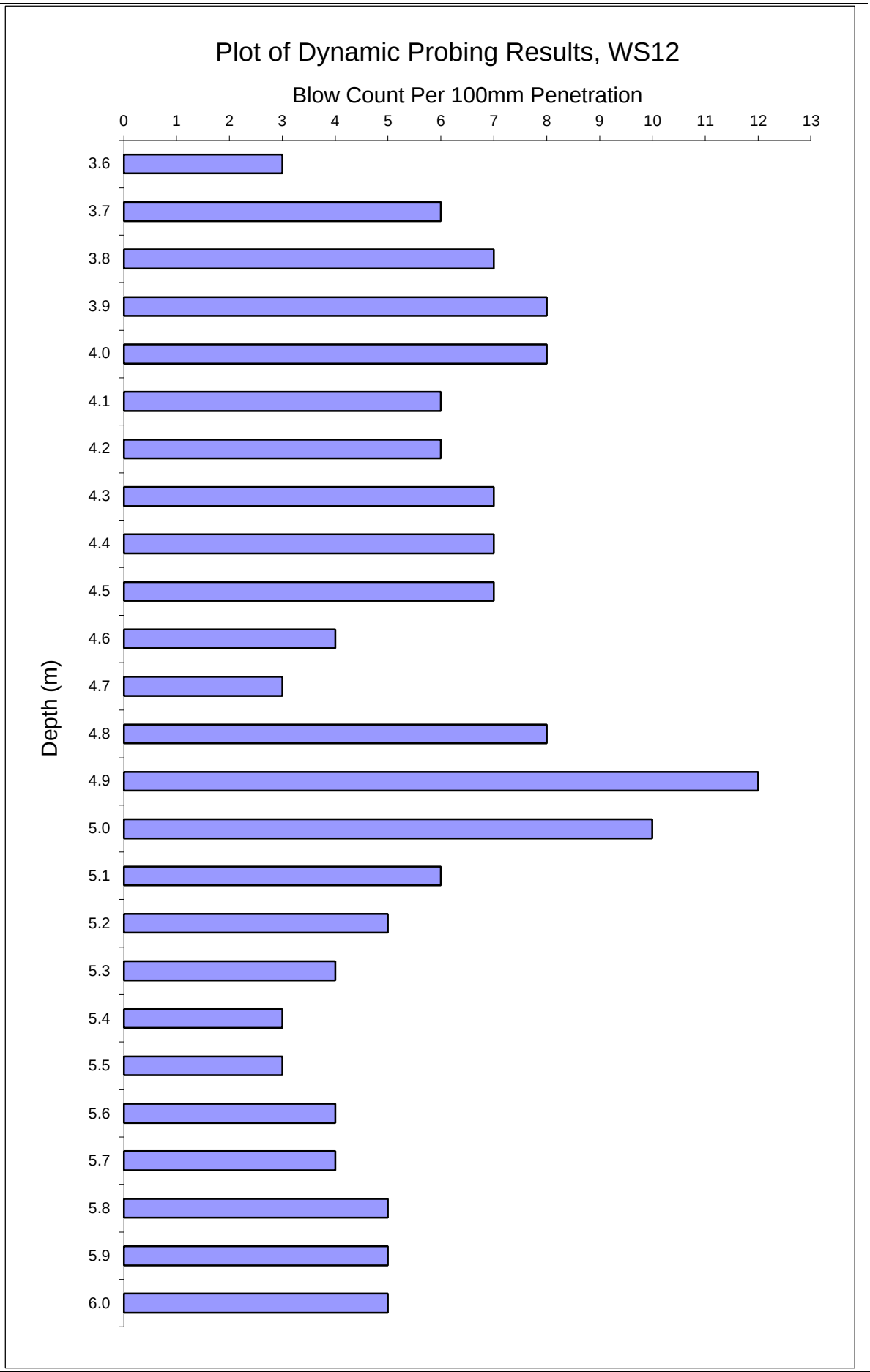
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.31	
				0.79	
				1.25	
				1.57	
				1.84	
				2.26	
				3.50	
				3.80	
				6.00	


Plot of Dynamic Probing Results, WS9
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Depth (m)
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

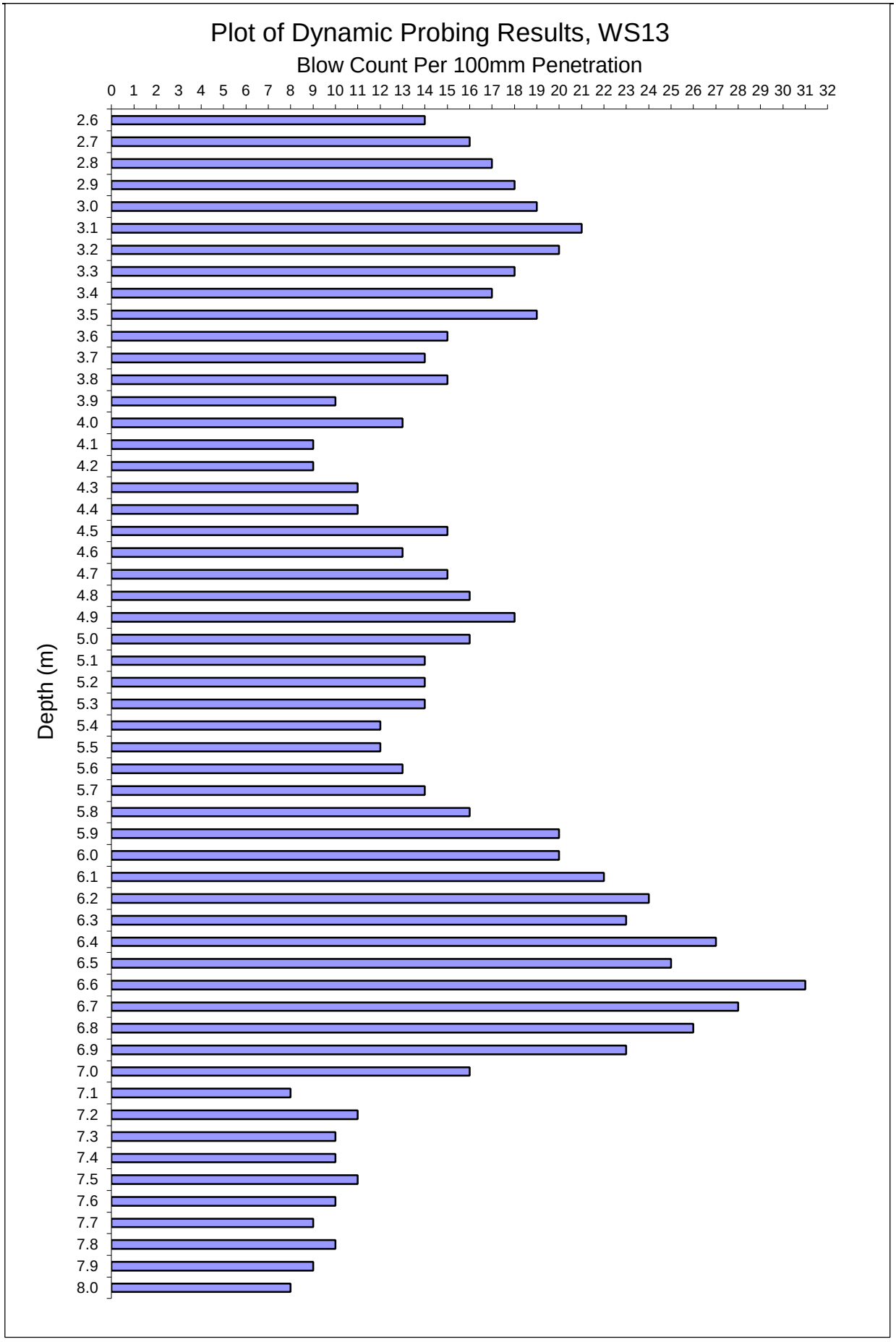
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.38	
				0.72	
				1.17	
				1.42	
				2.67	
				4.45	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.35	
				0.81	
				1.24	
				2.81	
				2.95	
				3.74	
				4.21	
				6.45	

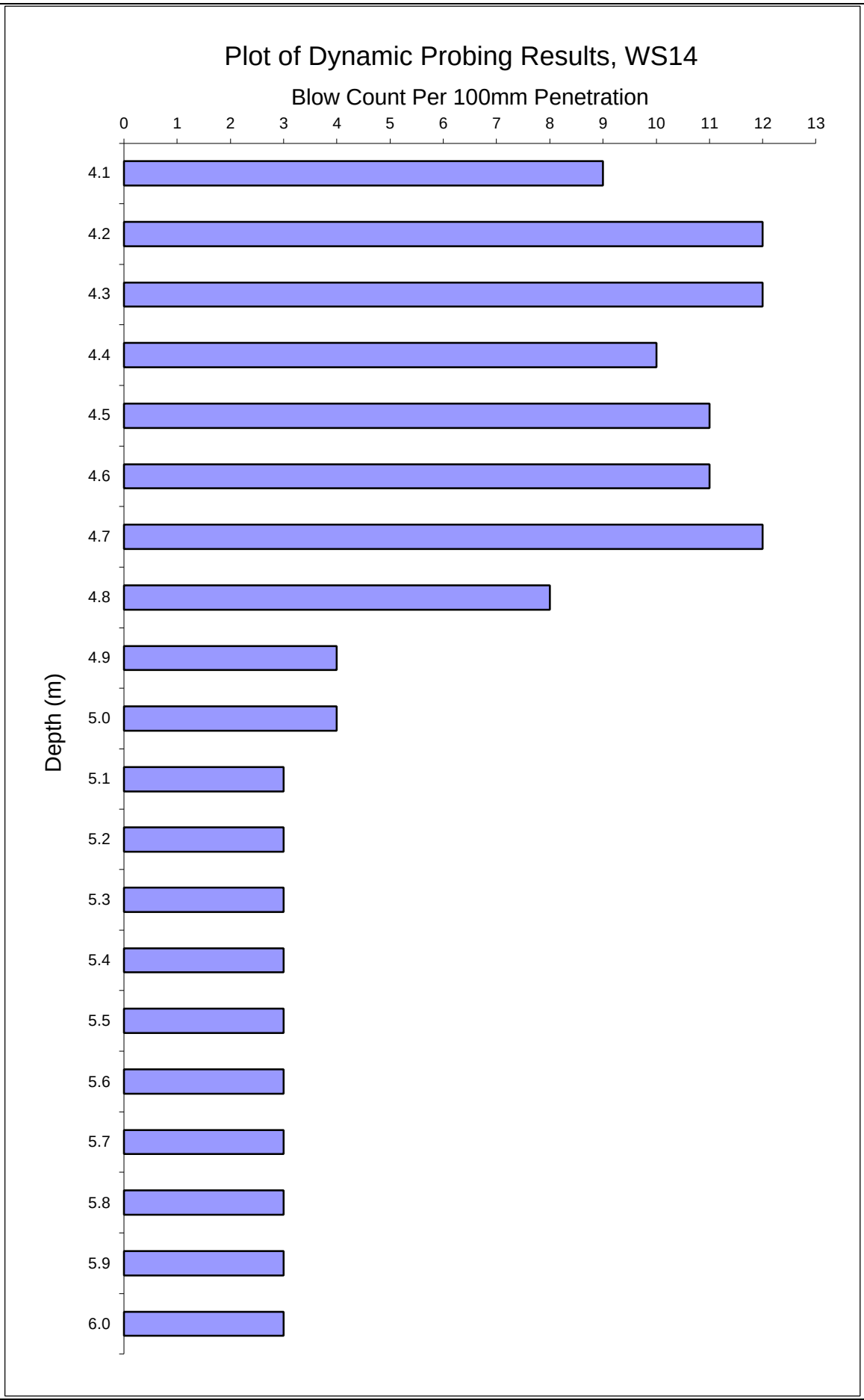
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.30	
				0.52	
				1.00	
				1.76	
				2.37	
				2.68	
				3.50	
				5.20	
				6.00	


Plot of Dynamic Probing Results, WS12
Blow Count Per 100mm Penetration
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Depth (m)
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

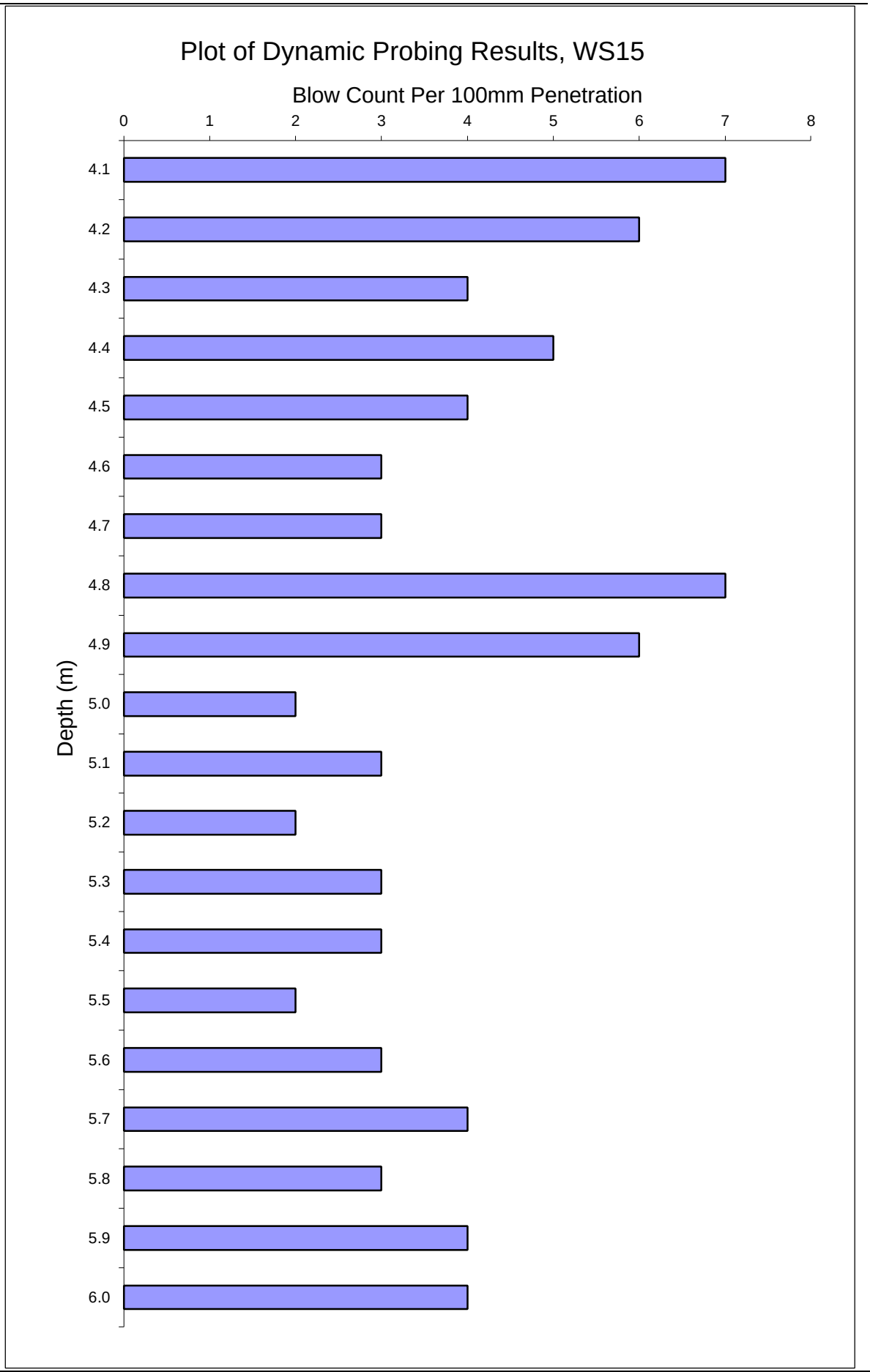
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.32	
				1.64	
				2.50	
				4.00	
				4.40	
				7.00	
				8.00	


Plot of Dynamic Probing Results, WS13
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Depth (m)
2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.0

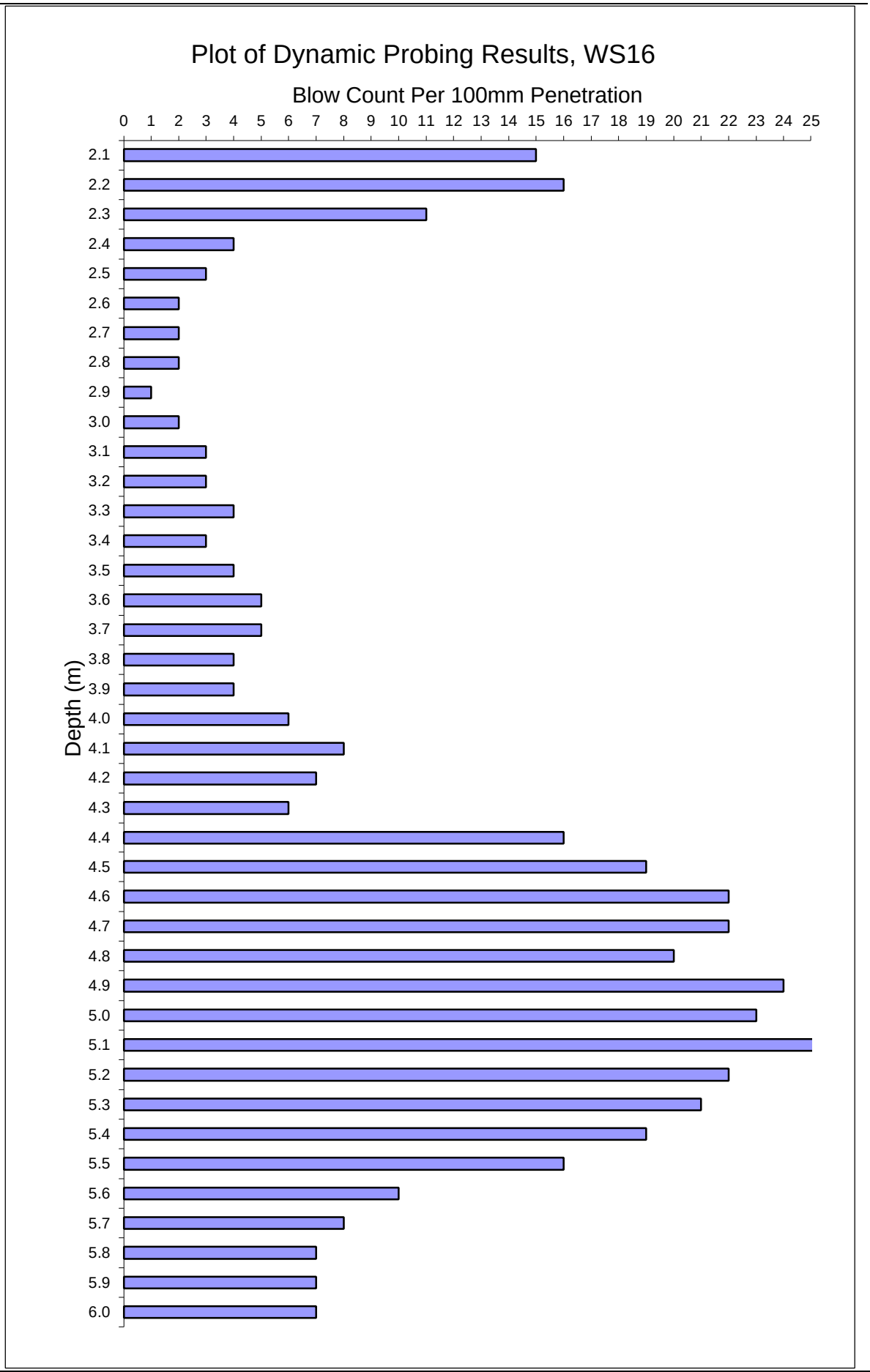
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.27	
				0.64	
				1.09	
				1.70	
				3.08	
				3.97	
				4.10	
				4.90	
				6.00	


Plot of Dynamic Probing Results, WS14
Blow Count Per 100mm Penetration
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Depth (m)
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

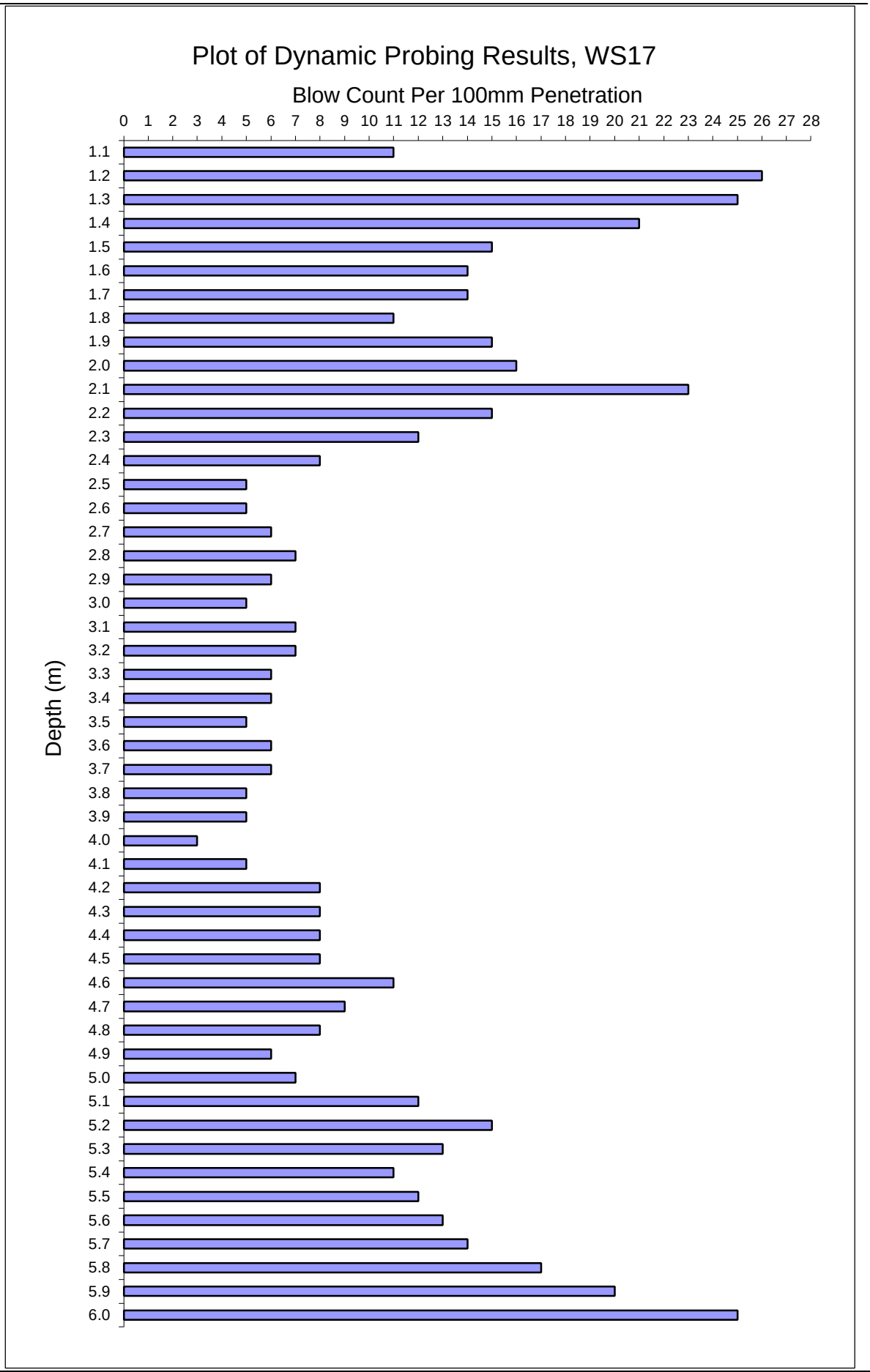
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.31	
				0.70	
				1.11	
				1.71	
				2.65	
				3.51	
				4.00	
				4.90	
				6.00	


Plot of Dynamic Probing Results, WS15
Blow Count Per 100mm Penetration
0
1
2
3
4
5
6
7
8
Depth (m)
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.33	
				0.68	
				1.22	
				1.54	
				1.71	
				1.90	
				2.30	
				3.90	
				5.70	
				6.00	

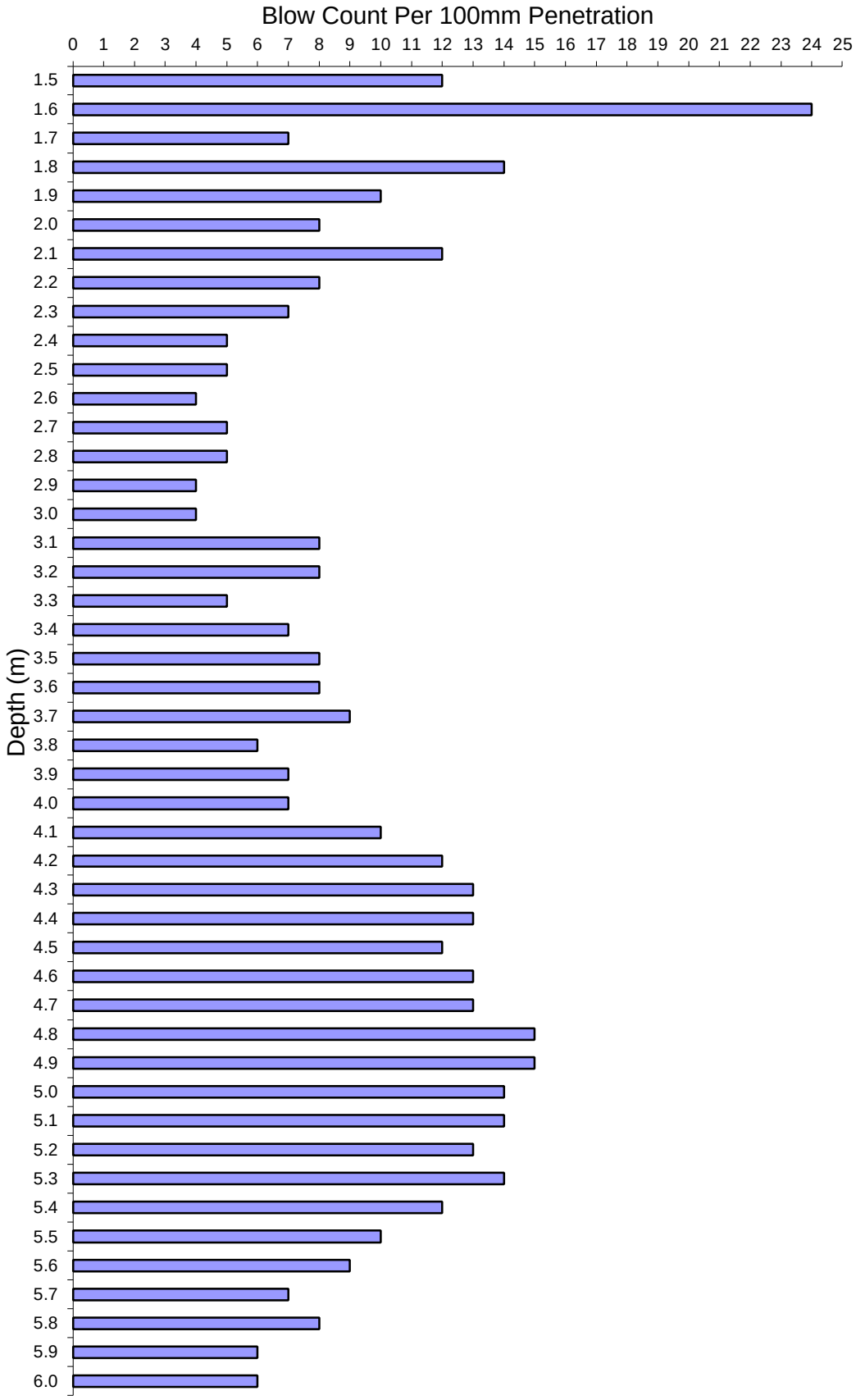

Plot of Dynamic Probing Results, WS16
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Depth (m)
2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.37	
				0.52	
				0.80	
				1.00	
				2.40	
				4.10	
				6.00	

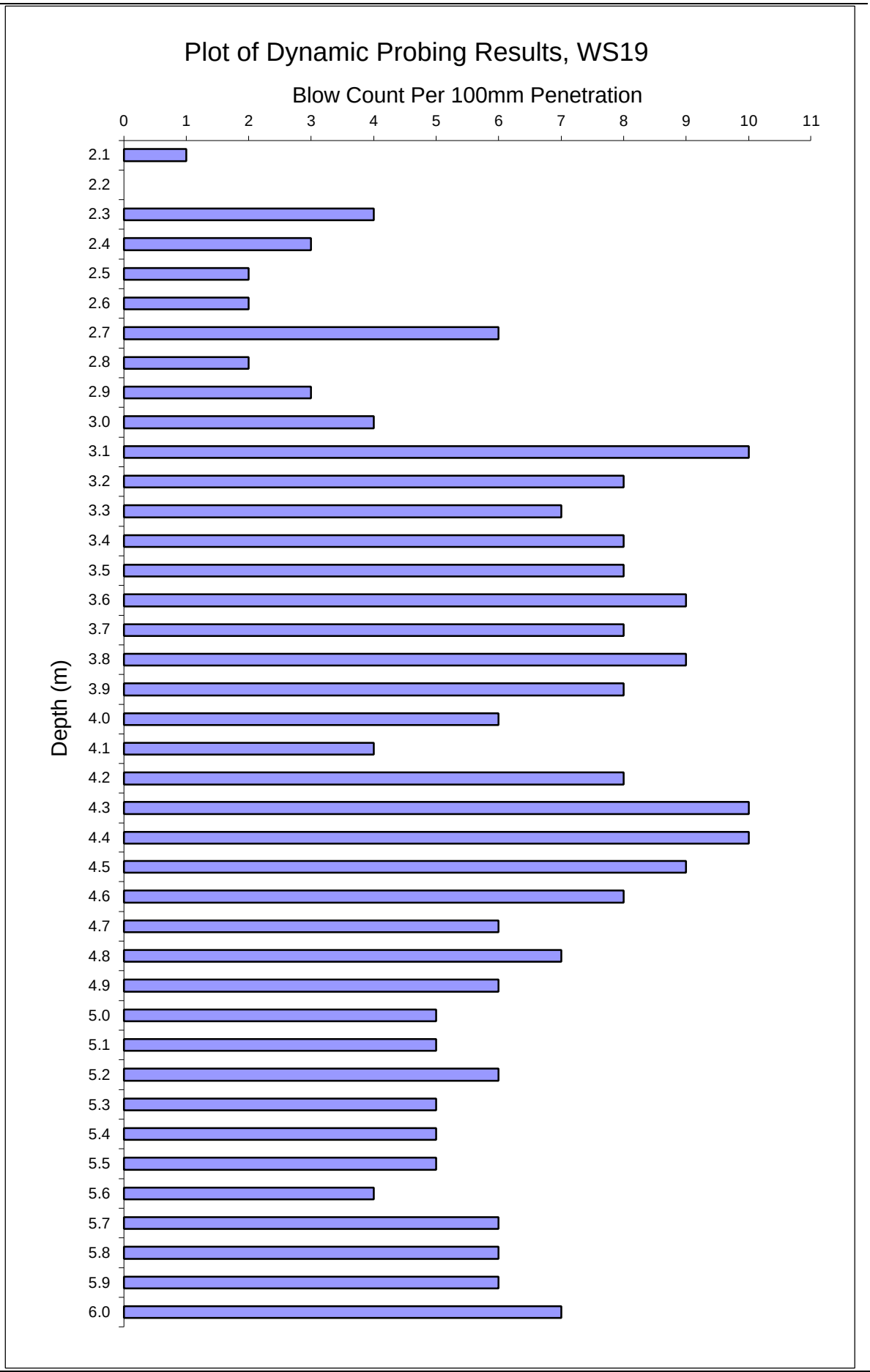

Plot of Dynamic Probing Results, WS17
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Depth (m)
1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.36	
				0.84	
				2.30	
				3.00	
				5.80	
				6.00	

Plot of Dynamic Probing Results, WS18

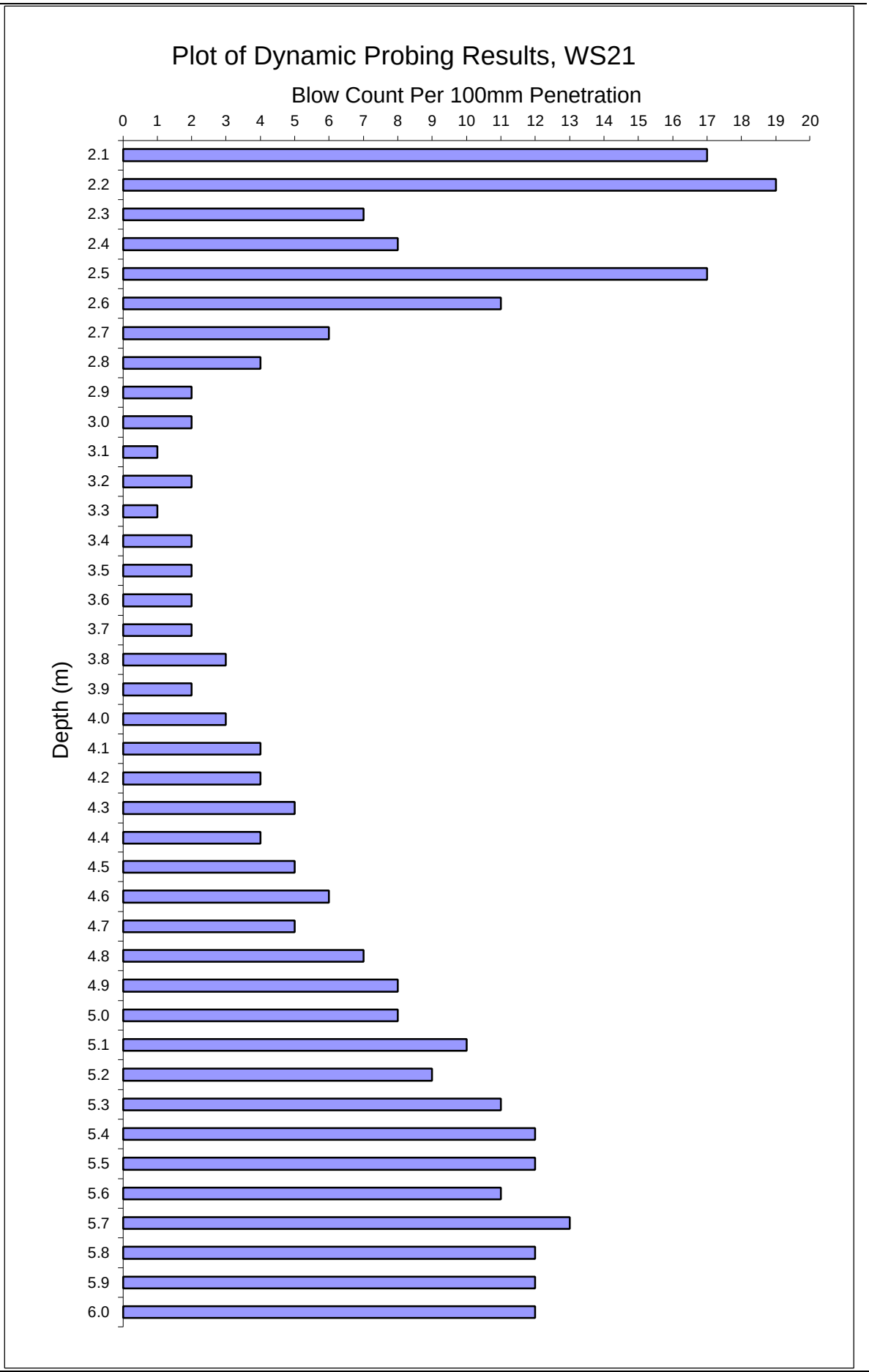


Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.35	
				0.59	
				0.75	
				1.00	
				2.00	
				3.00	
				4.60	
				6.00	

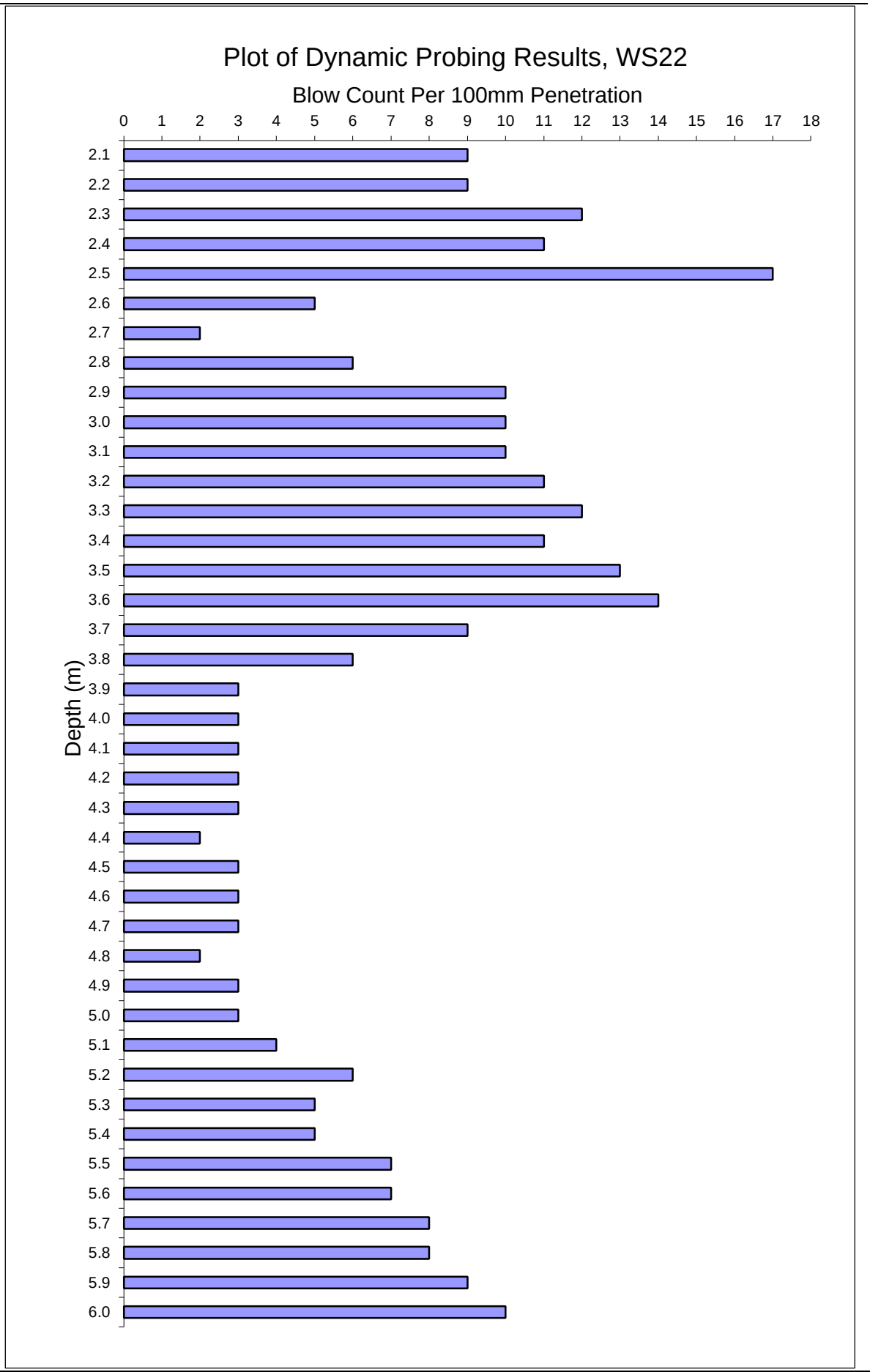

Plot of Dynamic Probing Results, WS19
Blow Count Per 100mm Penetration
0
1
2
3
4
5
6
7
8
9
10
11
Depth (m)
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.39	
				0.85	
				1.28	
				2.00	
				3.80	
				4.60	
				5.45	

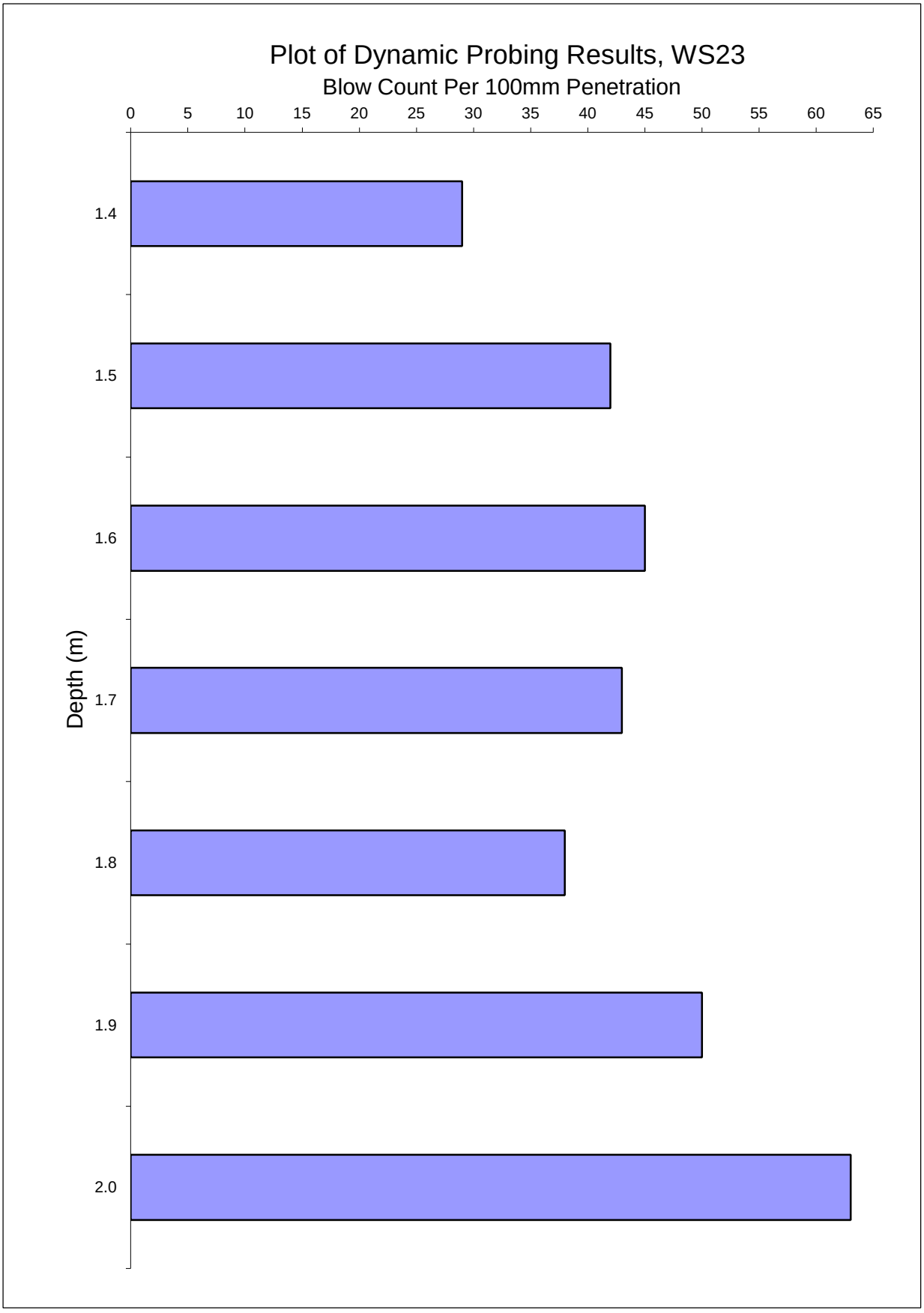
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.33	
				0.67	
				1.35	
				1.46	
				2.00	
				2.70	
				6.00	


Plot of Dynamic Probing Results, WS21
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Depth (m)
2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0

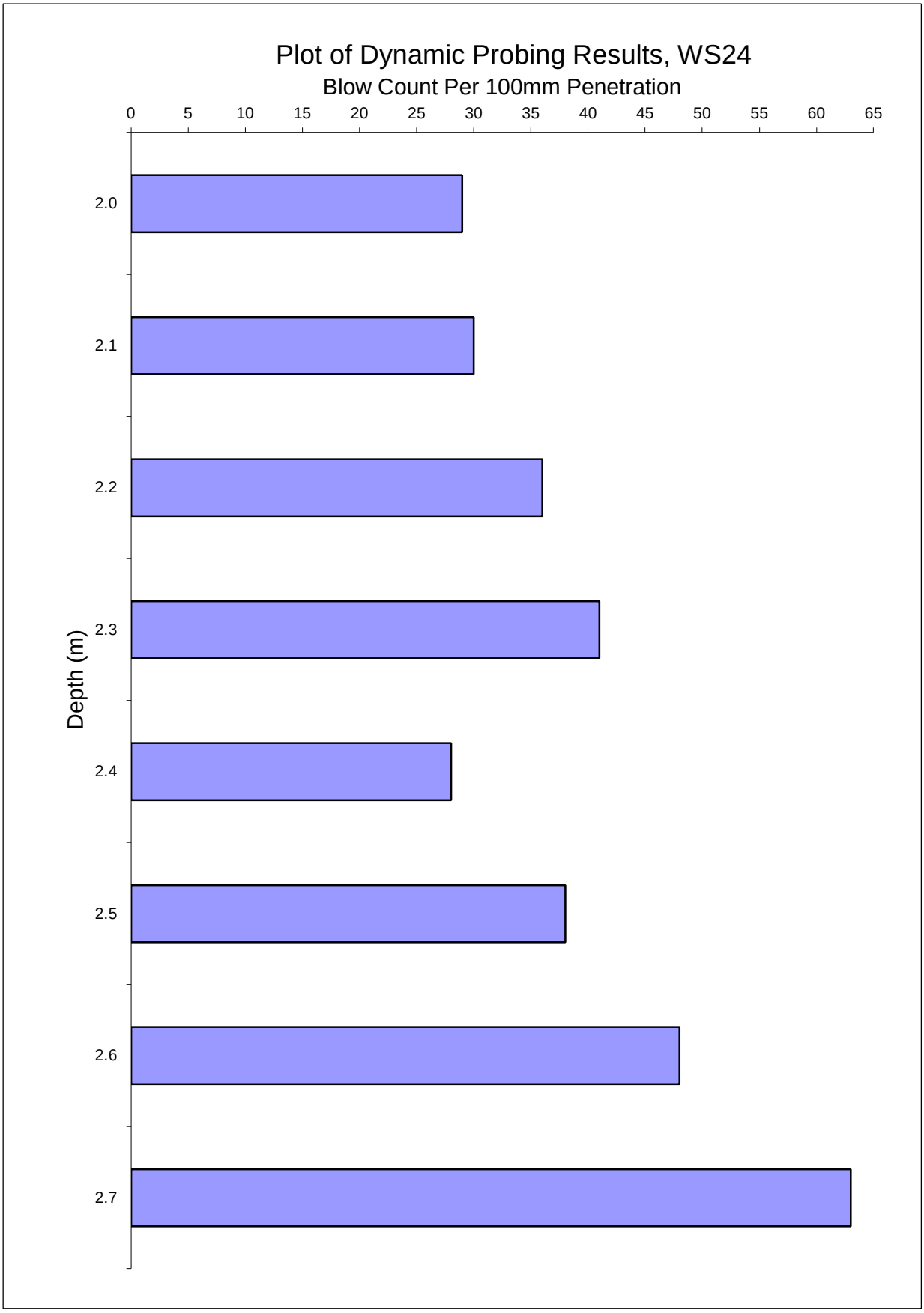
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.29	
				0.50	
				1.56	
				2.00	
				2.40	
				2.80	
				3.80	
				6.00	


Plot of Dynamic Probing Results, WS22
Blow Count Per 100mm Penetration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Depth (m)
2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9 6.0

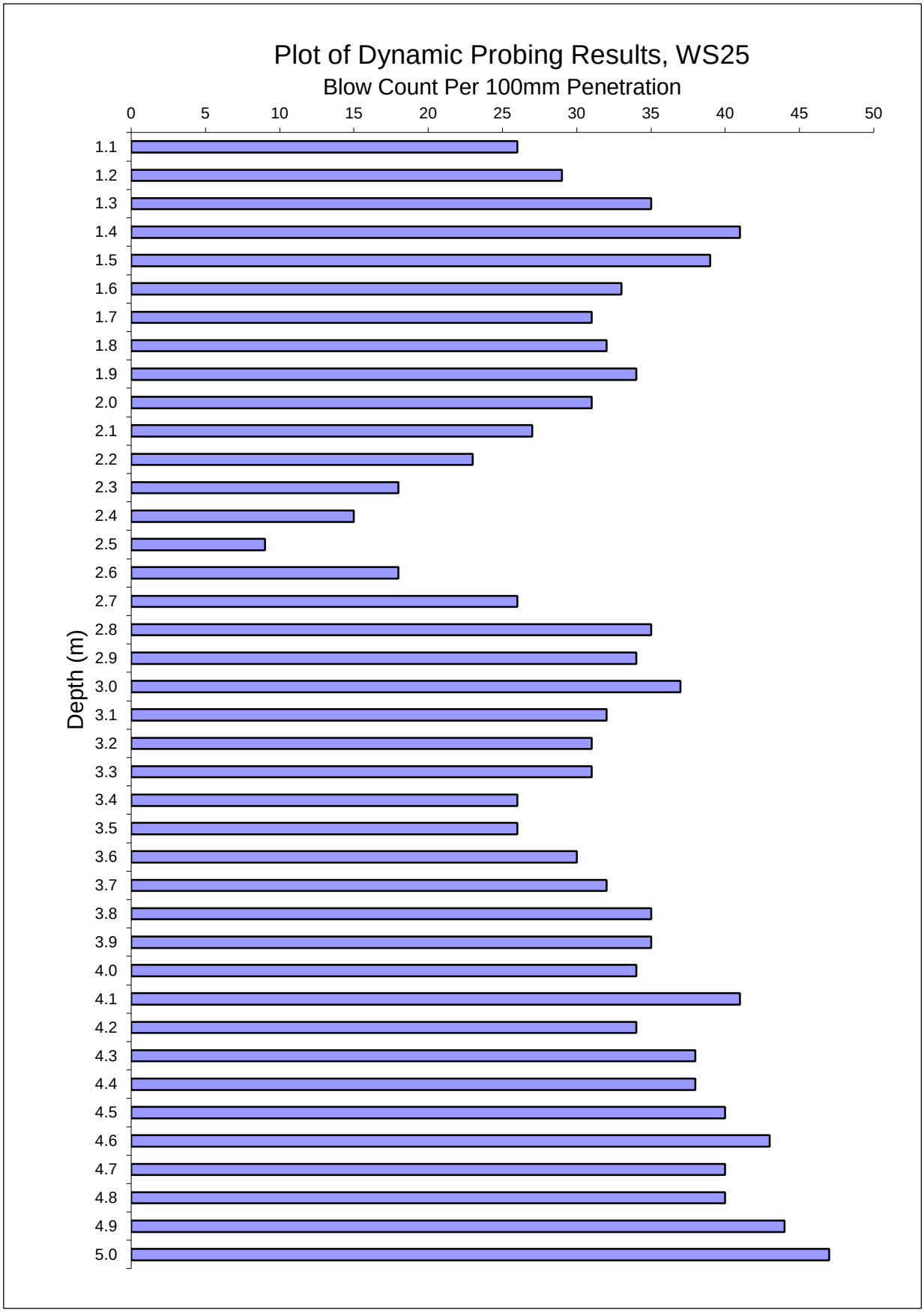
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.36	
				0.44	
				0.76	
				1.30	
				2.00	


Plot of Dynamic Probing Results, WS23
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Depth (m)
1.4
1.5
1.6
1.7
1.8
1.9
2.0

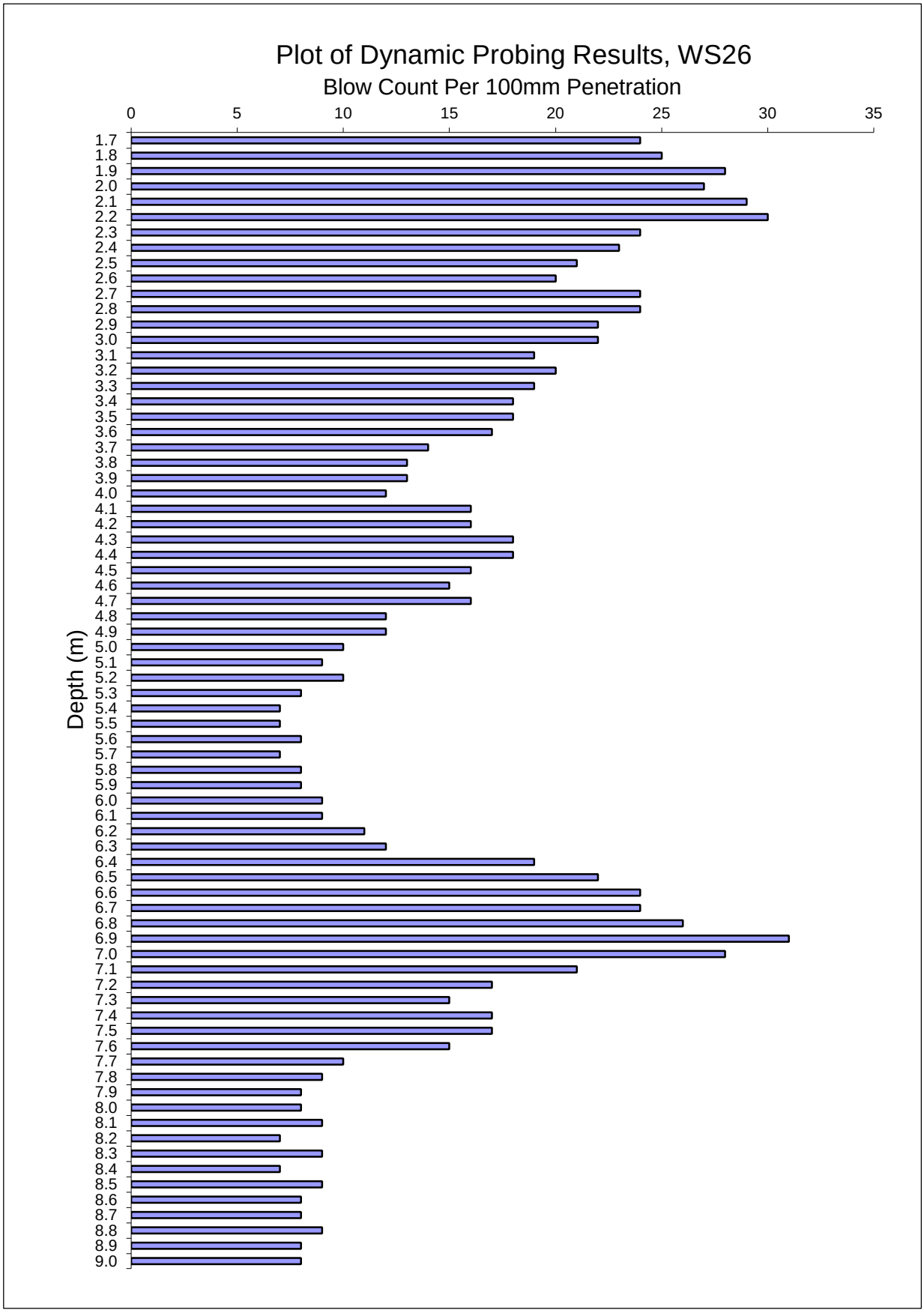
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.37	
				0.76	
				1.06	
				1.32	
				1.61	
				1.90	
				2.70	


Plot of Dynamic Probing Results, WS24
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
40
45
50
55
60
65
Depth (m)
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7

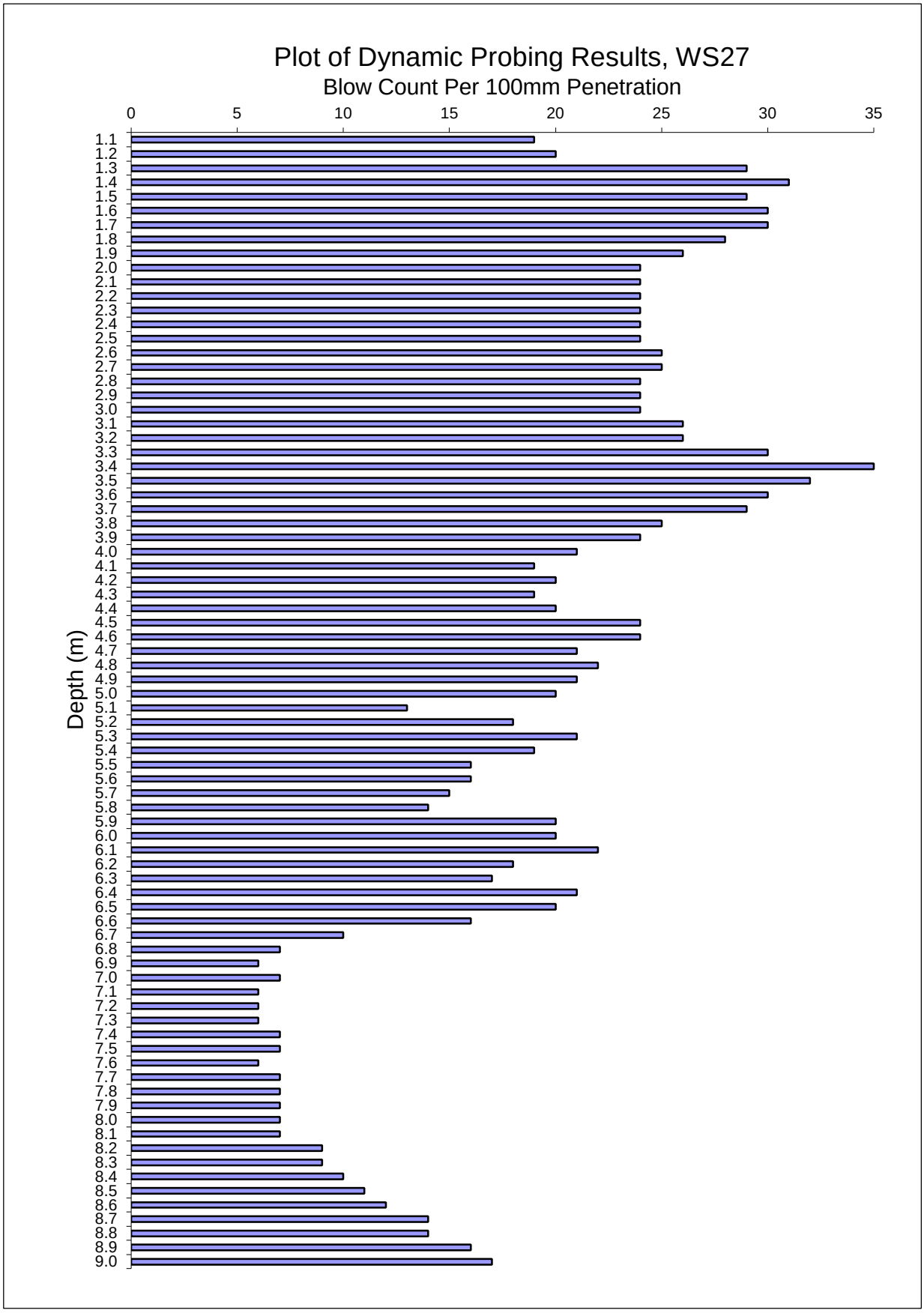
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.38	
				0.71	
				1.00	
				2.40	
				2.50	
				5.00	


Plot of Dynamic Probing Results, WS25
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
40
45
50
Depth (m)
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0

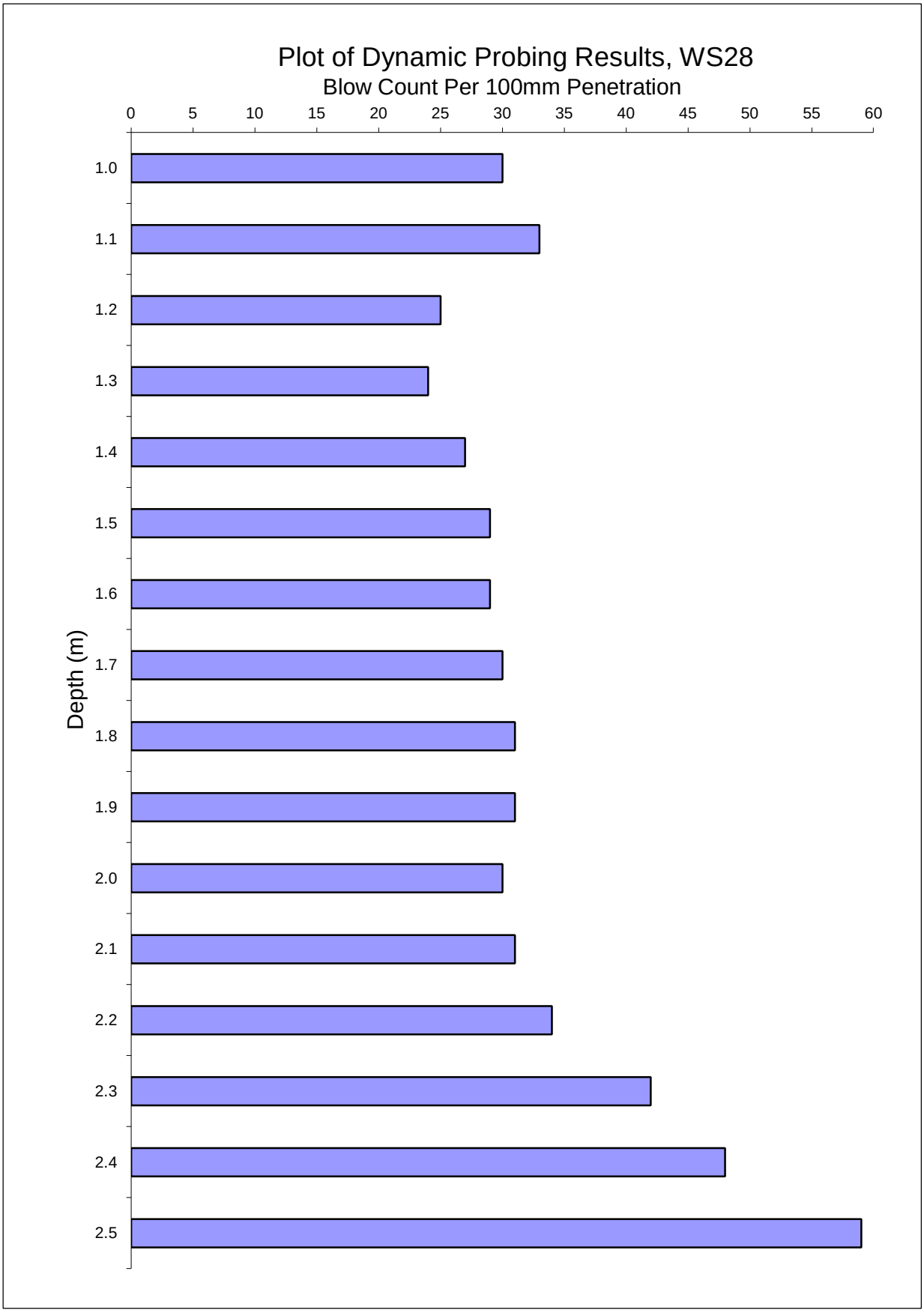
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.30	
				0.78	
				1.33	
				1.70	
				5.20	
				6.10	
				7.80	
				9.00	


Plot of Dynamic Probing Results, WS26
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
Depth (m)
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
8.0
8.1
8.2
8.3
8.4
8.5
8.6
8.7
8.8
8.9
9.0

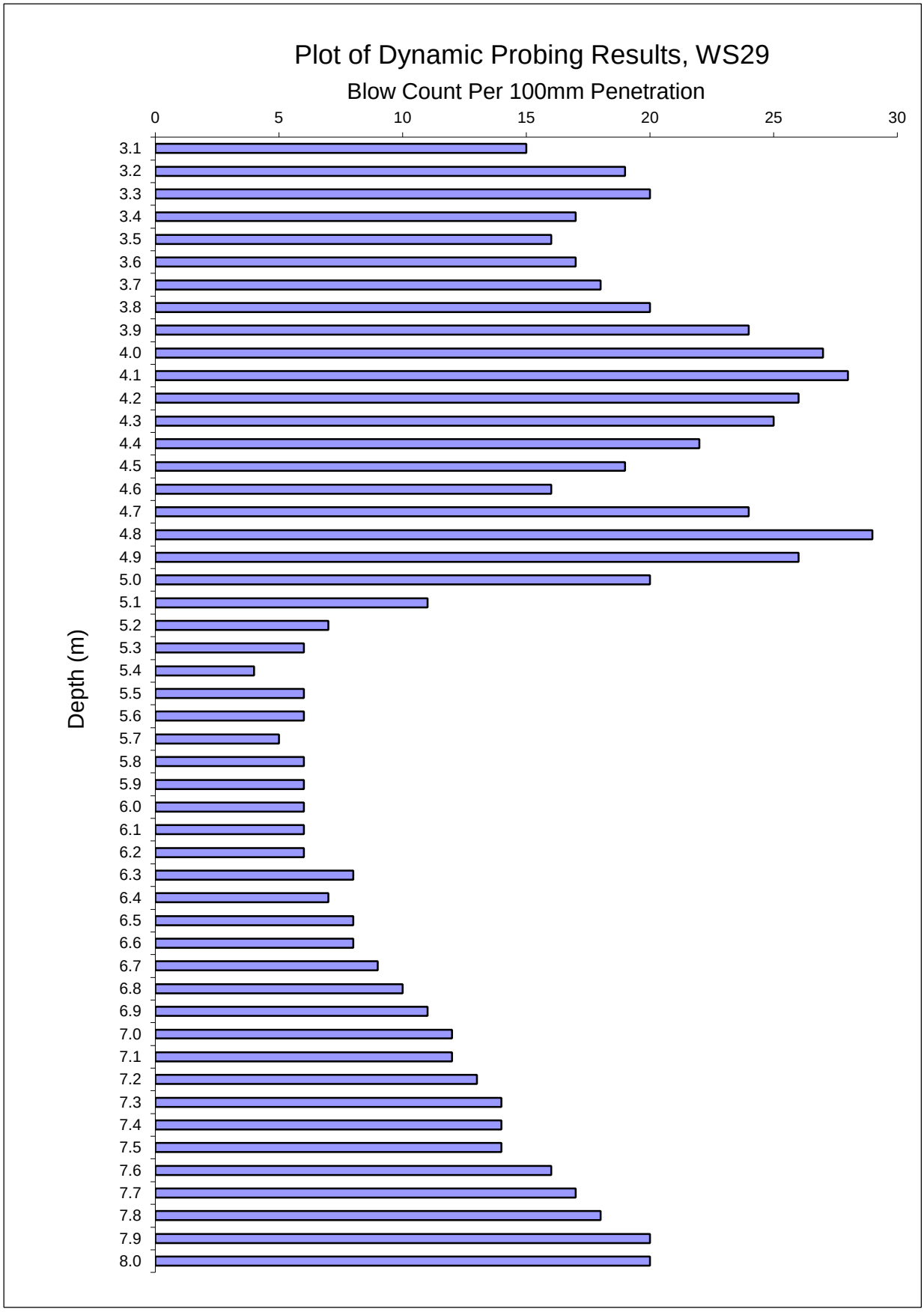
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.32	
				0.75	
				1.00	
				5.00	
				5.10	
				6.70	
				9.00	


Plot of Dynamic Probing Results, WS27
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
Depth (m)
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
8.0
8.1
8.2
8.3
8.4
8.5
8.6
8.7
8.8
8.9
9.0

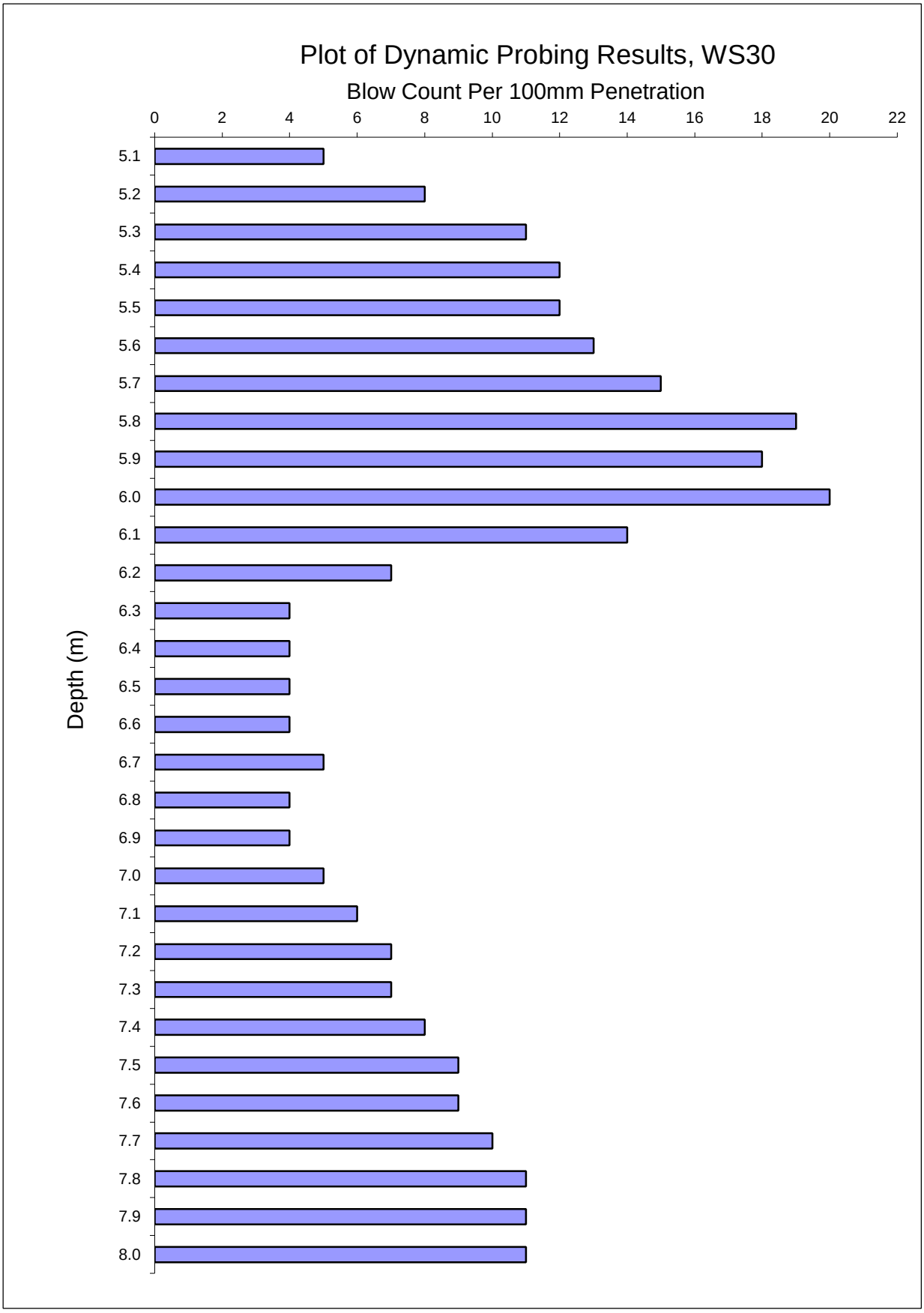
Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.33	
				0.82	
				0.90	
				2.50	


Plot of Dynamic Probing Results, WS28
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
35
40
45
50
55
60
Depth (m)
1.0
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2.0
2.1
2.2
2.3
2.4
2.5

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.38	
				0.93	
				1.63	
				3.00	
				5.40	
				8.00	


Plot of Dynamic Probing Results, WS29
Blow Count Per 100mm Penetration
0
5
10
15
20
25
30
Depth (m)
3.1
3.2
3.3
3.4
3.5
3.6
3.7
3.8
3.9
4.0
4.1
4.2
4.3
4.4
4.5
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
8.0

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.42	
				0.85	
				1.49	
				2.36	
				3.14	
				5.00	
				5.10	
				6.30	
				8.00	


Plot of Dynamic Probing Results, WS30
Blow Count Per 100mm Penetration
0
2
4
6
8
10
12
14
16
18
20
22
Depth (m)
5.1
5.2
5.3
5.4
5.5
5.6
5.7
5.8
5.9
6.0
6.1
6.2
6.3
6.4
6.5
6.6
6.7
6.8
6.9
7.0
7.1
7.2
7.3
7.4
7.5
7.6
7.7
7.8
7.9
8.0

Trial Pit Logs

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.30	
				0.45	
				1.10	
				1.20	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.40	
				0.91	
				1.34	
				1.63	
				1.79	
				2.04	
				2.40	
				2.60	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.35	
				1.20	
				1.40	
				2.00	
				2.76	
				2.95	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.31	
				1.27	
				1.60	
				2.95	
				3.50	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.30	
				1.10	
				1.52	
				4.30	
				4.50	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.29	
				0.90	
				1.24	
				1.80	
				2.20	
				3.30	

Samples & In Situ Testing			Strata Details		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend
				0.32	
				0.80	
				1.30	
				1.45	
				3.00	
				3.60	

Appendix (iii)
Laboratory Test Results – Material Properties

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

Client:

Compass Geotechnical Limited

13 Willow Park
Upton Lane
Stoke Golding
Nuneaton
Warwickshire
CV13 6EU

Soil Property Testing Ltd

15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG

Tel: 01480 455579
Email: enquiries@soilpropertytesting.com
Website: www.soilpropertytesting.com

Samples Submitted By:

Compass Geotechnical Limited

Samples Labelled:

Weeley

Approved Signatories:

- ☐ J.C. Garner B.Eng (Hons) FGS
  Technical Director & Quality Manager
- ☐ S.P. Townend
  Chairman
- ☐ W. Johnstone
  Materials Lab Manager
- ☑ D. Sabnis
  Operations Manager

Dinlar Sabnis

Date Received: 13/05/2020

Samples Tested Between: 13/05/2020 and 28/05/2020

Remarks:

For the attention of Rachel Foord
Your Reference No: 192815

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. (a) UKAS - United Kingdom Accreditation Service.
   (b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

UKAS TESTING

0998

Contract	Weeley		
Serial No.	36855_1	Target Date	27/05/2020
Scheduled By	Compass Geotechnical Limited		

SCHEDULE OF LABORATORY TESTS

Schedule Remarks

Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content (BSEN)	Liquid/Plastic Limits	Wet Sieve Preparation															Sample Remarks
WS1	D	-	0.50	1	1	1															
WS1	L	2	1.90	1																	
WS1	L	3	2.90	1	1																
WS1	L	4	3.90	1																	
WS1	D	-	4.50	1	1																
WS1	L	6	5.90	1																	
WS2	L	1	0.90	1																	
WS2	D	-	1.10	1	1																
WS2	L	3	2.90	1																	
WS2	L	4	3.90	1	1																
WS2	L	5	4.90	1																	
WS2	D	-	5.70	1	1																
WS3	D	-	0.55	1	1																
WS3	L	2	1.90	1																	
WS3	D	-	2.80	1	1																
WS3	L	4	3.90	1																	
WS3	L	5	4.90	1	1																
WS3	L	6	5.90	1																	
WS4	L	1	0.90	1																	
WS4	D	-	1.70	1	1																
WS4	L	3	2.90	1																	
WS4	D	-	3.60	1	1																
WS4	L	5	4.90	1																	
WS4	L	6	5.90	1	1																
Totals				24	12	1															End of Schedule

Soil Property Testing Ltd
18 Halcyon Court, St Margaret's Way, Stukeley Meadows,
Huntingdon, Cambs, PE29 6DG
Tel: 01480 455579
Email: jgarner@soilpropertytesting.com

UKAS TESTING
0998

Contract	Weeley
Serial No.	36855_1
Your Ref.	192815

SAMPLE UNSUITABLE FOR TEST

Borehole /Pit No.	Depth (m)	Type	Reference	Description
WS2	1.10	D		Brown, black and white very sandy fine to coarse angular to subrounded chert and quartzite GRAVEL. Sand is grey and fine to coarse.

Tests Scheduled:	Suitable	Unsuitable
Water content/Limits		X

Remarks

Material is non-plastic.

Alternative suitable samples available:

CUSTOMERS INSTRUCTIONS AND AUTHORISATION:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

SUMMARY OF WATER CONTENT

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Description	Remarks
WS1	0.50 - 0.70	D	-	19.2	Soft light grey slightly gravelly slightly sandy silty CLAY with occasional orange mottling, and rare recently active roots. Gravel is brown, black and white fine to coarse subangular to rounded chert and quartzite.	
WS1	1.90 - 2.00	L	2	35.0	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	
WS1	2.90 - 3.00	L	3	37.3	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and rare decayed roots.	
WS1	3.90 - 4.00	L	4	35.8	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	
WS1	4.50 - 4.80	D	-	33.4	Stiff fissured dark grey CLAY.	
WS1	5.90 - 6.00	L	6	35.5	Stiff fissured dark grey CLAY.	
WS2	0.90 - 1.00	L	1	10.4	Brown, black and white very sandy slightly clayey fine to coarse angular to rounded chert and quartzite GRAVEL. Sand is orange with grey pockets.	
WS2	2.90 - 3.00	L	3	36.5	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	
WS2	3.90 - 4.00	L	4	34.8	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	
WS2	4.90 - 5.00	L	5	34.6	Stiff fissured dark grey CLAY.	
WS2	5.70 - 6.00	D	-	34.2	Stiff fissured dark grey CLAY.	
WS3	0.55 - 0.75	D	-	40.3	Firm yellowish brown CLAY with rare recently active roots.	
WS3	1.90 - 2.00	L	2	34.5	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, rare orange pockets, and decayed roots.	
WS3	2.80 - 3.00	D	-	39.1	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, rare orange silt partings, and decayed roots.	

Method Of Preparation: BS EN ISO: 17892-1: 2014
Method of Test: BS EN ISO: 17892-1: 2014
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:

Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

SUMMARY OF WATER CONTENT

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Description	Remarks
WS3	3.90 - 4.00	L	4	37.3	Stiff slightly fissured dark grey CLAY with rare silt pockets.	
WS3	4.90 - 5.00	L	5	38.2	Firm fissured dark grey CLAY.	
WS3	5.90 - 6.00	L	6	38.3	Stiff slightly fissured dark grey CLAY.	
WS4	0.90 - 1.00	L	1	39.0	Firm yellowish brown CLAY with occasional bluish grey mottling, and rare recently active roots.	
WS4	1.70 - 1.90	D	-	29.6	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, orange silt partings, and rare decayed roots.	
WS4	2.90 - 3.00	L	3	31.1	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, rare orange silt partings, and decayed roots.	
WS4	3.60 - 3.80	D	-	34.1	Stiff closely fissured dark yellowish brown CLAY with occasional orange silt partings, rare bluish grey mottling, and selenite crystals.	Dried at 80°C due to the presence of selenite.
WS4	4.90 - 5.00	L	5	38.9	Stiff fissured dark grey CLAY.	
WS4	5.90 - 6.00	L	6	38.3	Stiff slightly fissured dark grey CLAY.	

Method Of Preparation: BS EN ISO: 17892-1: 2014
Method of Test: BS EN ISO: 17892-1: 2014
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:

Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110C

TEST REPORT

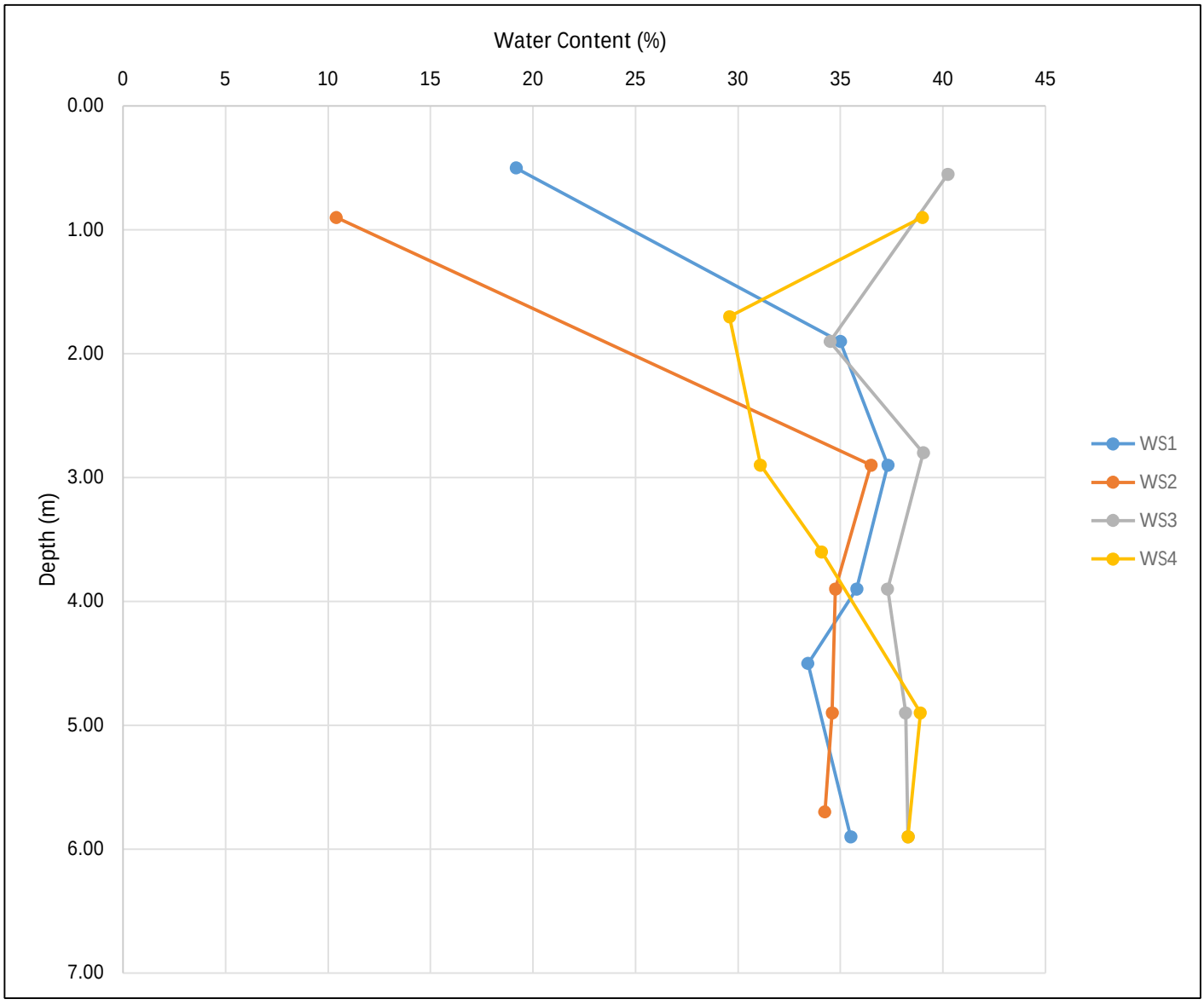
ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

WATER CONTENT VS DEPTH BELOW GROUND LEVEL



Method of Preparation:	BSEN ISO 17892-1: 2014
Method of Test:	BSEN ISO 17892-1: 2014
Type of Sample Key:	U - Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WS1	0.50 - 0.70	D	-	19.2	35	14	21	0.25	Wet Sieved	16 (M)	22.8*	97	Soft light grey slightly gravelly slightly sandy silty CLAY with occasional orange mottling, and rare recently active roots. Gravel is brown, black and white fine to coarse subangular to rounded chert and quartzite.	CL/CI
WS1	2.90 - 3.00	L	3	37.3	88	30	58	0.13	From Natural	0 (A)		98	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and rare decayed roots.	CV
WS1	4.50 - 4.80	D	-	33.4	92	28	64	0.08	From Natural	0 (A)		24	Stiff fissured dark grey CLAY.	CE
WS2	3.90 - 4.00	L	4	34.8	89	31	58	0.06	From Natural	0 (A)		99	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	CV
WS2	5.70 - 6.00	D	-	34.2	95	29	66	0.08	From Natural	0 (A)		24	Stiff fissured dark grey CLAY.	CE
WS3	0.55 - 0.75	D	-	40.3	93	29	64	0.18	From Natural	0 (A)		24	Firm yellowish brown CLAY with rare recently active roots.	CE
WS3	2.80 - 3.00	D	-	39.1	84	30	54	0.17	From Natural	0 (A)		24	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, rare orange silt partings, and decayed roots.	CV
WS3	4.90 - 5.00	L	5	38.2	98	29	69	0.13	From Natural	0 (A)		98	Firm fissured dark grey CLAY.	CE

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4

Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

Comments: *Corrected water content assume material greater than 0.425mm is non-porous. See BS1377: Part 2: 1990 Clause 3 Note 1.

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
WS4	1.70 - 1.90	D	-	29.6	85	29	56	0.01	From Natural	0 (A)		97	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, orange silt partings, and rare decayed roots.	CV
WS4	3.60 - 3.80	D	-	34.1	94	28	66	0.09	From Natural	0 (A)		99	Stiff closely fissured dark yellowish brown CLAY with occasional orange silt partings, rare bluish grey mottling, and selenite crystals.	CE
WS4	5.90 - 6.00	L	6	38.3	96	29	67	0.14	From Natural	0 (A)		99	Stiff slightly fissured dark grey CLAY.	CE

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4

Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

Comments:

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

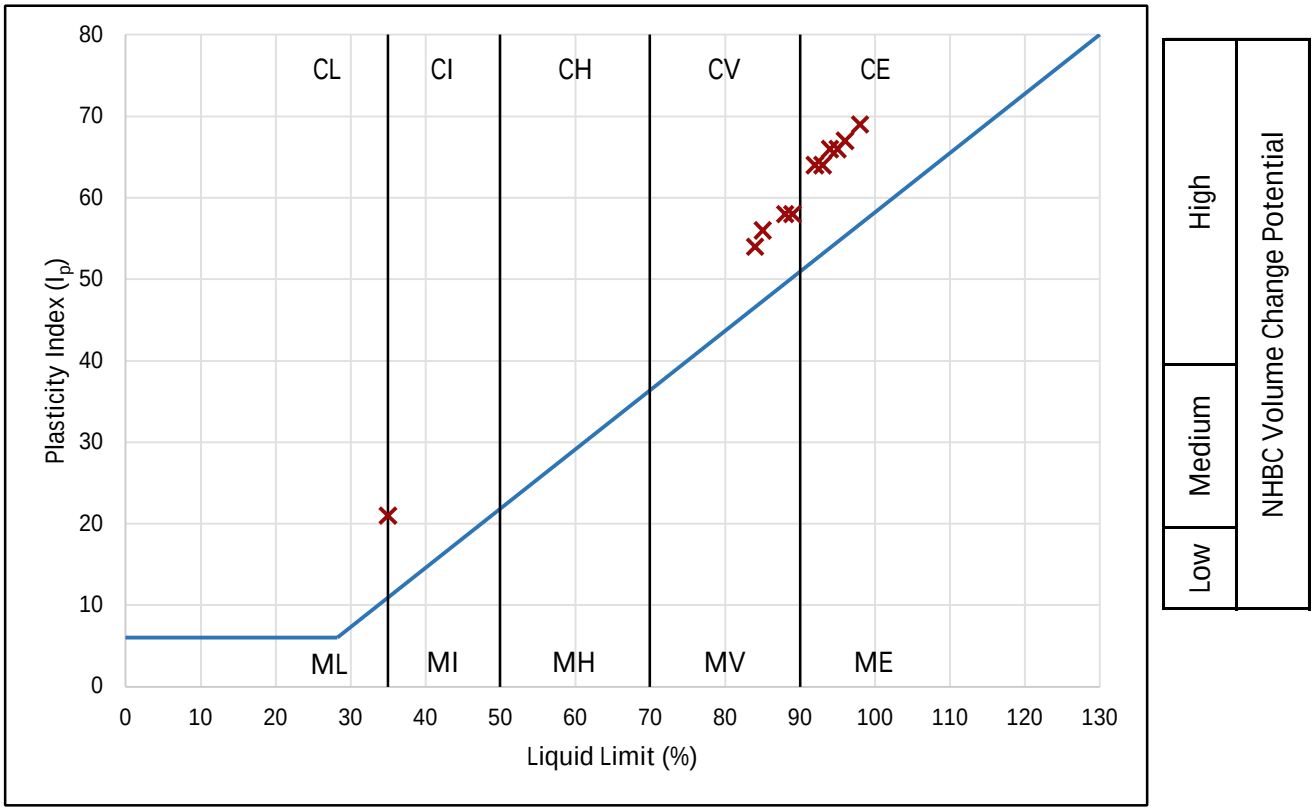
DATE ISSUED: 28/05/2020

0998

Contract	Weeley
Serial No.	36855_1

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS 1377: Part 2: 1990: 4.2
Method of Test:	BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 28/05/2020

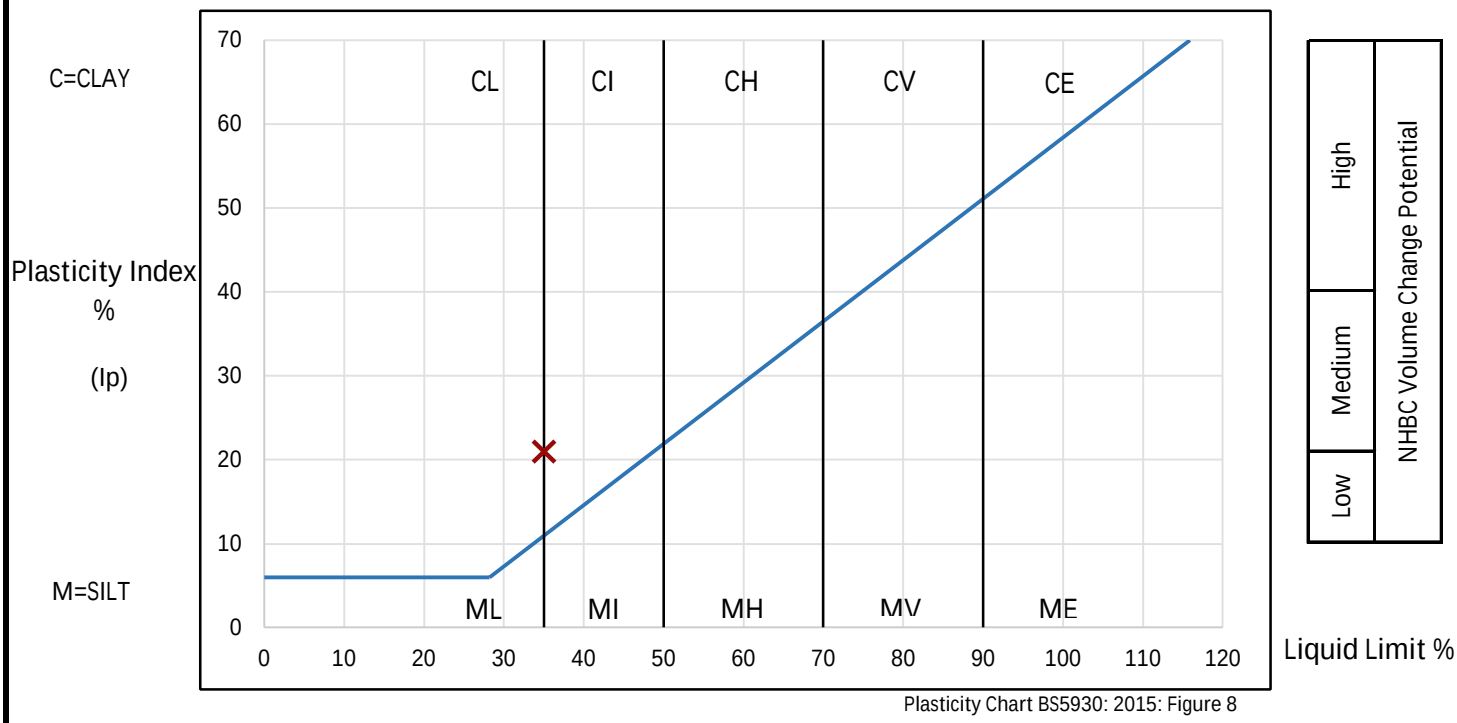
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS1	0.50 - 0.70	D	-	19.2	Soft light grey slightly gravelly slightly sandy silty CLAY with occasional orange mottling, and rare recently active roots. Gravel is brown, black and white fine to coarse subangular to rounded chert and quartzite.	

PREPARATION					
Method of preparation	Wet sieved over 0.425mm sieve			Liquid Limit	35 %
Sample retained 0.425mm sieve	(Measured)	16 %		Plastic Limit	14 %
Corrected water content for material passing 0.425mm		22.8 %		Plasticity Index	21 %
Sample retained 2mm sieve	(Measured)	11 %		Liquidity Index	0.25
Curing time	97 hrs	Clay Content	Not analysed	NHBC Modified (I'p)	18 %
				Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	Corrected water content assume material greater than 0.425mm non-porous. See BS1377: Part2: 1990 Clause 3 Note 1 Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index Note: Modified Plasticity Index I'p = Ip x (% less than 425microns/100)

TEST REPORT

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DATE ISSUED: 28/05/2020

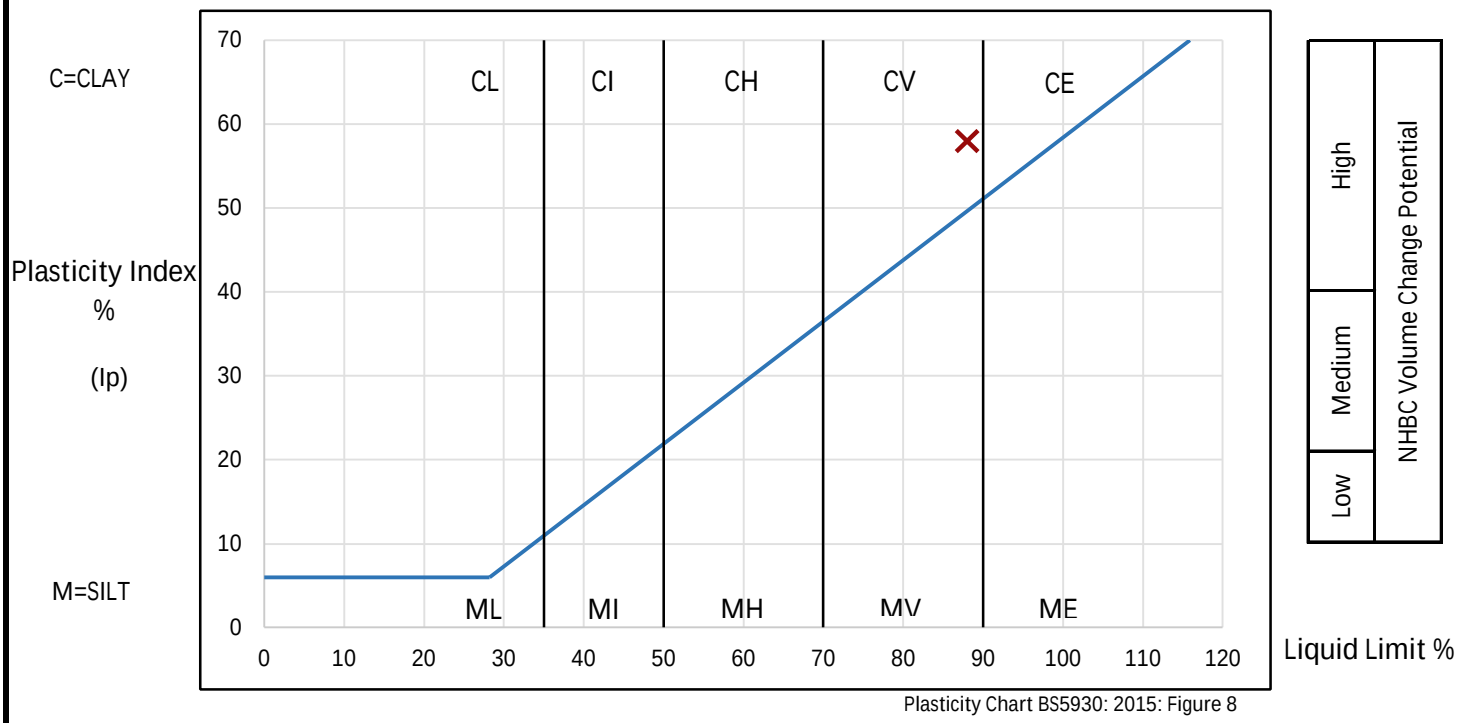
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS1	2.90 - 3.00	L	3	37.3	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and rare decayed roots.	

PREPARATION			Liquid Limit	88 %
Method of preparation		From natural	Plastic Limit	30 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	58 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.13
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	98 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

TEST REPORT

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DATE ISSUED: 28/05/2020

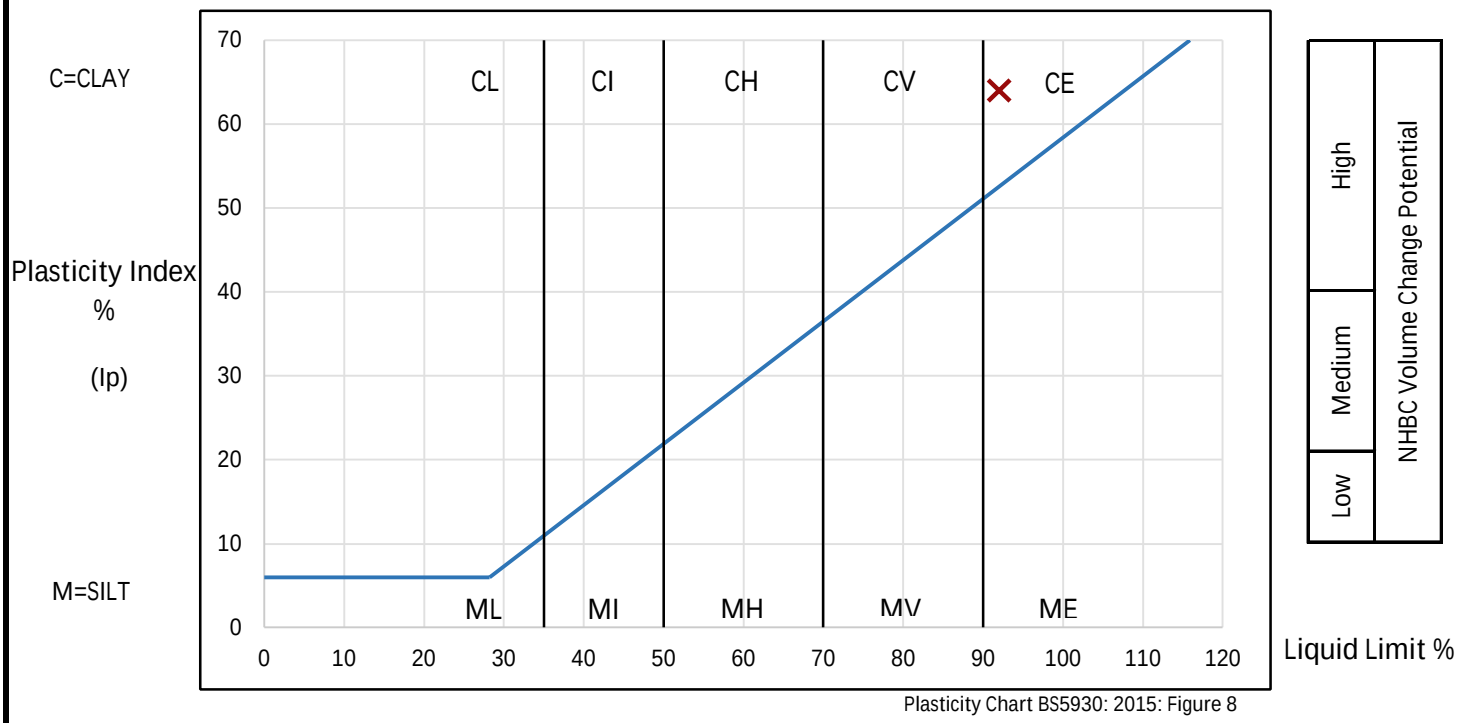
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS1	4.50 - 4.80	D	-	33.4	Stiff fissured dark grey CLAY.	

PREPARATION				Liquid Limit	92 %
Method of preparation		From natural		Plastic Limit	28 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plasticity Index	64 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.08
Sample retained 2mm sieve	(Assumed)	0 %		NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
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DATE ISSUED: 28/05/2020

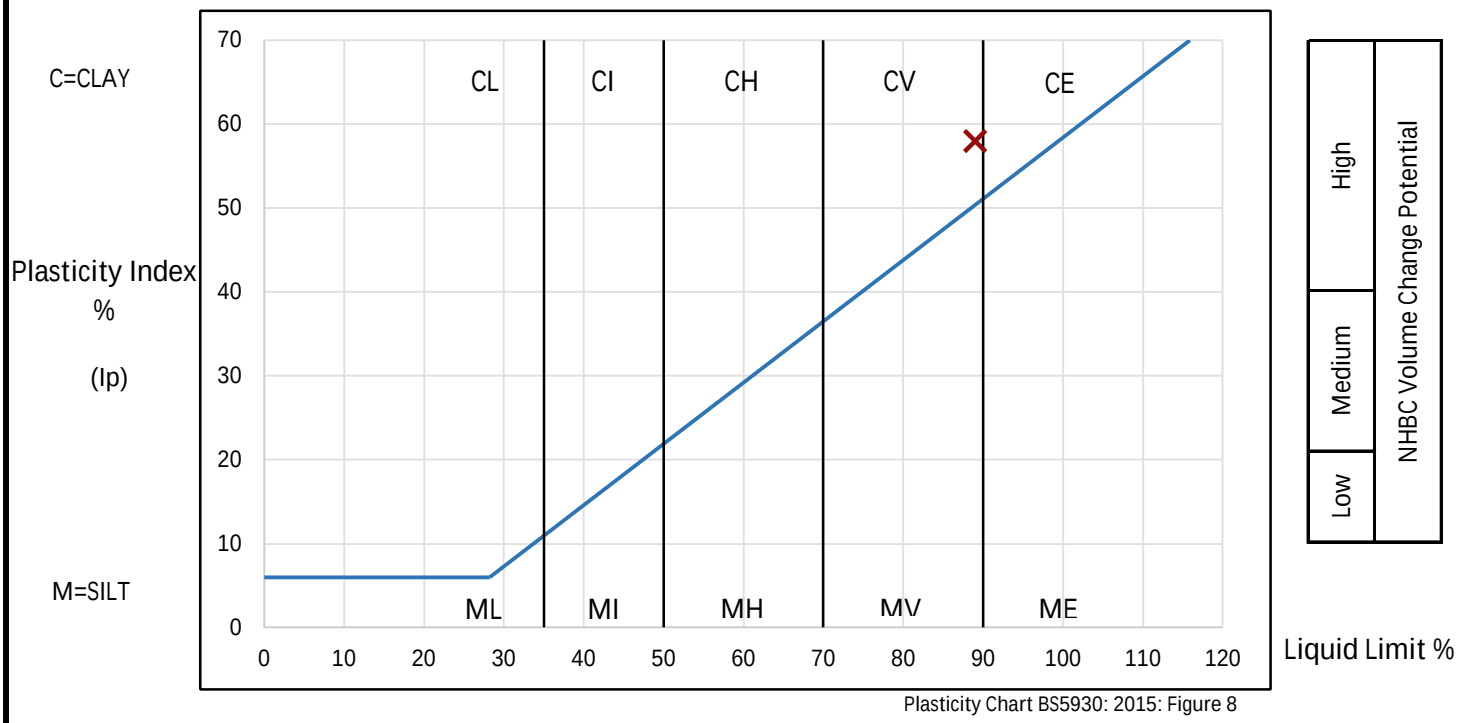
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS2	3.90 - 4.00	L	4	34.8	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, and decayed roots.	

PREPARATION			Liquid Limit	89 %
Method of preparation		From natural	Plastic Limit	31 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	58 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.06
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	99 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
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DATE ISSUED: 28/05/2020

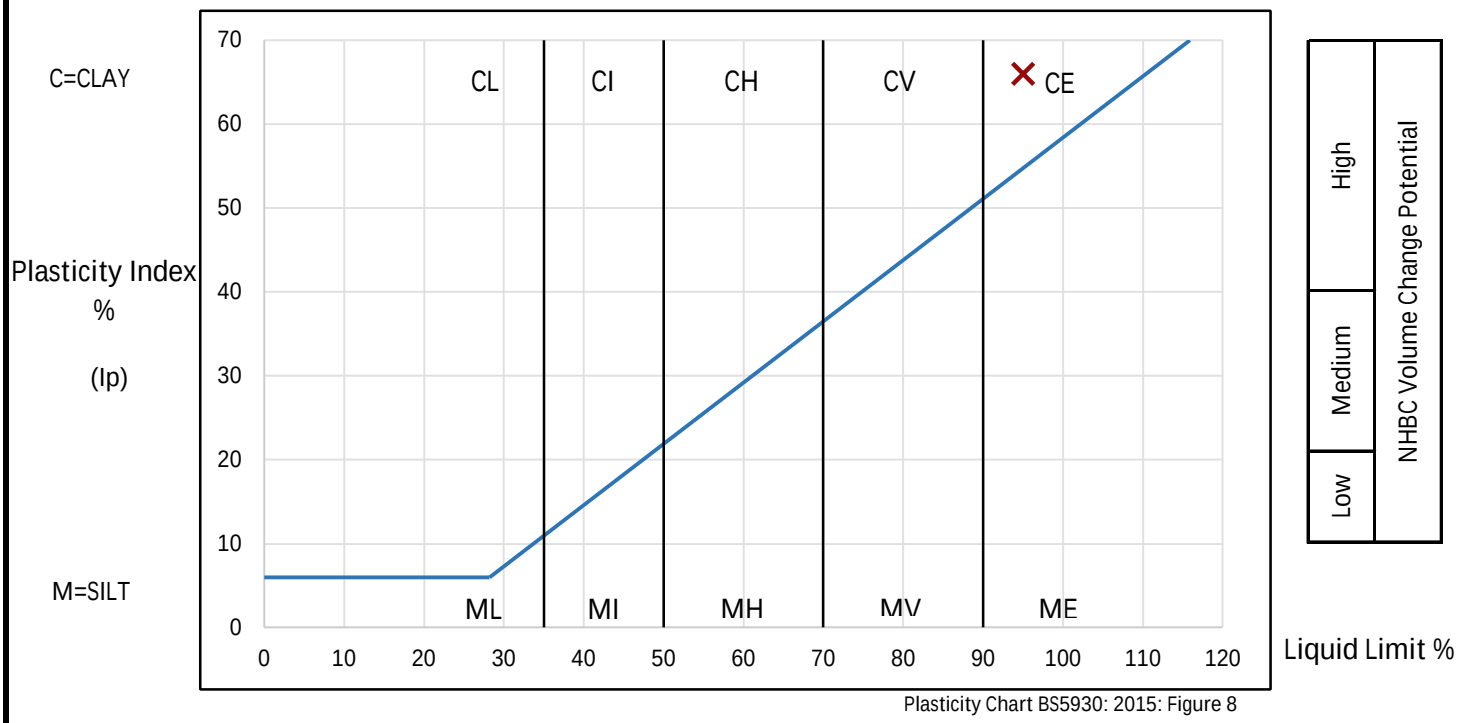
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS2	5.70 - 6.00	D	-	34.2	Stiff fissured dark grey CLAY.	

PREPARATION			Liquid Limit	95 %
Method of preparation		From natural	Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	66 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.08
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
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DATE ISSUED: 28/05/2020

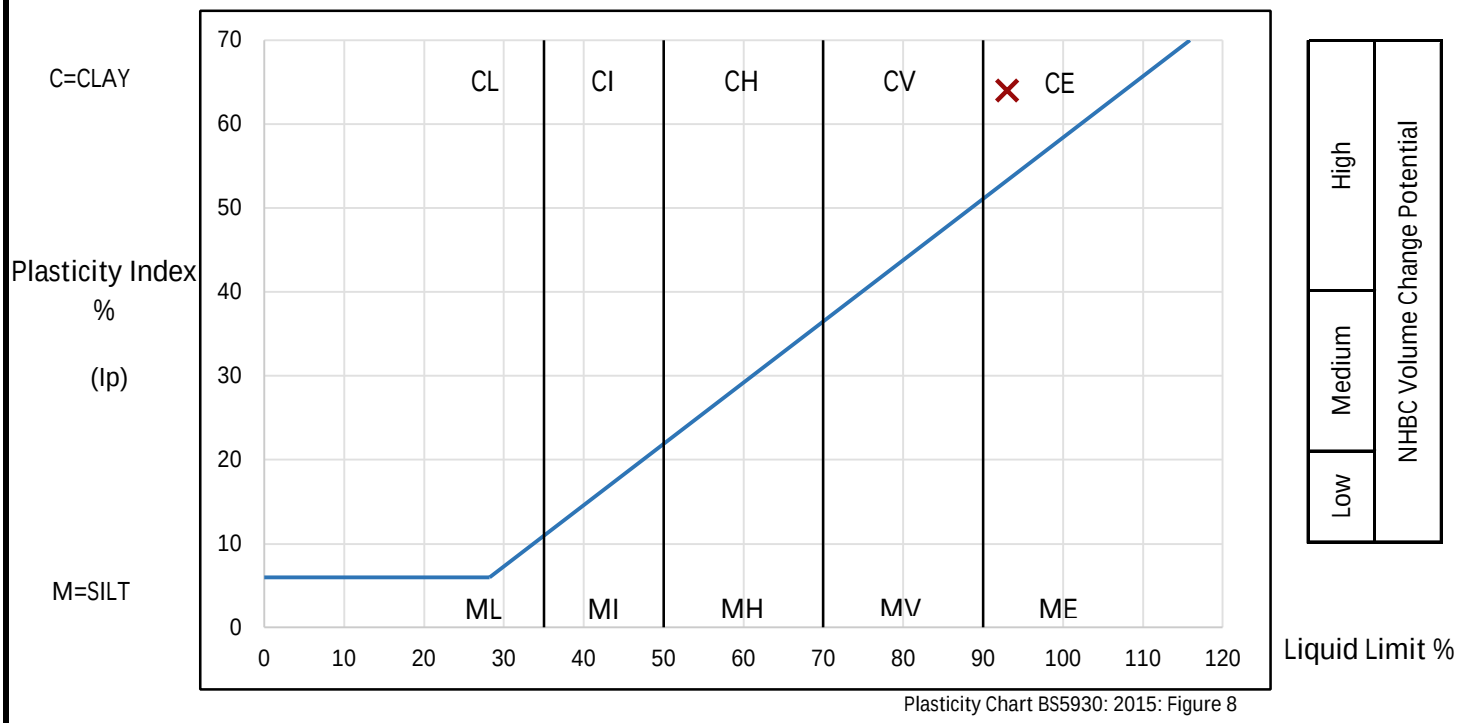
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS3	0.55 - 0.75	D	-	40.3	Firm yellowish brown CLAY with rare recently active roots.	

PREPARATION			Liquid Limit	93 %
Method of preparation		From natural	Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	64 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.18
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	24 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

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Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
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TEST REPORT

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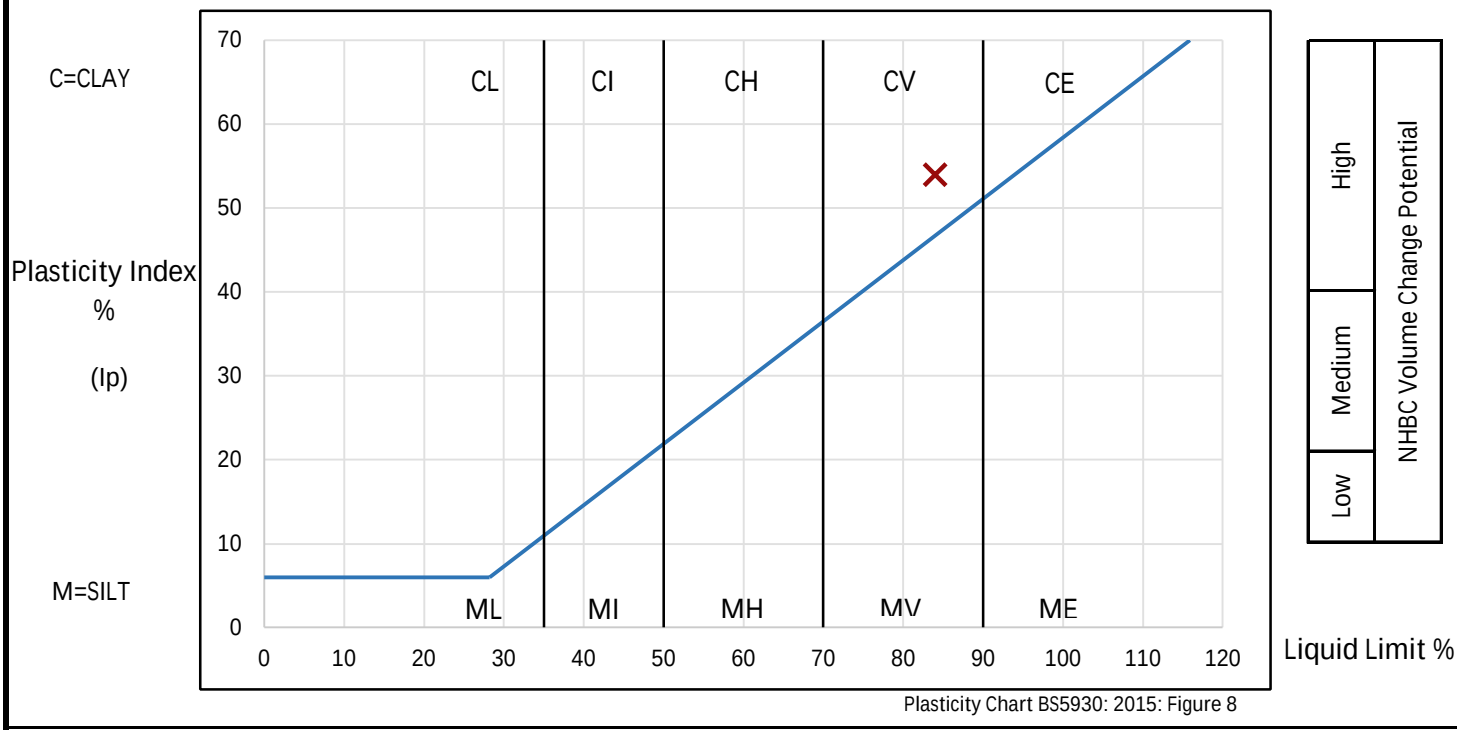
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS3	2.80 - 3.00	D	-	39.1	Firm closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, rare orange silt partings, and decayed roots.	

PREPARATION					
Method of preparation	From natural			Liquid Limit	84 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plastic Limit	30 %
Corrected water content for material passing 0.425mm				Plasticity Index	54 %
Sample retained 2mm sieve	(Assumed)	0 %		Liquidity Index	0.17
Curing time	24 hrs	Clay Content	Not analysed	NHBC Modified (I'p)	n/a
				Derived Activity	Not analysed



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Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
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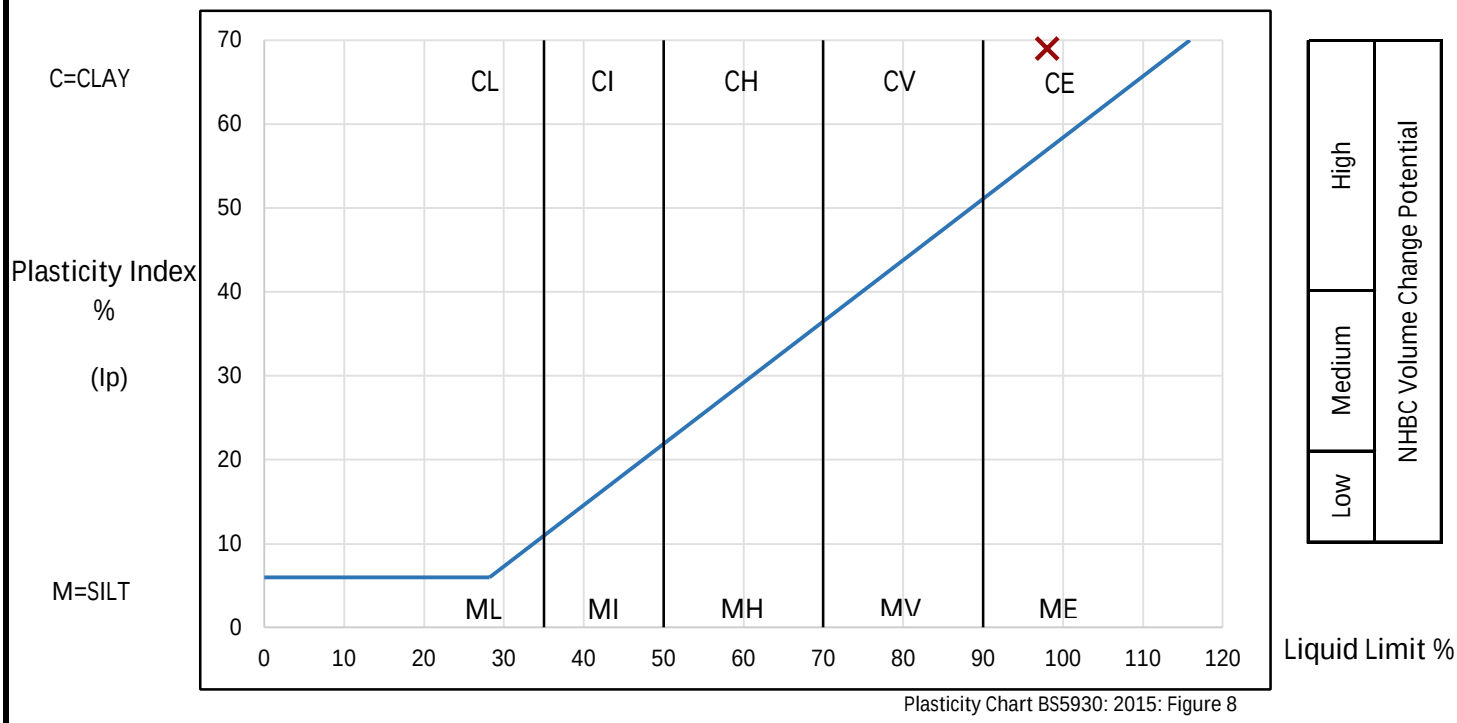
0998

Contract	Weeley
Serial No.	36855_1

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS3	4.90 - 5.00	L	5	38.2	Firm fissured dark grey CLAY.	

PREPARATION				Liquid Limit	98 %
Method of preparation		From natural		Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plasticity Index	69 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.13
Sample retained 2mm sieve	(Assumed)	0 %		NHBC Modified (I'p)	n/a
Curing time	98 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
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0998

Contract	Weeley
Serial No.	36855_1

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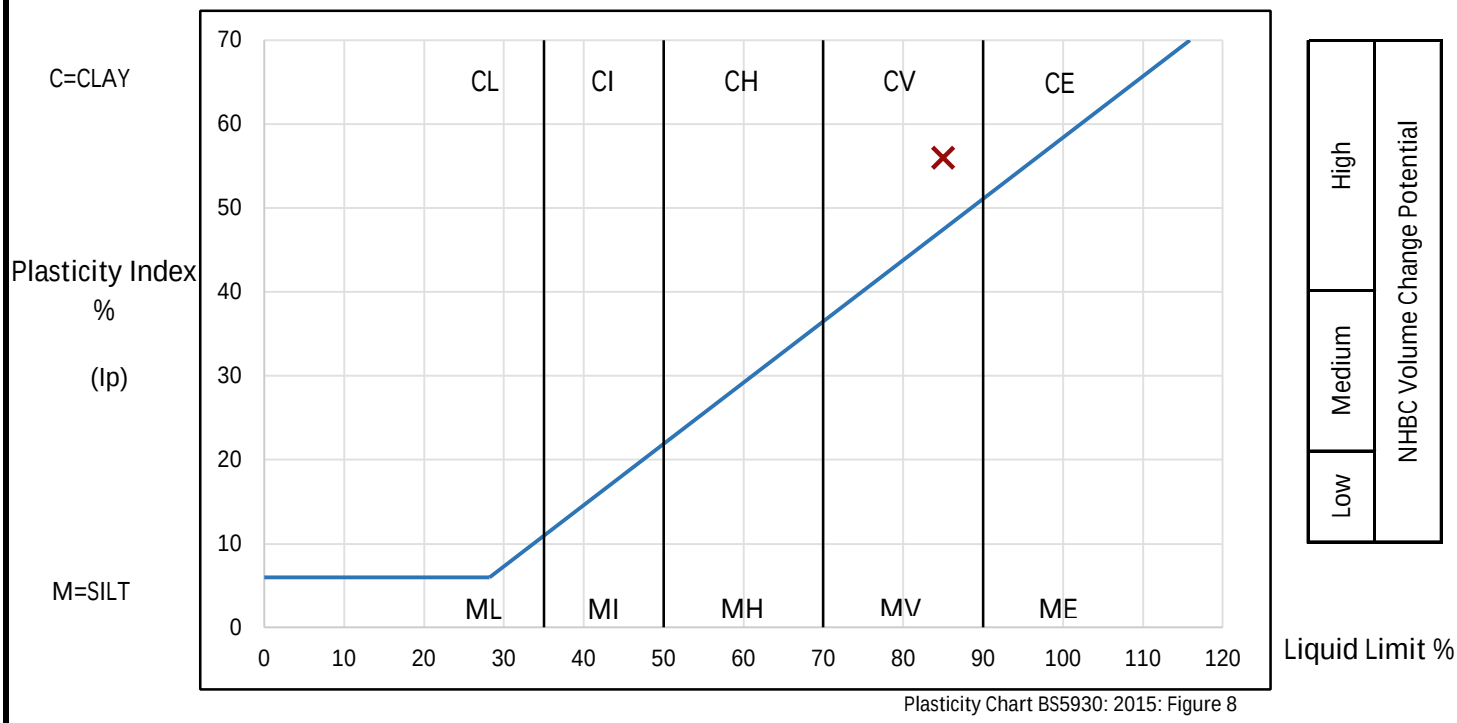
Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS4	1.70 - 1.90	D	-	29.6	Stiff closely fissured dark yellowish brown CLAY with occasional bluish grey mottling, orange silt partings, and rare decayed roots.	

PREPARATION			Liquid Limit	85 %
Method of preparation		From natural	Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	56 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.01
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	97 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
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0998

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Serial No.	36855_1

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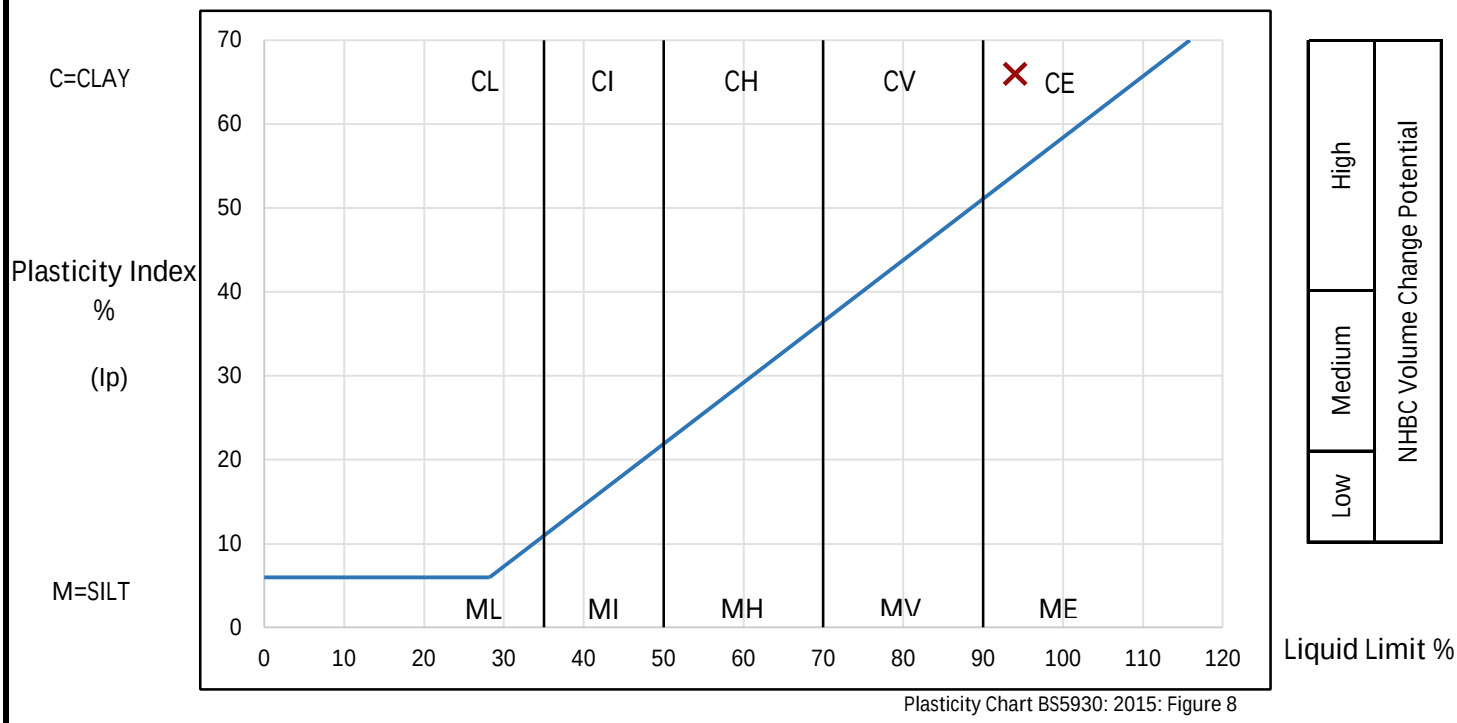
Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS4	3.60 - 3.80	D	-	34.1	Stiff closely fissured dark yellowish brown CLAY with occasional orange silt partings, rare bluish grey mottling, and selenite crystals.	Specimen dried at 80°C due to the presence of selenite.

PREPARATION				Liquid Limit	94 %
Method of preparation		From natural		Plastic Limit	28 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plasticity Index	66 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.09
Sample retained 2mm sieve	(Assumed)	0 %		NHBC Modified (I'p)	n/a
Curing time	99 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
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0998

Contract	Weeley
Serial No.	36855_1

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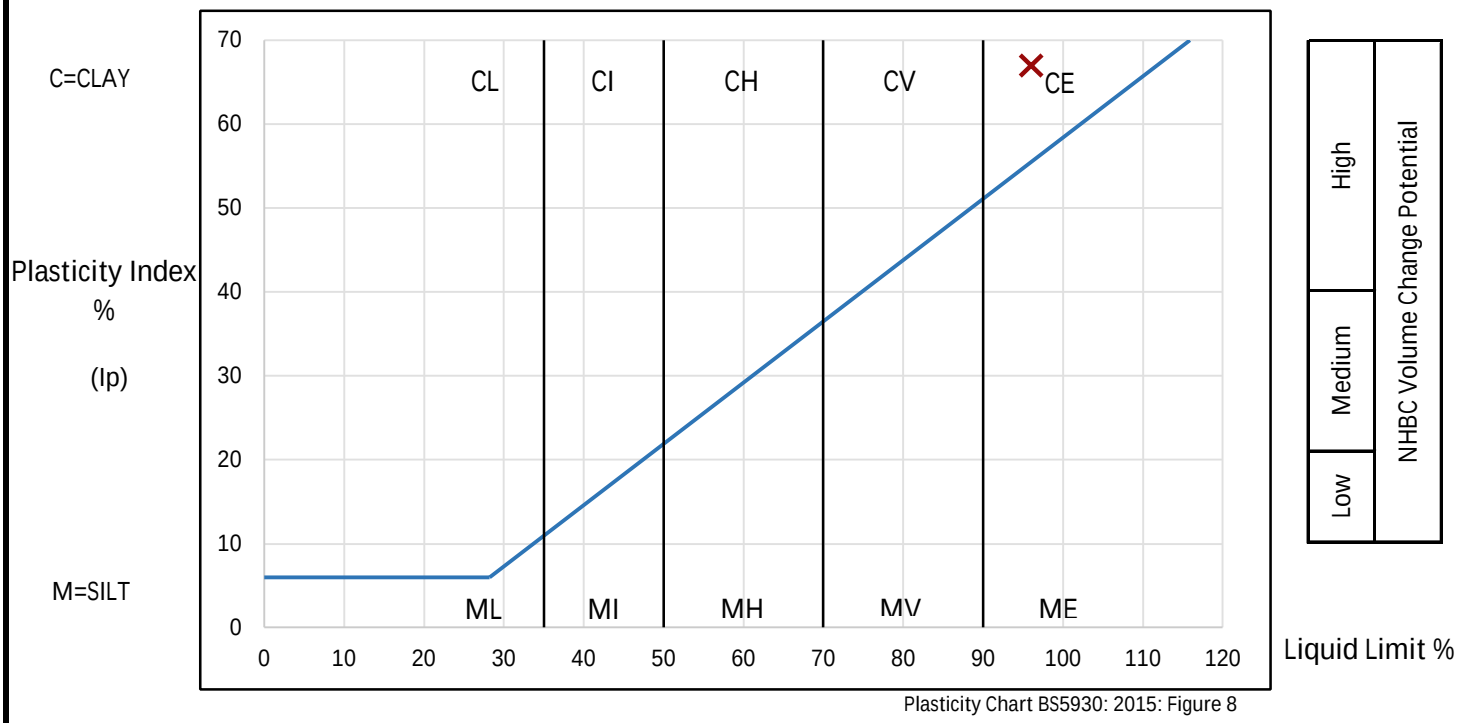
Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
WS4	5.90 - 6.00	L	6	38.3	Stiff slightly fissured dark grey CLAY.	

PREPARATION				Liquid Limit	96 %
Method of preparation		From natural		Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)	0 %		Plasticity Index	67 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.14
Sample retained 2mm sieve	(Assumed)	0 %		NHBC Modified (I'p)	n/a
Curing time	99 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2
Method of Test:	BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-12539-1		
Initial Date of Issue:	21-May-2020		
Client	Compass Geotechnical Limited		
Client Address:	13 Willow Park, Upton Lane Stoke Golding Warwickshire CV13 6EU		
Contact(s):	Rachel@compassgeotechnical.co.uk		
Project	Weeley		
Quotation No.:	Q19-18078	**Date Received:**	18-May-2020
Order No.:	192518	**Date Instructed:**	18-May-2020
No. of Samples:	8		
Turnaround (Wkdays):	5	**Results Due:**	22-May-2020
Date Approved:	21-May-2020		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: Weeley

Client: Compass Geotechnical Limited			**Chemtest Job No.:**		20-12539	20-12539	20-12539	20-12539	20-12539	20-12539	20-12539	20-12539
Quotation No.: Q19-18078			**Chemtest Sample ID.:**		1005441	1005442	1005443	1005444	1005445	1005446	1005447	1005448
			Client Sample ID.:		ES1	ES1	ES1	ES1	ES1	ES1	ES1	ES1
			Sample Location:		WS1	WS1	WS2	WS2	WS3	WS3	WS4	WS4
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.5	4.5	1.1	5.7	0.55	2.8	1.7	3.6
			Bottom Depth (m):		0.7	4.8	1.4	6.0	0.75	3.0	1.9	3.8
			Date Sampled:		14-May-2020	14-May-2020	14-May-2020	14-May-2020	14-May-2020	14-May-2020	14-May-2020	14-May-2020
			Time Sampled:		0:00	0:00	0:00	0:00	0:00	0:00	0:00	0:00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**								
Moisture	N	2030	%	0.020	16	22	12	22	25	24	19	21
Total Potential Sulphate as SO4	N	2175	%	0.030	0.042	1.4	0.11	1.4	0.099	0.033	0.039	0.51
pH (2.5:1)	N	2010		4.0	8.1	8.7	8.6	8.9	8.2	8.0	8.2	7.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.12	0.014	0.10	< 0.010	< 0.010	0.017	0.33
Sulphate (Acid Soluble)	U	2430	%	0.010	< 0.010	0.072	< 0.010	0.11	0.025	0.011	< 0.010	0.37

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

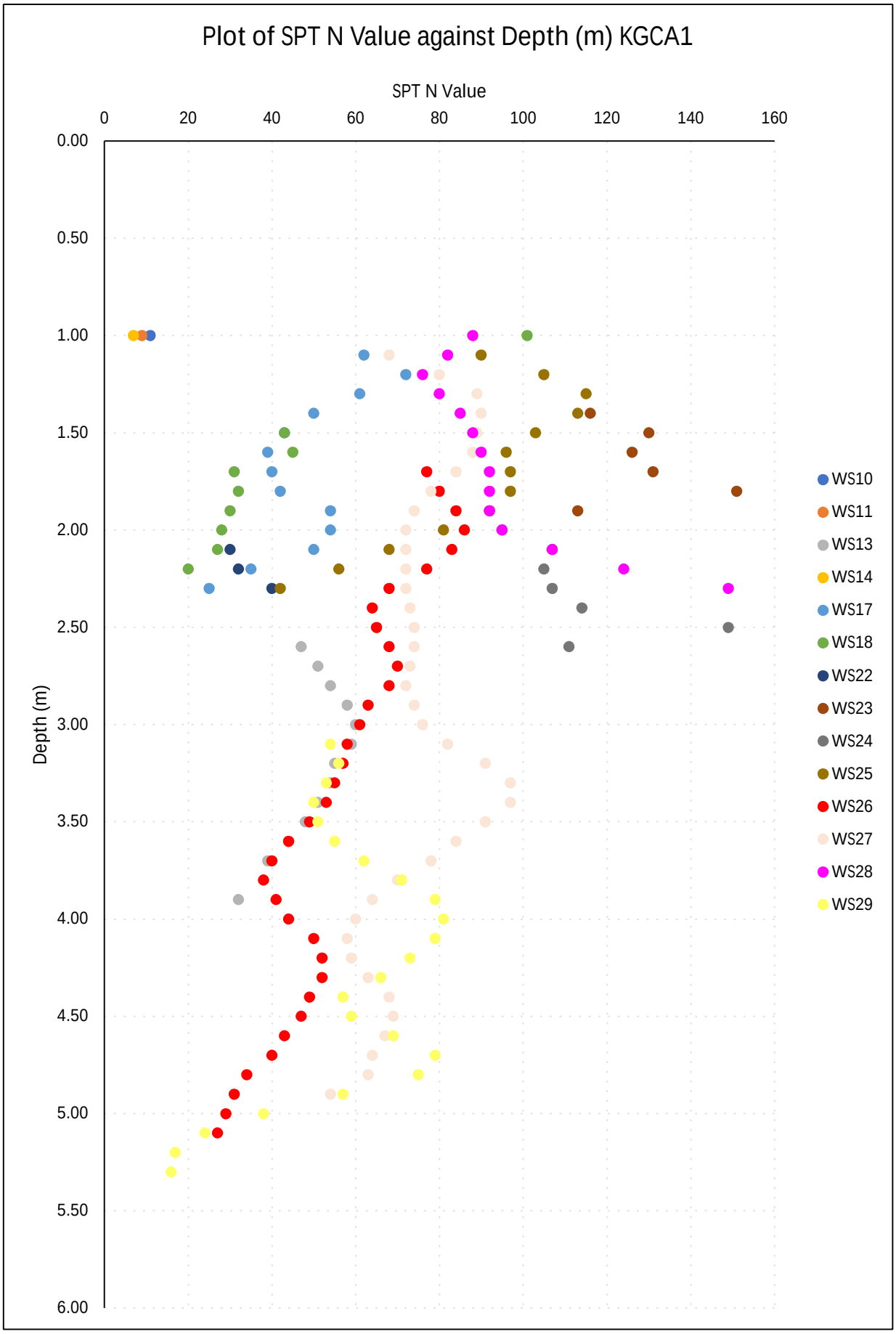
A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

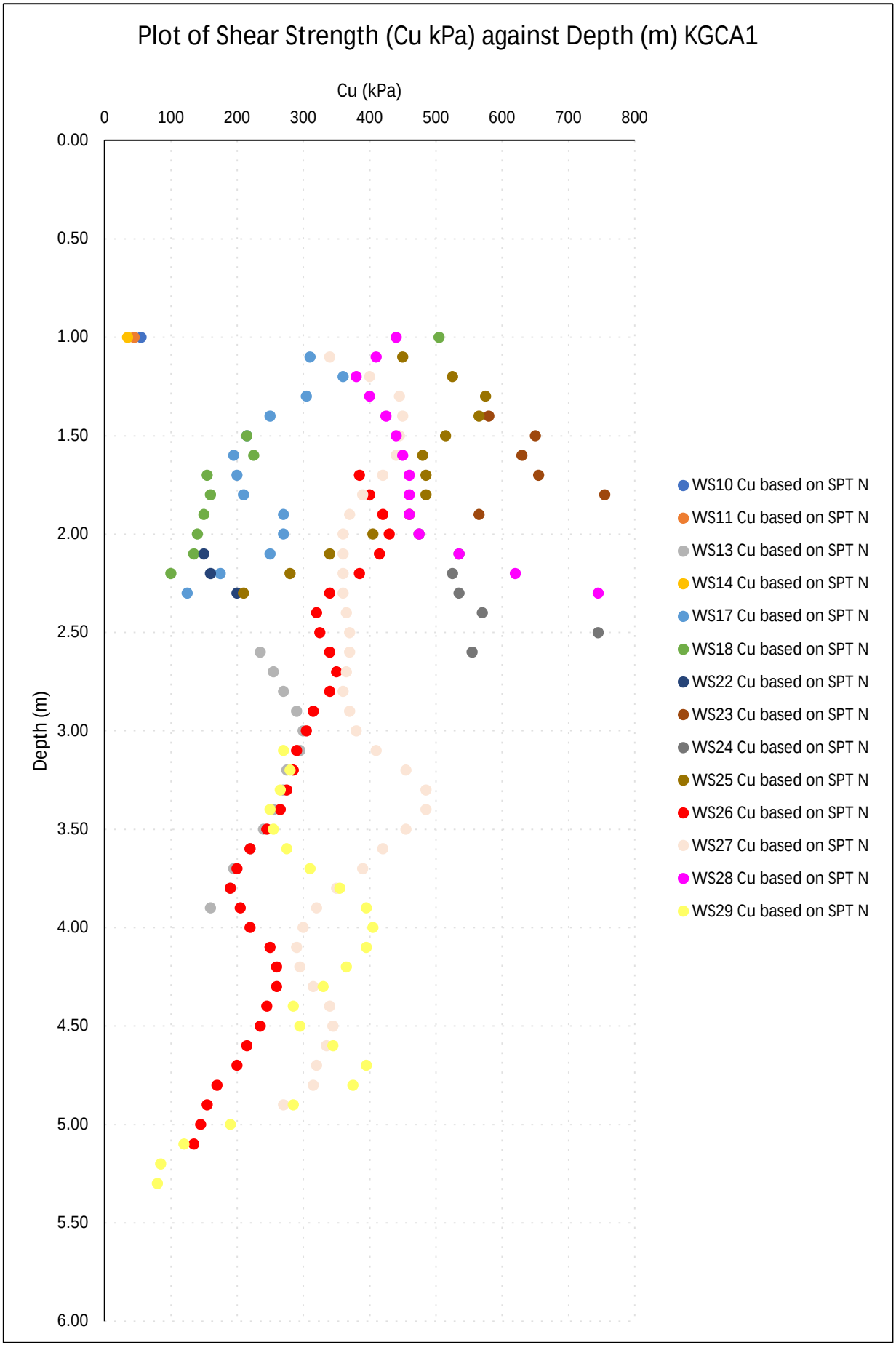
Sample Retention and Disposal

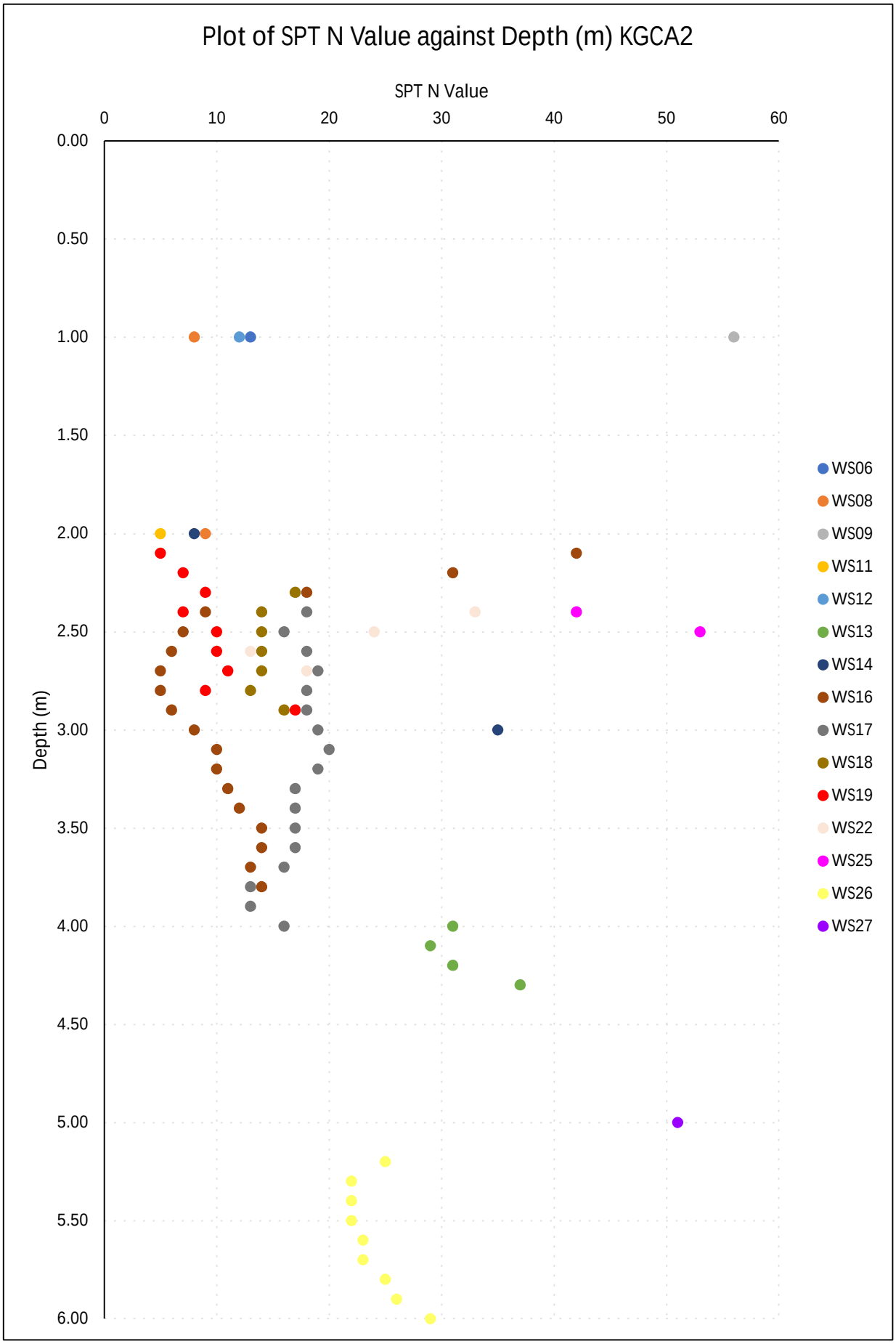
All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

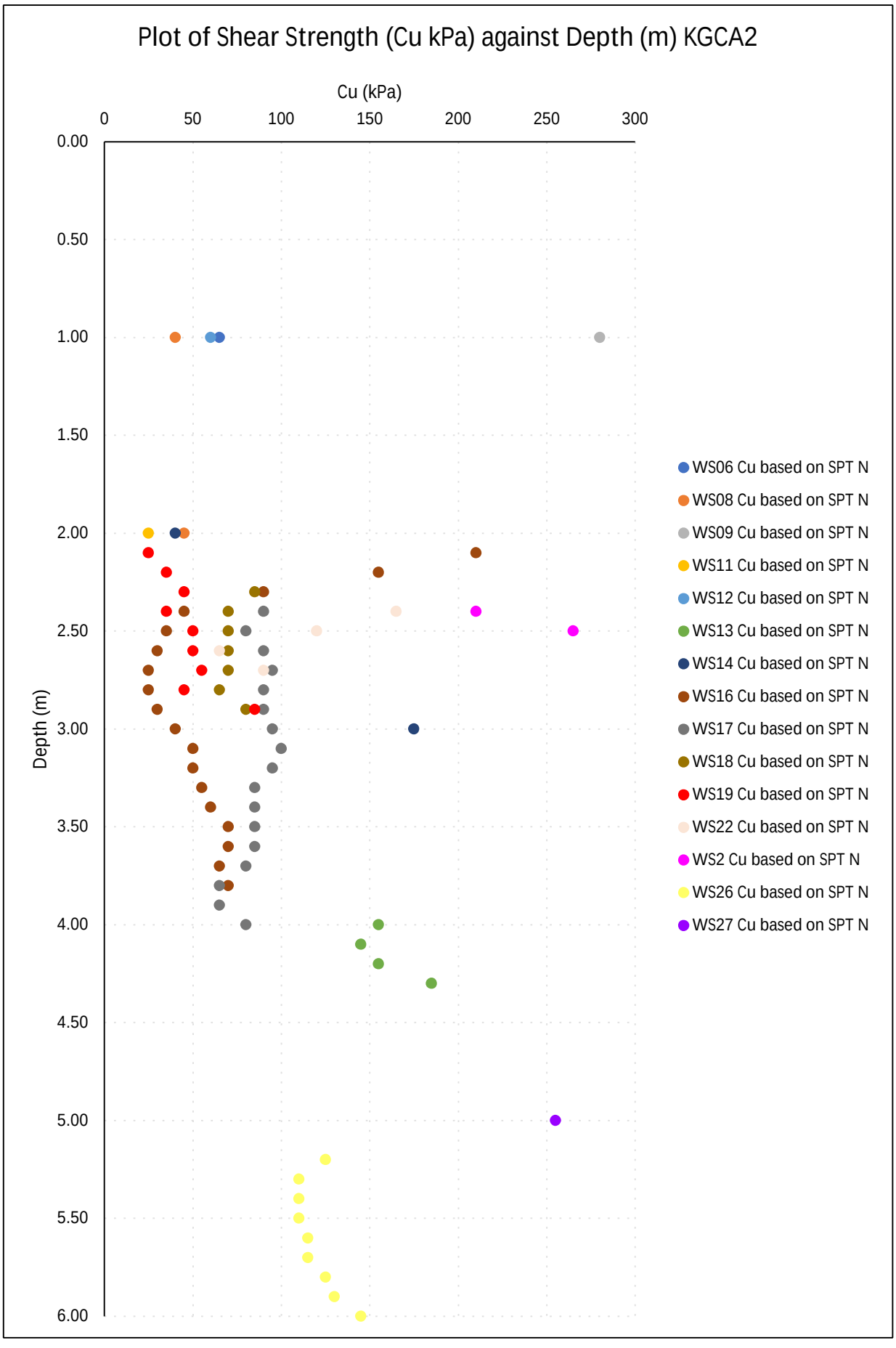
If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

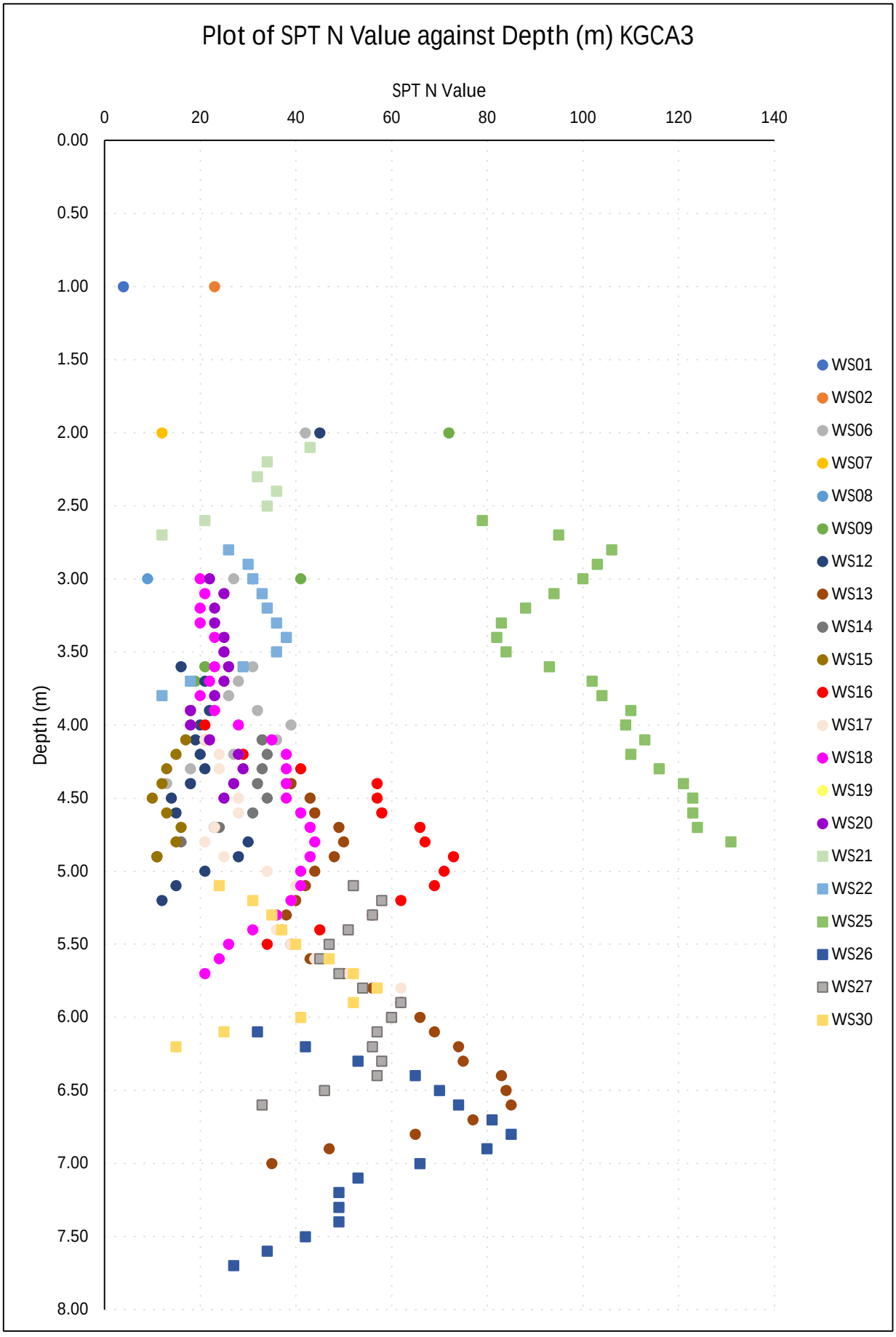
Appendix (iv)
Plots

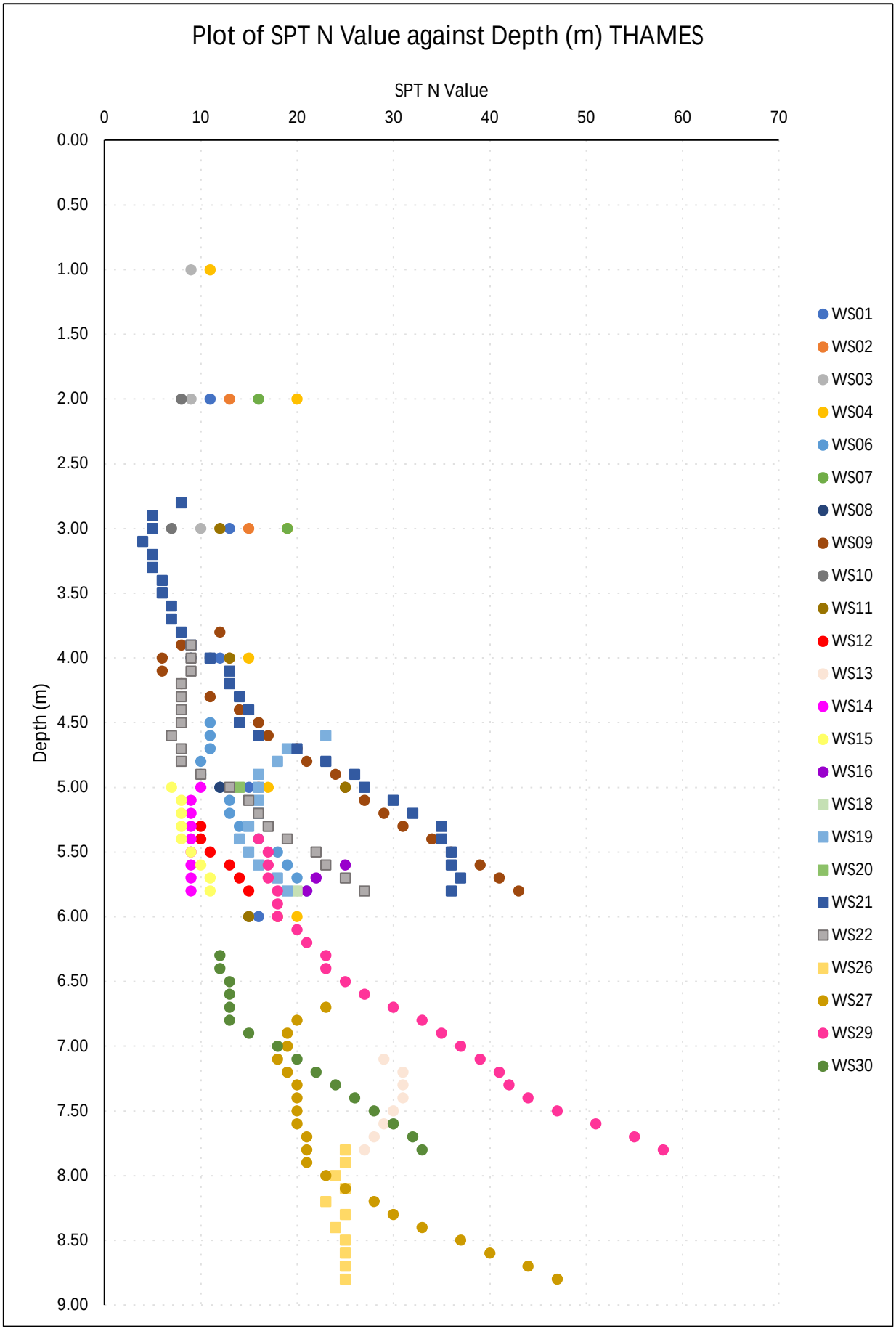

Plot of SPT N Value against Depth (m) KGCA1
SPT N Value
0
20
40
60
80
100
120
140
160
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
WS10
WS11
WS13
WS14
WS17
WS18
WS22
WS23
WS24
WS25
WS26
WS27
WS28
WS29

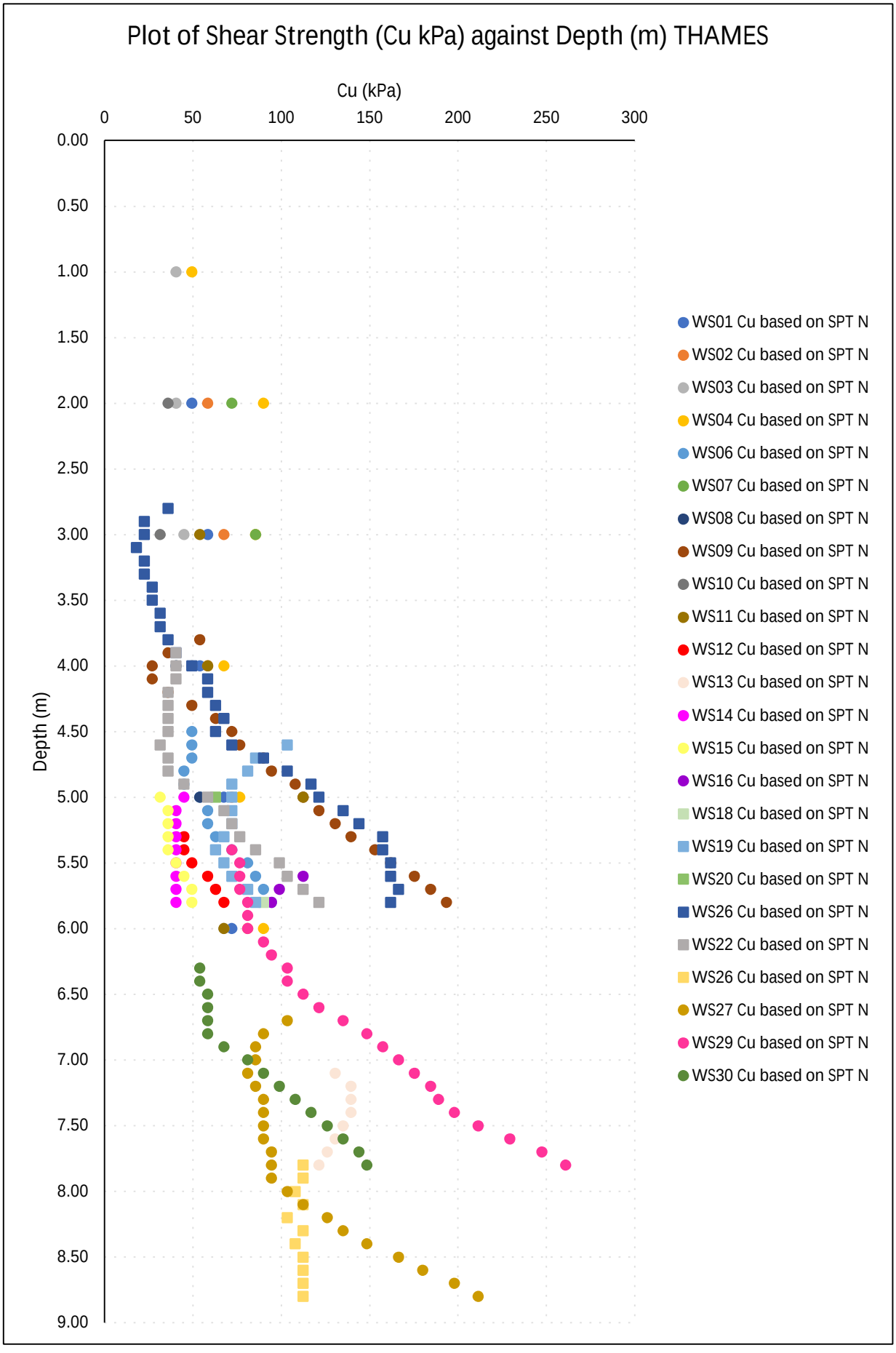

Plot of Shear Strength (Cu kPa) against Depth (m) KGCA1
Cu (kPa)
0
100
200
300
400
500
600
700
800
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
WS10 Cu based on SPT N
WS11 Cu based on SPT N
WS13 Cu based on SPT N
WS14 Cu based on SPT N
WS17 Cu based on SPT N
WS18 Cu based on SPT N
WS22 Cu based on SPT N
WS23 Cu based on SPT N
WS24 Cu based on SPT N
WS25 Cu based on SPT N
WS26 Cu based on SPT N
WS27 Cu based on SPT N
WS28 Cu based on SPT N
WS29 Cu based on SPT N


Plot of SPT N Value against Depth (m) KGCA2
SPT N Value
0
10
20
30
40
50
60
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
WS06
WS08
WS09
WS11
WS12
WS13
WS14
WS16
WS17
WS18
WS19
WS22
WS25
WS26
WS27


Plot of Shear Strength (Cu kPa) against Depth (m) KGCA2
Cu (kPa)
0
50
100
150
200
250
300
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
WS06 Cu based on SPT N
WS08 Cu based on SPT N
WS09 Cu based on SPT N
WS11 Cu based on SPT N
WS12 Cu based on SPT N
WS13 Cu based on SPT N
WS14 Cu based on SPT N
WS16 Cu based on SPT N
WS17 Cu based on SPT N
WS18 Cu based on SPT N
WS19 Cu based on SPT N
WS22 Cu based on SPT N
WS2 Cu based on SPT N
WS26 Cu based on SPT N
WS27 Cu based on SPT N


Plot of SPT N Value against Depth (m) KGCA3
SPT N Value
0
20
40
60
80
100
120
140
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
WS01
WS02
WS06
WS07
WS08
WS09
WS12
WS13
WS14
WS15
WS16
WS17
WS18
WS19
WS20
WS21
WS22
WS25
WS26
WS27
WS30


Plot of SPT N Value against Depth (m) THAMES
SPT N Value
0
10
20
30
40
50
60
70
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
8.50
9.00
WS01
WS02
WS03
WS04
WS06
WS07
WS08
WS09
WS10
WS11
WS12
WS13
WS14
WS15
WS16
WS18
WS19
WS20
WS21
WS22
WS26
WS27
WS29
WS30


Plot of Shear Strength (Cu kPa) against Depth (m) THAMES
Cu (kPa)
0
50
100
150
200
250
300
Depth (m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
6.50
7.00
7.50
8.00
8.50
9.00
WS01 Cu based on SPT N
WS02 Cu based on SPT N
WS03 Cu based on SPT N
WS04 Cu based on SPT N
WS06 Cu based on SPT N
WS07 Cu based on SPT N
WS08 Cu based on SPT N
WS09 Cu based on SPT N
WS10 Cu based on SPT N
WS11 Cu based on SPT N
WS12 Cu based on SPT N
WS13 Cu based on SPT N
WS14 Cu based on SPT N
WS15 Cu based on SPT N
WS16 Cu based on SPT N
WS18 Cu based on SPT N
WS19 Cu based on SPT N
WS20 Cu based on SPT N
WS26 Cu based on SPT N
WS22 Cu based on SPT N
WS26 Cu based on SPT N
WS27 Cu based on SPT N
WS29 Cu based on SPT N
WS30 Cu based on SPT N

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