Plots C & I & BNG Mitigation Areas, Humber Gate, Grimsby DN31 2TT

Additional Ground Investigation Report

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EXECUTIVE SUMMARY

Section	Summary Comments (only)
Site Location	Humber Gate, Grimsby DN31 2TT
Purpose & Scope	Mayer Environmental Ltd (Mayer) was commissioned by the client GRG to conduct an additional ground investigation due to a change in the proposed layout.
Site Description & **Future Use**	The site comprises two plots of land, referenced I & C, approximately 350m south west of the Humber Estuary and 4.5km to the north west of the town of Grimsby. In addition two areas identified as potential BNG mitigation areas have also been investigated. Development of a High Temperature Incinerator.
Historical Summary	In summary, it appears the site has had a fairly simple development history. Plot C housed part of a rifle range in the 1940s. By the 1960s rail sidings were present on this plot and the three buildings still present were constructed in the 1990s. The only development on Plot I has been rail sidings present from the 1960s. Off site a number of fibre manufacturers have inhabited works to the west with Lenzing Fibres still present. Engie, an energy company is currently housed adjacent to the west. An above ground landfill for inert fibres is also present adjacent to the east of Plot I.
Geo-Environmental Setting	
Geology:	Geological records indicate that the site is underlain by Tidal Flat Deposits, which overlies the Flamborough Chalk Formation. The Tidal Flat Deposits consist of silt, clay and fine grained sand with lenses of gravel and peat inclusions.
Hydrogeology:	The Tidal Flat Deposits have been classified by the Environment Agency as Unproductive Strata. The Flamborough Chalk Formation has been classified as a Principal Aquifer.
Hydrology	The nearest surface water features are drainage channels. Maps indicate that two drainage channels potentially run onto both plots. Oldfleet Drain borders the north-west site boundary, with other drainage channels bordering Plot I to the north east and running between the two plots. All channels are considered to link up and drain into the Humber Estuary 320 m to the south.

Summary of GI Findings	
Site Works	Site work was undertaken from the 11th June to the 20th July 2024.
Ground Conditions Encountered	Plot C - Made Ground was encountered at some locations to a maximum depth of 1.7 m bgl. Below this the Tidal Flat Deposits comprising a stiff brown clay were identified, with a soft grey clay also noted in some locations. Plot I – Made Ground was not encountered on Plot I in any location. In all locations the stiff clay of the tidal flat deposits was encountered to a maximum thickness of 3m, which was underlain by soft grey clay with peat and organic matter inclusions. The maximum thickness of this layer was 7.3m, with the firm brown clay present again under the grey clay.
Geotechnical Assessment	The principal geotechnical feature regarding this site is the presence of the low strength and compressible tidal flat deposits which are 7.0 to 8.9 m thick across most of the site but are 10.9 m thick in one location. There is a requirement to raise the ground level at the site by 0.45 to 1.75m but increase in levels are generally in the range of 1.30 to 1.60m to give a platform level of 3.75 mOD. This will cause significant settlement of 200 to 500 mm and settlement due to this loading. To allow for this settlement additional soil is required and by carrying out an iterative approach the site should be raised to 4.45 mOD to allow for settlement. However, this settlement will occur over very long periods of many years with 50% of the settlement occurring in 2 to 5 years. Therefore, it is proposed that this site is surcharged in stages with surcharging being rolled out across the site. This involved laying a drainage layer, installing vertical band drains and then temporarily raising to a level of at least 5.45 mOD. The settlement should be monitored before the surcharge is removed and trimmed down to the required level of 3.75 mOD. The surcharge from the initial area being moved to the next area. Smaller sized lightly loaded buildings can be constructed on raft foundations but nearly all of the proposed structures will be required to be on deep foundations (either piles or Controlled Modulus Columns). For design of hard standing, the CBR value of the placed fill will be the controlling factor so the CBR value to be used in design cannot be determined at this stage. In terms of designing concrete in the ground, no special precautions are required for the natural soils at this site and DC1/AC1s conditions apply.
Geo – Environmental Assessment	**Soils** No significant levels of contaminants were identified in the soils from Plot I. Asbestos fibres and PAHs were identified in discrete areas on Plot C. **Groundwater** No significant levels of contaminants were identified within the groundwater. Very low levels of PFOA and PFOS were identified in two groundwater samples. **Ground Gas** Elevated levels of methane have been identified within boreholes BH03 and BH05, potentially linked to dissolved methane identified in the groundwater which is likely to be from the peat and organic matter present within the clay. **Asbestos**

	Asbestos cladding is potentially present on the existing buildings on Plot C. **BNG Mitigation Areas** The soils were noted to contain no significant levels of contaminants. With regards to topsoil, a deficiency in some nutrients was noted and a high clay content was also recorded. PFOS and PFOA were identified at low levels within the lagoon in one of the BNG areas. **Ditches** PFOS and PFOA were recorded as present within the Oldfleet Drain and the pipe ditch running between the two plots.
Final Conceptual Site Model	Overall the main pollutant linkage of concern is considered to be the presence of ground gas and the potential impact it may have on the proposed development. Further monitoring is required to further establish the significance of these ground gases.
Recommendations	Further gas monitoring is required comprising in-situ continuous gas monitoring and surface gas monitoring.
The Executive Summary is based on the information presented in the full report and does not form a full assessment of the available data. This summary is to be read in conjunction with the full report.	

1 INTRODUCTION

1.1 Background

Mayer was commissioned by the client GRG to undertake additional ground investigation work for the site located at Humber Gate, Grimsby DN31 2TT.

Mayer have worked alongside geotechnical specialists Eccles Associates Ltd (EAL) who have advised on geotechnical aspects on the ground investigation and testing scopes of works as well as assessment and interpretation of the subsequent data. Sections 13, 14, 15 and 16 within this report have been written by EAL.

1.2 Purpose & Scope

Mayer and EAL undertook a detailed desk study and ground investigation in September 2023 for both geotechnical and environmental purposes targeting the proposed development area (Report ref 129-002870 dated November 2023). GRG have identified two adjoining parcels of land at Humber Gate (Plots C & I) that are being assessed for feasibility for developing a High Temperature Incinerator (HTI). Since the original investigation was undertaken, the proposed layout for Plot I has been altered due to identified constraints on the site. In addition, elevated levels of ground gases were identified during the previous work which require further investigation. Therefore, it was considered prudent to undertake further ground investigation works.

The main change to the proposed layout is the position of the main HTI building and stack. This area will require additional information to be obtained , particularly with regard to geotechnical aspects, to determine possible foundation solutions.

In addition to Plot C and Plot I, GRG have also identified two smaller parcels of land that could be used as mitigation areas for Biodiversity Net Gain (BNG). These areas are to the north of the Lenzing Factory and a thin strip of land to the west of Energy Park Way.

2 SITE DESCRIPTION

2.1 Site Location

The site comprises two plots of land, referenced I & C, approximately 350m south west of the Humber Estuary and two smaller plots of land for BNG mitigation. The location of the sites and the approximate outline of the site area are shown on the plan below and also provided in Appendix A.

IMAGE 2.1 PLANS SHOWING THE LOCATION OF PLOTS I & C

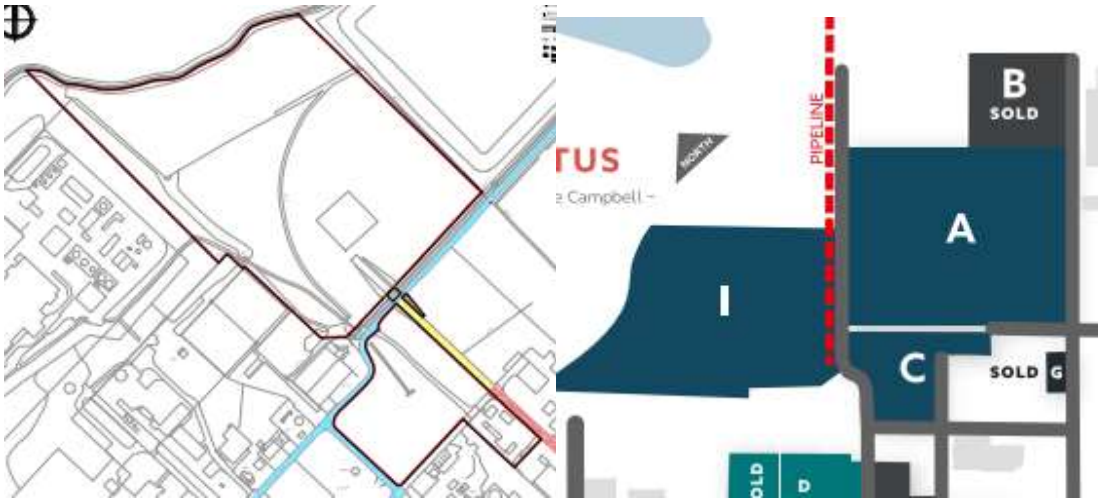
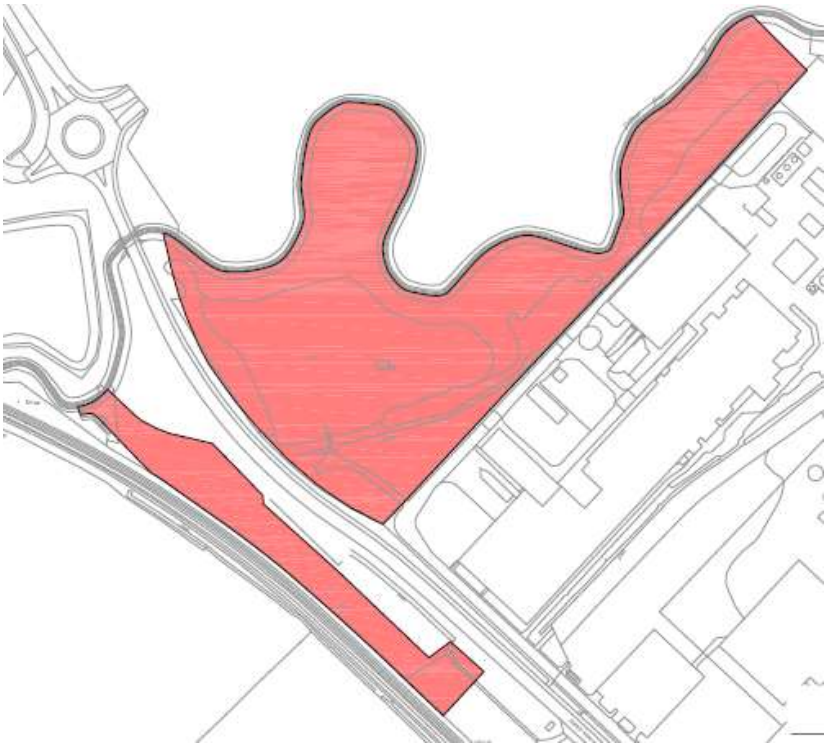


IMAGE 2.2 PLAN SHOWING THE LOCATION OF THE TWO BNG MITIGATION AREAS



2.2 Site Description

A detailed site description is included in the previous report. Below is a brief description of the site conditions at the time of the ground investigation.

2.2.1 Plots C & I

Plot C is the smaller plot where potentially a weighbridge and welfare facilities will be placed. The plot is covered mainly by low level scrub vegetation including brambles. A dirt roadway crosses Plot C

towards Plot I. Two tall corrugated concrete clad (possibly asbestos containing) buildings are located in the south-eastern corner of Plot C with a smaller building in front of them. Both tall buildings have fans on the top but their former use is unclear. Heras fencing still surrounds the buildings and the prior observed asbestos sheeting is still noted as present within the fenced area.

A pipeline is noted to run along the drainage ditch that runs between the two plots of interest. A second ditch runs along the eastern boundary of Plot I which borders onto the adjacent landfill. A site walkover was undertaken in May 2024 which included a walkover of the landfill. The visit identified that the western corner of the landfill appears to be slumping, with a red/orange leachate shown to be present within the ditch in this area which is adjacent to the subject site and the Oldfleet Drain.

Plot I is has not changed significantly since the previous investigation and is still covered in dense vegetation.

2.2.2 BNG Mitigation Areas

The mitigation area located behind the Lenzing Fibre factory comprises a large pond, considered to be present for ecological purposes rather than an industrial use, that is surrounded by dense vegetation. The pond has a small wooden jetty extending out into it.

The second thin area of land comprises dense vegetation in the south of the area with bare ground in the northern section.

3 ENVIRONMENTAL SETTING

Information in this section is a summary of the information contained within the previous report.

3.1 Geological Setting

3.1.1 Geology

The previous investigation identified Made Ground present at some locations to a maximum depth of 1.7 m bgl in Plot C. Below this the Tidal Flat Deposits comprising a stiff brown clay were identified, with a soft grey clay also noted in some locations.

Made Ground was not encountered on Plot I in any location. Topsoil was encountered in some locations at the surface. In all locations the stiff clay of the tidal flat deposits was encountered to a maximum thickness of 3m, which was underlain by soft grey clay with peat and organic matter inclusions. The maximum thickness of this layer was 7.3m, with the firm brown clay present again under the grey clay. This in turn was underlain by putty chalk of the Flamborough Chalk Formation from a depth of circa 20m bgl.

3.2 Hydrogeology

The Tidal Flat Deposits have been classified by the Environment Agency as Unproductive Strata. These are drift deposits with low permeability that have negligible significance for water supply or river water base flow.

The Flamborough Chalk Formation is classified as a Principal Aquifer due to its high fracture permeability and usually provides a high level of water storage and may support water supply / river base flow on a strategic scale.

3.3 Hydrology

3.3.1 Surface Water Features

Off-site, the nearest surface water feature runs along the north western boundary of Plot I and comprises the Oldfleet Drain. A number of other surface drains are located within the vicinity of the site boundary, as described in section 2.2 above. At its closest point, the subject site is 320m to the south west of the Humber Estuary.

3.3.2 Flooding

Flooding has been identified as a potential constraint to the site and Mayer are aware that GRG have contracted Flood Assessment specialists to assess the significance of the risk and identify potential solutions.

3.4 Ecologically Sensitive Areas

Areas of dense vegetation on site have been identified as potentially ecologically sensitive and are a potential constraint. Again, GRG have contracted an ecology specialist to identify these issues and provide solutions for the most effective use of the site.

4 EXISTING CONCEPTUAL SITE MODEL

The risk assessment process is one that develops as more information becomes available to the risk assessor. Potential sources of contamination, exposure pathways and sensitive receptors are identified and placed in to the context of a conceptual site model.

The conceptual site model is a dynamic representation of the site, to be refined and developed at each stage of the site investigation process. It is also to be used to direct and inform future investigation by highlighting areas requiring further investigation or eliminating those considered to be of insignificant or acceptable risk.

The conceptual site model contains the three elements the:

- **Source** - probable or actual contaminants their nature and location.
- **Receptor**– existing and, within reason, foreseeable targets upon which the source may impact these may be either on or off site.
- **Pathway –** means by which the source and the receptor may come in to contact.

Where a **source – pathway – receptor** pollutant linkage is envisaged, an estimation of the risk posed by this linkage can be made. Should any one of the three elements be absent, then there is no risk.

4.1 Conceptual Site Model

The table below identifies the pollutant linkages identified during the previous investigations. In addition, discussions between the Local Authority and GRG have identified that potentially PFAS and PFOA may be present within the adjacent landfill and potentially in the surrounding ditches.

TABLE 5.0 POTENTIAL SOURCES OF CONTAMINATION

SOURCE	IDENTIFIED PATHWAYS	RECEPTORS	CONSEQUENCE	PROBABILITY	RISK RATING	COMMENTS ON LINKAGE SIGNIFICANCE
Location TP09 **Plot C** **Soils:** Asbestos fibres	• Inhalation (fibres) •	• Ground Workers • Site Neighbours • Site Users	Severe	Likely	**High Risk**	Potential high risk as the asbestos fibres identified are in the Made Ground near surface with no hardstanding present currently. The risk will decrease if the ground is not further disturbed or capped with hardstanding.
Potential asbestos cladding on existing buildings on Plot C	• Inhalation (fibres)	• Ground Workers Site Users	Severe	Unlikely	**Moderate / Low Risk**	Potential Moderate / Low risk currently as the cladding appears visually to be in satisfactory condition and the buildings are not easily accessible. It is recommended that an asbestos survey is undertaken to establish the presence of asbestos within the cladding, particularly if the buildings are to be demolished.

Dibenzo(ah)anthracene present in TP11 (0.3m) and TP13 (0.3m)	• Ingestions (soils) • Direct Contact (Soils) • Inhalation (dust)	• Ground workers • Site Users • Site Neighbours	Medium	Unlikely	**Low Risk**	Potential Low Risk as the Made Ground the PAH is present in is under a roadway. Should this area be excavated, standard hygiene practices and dust suppression should be observed.
Methane Significantly elevated levels in BH03 and BH05 Present within WS01 and WS02 Potential sources are underlying peat and organic deposits and the adjacent landfill.	• Inhalation (vapours)	• Site Users for Proposed Development	Severe	Likely	**High Risk**	The significance of the methane levels identified need to be further established. In addition, the potential for the upper stiff clay layers to act as capping layers also needs to be further established. The current data suggests that there is a significant risk from the presence of the methane under the site, but further data will be necessary to come to an informed decision on how this may affect the proposed development.
PFOS /PFOA – potentially present within leachate from the landfill and in adjacent drains.	• Ingestion • Direct Contact • Leaching	• Site Users for Proposed Development • Groundwater • Surface Water	Severe	Likely	**High Risk**	The potential presence of PFOS and PFOA within the leachate from the adjacent landfill and within drainage ditches in the surrounding area shows that potentially there could be a risk of PFOS and PFOA being present on the site. The presence of the clay underlying the site will help to minimise movement of any contaminants present but the potential is still there.

5 GROUND INVESTIGATION

5.1 Site Works & Methodology

The work has been done to provide information for both environmental and geotechnical purposes. Mayer have worked alongside geotechnical specialists EAL on the following scope and interpretation of the subsequent findings and data.

Prior to any work being undertaken, an underground utilities report was obtained for the site. Prior to commencing, services were scanned for at all exploratory hole locations. Locations of the exploratory holes are marked on the site plan included in Appendix A. Logs and installation details are included in Appendix B.

The main ground investigation was undertaken between 11th and 20th June 2024 with Cone Penetration Testing (CPT) being undertaken on the 8th and 9th July 2024 by Central Alliance.

Soil samples were collected in accordance with the laboratory requirements for analysis, appropriately commensurate with BS 10175: 2011+A1:2013.

The following tables summarise the rationale for exploratory points and details of those undertaken.

TABLE 5.0 GROUND INVESTIGATION – PLOT C

Exploratory Holes	Depth (m bgl)	Method	Purpose	Notes / Installations
WS201	5.0	Tracked window sampling rig	Gas monitoring well to establish any presence of ground gas on Plot C	Installed with 50mm Ø monitoring well to full depth drilled.
WS202	0.2	Tracked window sampling rig	Refused near surface on all attempts.	Backfilled
WS203	5.0	Tracked window sampling rig	In potential location of weighbridge and associated buildings. Gas well installed to establish presence of ground gas on Plot C.	Installed with 50mm Ø monitoring well to full depth drilled.
CPT221, CPT222	Max 20.03	200KN Crawler CPT Rig	Obtain information on deeper geology under Plot C	N/A

TABLE 5.1 GROUND INVESTIGATION – PLOT I

Exploratory Holes	Depth (m bgl)	Method	Purpose	Notes / Installations
BH201	18.0	Cable Percussion	Establish ground conditions across Plot I in area of proposed development.	Backfilled.
BH202, CPT218	18.0 and 16.19 respectively	Cable Percussion / CPT Rig	Establish ground conditions in proposed area of stack.	Backfilled
BH203, CPT219	18.0 and 16.24 respectively	Cable Percussion / CPT Rig	Establish ground conditions across Plot I in area of proposed development, particularly focussed on where heavy plant will be located.	Backfilled
BH204	18.0	Cable Percussion	Establish ground conditions across Plot I in area of proposed development.	Backfilled
BH205	18.0	Cable Percussion	Establish ground conditions across Plot I in area of entrance to site.	Backfilled
WS204 – WS207	5.0	Tracked window sampling rig	Spread across area of proposed development and installed with gas wells to further identify gas regime underlying the site.	Backfilled Installed with 50mm Ø monitoring well to full depth drilled.
TP201-TP206	Excavations max 4m bgl	JCB 3CX.	Establish ground conditions across Plot I in area of proposed development.	Backfilled
CPT215 – CPT217	Max 16.78m	CPT Rig	Establish ground conditions across proposed buildings on Plot I	N/A
CPT220	15.65	CPT Rig	Establish ground conditions under HTI building footprint on Plot I	N/A

TABLE 5.2 GROUND INVESTIGATION – BNG MITIGATION AREAS

Exploratory Holes	Depth (m bgl)	Method	Purpose	Notes / Installations
TP207, TP208	0.3	Hand dug pit	To establish near surface conditions on BNG area adjacent to Lenzing Factory	Backfilled
TP209 – TP214	Max 0.4	Hand dug pit	To establish near surface conditions on BNG area adjacent to Energy Park Way	Backfilled

5.2 Strata Encountered – Plots C & I

Soils were logged in accordance with BS5930, logs and cross sections are included in Appendix F and Appendix G and a summary is included in the following tables.

Generally the geology encountered was very similar as that identified during the previous investigation.

TABLE 5.4 SUMMARY OF STRATA ENCOUNTERED

Strata	General Description	Depth to Top (m bgl)	Depth to Base (max) (m bgl)	Max Thickness (m bgl)
Made Ground – Plot C Only	Brick, concrete, ash, clinker.	Surface	0.4	0.4
Tidal Flat	Thin firm clay layer over soft and very soft silty clay, clayey silt, peat	0.0 – 0.4	9.5	9.5
	Firm brown clay with gravel	7.0 – 8.9	16.5	9.5
	Sand and gravel	15-16.5	N/A	Base not proven

Made Ground was encountered only on Plot C during this investigation and not on Plot I. During the previous investigation, Made Ground was encountered at two locations on Plot I – BH01 and TP08.

In Plot C, the three window sampler locations encountered Made Ground at the surface. Location WS202 did not progress past 0.1m bgl after two attempts as it refused on an unknown obstruction in the Made Ground. WS201 and WS203 encountered a shallow depth of Made Ground, both to 0.4m bgl, that generally comprised sand and clay with brick, concrete, ash, clinker and anthracite fragments.

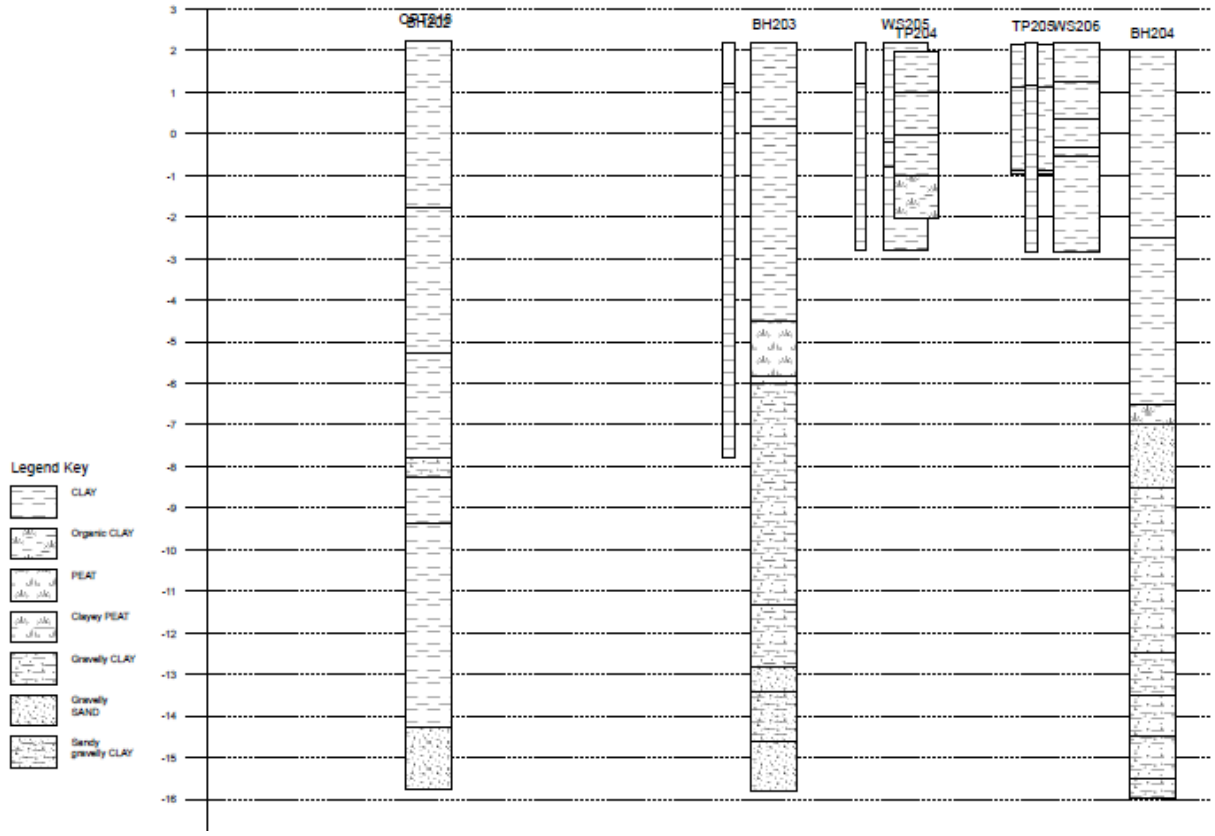
Below the made ground, or from surface where made ground was absent, strata comprised layers of tidal flat deposits of mixed silts, clays, and peat. Generally the clay was firmer at the near surface In the boreholes, before becoming very soft and soft. Generally a very soft black clay layer was encountered at the base of the trial pits which were excavated to a maximum depth of 4m bgl. The peat deposits were generally identified only within the boreholes due to the depth they were present and comprised narrow bands of clay with peat inclusions anywhere between 4.5 and 9.5m bgl.

From between around 9m to 12m depth, glacial clay was encountered which became stiffer with depth and included layers of sand and gravel, which were associated with water strikes.

Chalk was not encountered during this phase of works as the drilling was limited to within the clay to avoid the artesian water within the chalk.

The diagram below shows a cross section of the underlying geology of Plot I running south west to north east. The Cross Section is also included in Appendix C.

SECTION 1 CROSS SECTION RUNNING SW TO NE ON PLOT I



5.3 Summary of Strata – BNG Mitigation Areas

The hand dug pits undertaken in the two BNG mitigation areas were excavated to a maximum of 0.4m bgl to provide information on the near surface soils. Excavation of trial pits using an excavator was initially planned but access to both areas was limited and only hand tools could be used.

In the mitigation area adjacent to the Lenzing factory, made ground was excavated to the base of both pits located in this area (0.3m bgl). The made ground generally comprised dark brown gravels and frequent cobbles of brick and breeze block.

In the mitigation area adjacent to Energy Park Way, made ground was only encountered in location TP210 comprising a dark gravelly clay with concrete and brick gravel and cobbles. At all other locations dark brown clay was identified to the full depth of the pits.

5.4 Site Observations

From the ground investigation undertaken, the following table summarises the observations noted in each exploratory point, comprising subsurface structures or features and any visual or olfactory evidence of contamination.

Typically, contamination that can be apparent from visual or olfactory evidence includes (but not exclusively) organics / hydrocarbons, sulphurous materials, metals, free cyanides and cemented asbestos fragments.

TABLE 5.5 SUMMARY OF SITE OBSERVATIONS – PLOTS C & I

Exploratory Point	Depth	Observation
WS201 **Plot C**	0.0 – 0.4	Ashy Made Ground with clinker
TP202 **Plot I**	1.0	Red brick land drain encountered

TABLE 5.6 SUMMARY OF SITE OBSERVATIONS – BNG MITIGATION AREAS

Exploratory Point	Depth	Observation
TP207	0.0 – 0.3	Red brick, breeze block and black ash pockets.

6 ENVIRONMENTAL TESTING

6.1 Soils

Representative samples of the Made Ground and natural soils were submitted for chemical analysis at a NAMAS / UKAS accredited laboratory with MCERTS certificates (where available) for analytes. Note that as the ground conditions identified were similar to that identified in the September 2023 investigation and no visual or olfactory evidence of contamination was noted, only a limited number of samples have been submitted for analysis to confirm previous findings.

TABLE 6.4 SUMMARY OF SOIL ANALYSIS – PLOT C

Soil Analysis Suite	Made Ground	Natural Clay
ME2	3	-
Asbestos	3	-
TPH CWG	3	-

PCB	3	-
SVOC / VOC	3	-
PFOS/PFOA	2	

TABLE 6.5 SUMMARY OF SOIL ANALYSIS – PLOT I

Soil Analysis Suite	Made Ground	Natural Clay
ME2	-	16
Asbestos	-	14
TPH CWG	-	16
PCB	-	6
SVOC / VOC	-	16
PFOS/PFOA	-	4

Note that Made Ground was not encountered on Plot I and therefore no samples were available for testing. Although chalk was encountered during the previous investigation the depth the chalk was present at was not targeted on this occasion due to the presence of artesian water within the chalk.

TABLE 6.5 SUMMARY OF SOIL ANALYSIS – BNG MITIGATION AREAS

Soil Analysis Suite	Made Ground	Topsoil	Natural Clay
ME2	4	-	4
Asbestos	4	-	4
TPH CWG	4	-	4
PCB	2	-	1
SVOC / VOC	4	-	4
Topsoil Suite	-	1	-

6.2 Groundwater

To provide a general indication of the groundwater quality, four groundwater samples from BH201, BH203, WS204 and WS01, were collected on the 15th August 2024 and submitted for the general Mayer suite of contaminants, TPHCWG analysis and PFOS and PFOA.

The data is presented in the certificates of analysis in Appendix E.

6.3 Drainage Ditches

To provide a better understanding of the quality of the water within the ditches surrounding the site and if they may pose a risk to the site, a number of samples was collected during the ground investigation works. The following samples were taken:

- Pipe Ditch – sample collected from the ditch between Plot C and Plot I
- Oldfleet Up – sample collected from Oldfleet Drain upstream of the adjacent landfill where a leachate breach has been identified
- Oldfleet Down - sample collected from Oldfleet Drain downstream of the adjacent landfill where a leachate breach has been identified

A sample was also collected from the lagoon located on the BNG mitigation area adjacent to the Lenzing factory.

7 GROUNDWATER CONDITIONS

The following table details the groundwater levels in locations with well installations noted during the ground investigation and afterwards, during monitoring. The groundwater monitoring records are included in Appendix F.

TABLE 6.4 GROUNDWATER LEVELS, DURING MONITORING

	During GI	10th July 2024	15th/16th Aug 2024
WS01	-	1.11m bgl	-
WS02	-	0.56m bgl	1.37m bgl
WS03	-	0.89m bgl	-
WS04	-	0.2m bgl	-
WS201	-	1.22m bgl	1.25m bgl
WS203	-	1.54m bgl	1.12m bgl
WS204	--	0.8m bgl	1.67m bgl
WS205	-	0.83m bgl	-
WS206	-	0.91m bgl	-
WS207	-	0.85m bgl	-
BH01	Above GL	-	-
BH05	12 m bgl	-	-
BH201	10.5m bgl	-	

BH203	9.5m bgl	-	
Tide Level	n/a	-	

The groundwater monitoring data suggests that, as previously, during the drilling groundwater was generally encountered at depth. Subsequent monitoring indicates that the groundwater is near surface. This could be due to the monitoring wells creating preferential pathways for the groundwater, making it appear higher than it actually is. Within some of the trial pits excavated, groundwater seepage was noted at the base of some of the pits at approximately 4m bgl.

Artesian groundwater was not encountered during this phase of the ground investigation as drilling was not progressed to the chalk. Previously BH01 encountered artesian groundwater and the water appears to still be near surface within that monitoring well.

Groundwater sampling for chemical analysis was undertaken in the BHs referred to on 15th September 2024. The wells were purged of three well volumes and the water purged from the wells was generally noted to be of dark grey and dark brown in colour, with some suspended sediment. No sheens or other odours were noted during the sampling.

9 SOIL ASSESSMENT – PLOT C & PLOT I

Soil chemical analysis results are included in Appendix D, undertaken by Chemtest. The following sections provide the assessment and comparison against relevant screening values of the chemical analysis undertaken.

9.1 Interpretation of Soil Analysis Data

Comments on the significance of the testing results and our recommendations are based on Mayer Guidelines for the Assessment of Soil Quality and current UK good practice. Further information on this is included in Appendix G.

9.2 General

The following analytes have been assessed in accordance with good practice and respective guidance.

9.2.1 Asbestos in Soils

Asbestos was not identified in any of the samples screened across both Plot C and Plot I.

9.2.2 pH

The soil pH values in the samples across both plots typically varied between slightly alkaline to alkaline (pH values from 7.4 to 9.4).

9.2.3 Sulphur & Sulphides

From the sampling and analysis undertaken, concentrations of total sulphur and sulphides detected within the soil samples across both plots were not considered significant.

9.3 Human Health Risk Assessment Explanation

Contaminant linkages for human health have been risk assessed by comparing the reported soil laboratory results to Tier 1 Screening Values. Following the rationale of Land Contamination Risk Management (LCRM) guidance, Environment Agency, October 2020 (formerly CLR11), this Tier 2 assessment uses soil screening values for the Contaminated Land Exposure Assessment (CLEA) land end use relevant to commercial end use, commensurate to the proposed land use of the site.

Soil screening values used are the Soil Guideline Values (SGVs) to assess the long term exposure of chemicals in soil to human health, generic assessment criteria (GAC) from CLEA; with updates from more recent Category 4 Screening level (C4SL) and Suitable for Use Levels (S4UL) from CIEH / LQM used where applicable, (for simplicity all are referred to as GAC).

For the statistical computations of the chemical analysis, where less than the detection limits (e.g. <0.01) has been reported to enable the statistical calculations, the detection limit has been chosen (e.g. for <0.01, the value 0.01 used for the statistics). This enables a reasonable conservative value for the statistics generated.

The background behind the statistical tests is included in Appendix E. The tests have been undertaken using excel-based spreadsheet calculations.

9.4 Metals /Metalloids

No significant levels of metals were identified within any of the samples analysed from either the Made Ground or Natural ground from both plots.

9.5 Phenols

Phenols were below the limit of detection (<0.1mg/kg) in all of the soil samples analysed from both plots, from both the Made Ground and Natural Ground.

9.6 Polychlorinated Biphenyls (PCBs)

PCBs were recorded below the limit of detection (LOD) in all samples analysed across Plot C.

9.7 Poly Aromatic Hydrocarbons

PAHs were not identified at significant levels in either the Made Ground or Natural ground on both plots.

9.8 Petroleum Hydrocarbons

The data provided is based on the findings of the TPH Criteria Working Group (TPH CWG). TPH CWG analysis involves the samples to be subjected to a column clean up to extract both the aromatic and aliphatic fractions, which are then quantified. The clean-up also removes any plant-derived materials.

None of the speciated and fractionated hydrocarbon band concentrations within both the Made Ground and Natural Clay samples were shown to be at significant levels across both plots.

9.9 Semi Volatile Organic Compounds (SVOCs) & Volatile Organic Compounds (VOCs)

From the sampling and analysis undertaken, no SVOC or VOC concentrations were in excess of their respective GACs in the samples analysed from both plots.

9.10 PFOA/PFOA

A small number of near surface soil samples were submitted for PFOS and PFOA to determine if the adjacent landfill was having any significant impact on the site, as Mayer have been made aware of the presence of PFOS and PFOA within the surrounding ditches.

PFOS and PFOA were not detected above the level of detection within the samples tested.

10 SOIL ANALYSIS – BNG MITIGATION AREAS

Soil chemical analysis results are included in Appendix D, undertaken by Chemtest. The following sections provide the assessment and comparison against relevant screening values of the chemical analysis undertaken for the soil samples collected from the BNG mitigation areas.

A Public Open Space (Park) end use has been used to risk assess the reported laboratory results where applicable.

10.1 Asbestos in Soils

Asbestos was not identified in any of the samples screened across the BNG Mitigation areas.

10.2 pH

The soil pH values in the samples across the BNG mitigation areas were typically alkaline (pH values from 8.2 to 9.0).

10.3 Sulphur & Suphides

From the sampling and analysis undertaken, concentrations of total sulphur and sulphides detected within the soil samples across both plots were not considered significant.

10.4 Metals /Metalloids

No significant levels of metals were identified within any of the samples analysed from either the Made Ground or Natural ground from the BNG Mitigation areas.

10.5 Phenols

Phenols were below the limit of detection (<0.1mg/kg) in all of the soil samples analysed from the BNG Mitigation areas.

10.6 Polychlorinated Biphenyls (PCB's)

PCBs were recorded below the limit of detection (LOD) in all samples analysed across the BNG Mitigation areas.

10.7 Poly Aromatic Hydrocarbons

PAHs were not identified at significant levels in any of the samples tested from the BNG Mitigation areas.

10.8 Petroleum Hydrocarbons

The data provided is based on the findings of the TPH Criteria Working Group (TPH CWG). TPH CWG analysis involves the samples to be subjected to a column clean up to extract both the aromatic and aliphatic fractions, which are then quantified. The clean-up also removes any plant-derived materials.

None of the speciated and fractionated hydrocarbon band concentrations within any of the samples tested were shown to be at significant levels across the BNG Mitigation areas.

10.9 Semi Volatile Organic Compounds (SVOCs) & Volatile Organic Compounds (VOCs)

From the sampling and analysis undertaken, no SVOC or VOC concentrations were in excess of their respective GACs in the samples analysed from the BNG Mitigation areas.

10.10 Topsoil Assessment

One sample from TP211 was assessed against topsoil parameters to determine the topsoil quality in the BNG Mitigation areas.

The sample tested was shown to be slightly deficient in nitrogen and with slightly elevated levels of magnesium. In addition, the clay and silt fractions of the topsoil were shown to be high with a very low sand content.

Overall it is unlikely that the nutrient deficiencies/exceedances are likely to have a significant impact on the vegetation that may be present on the site. The high clay and silt fractions may suggest that drainage in this area may be poor and they may be prone to waterlogging.

11 GROUNDWATER & DITCH CONDITIONS & ANALYSIS

11.1 Summary of Groundwater Conditions

Groundwater samples were collected 15th August 2024 from the boreholes (BH201, BH203, WS204 and WS01). As discussed in section 6.5, groundwater levels recorded indicate that there is a tidal influence on the groundwater levels. The groundwater appears to sit within the Tidal Flat Deposits, likely within the higher permeability strata within the clay such as the sands and gravels layers identified

The groundwater levels recorded to date indicate that the groundwater flow is towards the estuary as would be expected.

11.2 Screening / Comparison Values

To assess the groundwater analysis, conservative UK Drinking Water Standards (DWS) or Environmental Quality Standards (EQS) that are relevant to controlled waters as a receptor have been sourced with a dilution of factor of one to two orders of magnitude (i.e. DWS / EQS x10 or 100) calculated as a comparison value (CV) for the groundwater analysis assessment. The DWS & EQS are the only quality standards available in the UK for assessment and are considered highly conservative; therefore these will be highly protective when taking into account that the site is not located within a Source Protection Zone (SPZ).

11.3 Analysis Results - Groundwater

11.3.1 Metals

Low concentrations of metals were detected at all locations at levels that would not be considered significant and were below the relevant screening values.

11.3.2 Organics

Generally, all organic parameters were below the limit of detection. Low levels of the heavier end aliphatic fractions of hydrocarbons were detected within sample WS204, but not at levels that would be considered significant.

11.3.3 PFOS/PFOA

Within the samples analysed, the samples from BH201 and BH203 displayed very low levels of PFOS, with BH203 also displaying very low levels of PFOA. The samples from WS01 and WS204 did not display any levels of PFOS and PFOA above the relevant LOD.

11.4 Summary of Water Conditions – Ditch

The three samples collected from the Oldfleet Drain and the pipe ditch that runs between the plots did not display any significant sheens or odours at the time of sampling. The water at all locations was noted to have the presence of surface vegetation and to be tinged green and brown in colour.

11.5 Analysis Results – Ditch

11.5.1 Metals

Low concentrations of metals were detected at all locations at levels that would not be considered significant and were below the relevant screening values.

11.5.2 Organics

All organic parameters were noted to be below the limit of detection.

11.5.3 PFOS/PFOA

The two samples from the Oldfleet Drain were taken upstream and downstream of the corner of the landfill where a breach was noted to determine if this has had any impact on the drain. PFOA were detected at low levels within both samples but not at significantly different levels that would indicate the landfill has had an impact. However, low levels of PFOS were detected in the downstream sample with the upstream sample displaying lower PFOS levels. This could suggest that the landfill has had impact on the PFOS levels in the Oldfleet Drain.

The sample collected from the pipe ditch running between the two plots displayed significantly higher levels of PFOS, and particularly PFOA, which would confirm the Local Authorities statement that they have previously been detected in this area.

11.6 Analysis Results – BNG Mitigation Area Lagoon

11.6.1 Metals

Low concentrations of metals were detected within the sample that would not be considered significant and were below the relevant screening values.

11.6.2 Organics

All organic parameters were noted to be below the limit of detection.

11.6.3 PFOS/PFOA

Low levels of PFOS and PFOA were detected within the sample of lagoon.

12 GROUND GAS

12.1 Ground Gas Monitoring

Ground gas monitoring on window sample locations WS01 through WS04 was undertaken on three occasions from mid-July to mid-August 2024, using a portable landfill gas monitoring equipment during, as reasonably practicable, periods of falling atmospheric pressure, in accordance with BS 8485:2015.

An analox infrared monitor was used to measure concentrations of methane, carbon dioxide and oxygen. The analox instrument is intrinsically safe and displays the presence of the three gases in the range of 0.1% to 100% concentration. The instrument samples continuously by pumping air over its detectors and displaying the concentration of methane, carbon dioxide and oxygen. Atmospheric pressure was also recorded. The presence of volatile organic compounds (VOCs) was recorded using a photo ionisation detector (PID). Initially, the PID and GFM 436 meters were turned on and 'fresh air' was pumped through to confirm zero and stable readings. Once the meters were calibrated, the GFM 436 gas monitor was attached to the borehole using the pipe for recording airflow, the gas valve was opened and any positive or negative flow rate was recorded. The gas valve was closed and the pipe removed. The pipe used for 'standard gas monitoring' was attached to the borehole and the valve opened. The PID meter was attached to the outflow tubing. At every 30-second interval (for a maximum of 300 seconds (five minutes)) the oxygen, carbon dioxide, methane, hydrogen sulphide, carbon monoxide and VOCs were recorded. The data is presented in the certificates of analysis in Appendix F and the following table summarises the ground gas monitoring data collected where the stabilised readings of ground gases were above the LOD.

TABLE 10.0 SUMMARY OF GROUND GAS MONITORING DATA

Borehole	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow (l/hr)	Atm. Pressure (mb)	Tide Level
WS01	<0.1	<0.1	17.7	<0.1	1012	
	<0.1	0.4	19.4	-	1010	Low
	<0.1	2.5	19.6	-	1015	Low
WS02	<0.1	1.6	15.1	<0.1	1012	
	<0.1	0.4	19.4	-	1010	Low
	<0.1	2.3	19.9	-	1010	Rising
BH03	-	-	-	-	-	-
	-	-	-	-	-	-
	87.6	4.1	0.6	-	1010	Rising
BH05	-	-	-	-	-	-
	-	-	-	-	-	-
	60.1	7.6	6.5	-	1015	Low

Borehole	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow (l/hr)	Atm. Pressure (mb)	Tide Level
WS204	6.2	3.4	16	-<0.1	1008	
	<0.1	6	15.2	-	1010	Rising
	13.3	7.5	10.5	-	1010	Rising
BH201	-	-	-	-	-	-
	1.5	0.9	16.7	-	1010	High
	1.8	1.6	15	-	1010	Rising
BH203	-	-	-	-	-	-
	<0.1	0.2	19.2	-	1010	Falling
	0.4	3.8	18	3	1010	Rising

As seen previously, the levels of methane identified in BH03 and BH05 were extremely elevated on the one occasion they were monitored (on other occasions the gas bungs were missing and they were unable to be monitored). Although low levels of methane and/or carbon dioxide were identified in a number of other locations they would not be considered significant. The recent drilling does not appear to confirm that there is a certain area of the site that is producing ground gas as BH201 and BH203 are positioned between BH03 and BH05 where significant levels of methane have been identified.

Previously, dissolved methane was tested for within groundwater samples from BH03 and BH05. Although this testing was not undertaken during this phase it is considered likely that dissolved methane is present in the groundwater at these locations, as seen previously.

Although it is considered likely that, as before, the presence of the alluvium within the grey clay is the source of the methane within the groundwater and within the headspace of the monitoring wells, the absence of methane from the two deeper wells at locations BH201 and BH203 suggests that this may not be case across the whole site.

As before, the groundwater levels monitored at all locations have been close to the surface and therefore there has been minimal headspace within the wells. In addition, the groundwater levels appear to be affected by the tide and fluctuate.

Due to the levels of dissolved methane identified within the groundwater, it is considered likely that the elevated gas concentrations in the well headspace could be due to continuous partitioning of methane in and out of the gaseous phase. The gas becomes trapped within the headspace and can give high concentrations during monitoring, particularly when the response zone of the well is flooded.

Typically, in accordance with CIRIA C665, the ground gas concentrations and flow rates recorded during the monitoring visit would be used to determine potential risks to future site users. However, using the maximum concentration of methane identified and highest flow reading would immediately indicate the highest characteristic situation is present, which may not be the case.

We understand that the site levels may need to be raised due to flood risks and surcharging of the site would be necessary to ensure settlement is not an issue. If this is to occur, we would consider that further monitoring will be required once this has been undertaken to establish if raised ground levels impact the ground gas generation and if it is present at the site surface. The stiff clay naturally present at the surface and the placing of material to raise site levels may act as a capping layer, but further monitoring will be require to establish this.

13 GEOTECHNICAL TESTING

13.1 Soil Testing

Soils testing, as with the ground investigation took place in two phases.

13.1.1 Phase 1 2023

A total of 51 No. soil samples of Made Ground and natural strata were submitted for geotechnical laboratory testing with the majority of the testing being on the natural soils due to limited Made Ground being present. Tests included:

- Moisture Content (BS 1377:1990 Part 2 Clause 3.2);
- Liquid Limit (BS 1377:1990 Part 2 Clause 4.3);
- Plastic Limit (BS 1377:1990 Part 2 Clause 5);
- Particle Size Distribution (PSD) by Wet Sieve (BS 1377:1990 Part 2 Clause 9.2);
- Particle Size Distribution (PSD) by Sedimentation (BS 1377:1990 Part 2 Clause 9.5);
- Particle Density (BS 1377-2: 1990: Clause 8.2)
- One Dimensional Consolidation Oedometer (BS 1377:1990 Part 5 Clause 3);
- Undrained Shear Strength (Single Stage) in Triaxial Compression (BS 1377:1990 Part 7 Clause 8); and
- pH and Sulphate testing to BRE Special Digest 1

The completed Geotechnical Laboratory Soil Analysis Reports and a summary of the full record of geotechnical soil testing are presented in Appendix J (laboratory report ref: 23-61503-1 and 23-61503 (pH and sulphates)).

13.1.2 Phase 2 2024

A total of 15 No. soil samples of natural strata were submitted for geotechnical laboratory testing, which included:

- Moisture Content (BS 1377:1990 Part 2 Clause 3.2);
- Liquid Limit (BS 1377:1990 Part 2 Clause 4.3);
- Plastic Limit (BS 1377:1990 Part 2 Clause 5);
- Particle Density (BS 1377-2: 1990: Clause 8.2)
- One Dimensional Consolidation Oedometer (BS 1377:1990 Part 5 Clause 3);
- Undrained Shear Strength (Single Stage) in Triaxial Compression (BS 1377:1990 Part 7 Clause 8); and

The completed Geotechnical Laboratory Soil Analysis Reports and a summary of the full record of geotechnical soil testing are presented in Appendix I (laboratory report ref:24-029679-1).

13.2 Rock Testing

Rock cores, although initially planned as part of the 2023 investigation, were not undertaken. Ground conditions were reviewed throughout the fieldworks, and the glacial till was found to be relatively stiff, and thicker than originally anticipated, with variable and less competent results found in the chalk. It was anticipated that foundations would be within the glacial till rather than the rock, hence rock information would not be required.

13.3 In-Situ Field Testing

In-Situ field and geotechnical testing comprised the following has been undertaken across the site:

- 146 No. SPTs were completed at approximate 1m intervals to a maximum depth of 27m bgl in Made Ground and natural strata (87 No. in Phase 1; 59 in Phase 2).
- 14 No. cone penetration tests (CPTs) to final depths of between 15.00 and 25.00m bgl (6 No. Phase 1; 8 No. Phase 2).
- 1 No. set of downhole seismic testing (comprising P/S wave velocity and soil engineering properties including shear modulus, bulk modulus, Young's modulus) completed to a maximum depth of 30m bgl in BH02.
- 9 No. Plate Load Tests to obtain approximate CBR Value at a typical depth of 0.1m below ground surface (formation level).
- 22No. Hand Shear Vane tests to obtain undrained shear strengths at depths between 0.1 and 3.7mbgl in the trial pits.

14 GEOTECHNICAL TEST RESULTS

The results of the geotechnical in-situ testing and laboratory testing have been included as factual data only. Interpretation with regards to future foundation design will need to be carried out by specialist designers once the design is completed and the loads are known.

14.1 SPT Testing

The Standard Penetration Test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The number of blows to penetrate 450 mm is recorded. The number of blows to penetrate the initial 150 mm is disregarded to account for material disturbed by the borehole process. Hence the SPT N_{300} value is the number of blow counts to penetrate 300 mm of undisturbed ground. The full test procedure is described in more detail in BS ISO 22476-3.

In-situ field geotechnical testing comprised 146 No. SPT tests generally undertaken at 1m intervals within Made Ground and natural strata across the site to a maximum depth of 27m bgl. The SPT results indicate that the ground strength varied laterally and vertically across the site. The SPT results from the testing undertaken are summarised in the table below and in Figure 1.

TABLE 14.1 - SUMMARY OF SPT TEST RESULTS

Strata	No. of SPTs	SPT N-Value Minimum	SPT N-Value Average	SPT N-Value Maximum
Made Ground	2	17	17.5	18
Tidal Flat	74	0	2.6	11
Peat	8	0	0.9	3
Glacial Till (Cohesive)	37	4	23.4	50
Glacial Till (Granular)	15	8	31	50
Chalk	10	21	39.6	50

The SPT tests indicate that the tidal flat deposits have a higher strength desiccated crust.

Note that there is a wide range of SPT N-value in the granular till and the chalk. This is due to a range of factors:

- The low SPT N-values in the glacial sands are probably due to drilling with water balance not being correctly maintained. All N-values below 8 to 10 are probably affected by 'piping' reducing the density.

- High N-values in the gravels are probably due to the influence of coarse gravel and cobbles of flint on the relatively small diameter of the SPT sampler giving high results which are a function of particle size rather than the density of the ground.
- The variable SPTs in the chalk are due to variable weathering creating low density & strength zones and the high N-values due to coarse gravel and cobbles of chalk.

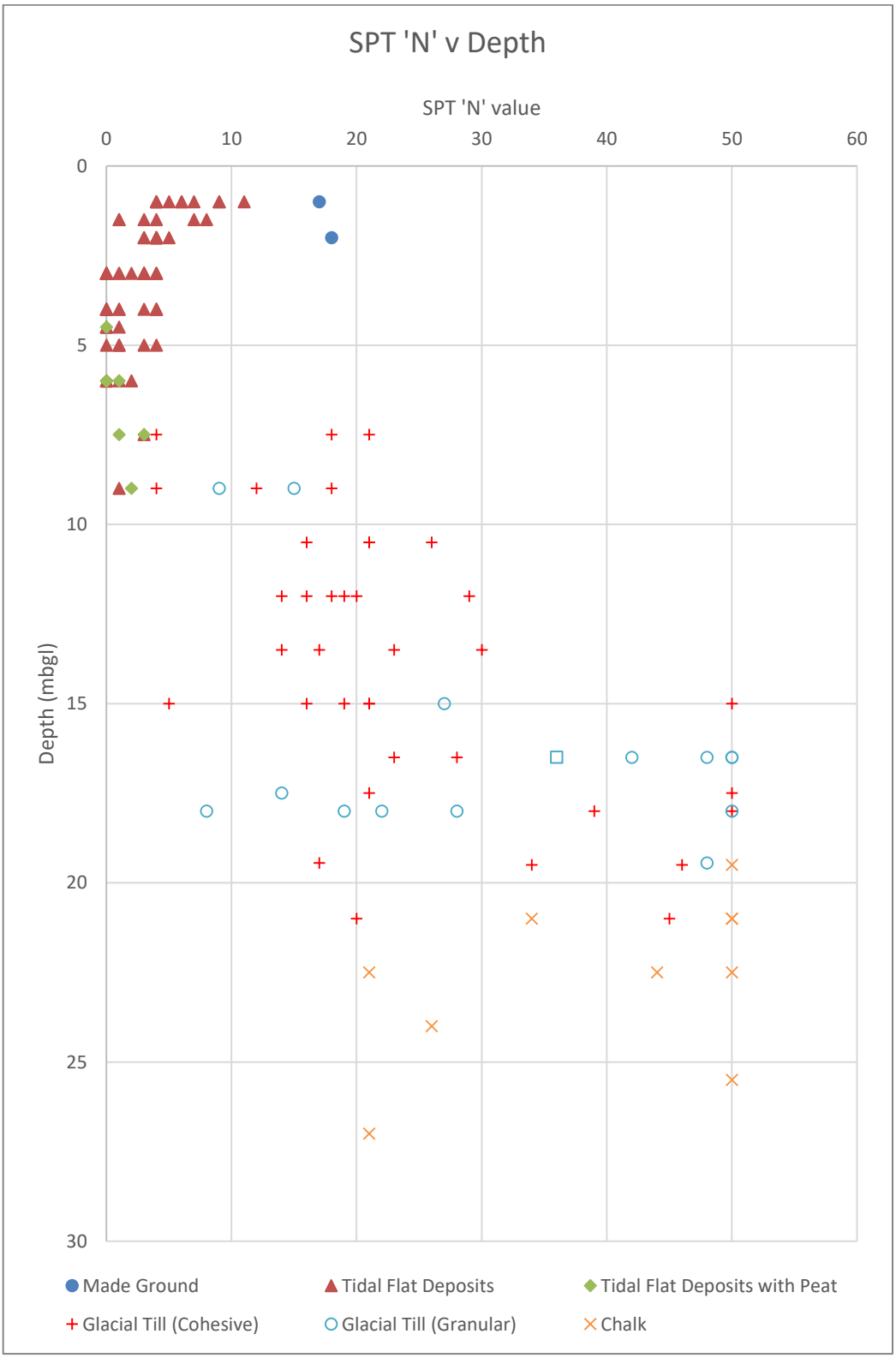


FIGURE 1 - SUMMARY OF SPT TESTS BY MATERIAL TYPE -SPT N-VALUE AGAINST DEPTH

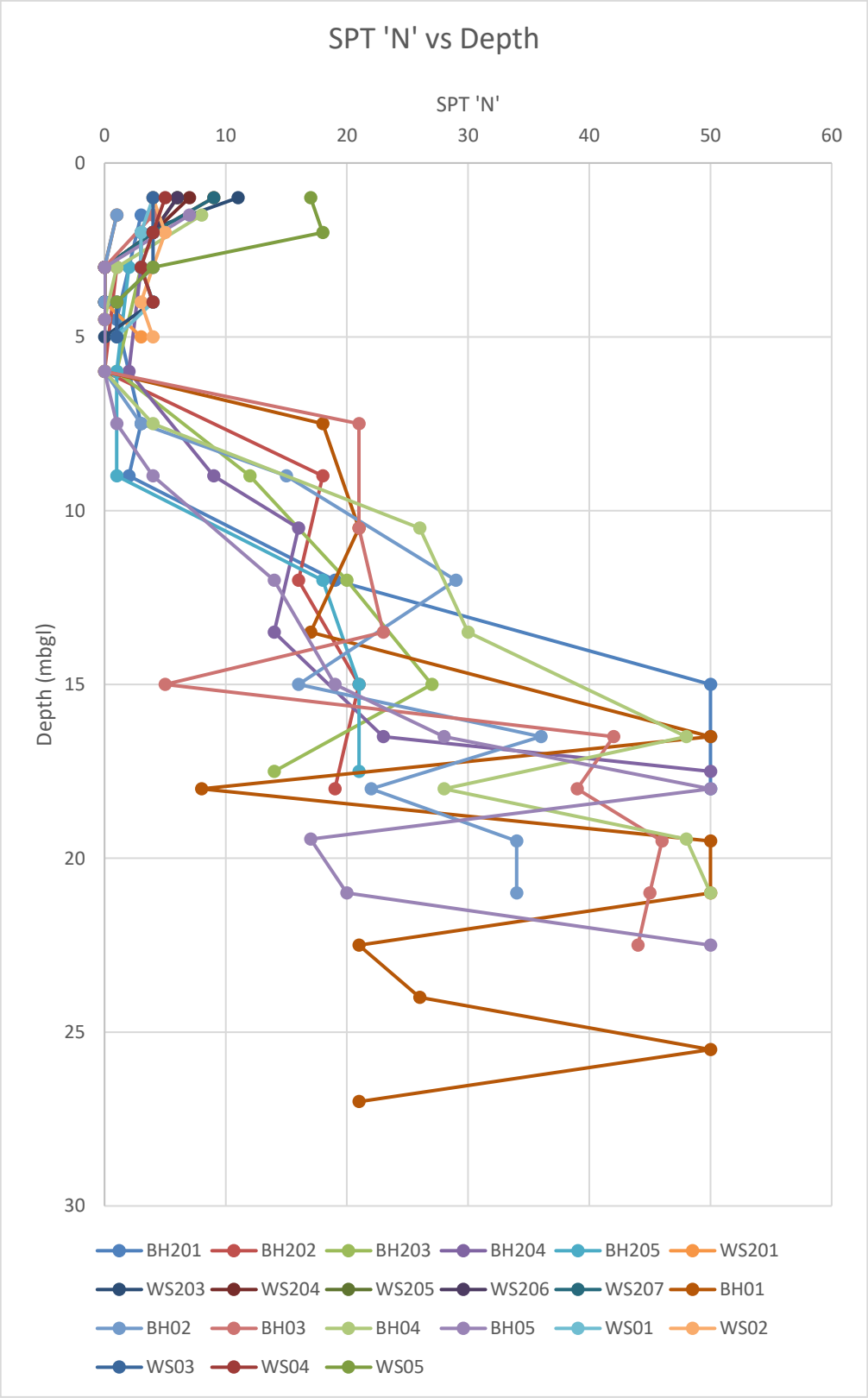


FIGURE 2 - SUMMARY OF SPT TESTS BY EXPLORATORY HOLE -SPT N-VALUE AGAINST DEPTH

14.2 CBR Plate Load Testing

Plate Loads were undertaken at nine locations to determine CBR values. At each location, the top 0.1m was removed and the test was undertaken at formation level.

TABLE 14.2 - SUMMARY OF PLATE LOAD TEST (AND CBR) RESULTS

Sample ID	Depth (m bgl)	Plate Diameter (mm)	Approximate CBR Value (%)
CBR1	0.10	**300**	**1.8**
CBR2	0.10	**300**	**10**
CBR3	0.10	**300**	**0.7**
CBR4	0.10	**300**	**15**
CBR5	0.10	**300**	**2.4**
CBR6	0.10	**300**	**6.3**
CBR7	0.10	**300**	**1.9**
CBR8	0.10	**300**	**0.9**
CBR9	0.10	**300**	2.9

14.3 Cone Penetration Testing

Cone penetration testing was undertaken to ascertain soil property information for use in settlement analysis and geotechnical modelling. The testing comprised 16No. CPTs, 6 CPTs being sunk in the 2023 investigation and 10 in the 2024 investigation. The CPTs were carried out in general accordance with BS ISO 22476-1:2012 using a 20-tonne tracked rig utilising a piezocone. Two of the Phase 2 CPTs terminated at shallow depth within in the Tidal Flat Deposits to allow for dissipation testing. Eleven of the fourteen deeper CPTs terminated on granular bands in the glacial till with only three of them fully penetrating these granular layers.

The soil profile indicated by CPT218 is of note, as this is significantly different to those noted in the other CPTs, and the boreholes. The sleeve frictions noted for this hole are considerably lower than those observed in the other profiles, with the materials interpretated as 'clean' and 'silty' sands. These granular materials are noted to be present at depths typically occupied by the tidal flat deposits and cohesive glacial till material elsewhere at the site. It is possible that this material represents an infilled tidal creek/glacial channel.

As can be seen by reference to the CPT reports (attached as Appendix J), a series of soil properties have been derived from the end cone resistance and sleeve friction resistance results using empirical relationships and published data. These include equivalent SPT N_{60}, modulus of volume change potential (m_v), Young's modulus E_o, Friction angle ϕ', and relative density. The correlations used to derive many of these properties are based on research and data conducted in clean sands or relatively homogenous clays, akin to the glacial till encountered beneath the site. The correlation for m_v makes use of the constrained modulus, which is intended for all soil types. The average results from the CPTs are summarised in the table below. Summary plots of CPT data are presented in Figure 2 with approximate indication of strata (note the boundaries vary from location to location so boundaries are approximate).

TABLE 14.3 - SUMMARY OF CPT DERIVED APPROXIMATE GEOTECHNICAL PARAMETERS

Test Location Ref	Depth to Refusal (m bgl)	Undrained Shear Strength (kPa)	Volume Change Coefficient, m_v (m^2/MN)	Friction Angle ϕ' (°)	Young's Modulus E_0 (MPa)	Unit Weight γ_B (kN/m^3)
CPT01	24.94	Tidal Flat Deposits: Very Soft to firm Glacial Clay: stiff	0.1 - >4 Tidal Flat Deposits 0.1 Glacial Clay	10 – 40 in Glacial Sand	60-125 Tidal Flat Deposits 180-260 Glacial Clays 300 Glacial Sands	Tidal Flat Deposits 15-18 Glacial Clay 18-19 Glacial Sand 18-19
CPT02	16.85					
CPT03	14.85					
CPT04	21.15					
CPT05	15.01					
CPT06	15.12					
CPT215	16.75					
CPT215A	5.04					
CPT216	16.09					
CPT217	16.18					
CPT218	16.16					
CPT219	16.21					
CPT220	15.59					
CPT220A	4.99					
CPT221	20.03					
CPT222D	16.97					

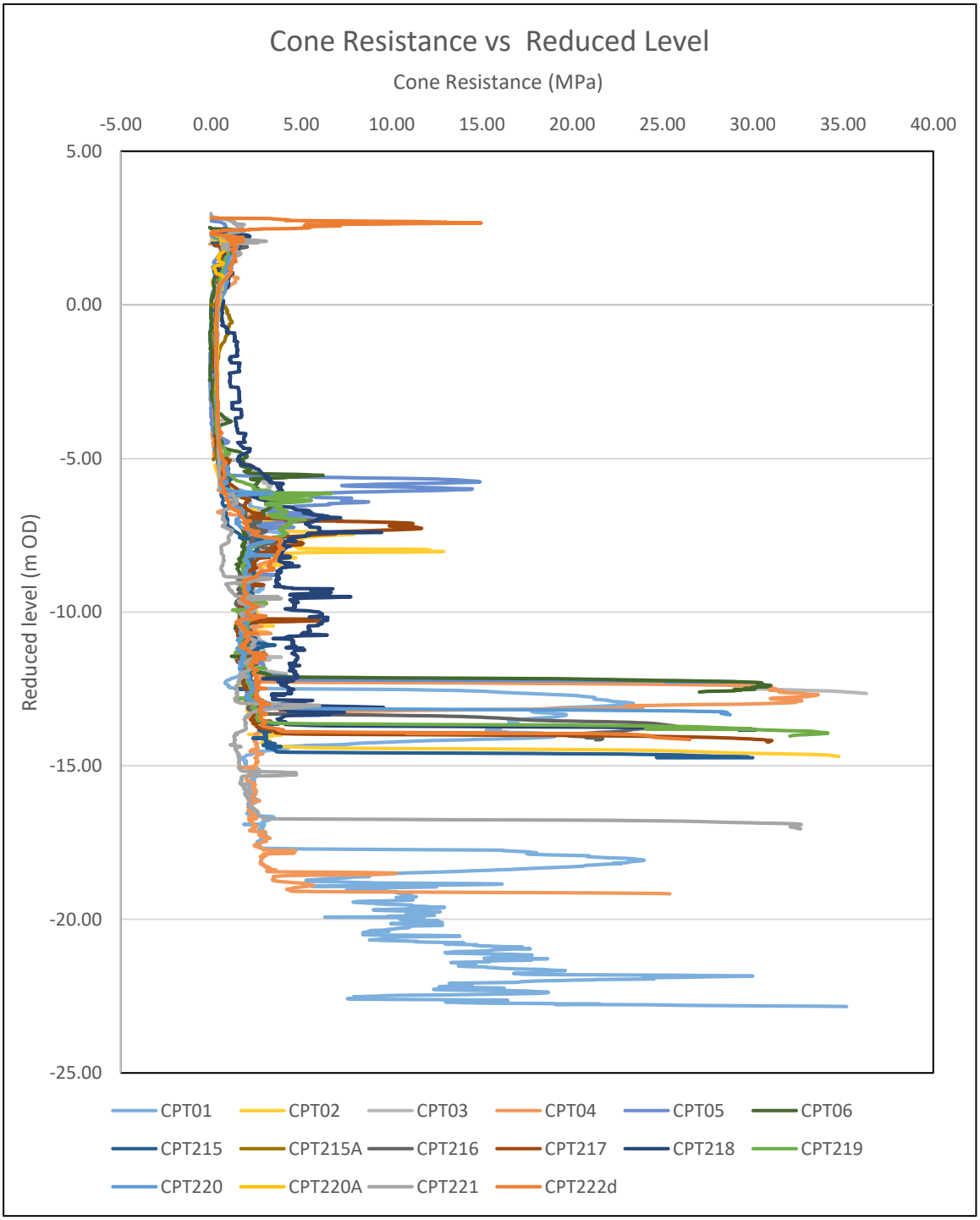


FIGURE 3 - SUMMARY OF CPT TESTS – CONE RESISTANCE AGAINST REDUCED LEVEL

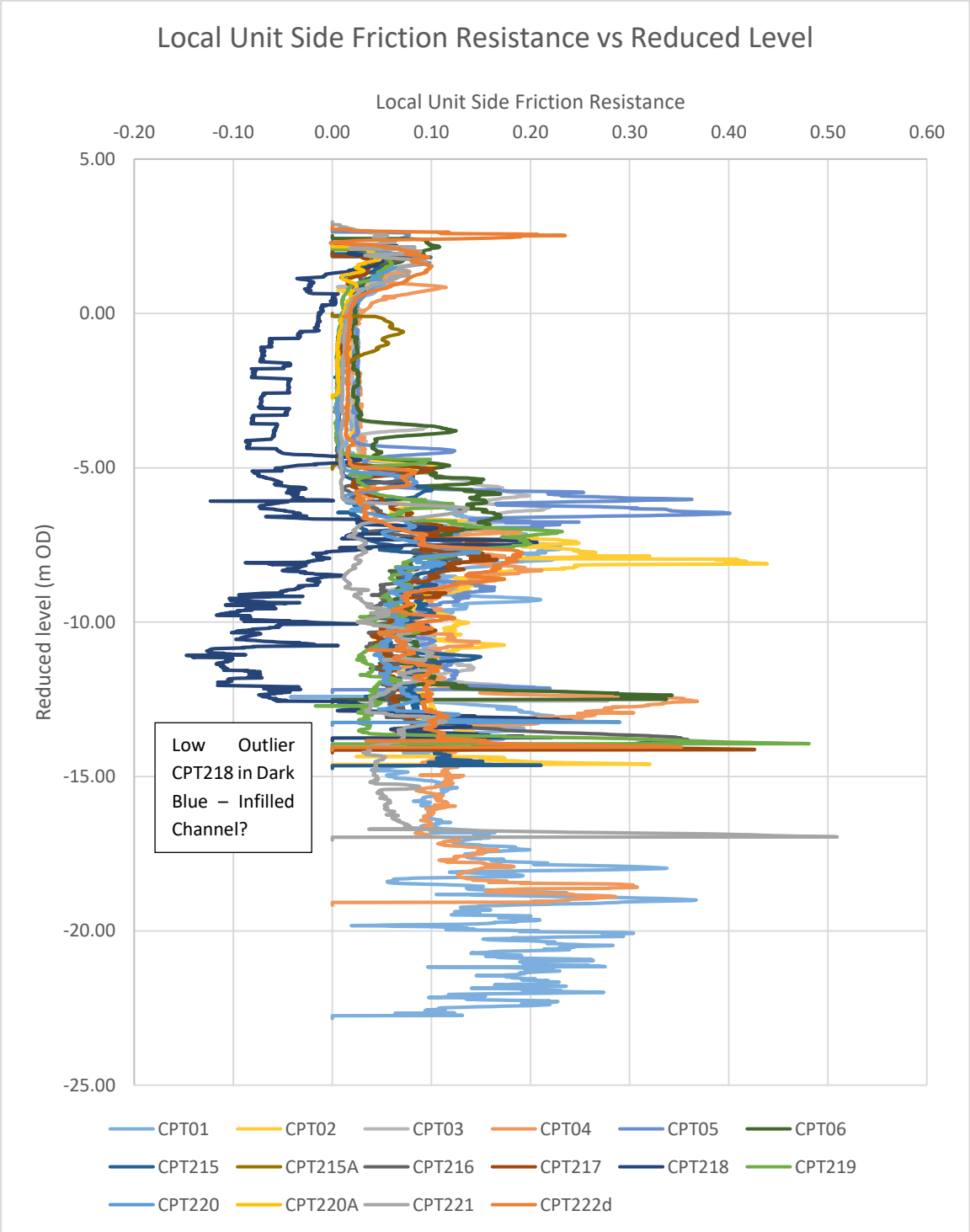


FIGURE 4 - SUMMARY OF CPT TESTS – LOCAL UNIT SIDE FRICTION AGAINST REDUCED LEVEL

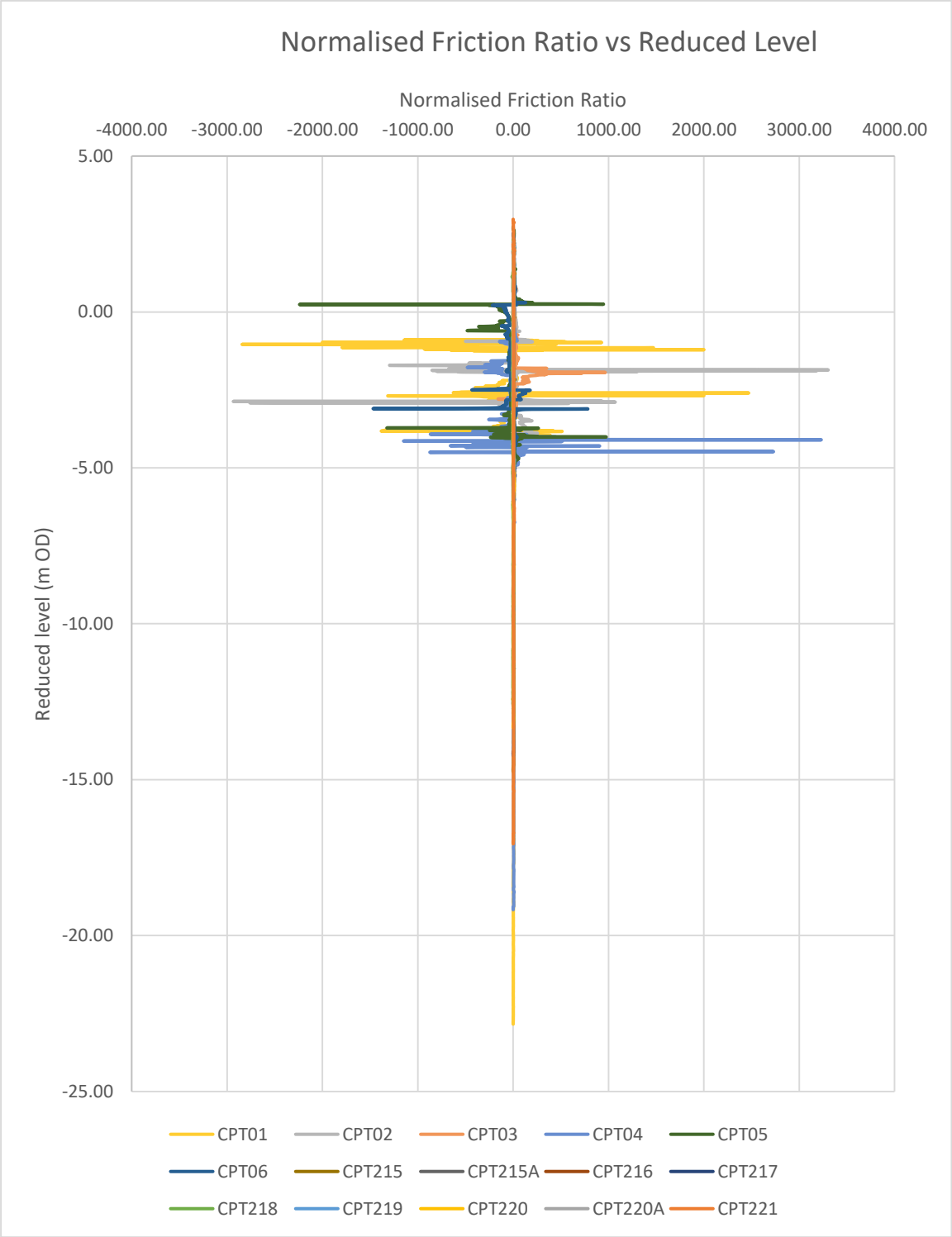


FIGURE 5 - SUMMARY OF CPT TESTS – NORMALISED FRICTION RATIO AGAINST REDUCED LEVEL

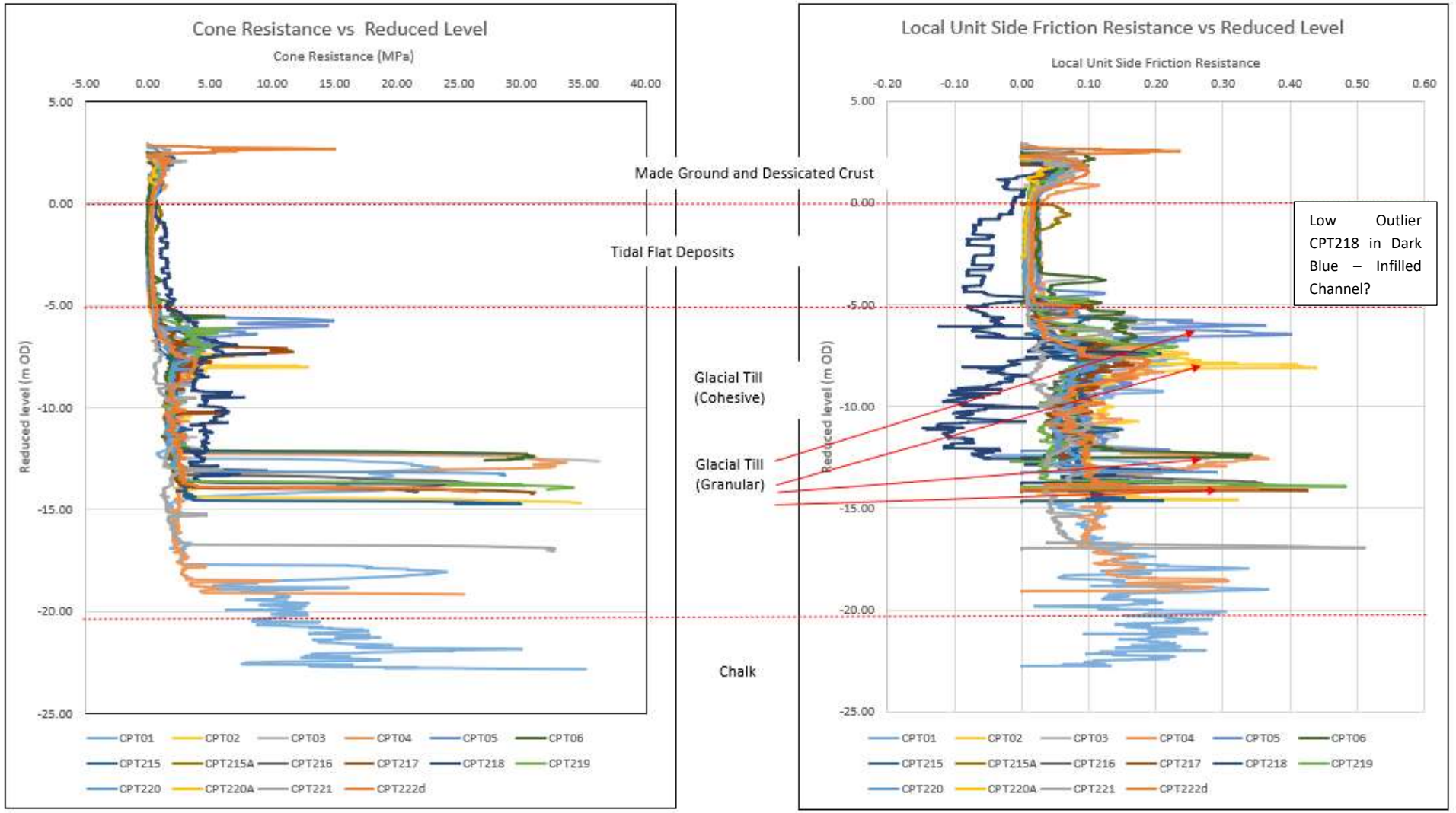


FIGURE 6 - SUMMARY OF CPT TESTS

14.4 Seismic Surveying

As part of the first phase of works downhole seismic test (measuring P/S wave velocity and soil engineering properties including shear modulus, bulk modulus, Young's modulus) were completed to a maximum of 20m bgl in BH02 In the second phase of works seismic testing was carried out adjacent to CPT218 and CPT219 using a Marchetti dilatometer with as part of the second phase of investigation with this being surface to downhole testing with. Note that CPT218 was the location which had the CPT profile which was an outlier from the rest of the CPT testing.

Reference should be made to the factual reports attached in Appendix K, which is summarised below:

From Figure 7 and 8 it can be seen that the seismic p-wave and s-wave testing from the three locations carried out nearly one year apart are actually in very close agreement, particularly given:

- Using two different methods of collecting the data.
- The lateral distance between the three locations and the different measurement types.

The P-wave velocity was observed to decrease slightly at around 13m depth, which implies that the clays and sand below this point are highly saturated and the clays have a consistent Young's Modulus below this depth but the shear modulus reduces in the lower part of the glacial till.

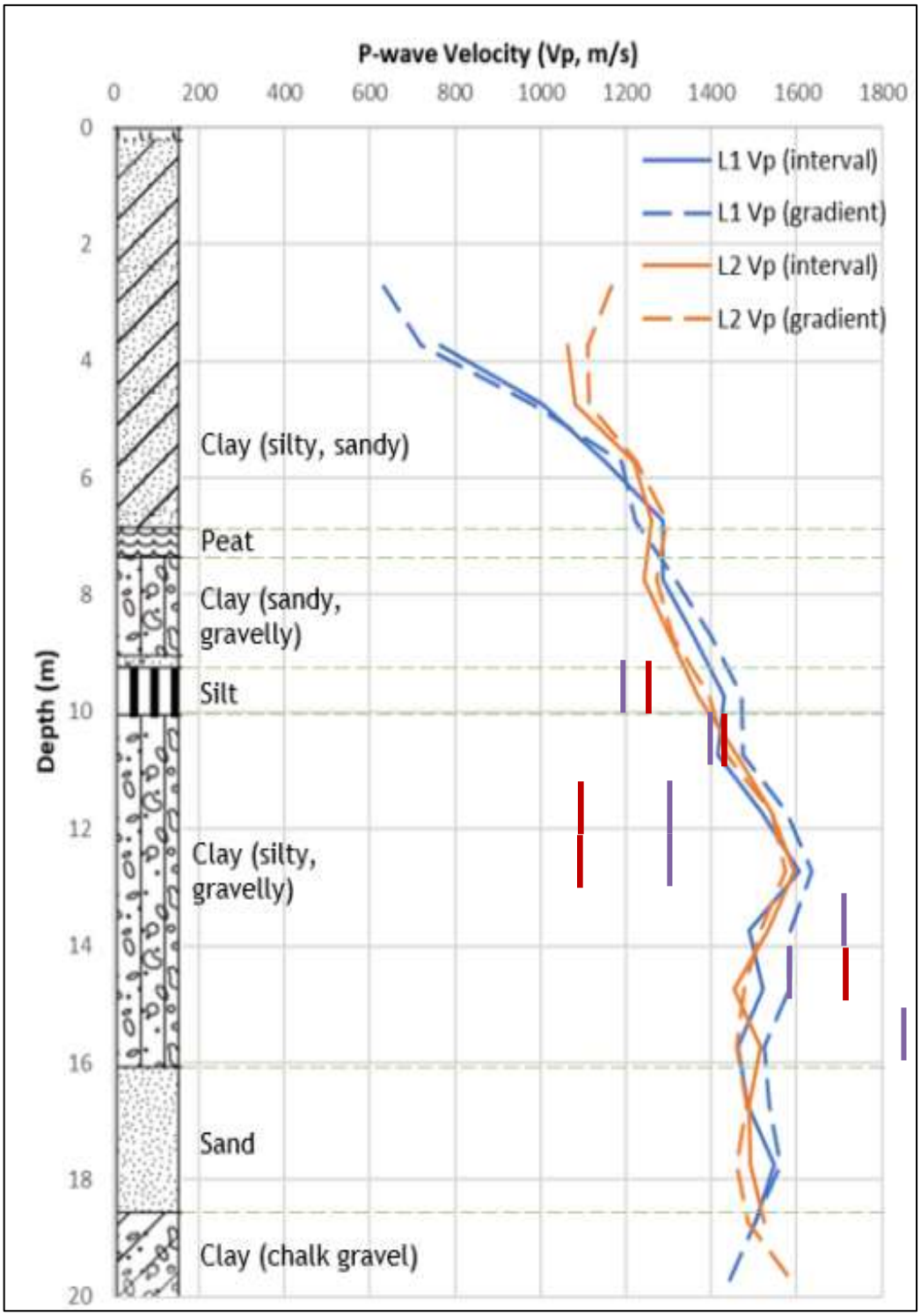


FIGURE 7: P-WAVE VELOCITY AGAIST REDUCEND LEVEL FROM ZETICA SEISMIC SURVEY REPORT

Blue and Orange Lines from 2023 BH02, Red lines from CPT218 and Purple from CPT219

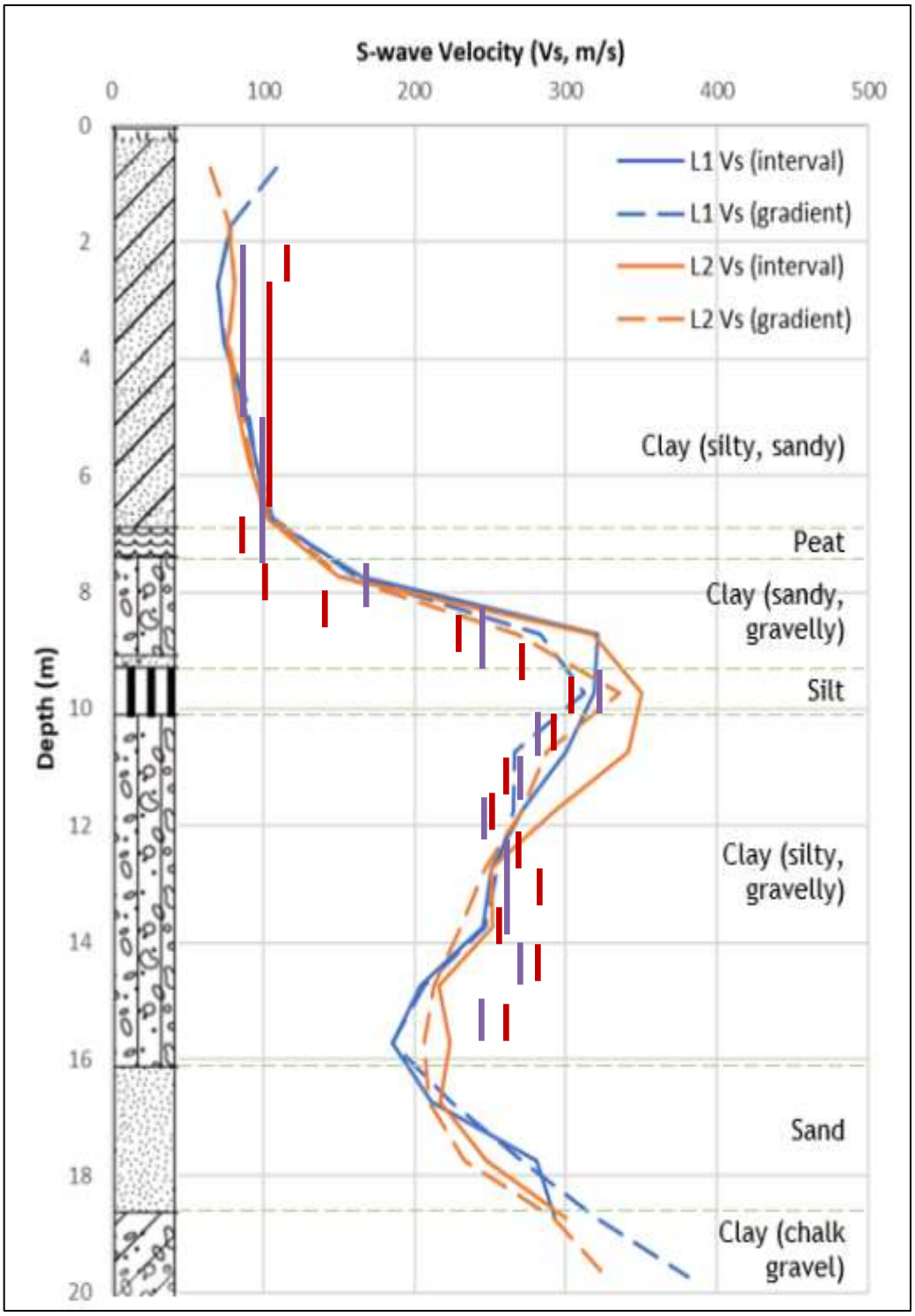


FIGURE 8: S-WAVE VELOCITY AGAIST REDUCEND LEVEL FROM ZETICA SEISMIC SURVEY REPORT

Blue and Orange Lines from 2023 BH02, Red lines from CPT218 and Purple from CPT219

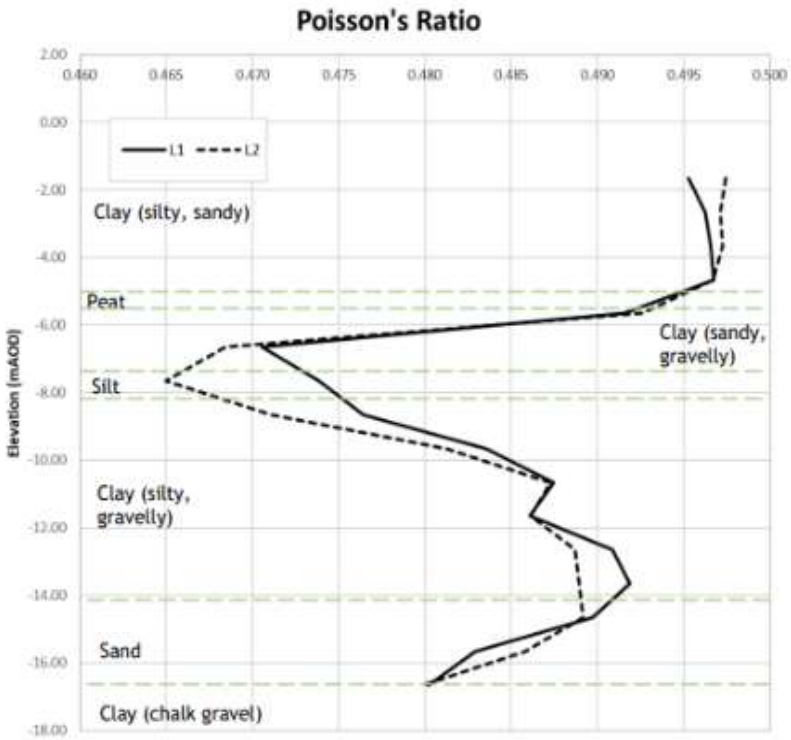


Figure 16: Poisson's Ratio calculated from the velocities derived from the L1 and L2 source locations, varying with elevation (mAOD).

FIGURE 9: POISSON'S RATIO FROM ZETICA SEISMIC SURVEY REPORT IN 2023

TABLE 14.4 – CALCULATED DESIGN PARAMETERS FROM SEISMIC TESTING

Geotechnical results calculated from the L1 shot location (3 m offset)									
Depth (m)	Elevation (mOD)	Vs (m/s)	Vp (m/s)	Estimated Bulk Density (kg/m3)*	Velocity Ratio V_p/V_s	Soil Engineering Properties (ref: https://doi.org/10.1016/0148-9062(88)90985-0) Shear Modulus (G_m) (MN/m^2)	Poisson's Ratio	Young's Modulus E_v (MN/m^2)	Bulk Modulus K (MN/m^2)
1.73	0.34	79							
2.73	-0.66	70							
3.73	-1.66	74	764	1700	10.3	9	0.50	28	980
4.73	-2.66	87	1004	1600	11.5	12	0.50	36	1597
5.73	-3.66	95	1151	1550	12.1	14	0.50	42	2035
6.73	-4.66	103	1285	1500	12.5	16	0.50	48	2456
7.73	-5.66	165	1285	1800	7.8	49	0.49	146	2907
8.73	-6.66	321	1361	1850	4.2	191	0.47	561	3173
9.73	-7.66	319	1431	1850	4.5	188	0.47	555	3537
10.73	-8.66	300	1414	1850	4.7	167	0.48	492	3477
11.73	-9.66	271	1518	1850	5.6	136	0.48	403	4082
12.73	-10.66	251	1605	1850	6.4	117	0.49	347	4610
13.73	-11.66	245	1489	1850	6.1	111	0.49	330	3954
14.73	-12.66	204	1521	1850	7.5	77	0.49	230	4177
15.73	-13.66	185	1461	1900	7.9	65	0.49	194	3969
16.73	-14.66	211	1486	1900	7.0	85	0.49	252	4083
17.73	-15.66	281	1546	1900	5.5	150	0.48	445	4341
18.73	-16.66	293	1502	1900	5.1	163	0.48	483	4069

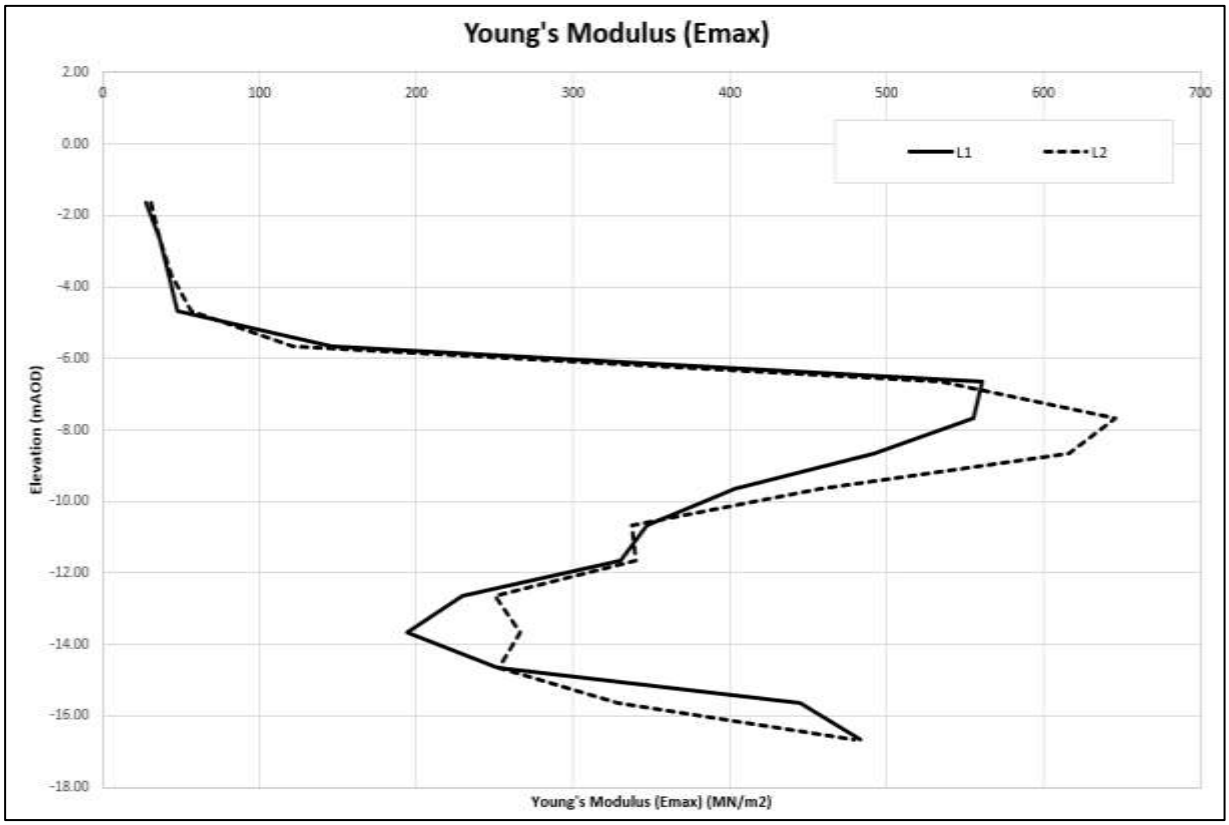


FIGURE 10: YOUNG'S MODULUS AGAINST DEPTH DERIVED FROM ZETICA SEISMIC SURVEY REPORT

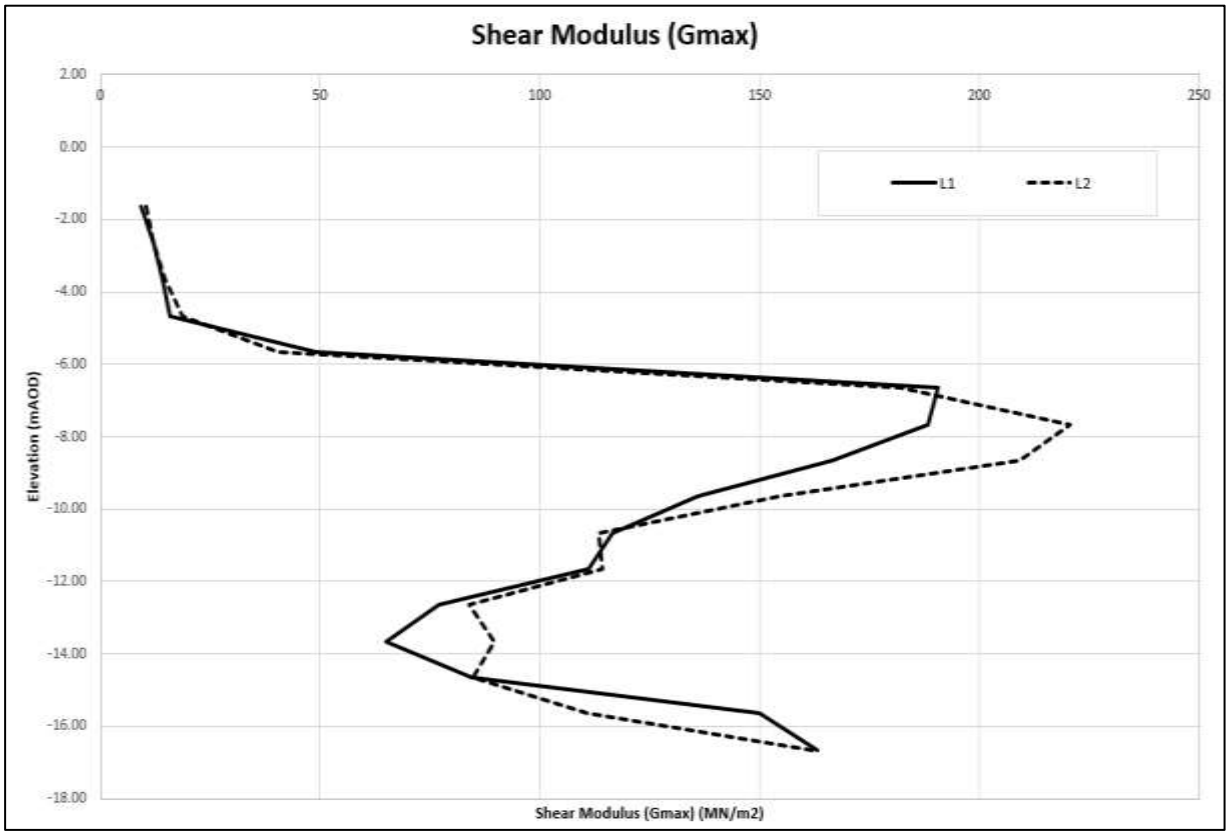


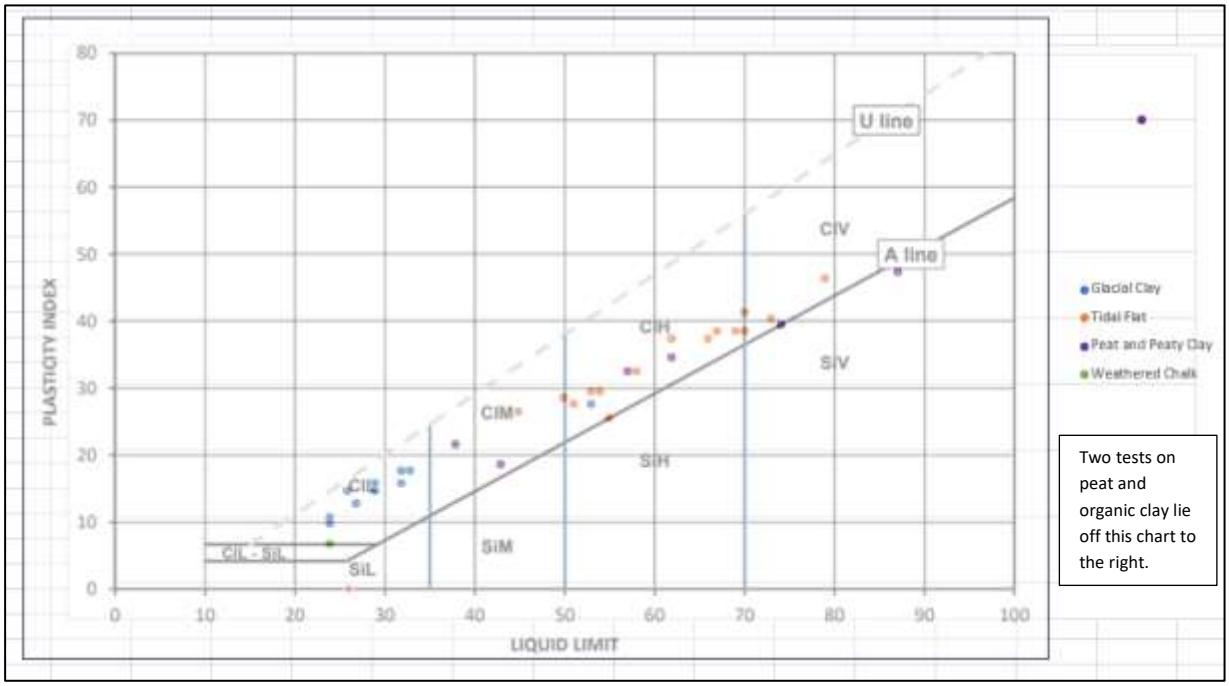
FIGURE 11: SHEAR MODULUS AGAINST DEPTH DERIVED FROM ZETICA SEISMIC SURVEY REPORT

14.5 Geotechnical Laboratory Testing

Representative samples of the subsurface were collected and scheduled for geotechnical laboratory testing as detailed in the factual report (report ref: 23-61504-01 (phase 1) and 24-029679-1). The test results are summarised in the sections below.

14.5.1 Geotechnical Laboratory Testing Results

Atterberg limit testing has indicated the tidal flat deposits to be mainly clays of high plasticity. Peaty clay was assessed as a more borderline silt/clay material of high and very high plasticity. The glacial clays were of low plasticity. The weathered chalk material was also of low plasticity. A Summary is presented as Figure 10. A single sample of peat with a plastic limit of 181% and liquid limit of 466% and a single sample of organic clay with a plastic limit of 75% and a liquid limit of 155% have been omitted from the chart for clarity.



- FIGURE 10: SUMMARY OF LIQUID AND PLASTIC LIMIT TEST SOIL CLASSIFICATION TESTS

Particle density testing indicated 2.68 and 2.73 Mg/m^3 for glacial clay and 2.67 and 2.76 Mg/m^3 for the tidal flat deposits. These values reduced in organic material, indicated as 1.38 Mg/m^3 for peat and 2.53 Mg/m^3 for tidal flat deposits with a noted organic content.

Moisture contents in the peat material were recorded between 30% and 365%.

Particle Size Distribution curves have shown the weathered chalk to be variable, comprising mainly silt and fine sand in three samples, with the deepest (least weathered) sample comprising mainly gravel. The tidal flat deposits comprised mainly silt sized particles and around 15 to 50% clay.

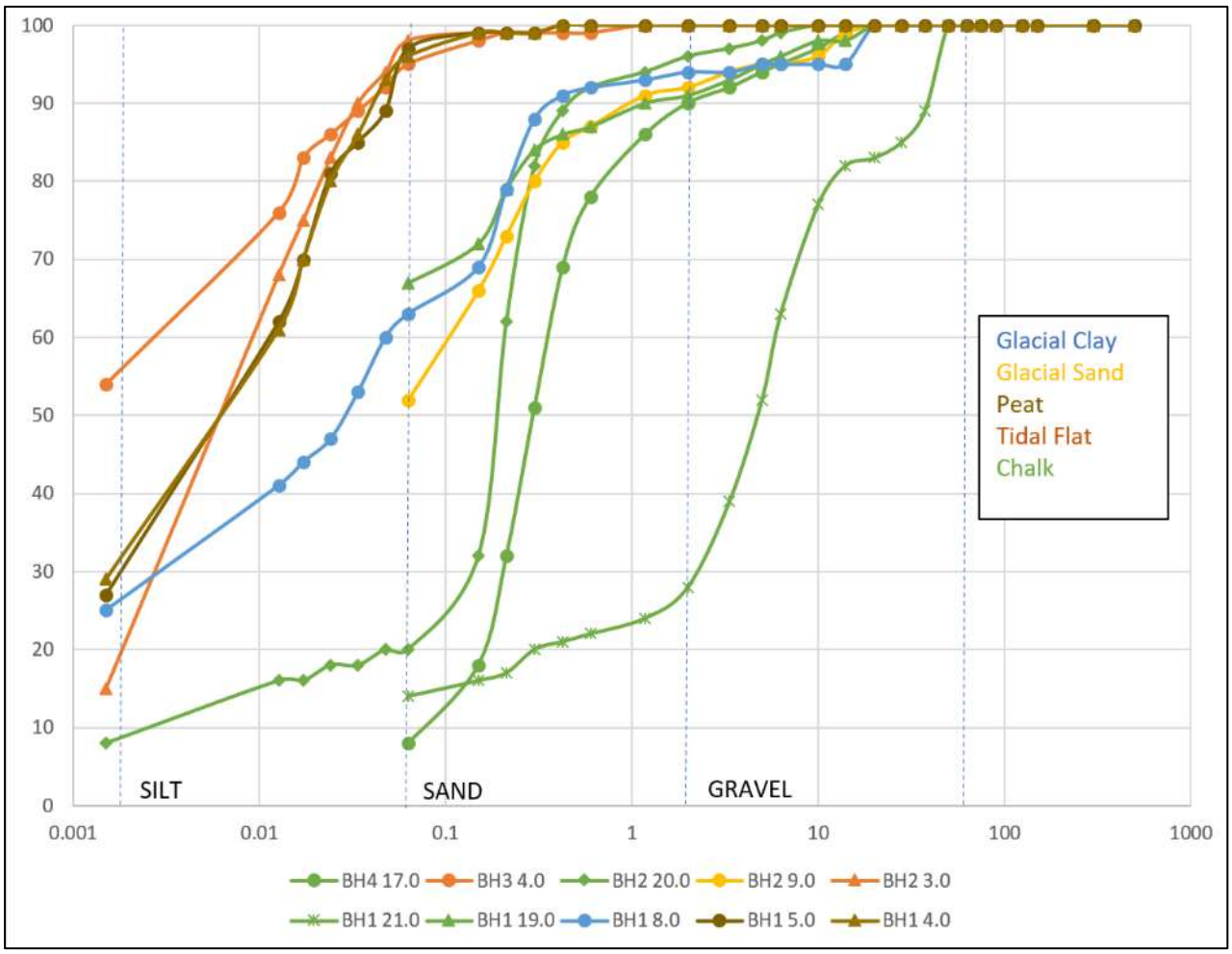


FIGURE 11 PARTICLE SIZE DISTRIBUTION TEST SUMMARY

Shear strength testing and oedometer testing was carried out on the tidal flat deposits and the glacial till.

Hand shear vanes were carried out at shallow depth in the tidal flat deposits, quick undrained shear tests were carried out on the tidal flat deposits and glacial till. A summary of these results, is presented as Figure 12. However, the hand shear vane test results are only indicative and could be due to the tests being sheared too quickly. Notwithstanding this, the results indicate the presence of a stiffer crust at shallow depth overlying considerably softer tidal flat deposits. A similar profile is exhibited in the CPT plots.

Quick undrained triaxial testing reported undrained shear strengths for the tidal flat deposits below the crust to be in the range 4 and 74 kPa, possibly with some increase in strength at depth. For design purposes a design value in the range 8-11 kPa should be considered.

One-Dimensional Consolidation (Oedometer) tests were carried out on the tidal flat deposits. M_v measured at the approximate overburden values (P_0) to P_0+50kPa was between 0.34 and 1.0 m^2/MN. A sample of peat was measured as having an M_v of 1.5 m^2/MN

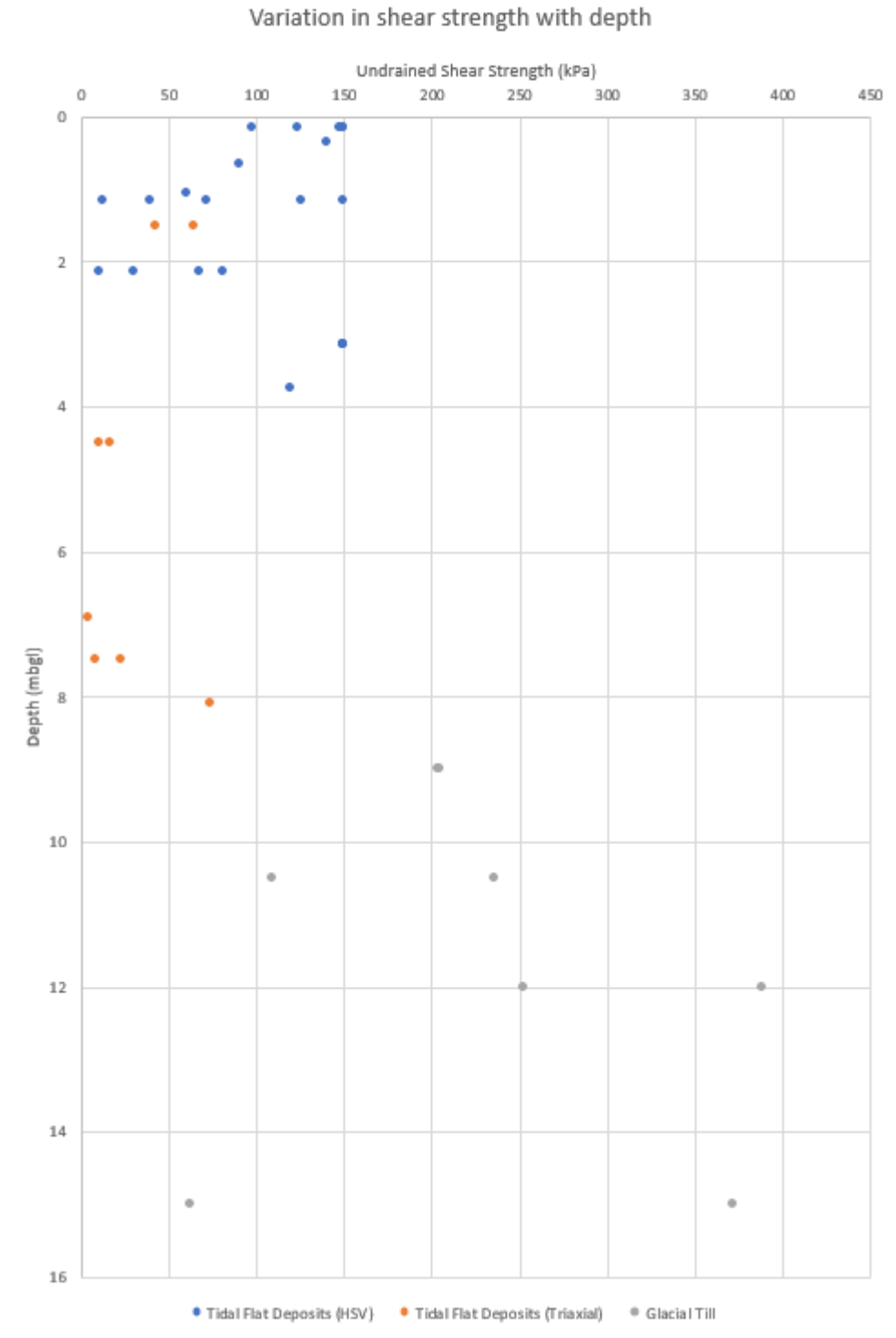


FIGURE 12 VARIATION IN UNDRAINED SHEAR STRENGTH WITH DEPTH

Some shear strength and oedometer testing scheduled on undisturbed samples of the glacial till had to be cancelled due to the very stiff nature of the samples. Photographs of these samples are presented in Figure 13.

Results for glacial till samples that were tested had high shear strengths and low compressibility.

TABLE 14.5 - RECOMMENDED DESIGN PARAMETERS

Glacial Clay U100 Samples	Average result
BH1 9m: 204 kPa BH1 12m: 253kPa BH1 15m: 62 kPa BH2 10.5m: 109 kPa BH3 9.0m: 205 kPa BH3 12m: 389 kPa BH4 15m: 372 kPa BH5 10.5m: 236 kPa	228 kPa

One-Dimensional Consolidation (Oedometer) tests were all on the U100 samples in the glacial clay. Mv measured at the approximate overburden values (P_0) to P_0+100kPa was between 0.18 and 0.052 m^2/MN.



FIGURE 13: ILLUSTRATING VERY STIFF CLAY SAMPLES THAT COULD NOT BE TESTED

14.5.2 pH & Sulphate Testing Summary

11No. samples were submitted for the full BRE SD1 Suite. This suite of testing is used to determine the risks of pH and other ions on below ground content. The suite includes water soluble sulphate, acid soluble sulphate and total sulphur testing. The test results are used to assess aggressive ground conditions for use in foundation design when concrete foundation solutions are proposed.

pH values were between 7.7 and 8.9, however, the laboratory was unable to obtain a pH value for the sample of peat. Typically, peat is acidic. Corresponding soluble sulphate concentrations were between 7.1 and 7680 mg/l. High sulphate results were recorded in the tidal flat and peaty deposits (125 mg/l to 7680 mg/l, average 2061 mg/l). Glacial clay, glacial sand and weathered chalk had a maximum sulphate concentration of 136 mg/l.

Peat soils can contain pyrite (FeS_2), have elevated sulphates and have a low pH. It is possible that the pyrite could be disturbed for example if foundation loads are taken down through the alluvial deposits to the glacial clays. When disturbed, pyrite can oxidise to form sulphates. The high levels of oxidisable sulphates calculated to be present in the tidal flat deposits suggest this may be occurring.

The recommended Design Sulphate Class is DS-5 and corresponding ACEC Class AC-5, assuming a mobile groundwater condition for any below ground concrete. If additional testing is carried out on shallow soils it may be possible to derive a lower ACEC Design Class for the foundation slab and any concrete hard standings.

15 MATERIAL PROPERTIES REVIEW

15.1 Fieldwork and Laboratory Data Review

As described in Section 5, the ground conditions can be simplified into four main stratum types:

- Made Ground
- Tidal Flat Deposits including Peat,
- Glacial Till
- Chalk

The material properties of each stratum type are summarised below.

15.2 Made Ground

Made Ground was encountered in most locations in Plot C up to 2m deep, and in only two locations in Plot I up to 0.5m deep. The Made Ground was generally granular.

In Plot I, Made Ground was encountered in BH01 and in TP08, comprising soils with brick to 0.3m and cobbles of brick and concrete with occasional plastic 0.5m, respectively.

In Plot C, all of the positions except TP10 encountered made ground, up to a maximum of 2m depth (WS05, TP09). The Made Ground generally comprised demolition type materials (brick and concrete, including whole bricks), surface concrete and roadstone (WS06, WS07) and gravelly ashy material with clinker, anthracite and slag (TP12, TP01, WS201). Layers of possible former slabs (concrete / limestone) and brickwork were found in TP 11, TP12 and TP13. Cohesive material with gravel inclusions was reported in WS203. WS202 terminated at 0.1m on an unspecified obstruction.

Some positions encountered more than one layer of fill: In TP09, brick and concrete gravel and cobbles 0.4m thick were over a layer of boulders of chalk to 1m depth. In TP01, two layers were observed with a 0.3m layer of ashy Made Ground with flint brick and concrete, above a layer of ashy made ground with brick, concrete, anthracite and pieces of rubber and fabric to 0.85m depth.

Topsoil type materials were noted, typically 0.4m thick in TP03, TP04, TP06, TP07 (including piece of wood and metal) and TP10. Shallower topsoil materials, overlying made ground, were found in TP11 (5cm thickness) TP12 and TP 13 (0.2m).

There are two SPT tests in the crush material from WS5 but these cannot be considered representative of the Made Ground elsewhere on the site.

Material properties, for use in design, are taken from material descriptions and published values:

TABLE 15.1 - RECOMMENDED DESIGN PARAMETERS MADE GROUND

Made Ground Type	Bulk Unit Weight (kN/m3)	SPT N
Granular Made Ground	15 - 20	Could vary from 0 to 20
Topsoil	15 - 18	N/A

15.3 Tidal Flat Deposits

Below the made ground or topsoil, or from surface where made ground / topsoil was absent, strata comprised layered tidal flat deposits of mixed silts, clays, and peat. In the boreholes and CPTs, it was possible to discern a "crust" of slightly more competent material to around 2m depth, but below this depth general, the material was generally very soft.

The in situ CBR tests were all carried out in Plot I at 0.1m depth. It is assumed that these will have taken place within the tidal flat deposits. Values were between 0.7% and 6.3%, with two higher results of 10 and 15%, with most results averaging at 2.4%. A value of 2.0% at a depth of 0.40m below current ground level is recommended for design.

Testing has indicated the tidal flat material to principally be a high plasticity clay, locally very highly plastic. The material contains organic horizons. These materials were noted to have very high natural moisture contents, with large liquid and plastic limits, plotting outside of the standard plasticity chart.

Triaxial testing of the tidal flat deposits indicate it to be very soft to soft with undrained shear strengths in the range 4 to 43kPa. A sample tested from the desiccated crust was noted to be firm at 64kPa, whilst a sample of peat at a depth of 8.1mbgl was noted to be firm to stiff at 74kPa. This higher strength could be due to the presence of plant fibres.

Oedometer testing indicates the tidal flat materials to be highly compressible with M_v measured in the range of 0.34 and 1.5 m^2/MN. Generally, lower values of Mv, 0.34-0.55 m^2/MN, were noted in the stiffer crust, increasing to 0.51 to 1.0 m^2/MN for the tidal flat deposits below the crust. A sample of peat was registered with an M_v of 1.5 m^2/MN.

The organic layers within the tidal flat deposits are anticipated to be more compressible than a non-organic clay. The widespread presence of beds of peat up to 1.90 m thick (BH05 and BH203) also means that there are areas of the site where very high settlements and deformations could occur if the peat is loaded. The large settlement and also the time dependency of the settlement of peat should be noted.

TABLE 15.2 - RECOMMENDED DESIGN PARAMETERS TIDAL FLAT DEPOSITS

Parameter	Value
Bulk Unit Weight	17 kN/m^3 reducing below ~2.0m depth to 15 kN/m^3
Moisture Content	Generally 30 - 50 % but in more organic rich layers/peat in the range 80-185 %
Plasticity	High to very high
SPT N	0 to 8. Characteristic: 1
Undrained shear strength	10 to 40 kPa Characteristic: 10kPa
Effective cohesion, c'	Zero
Effective angle of friction, ϕ'	0 – 10
Coefficient of volume compressibility. Mv	0.5-1.5 (from oedometers) characteristic 1.0 m^2/MN for non-organic clays, 1.5 m^2/MN for organic material
Youngs Modulus	30 increasing to 50MN/m^2 (from Seismic Testing)

Parameter	Value
CBR	2.0% at a depth of 0.40m below current ground level

15.4 Glacial Till

From between around 7m to 10.5m depth, glacial clay was encountered which became stiffer with depth and included layers of sand and gravel, which were associated with water strikes.

This stratum is 10.7 to 13.5m thick. It is generally cohesive, and typically firm to stiff, stiff, or very stiff with medium dense granular horizons. Two low SPT N values were noted at depth (N=5 in BH03 at 15m and N=8 in BH1 at 18m) which may be due to the drilling technique and artesian water conditions in these holes. Other holes showed a general increase in strength with depth.

The glacial clay is typically of low plasticity.

TABLE 15.3 - RECOMMENDED DESIGN PARAMETERS GLACIAL TILL

Parameter	Value
Bulk Unit Weight	18-19 kN/m^3
Moisture Content	15-20%
Plasticity	Low
SPT N	4 – 50. Characteristic: 15, increasing to 30 - 40 at depth
Undrained shear strength	75kPa, increasing to 200kPa at depth
Effective cohesion, c'	0 to 2 kPa
Effective angle of friction, ϕ'	20-40° in sands (from CPT)
Coefficient of volume compressibility. Mv	0.1 m^2/MN
Youngs Modulus	500MN/m^2 reducing to 200 MN/m^2 (From Seismic Testing)

15.5 Chalk

The top of the chalk was encountered at a depth of 18.5 to 22.1 m and was penetrated by up to 7m (BH1). SPT tests in the chalk in BH1 show variable strength which is typical for chalk, with SPT N values of between 21 and 50.

The upper part of the chalk was logged as a silty clay with chalk gravel or as gravel of chalk (ie likely to be Grade Dm or Dc Chalk).

16 GEOTECHNICAL ASSESSMENT & RECOMMENDATIONS

16.1 General Considerations

In general, there is only a thin coverage of Made Ground, typically less than 1m. Some remnant foundations are present, and one location with chalk boulders to 2m depth (TP09). The exploratory holes suggest that the made ground is generally confined to Plot C, which has previously been developed. However localised areas of made ground should be anticipated to be present across Plot I associated with the historical footprint of the railway sidings. The site is located on the southern banks of the River Humber. At the time of the earliest available mapping this land was already drained for agriculture, the presence of infilled tidal creeks cannot be discounted, and in fact evidence for a possible infilled granular channel structure was observed in CPT 218.

The upper natural strata comprise tidal flat deposits which extend to a depth of between 7.0 and 8.9 m depth but is 10.5m thick in one location. The tidal flat deposits are a sequence of mainly very low strength and high compressibility clay with localised interbeds of peat and organic clays.

Below the tidal flat deposits there are glacial clays which have sporadic sand beds to a depth of 18.50 to 21.1 m. These in turn overlie chalk which is weathered at the surface to Grade Dm or Dc Chalk.

There is artesian groundwater in some of the glacial sands and in the chalk bedrock. Groundwater monitoring suggests that some groundwater is tidally influenced by the nearby River Humber.
The tidal flat deposits have the potential to undergo significant primary consolidation on loading and also a much longer-term secondary settlement over a period of several years. The presence of the relatively thick bed of very low strength and very high compressibility material governs the options available to develop the site in terms of geotechnics.

16.2 Construction of the Development Platform and Raising of Levels

The first stage of the development after site clearance will be to form a development platform, which will involve raising levels. It is understood that, for flood protection reasons, it is proposed to raise ground levels across the two plots to a minimum of 3.75mAOD. Ground levels across Plot C are in the range 2.3 to 3.0 mAOD (a 0.75 to 1.5 m increase in level, typically falling to the north east from around 2.9mAOD on the south west margin to 2.0 mAOD on the north east margin (this is a 1.7 m increase in level). Ground levels across Plot I range between 2.0 and 3.3 mAOD (0.45 to 1.75 m increase) and are typically in the order of 2.3 to 2.6mAOD, locally reaching 3.0mAOD in the areas of the footprint of the railway line.

Anticipated increases of elevation are generally in the range 1.3 to 1.6m. The type of fill to be used for the land raise is yet to be confirmed, but for the purposes of this assessment have been assumed to be granular selected engineering fill. Typical bulk densities for such materials are 19 kN/m^3. Raising the ground levels by 1.3 to 1.7m would resulting in a net loading increase in the order of 25-34 kPa.

Increasing land elevation will increase the loading applied to the soils at depth. The highly compressible nature of the tidal flat deposits, especially the organic and peat layers, means there is the potential for significant short term and long-term settlement post construction. The time for settlement will also

have to be considered with regard to required construction programmes. Typical settlement in the order of 15-50mm for immediate settlement and 200 to 500mm for total settlement have been estimated. Time scales for such long-term settlements are in the order of 50-100years (including creep settlement), with around 50% of the settlement occurring after approximately 2 to 5 years with on-going settlement occurring at a decreasing rate.

However, this is only part of the settlement issue. If an increase levels by 1.7 m to 3.75 mOD causes 500 mm of settlement the final land ground level would only be 3.25 mOD after settlement. Therefore, more than 1.7m of soil has to be added, this greater thickness increases loads and causes more settlement. By iteratively repeating the calculation, in order to raise ground level by 1.7 m a thickness of 2.3 to 2.5 m of soil would be required.

Overall, to achieve a level after settlement of 3.75 mOD the ground surface would have to be raised to 4.45 mOD to allow for the settlement.

The time for the settlement to occur can be accelerated by utilisation of surcharging, in conjunction with vertical band drains (also called wick drains) to accelerate the consolidation of the underlying soils. The increase in ground level by surcharge would have to be to a minimum of 5.45 mOD whilst the majority of settlement occurs before the surcharge is removed. The surcharging will also ensure that there are no long-term creep settlements.

Although laterally continuous across the site as a deposit, the ground investigation has found the tidal flat deposits to contain variable thicknesses of organic clays and peats, with peat layers ranging from 'pockets' to beds of 1.5m thickness. This variation means that for any given loading at the surface a range in settlements should be anticipated due to the different degrees of compressibility of the soils. For example, odometer measurements indicate the tidal flat deposits to be highly compressible with coefficients of compressibility in the range 0.34 and 1.5 m^2/MN for an increase in load of 50kPa. The CPTs indicate higher variations in M_v ranging between 0.1 and 2 m^2/NM. The process of surcharging will remove this variability in settlement across the site.

Overall, surcharging reduces the time that settlement takes and will reduce the magnitude of creep settlement. The time that surcharging is required to be placed is a function of a number of factors including but principally:

- Permeability of the ground
- Spacing of band drains
- Availability of fill materials

The closer the band drain spacing the faster the settlement occurs, but faster settlements incur greater cost due to increased number of sand drains. Increasing the height of the surcharge can also speed up the overall settlement process as the surcharge can be taken off earlier.

Overall, the surcharging process would involve:

- Stripping the vegetation (topsoil can remain in situ).
- Placement of a geotextile separation layer, then 300 mm of Class 6C single size drainage stone (typically a 60/75mm sized aggregate but this can be coarser).
- Install band drains.

- Place geotextile separation layer and then plate settlement gauges.
- Place surcharge increasing the height of the settlement gauges using extension rods whilst surcharge is placed.
- Monitoring of settlement during the period of surcharging
- Remove surcharge when settlement rate has decreased to an acceptable limit
- Monitor settlement after surcharge removal (typically for one month) to allow for the rebound of the ground after surcharge has been remover
- Continue with construction.

In addition to monitoring settlement, it is normal practice to also have a number of piezometers installed to monitor water levels which should initially rise when surcharge is installed then decreasing water levels are measured as settlement occurs.

Surcharging is normally carried out in stages working progressively across a site with the first areas surcharged to be the access roads and the principal building so that construction can be commenced on this while other areas are surcharged. The surcharge from the first area is rolled onto the next area and is reused as either fil or surcharge. Often the upper layers of surcharge become softened due to weather, so it is useful to reuse this soil as surcharge rather than new permanent fill. Planning and consideration of the reuse of surcharge from the last area being surcharged should also be considered at an early stage, this can often be used to fill and surcharge a landscaping area.

16.3 Foundations for Lightly Loaded Structures

In general, most of the structures will need to be constructed on deep foundations (e.g. piled or Controlled Modulus Columns, CMCs) but any smaller lightly loaded structures such as amenity buildings could possibly be constructed on a raft foundation. As a general rule, it is recommended that an allowable bearing pressure of 35 kPa is taken for preliminary design purposes for shallow foundations for lightly loaded structures on rafts which are not sensitive to differential settlements assuming that the site level is raised and surcharged.

However, it is recommended that the gatehouse/weighbridge office and weighbridge should have deep foundations because weighbridges are relatively sensitive to differential movement unless the weighbridge can be designed so that it can be re-levelled to cope with future settlement and ensure serviceability.

16.4 Foundations for Main Plant & Structures

Given the presence of high compressibility and low strength material with peat beds, and that the main structures will impose high loadings on the ground, shallow spread foundations will not be applicable. The loads are likely to be too high and the shear strength of the tidal flat deposits too low for ground improvement techniques such as vibro (stone) columns or vibro concrete columns to be suitable. In addition, the poor and variable nature of the upper layers of chalk at depth is not ideal for deep piles which would have to penetrate a significant depth into the chalk.

Controlled Modulus Columns (CMCs) are an alternative deep foundation solution to piles. CMCs comprise a hybrid ground improvement/displacement pile technique which may be appropriate on this site. CMCs increase the stiffness of the ground, remove inhomogeneity and also transfer some load down to the stronger deposits at depth, such as the glacial clays at this site. CMCs may be more

economic than piles in the ground conditions at this site. Like other ground improvement methods, the CMCs could also be installed below floors.

When designing piles appropriate allowance should be made for negative skin friction (down-drag) on the piles due to consolidation of the tidal flat deposits due to the land raising and from pre pressures set up by the piling itself. Due to the thickness of the tidal flat deposits, there is likely to be relatively high down-drag forces calculated relative to the positive support on pile shafts from the glacial clay. Alternatively, consideration could be given to applying a slip-coat to the piles to reduce negative skin friction on the pile shaft through the soft clay/peat layer.

Where large concentrations of driven piles are required, consideration of the effects of heave of the ground should be considered and higher proportions of the total maximum down-drag forces will act on piles. Even with small displacement driven piles, a driving pattern should be followed which minimises the gross effect of pressure in the ground; i.e. piles should be driven from the centre of an overall piling scheme outwards rather than working from one end. Driven piles should be levelled and checked as driving proceeds; any piles showing uplift should be re-driven. Spacing of piles should not generally be closer than three pile diameters.

A specialist contractor should be contacted with regards to the selection of appropriate CMC design and construction method. Geotechnical information within this report should be provided to give design parameters.

Chalk is susceptible to karst type weathering and localised deep weathering can occur although voids are rare in chalk. No such features were encountered during the investigation, but a variable depth of weathering was encountered. Should it be decided that piles need to extend into the chalk, an additional investigation will be required to further characterise the weathering profile and determine appropriate design characteristics. Reference should be made to Section 6 of CIRIA Report 574: Engineering in Chalk (2002) and more recent good practice set out in the ICE Proceedings of the conference on Engineering in Chalk (2018).

Any piling works undertaken from existing ground levels will require a suitable piling mat/platform constructed in accordance with BRE Report 470 (2004). A geotextile may be incorporated into the platform to reduce the required thickness and the platform could be designed as part of the engineering fill required for any earthworks to alter final site levels.

It is proposed to increase ground levels across the site. This will cause significant immediate and long-term settlement of ground levels across the plots. It is anticipated that the main plant and structures at the site, being on deep foundations, will be subject to lower amounts of settlement. There is the potential for differential settlements to be observed between structures and the local ground levels. This should be considered in the design of services and at the interface of the building and surrounding ground. As discussed in section 16.2 the potential impacts of long-term settlement can be reduced by the utilisation of surcharging in conjunction with band drains.

16.5 Foundations for the Access Bridge

At present Plots I and C are separated by a north east trending ditch/watercourse. Plot I can be accessed via a small bridge/culvert at the southwestern corner of Plot C. It should be noted that this bridge is unlikely to be suitable for construction traffic and a suitable access bridge is required to allow the development of Plot I. The proposed development plan indicates a bridge connecting the two plots.

The proposed phasing of works is yet to be confirmed. Hence it is not known whether the proposed bridge or a temporary structure will form part of the preliminary works at the site allowing subsequent development of Plot I. The location of a temporary bridge, if any, is currently unknown.

The nearest exploratory holes to the proposed permanent bridge location are BH205 (north side) and WS203 and CPT221 (south side). Ground conditions in this area are indicated to be tidal flat deposits to around 10mbgl, overlying glacial clays. The upper 1.5m of the tidal flat deposits form a more competent crust over the underlying very low strength clays which have recorded shear strengths in the range 11 to 25kPa. The tidal flat deposits are unsuitable as a founding strata for the permanent structure and any associated loading should be taken to the underlining strata using a deep foundation as discussed earlier.

The tidal flat deposits in this area are indicated to be highly compressible and of significant thickness. Significant settlement of the ground surrounding the bridge is anticipated in the long term in the order of 300-500mm due to the raising of ground levels across the plots. Settlement tolerances for the bridge abutments will be significantly less, consequently there is a potential for differential settlement between the bridge and the road. Consideration should also be given to piling a section of the approach road on either side of the bridge as a transfer slab to remove differential settlement between the bridge and the surrounding filled ground.

16.6 Foundations for Main Plant Chimney

It is proposed to construct a chimney (referred to as the stack on the scheme drawings) near to the eastern corner of the main building. The dimensions and loading associated with the structure are yet to be confirmed. However, the chimney is understood to be around 30m in height. The design of the foundations for the chimney will need additional assessment as part of the design and this will have to take into account variable wind loadings transferred to the foundations with the parameters from the seismic testing providing information for this part of the design.

The nearest exploratory holes to the proposed chimney location are BH202, BH4 and CPT218 (north) and BH202 and CPT219 (south). Ground conditions in this area are anticipated to comprise tidal flat deposits to a depth of around 7.5-8mbgl overlying glacial till. Laboratory testing suggests beneath a more competent crust around 1m thick, the tidal flat deposits comprise extremely low to very low strength clays with recorded shear strengths in the range 4 to 17kPa. Locally peat up to 1.3m in thickness is also noted. The chimney will require a deep foundation solution that can take the variable horizontal loads from the stack due to wind loading, and hence the base foundation will be subject to static, cyclical and lateral loadings. If clay fill is to be used as surcharge, consideration could be given to place the surcharge below the chimney and in the immediate area around it as a granular layer (e.g. capping or 6F2) as this would provide a greater lateral stiffness than a clay and reduce the size or number of piles.

16.7 Piling Risk Assessment

Piled foundations have the potential to form a pathway for contaminants to migrate between different groundwater bodies. The Environment Agency generally require that a Piling Risk Assessment be undertaken prior to piling, taking account of the following Environment Agency documents:

"Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention" (Ref: NC/99/73, 2001);
"Piling into contaminated sites" (2002);
"Piling in Layered Ground: risks to groundwater and archaeology" (SC020074SR,2006).

The Controlled Waters Risk Assessment (see Section 11) has shown that there is limited potential to be a significant source of mobile contamination to the identified controlled waters receptors. There is no requirement for any groundwater mitigation measures. The tidal flat deposits are relatively thick and the clays will be of low permeability. Given this, any piles (either, bored, or CFA or driven, or CMCs) will not form a pathway as the tidal flat deposits clays around the piles will form a 'thick' low permeability layer. Given that there is a very limited potential contaminant source term and a very unlikely pathway, there is a negligible risk from the use of piled foundations to either the groundwater in the glacial sand layers or bedrock Principal Aquifer for this development.

16.8 Shallow Groundwater & Excavations

The considerations in this section are intended for excavations through the Made Ground and into the upper natural layers. Shallow excavations to 1.0 to 1.2 m will likely remain stable only in the short-term, if dry. Temporary side support will be required to maintain stability or if groundwater is present. Where excavations require man entry, they will require assessment of temporary support and dewatering in order to ensure the safety of construction workers. However, with the proposed land raising, most services will be in the surcharge material. Also with surcharging, the site will have a drainage layer at the level of the current ground level and this should ensure that there is no groundwater in the imported fill material after surcharging has been completed.

Previous groundwater monitoring has indicated the potential for groundwater at the site to be tidally influenced. The extent of such influence and lag periods has not been determined. Any groundwater control should consider the potential impact of tidal groundwater movements.

Excavations below the groundwater table will require full face sheeting and sump pumping in order to prevent instability of the sides of excavations. Basal heave will also have to be considered. All excavations should be carried out in accordance with CIRIA Report 97 "Trenching Practice" and BS6031: 2009: Code of Practice for Earthworks. Dewatering guidance can be found in CIRIA Report C515: Groundwater Control Design and Practice (2000).

If deep manholes are required into the tidal flat deposits, consideration will have to be made as to whether or not these will be required to be piled/treated.

16.9 Road & Pavement Design

The design of the development will require an understanding of the CBR of the imported fill material used to raise ground levels to the required formations. The design CBR for these materials will depend upon the type of material and properties of the imported soils used to form the fill below the construction platform.

16.10 Buried Concrete and Pipework

The recommended Design Sulphate Class is DS-5 and corresponding ACEC Class AC-5, assuming a mobile groundwater condition, in accordance with BRE Special Digest 1, 2005 (the Design Concrete

Class). If additional testing is carried out on shallow soils it may be possible to derive a lower ACEC Design Class for the foundation slab and any concrete hard standings.

17 GEO-ENVIRONMENTAL CONCLUSIONS

In summary, from the ground investigation undertaken, the site is considered suitable for an industrial development, although further gas monitoring is required to further establish the significance of the findings so far. The site does not appear to be a significant contaminative liability to neighbours.

In addition, the BNG Mitigation areas that were investigated appear to be of a satisfactory standard.

17.1 Soils, Human Health

No significant levels of contaminants were identified on either plot during this phase of investigation. The previous investigation identified asbestos fibres close to the building located on Plot C.

17.2 Groundwater

As before, the monitored groundwater levels during July and August 2024 were noted to be much closer to the surface than those identified during drilling. The presence of the wells has potentially created preferential pathways that the groundwater is travelling along and the actual groundwater may sit at a slightly lower depth.

The monitoring data suggests that there is a groundwater flow towards the estuary, as expected, although the gradient is fairly shallow.

Sampling and analysis of groundwater from the four locations did not determine any significant levels of potential contaminants. PFOS and PFOA were noted to be present within two of the deeper wells but at very low levels.

17.3 Surface Water – Ditches and Lagoon

The samples taken from the Oldfleet Darin suggests that the adjacent landfill may be having an impact on PFOS levels within the drain due to the difference between the upstream and downstream samples collected.

In addition, the pipe ditch was noted to have the highest PFOS and PFOA levels of the surface water samples taken.

The sample from the lagoon in one of the BNG Mitigation areas was noted to display low levels of PFOS and PFOA.

17.4 Ground Gas

In summary, significantly elevated levels of methane were identified in BH03 and BH05 on two monitoring occasions, as before. There does not appear to be a conclusion that this area is generally high gassing and two deeper wells installed in this area during this phase of works did not display significantly elevated levels of methane. Methane was also detected in the window sampler locations, although at lower levels. It is considered likely that the peat deposits underlying the site could be the source of the methane and the high concentrations attributed to the small headspace in the wells due to high groundwater levels as dissolved methane was also identified within the groundwater.

We would recommend that further monitoring is undertaken to establish further the effect of the tidal influence on the groundwater and the methane concentrations detected, particularly once site levels have been raised / the site has been subjected to surcharging. Surface gas monitoring should be undertaken to determine if the stiff clay layers above the soft clay, and additional material from raising site levels, may afford some protection to the proposed development.

With regard to the proposed industrial use, the levels of ground gases currently identified may pose a significant risk and therefore work is required to further clarify this.

18 RISK ASSESSMENT & CONCEPTUAL SITE MODEL

Completing the risk assessment process requires that the potential pollutant linkages be re-assessed from the proposed conceptual model within Section 5.

With respect to this phase of investigation, there is no significant change to the CSM. The presence of PFOS and PFOA have been shown to be present within the ditches to the north and south of the site, potentially impacted by the landfill. Very low levels have been detected within two groundwater samples from the site and also the lagoon on the BNG mitigation area. No PFOA/PFOA levels have been detected within soils on the site. Potentially, PFOS and PFOA have had a low level impact on the groundwater within the area.

The following table provides a revised assessment of the preliminary conceptual model, included in Section 5, based on the findings from the ground investigation.

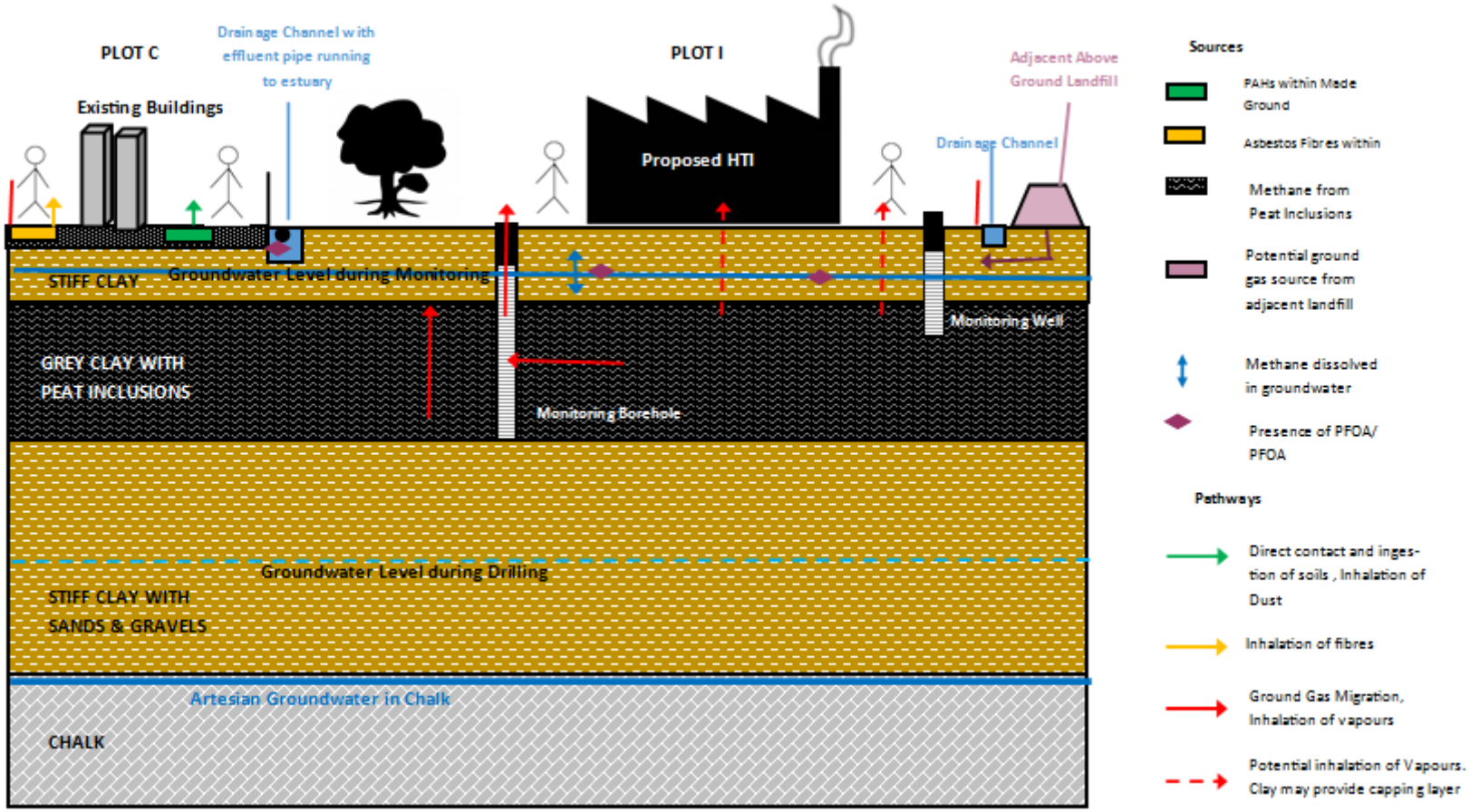
TABLE 15.1 REVISED CONCEPTUAL SITE MODEL

SOURCE	IDENTIFIED PATHWAYS	RECEPTORS	CONSEQUENCE	PROBABILITY	RISK RATING	COMMENTS ON LINKAGE SIGNIFICANCE
Location TP09 (previous investigation) **Plot C** **Soils:** Asbestos fibres	• Inhalation (fibres) •	• Ground Workers • Site Neighbours • Site Users	Severe	Likely	**High Risk**	Potential high risk as the asbestos fibres identified are in the Made Ground near surface with no hardstanding present currently. The risk will decrease if the ground is not further disturbed or capped with hardstanding.
Potential asbestos cladding on existing buildings on Plot C	• Inhalation (fibres)	• Ground Workers Site Users	Severe	Unlikely	**Moderate / Low Risk**	Potential Moderate / Low risk currently as the cladding appears visually to be in satisfactory condition and the buildings are not easily accessible. It is recommended that an asbestos survey is undertaken to establish the presence of asbestos within the cladding, particularly if the buildings are to be demolished.
Dibenzo(ah)anthracene present in TP11 (0.3m) and TP13 (0.3m) (previous investigation)	• Ingestions (soils) • Direct Contact (Soils) • Inhalation (dust)	• Ground workers • Site Users • Site Neighbours	Medium	Unlikely	**Low Risk**	Potential Low Risk as the Made Ground the PAH is present in is under a roadway. Should this area be excavated, standard hygiene practices and dust suppression should be observed.

Methane Significantly elevated levels in BH03 and BH05 Present within WS01 and WS02 Potential sources are underlying peat and organic deposits and the adjacent landfill.	• Inhalation (vapours)	• Site Users for Proposed Development	Severe	Likely	**High Risk**	The significance of the methane levels identified need to be further established. In addition, the potential for the upper stiff clay layers and additional used for raising site levels/surcharging to act as capping layers also needs to be further established. The current data suggests that there is a significant risk from the presence of the methane under the site, but further data will be necessary to come to an informed decision on how this may affect the proposed development.
PFOS /PFOA – Identified within ditches to north and south. Very low levels within the groundwater and lagoon in BNG Mitigation Area	• Ingestion • Direct Contact • Leaching	• Site Users for Proposed Development • Groundwater • Surface Water	Severe	Unlikely	**Moderate Risk**	The presence of PFOS and PFOA has been identified within ditches to the north and south. However, it is not considered that they are part of the subject site and appear to have had limited impact on the groundwater and soils on site. In addition, the presence of hardstanding over much of the site on completion of the proposed development will limit exposure to future site users.

Below is a pictorial representation of the Conceptual Site Model.

Conceptual Site Model for Proposed Development



19 RECOMMENDATIONS

19.1 General

The previous and current ground investigations have found minor soil contamination to be sporadic in hotspots on Plot C with no significant soil contamination identified on Plot I.

It is anticipated that if the soils close to the buildings on Plot C are not disturbed, then the asbestos fibres identified within the Made Ground at this location are unlikely to pose a significant risk. However, should works be done, the presence of the fibres will need to be considered for any works going forward with regard to impact on the ground workers. It is recommended that if the area is to be used and the Made Ground left in-situ, hardstanding should be placed to encapsulate the asbestos fibres and remove the inhalation pathway identified.

The PAHs identified under the roadway on Plot C do not currently pose a significant risk if left under the road. However, should redevelopment of this area occur, standard high hygiene practices should be adhered to for ground workers. If the Made Ground is left in-situ, again it is recommended that it is encapsulated under hard standing to eliminate any direct contact or inhalation pathways.

The buildings present on Plot C potentially have asbestos cladding on them. We would recommend that an asbestos survey is undertaken to establish this, particularly if the buildings are to be demolished.

With regard to the methane identified on Plot I, further work is required to further establish the levels and any patterns present. It is proposed that this should be done once the site levels have been raised / site has been surcharged by:

- In-situ continuous ground gas monitoring to determine ground gas patterns over time and tidal influence. The current monitoring wells, particularly BH03 and BH05 should be retained if possible during the raising of the site levels.
- Surface gas survey (such as flux box survey) to determine if the near surface clay layers and material placed to raise the site levels will afford protection to the above ground development and act as a capping layer.

Once further information on the ground gas regime is obtained, a decision can be made on the remedial strategy for the site. It is currently considered that a strategy would need to be put in place to deal with the potential creation of pathways to the surface by piling. This could be a pile location specific strategy or a site wide (incorporating the development area) solution such as installing a low permeability layer under the development to siphon any ground gas present away from the development area.

19.2 Ground Workers

From the ground gas monitoring undertaken, oxygen depletion (below the HSE recommendation for oxygen above 19.5%), was widespread across the site; partially due to the elevated levels of methane identified.

Although risks to construction workers are not generally discussed in this report, and ground gas concentrations are not necessarily those in the breathing zone; this report with ground gas monitoring

data should be provided to all future parties / stakeholders, including contractors and maintenance workers, to assess health and safety measures for subsurface confined spaces, including trenches, for possible measures to allow temporary / permanent works to be undertaken.

Consideration will also need to be given to the protection of construction workers during development.

20 REPORT LIMITATIONS

20.1 Site Specific Comments

It is anticipated that Regulatory authorities will require additional ground gas monitoring to characterise the site in more detail and fully comply with CIRIA 665. When further monitoring is undertaken, the conclusions of this report will need to be updated.

20.2 General

This report presents our observations, borehole logs, laboratory results and interpretation of these logs, observations and results from the ground investigation undertaken between the dates 11th June and 20th July 2024. The scope of works was agreed with GRG prior to the ground investigation being carried out and, on this basis, Mayer Environmental & Eccles Associates Ltd have used reasonable skill, care and diligence in its design. Although every reasonable effort has been made to gather relevant information, all potential environmental and geotechnical constraints or liabilities associated with the site may not have been revealed.

On any site, and in particular on sites of potentially contaminative previous uses, ground conditions can change rapidly over short distances and there may be variability in ground conditions between exploratory positions. Ground conditions between exploratory points are inferred. It should be noted that investigation beneath building footprints has not been possible. No responsibility can therefore be accepted for varying ground conditions, between exploratory points, not revealed during the ground investigation.

No assessment has been undertaken for the presence of radioactive substances or unexploded ordnance, unless stated otherwise.

Third party information has been used in good faith and taken at face value. Mayer Environmental cannot guarantee the accuracy or completeness of Third Party information. It is assumed that previous reports provided have been assigned to the Client and can be relied upon. Should this not be the case, Mayer Environmental should be informed, as additional work may be required.

Site assessments can range from limited observations to extensive investigations, and testing. The degree of uncertainty in interpreting a site's environmental condition will depend upon the budget and scope of work authorised by the client. Some degree of uncertainty will always exist.

Groundwater and ground gas monitoring observations are applicable to those dates on which they were made and concentrations may vary.

Chemical analysis was formulated to comply with land / groundwater quality assessment for Part 2A, Environmental Protection Act, 1990 (as amended) assessment. Analysis was not formulated to comply with drinking water supply requirements; unless stated otherwise.

The phrase 'suitable for use' is in keeping with the terminology used in planning designation and does not imply any specific warranty or guarantee.

This report may identify risks to site workers, including those during demolition, maintenance and redevelopment. Guidance on occupational health and safety issues is beyond the brief and scope of this report and appropriate advice should be sought by the client.

Please note that notwithstanding any site observations, including the presence or otherwise of archaeology; flora / fauna, including invasive weeds e.g. Japanese Knotweed, and / or asbestos-containing materials, this report does not comprise a formal survey and expert survey(s) / advice should be sought.

The recommendations in this report assume that ground levels will remain as those during the investigation, unless stated otherwise. If re-profiling is undertaken, then the conclusions and recommendations made may need re-evaluating. Any site boundary line on plans does not imply legal ownership of land.

This report has been prepared solely for the benefit of our client, GRG, for the purpose as outlined above. New site information, changes in practice / guidance or new legislation may require revised interpretation of the report, subsequent to its issue.

No warranty is offered to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon, either in its entirety or in part, by a third party or used in circumstances for which it was not originally intended. This report shall not be transferred to or relied upon by any other party without express written permission of Mayer Environmental Ltd.

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21 REFERENCES

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Appendix A

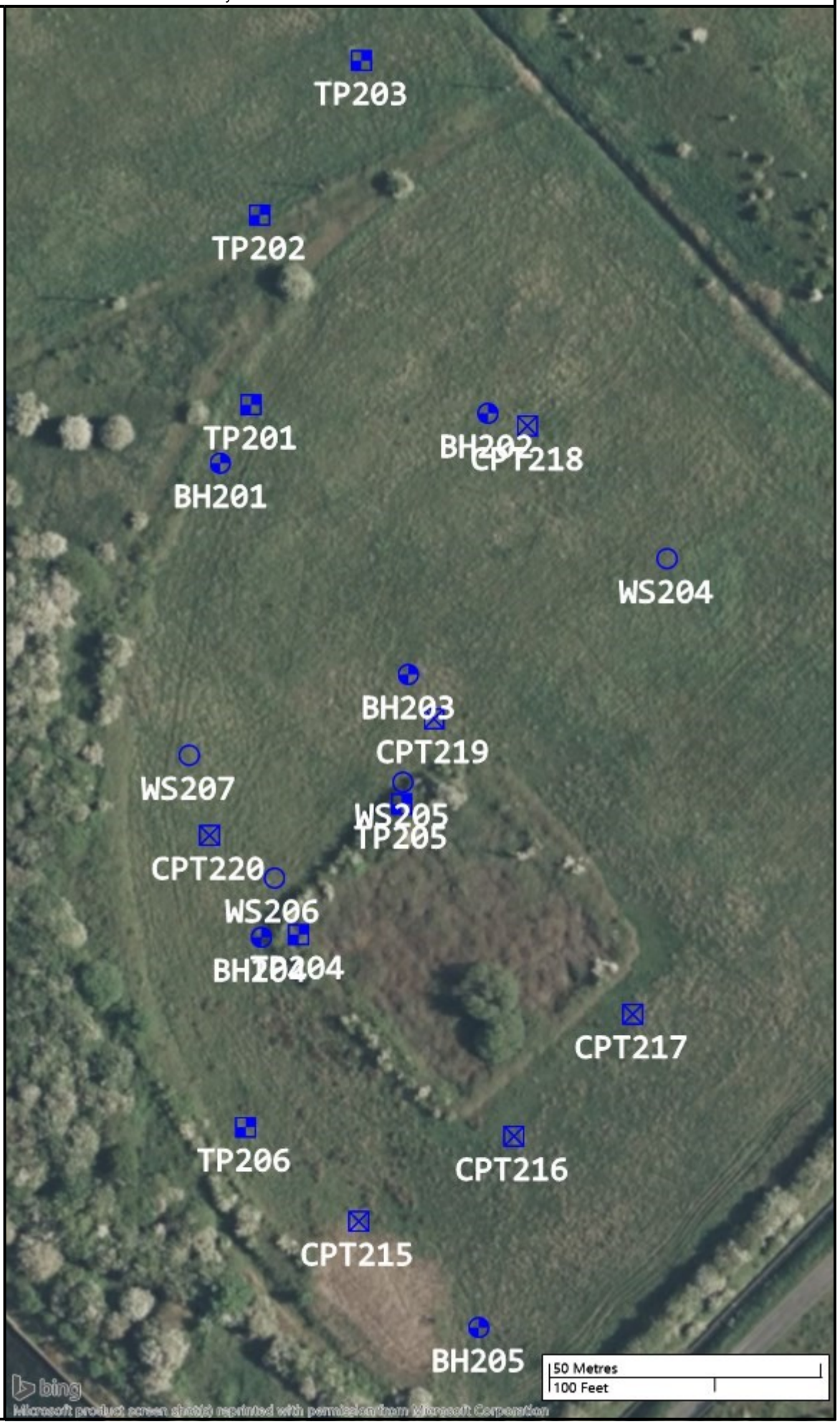
Site Plans


E523400
E523450
E523500
E523550
E523600
E523650
E523700
E523750
E523800
E523850
N413000
N412950
N412900
N412850
N412800
N412750
Firewater Reservoir (Lagoon)
WATER TREATMENT PLANT 15m x 20m
WATER TREATMENT PLANT 15m x 20m
WATER TREATMENT PLANT 15m x 20m

Project Id:	129-003084	Title:	Site Plan
Project Title:	Humber Gate (HTI), Grimsby - Additional Works	Scale:	1:1000
Location:	DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

Legend Key

- Locations By Type - Empty
- Locations By Type - TP
- Locations By Type - HP
- Locations By Type - CP
- Locations By Type - OP
- Locations By Type - WLS



Project Id:	129-003084	Title:	Site Plan
Project Title:	Humber Gate (HTI), Grimsby - Additional Works	Scale:	1:3000
Location:	DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

mayer

Legend Key

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- Locations By Type - OP
- Locations By Type - WLS
- Project Bounds - Project Bounds

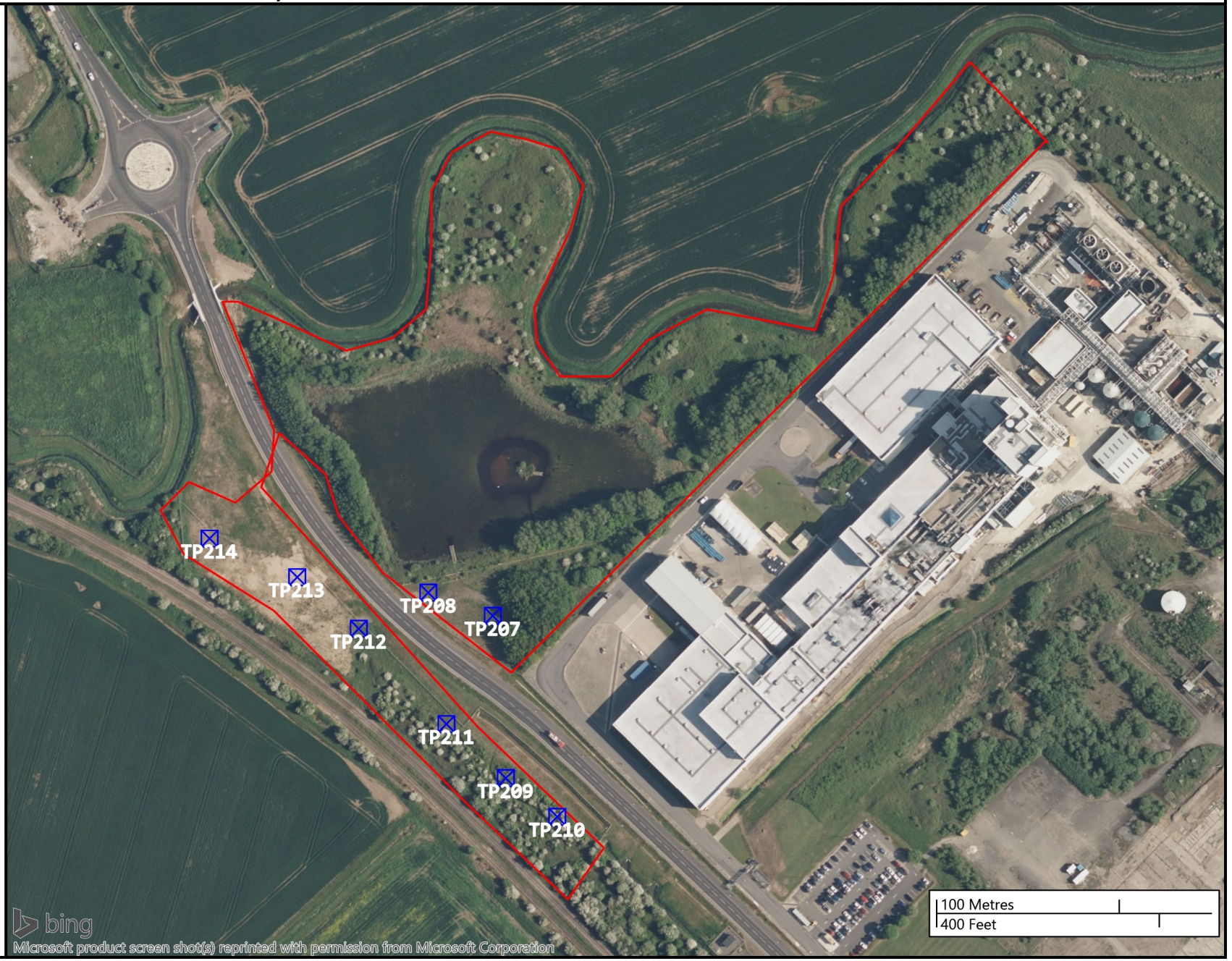


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Project Title:	Humber Gate (HTI), Grimsby - Additional Works	Scale:	1:3000
Location:	DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

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Legend Key

- Locations By Type - Empty
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- Locations By Type - HP
- Locations By Type - CP
- Locations By Type - OP
- Locations By Type - WLS
- Project Bounds - Project Bounds



Project Id:	129-002870	Title:	Site Plan
Project Title:	Grimsby HTI	Scale:	1:1500
Location:	Grimsby, DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

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Legend Key

- Locations By Type - Empty
- Locations By Type - TP
- Locations By Type - CP
- Locations By Type - WLS
- Project Bounds - Project Bounds



Project Id:	129-002870	Title:	Site Plan
Project Title:	Grimsby HTI	Scale:	1:2000
Location:	Grimsby, DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

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Legend Key

- Locations By Type - Empty
- Locations By Type - TP
- Locations By Type - CP
- Locations By Type - WLS
- Project Bounds - Project Bounds



Appendix B

Site Logs

Borehole Log

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Borehole No. **BH201**

Sheet 1 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523640.32 - 412891.44	Hole Type CP
Location:	DN31 2TT		Level:	2.46	Scale 1:50
Client:	GRG		Dates:	10/06/2024 - 11/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10 - 0.60	B					Firm, friable dark brown CLAY with occasional light grey mottling.
		1.40	D		1.40	1.06		
		1.50		N=3 (1,0/1,1,1,0)				Soft dark brown CLAY with light brown mottling.
		2.40	D					
		2.80 - 3.00	B		2.80	-0.34		
		3.00	U	Ublow=3				Very soft black CLAY.
		3.50	U	Ublow=3				
		3.50 - 4.00	B					
		4.50	D					
		4.50		N=1 (1,0/0,1,0,0)				
		5.50	D					
		6.00	U	Ublow=2				
		6.50	U	Ublow=3				
		6.50 - 7.00	B					
		7.50	D					
		7.50		N=3 (1,0/1,0,1,1)				
		7.80	P					
		8.00 - 8.80	B					
		9.00		N=2 (1,0/0,0,2,0)	9.10	-6.64		Brown PEAT.
		9.50	D		9.50	-7.04		Firm, dark brown sandy, slightly gravelly CLAY. Fine gravel of chalk.
		10.00	D					

Continued on next sheet

Remarks

Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

AGS

Borehole Log

mayer			Borehole No. **BH201** Sheet 2 of 2	
Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523640.32 - 412891.44	Hole Type CP
Location:	DN31 2TT		Level: 2.46	Scale 1:50
Client:	GRG		Dates: 10/06/2024 - 11/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	U	Ublow=36				
		10.50 - 11.00	B					
		11.50	D					
		12.00		N=19 (1,2/3,5,5,6)				
		12.50	D		12.50	-10.04		Soft dark brown sandy, gravelly CLAY. Fine gravel of chalk. Clay is wet.
		13.50	D		13.50	-11.04		Firm, dark brown sandy, gravelly CLAY. Gravel of fine chalk.
		13.50	U	Ublow=40				
		13.50 - 14.00	B					
		14.50	D					
		15.00		N=50 (4,6/50 for 200mm)	15.00	-12.54		Gravelly, clayey SAND with fine gravels of chalk.
		15.00 - 15.50	B					
		16.50		N=50 (4,5/50 for 285mm)				
		16.50 - 17.00	B					
		18.00		N=50 (5,6/50 for 295mm)	18.00	-15.54		End of borehole at 18.00 m

Remarks
Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

AGS

Borehole Log

Borehole No. **BH202**

Sheet 1 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523689.27 - 412901.93	Hole Type CP
Location:	DN31 2TT		Level:	2.22	Scale 1:50
Client:	GRG		Dates:	11/06/2024 - 12/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Soft dark brown CLAY with grey mottling.
		1.00	D					
		1.50	U	Ublow=6				
		2.00	D					
		3.00	D					
		3.00		N=1 (1,1/1,0,0,0)				
		4.00	D		4.00	-1.78		
								Soft dark grey CLAY with occasional black peat deposits.
		4.50	P					
		5.50	D					
		6.00		N=0 (1,0/0,0,0,0)				
		6.50	D					
		7.50	D		7.50	-5.28		
		7.50	U	Ublow=14				Firm dark brown CLAY with grey mottling.
		8.00	D					
		9.00	D					
		9.00		N=18 (1,2/4,5,4,5)				
	▼	10.00	D		10.00	-7.78		
								Continued on next sheet

Remarks

Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH202** Sheet 2 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523689.27 - 412901.93	Hole Type CP
Location:	DN31 2TT		Level: 2.22	Scale 1:50
Client:	GRG		Dates: 11/06/2024 - 12/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	U	Ublow=24	10.50	-8.28		Firm grey CLAY with fine to medium gravels of chalk.
		10.50 - 11.00	B					Grey CLAY recovered as slurry.
		11.60	D		11.60	-9.38		Firm brown CLAY with occasional fine gravels of chalk.
		12.00		N=16 (2,2/3,4,4,5)				
		12.50	D					
		13.50	D					
		13.50	U	Ublow=30				
		13.50 - 14.00	B					
		14.50	D					
		15.00		N=21 (2,4/4,5,6,6)				
		15.50	D					
	▽	16.50	D		16.50	-14.28		Brown gravelly SAND. Gravel is medium, subangular of flint and chalk.
		16.50	U	Ublow=40				
		16.60 - 17.00	B					
		18.00		N=19 (3,3/4,4,5,6)	18.00	-15.78		End of borehole at 18.00 m

Remarks
Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH203**

Sheet 1 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523676.08 - 412853.38	Hole Type CP
Location:	DN31 2TT		Level:	2.19	Scale 1:50
Client:	GRG		Dates:	12/06/2024 - 13/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D					Firm dark brown CLAY with occasional fine gravel of chalk.
		1.50	D					
		1.50	U	Ublow=6				
		2.00	D		2.00	0.19		Soft grey CLAY with occasional fine gravel of chalk.
		3.00		N=3 (1,0/1,1,1,0)				
		3.40	D					
		4.50	D					
		4.50	U	Ublow=2				
		4.50 - 5.00	B					
		5.50	D					
		6.00		N=1 (1,0/0,1,0,0)				
		6.70	D		6.70	-4.51		Black PEAT with vegetation visible. Fine gravel of chalk occasionally resent. Red/brown mottling/ banding noted within the layer.
		6.90	P					
		8.00	D		8.00	-5.81		Soft dark grey CLAY with black peat deposits.
		8.00	P		8.20	-6.01		Firm brown gravelly CLAY with grey mottling and fine to coarse gravels of chalk and flint.
		8.20	D					
		9.00		N=12 (2,2/2,2,4,4)				
		9.50	D					

Continued on next sheet

Remarks

Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH203** Sheet 2 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523676.08 - 412853.38	Hole Type CP
Location:	DN31 2TT		Level: 2.19	Scale 1:50
Client:	GRG		Dates: 12/06/2024 - 13/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	U	Ublow=40				
		10.50 - 11.00	B					
		11.50	D					
		12.00		N=20 (2,3/3,5,6,6)				
		12.50	D					
		13.50	D		13.50	-11.31		
		13.50	U	Ublow=45				Soft brown gravelly CLAY with fine to coarse gravels of chalk and flint.
		13.50 - 14.00	B					
		14.50	D					
		15.00		N=27 (4,4/6,6,8,7)	15.00	-12.81		
		15.00 - 15.50	B					Grown gravelly SAND with fine gravels of chalk. (Wet)
		15.60	D		15.60	-13.41		Firm brown sandy, gravelly CLAY with fine to coarse gravels of chalk.
		16.50	U	Ublow=40				
		16.80 - 17.00	B		16.80	-14.61		Brown SAND with fine gravels of chalk. (Wet)
		17.50		N=14 (2,2/3,4,3,4)				
		17.50 - 18.00	B					
					18.00	-15.81		End of borehole at 18.00 m

Remarks
Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH204**

Sheet 1 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523649.85 - 412804.17	Hole Type CP
Location:	DN31 2TT		Level:	2.00	Scale 1:50
Client:	GRG		Dates:	13/06/2024 - 17/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.50	D					Soft dark brown CLAY.
		1.00	D					
		1.50	U	Ublow=9				
		2.00	ES					
		2.60	D					
		3.00	ES					
		3.00		N=3 (1,0/1,1,1,1,0)				
		3.50	D					
		4.00	D					
		4.50	D		4.50	-2.50		
		4.50	U	Ublow=3				Soft dark grey CLAY with occasional fine gravel of chalk.
		4.50 - 5.00	B					
		5.50	D					
		6.00		N=2 (1,1/0,1,1,0)				
		6.50	D					
		7.50	U	Ublow=3				
		7.50 - 8.00	B					
		8.10	D					
		8.10	P					
					8.50	-6.50		Soft dark grey CLAY with small deposits of black peat noted.
		9.00		N=9 (2,2/2,3,2,2)	9.00	-7.00		
		9.00 - 9.50	B					Dark brown wet gravelly SAND. Gravel is fine to coarse, subangular of chalk.
		10.00	D					

Continued on next sheet

Remarks

Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH204** Sheet 2 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523649.85 - 412804.17	Hole Type CP
Location:	DN31 2TT		Level:	2.00	Scale 1:50
Client:	GRG		Dates:	13/06/2024 - 17/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50 10.50	D	N=16 (1,2/3,3,5,5)	10.50	-8.50		Firm dark brown gravelly CLAY. Gravel is fine to coarse, subangular of chalk.
		11.50	D					
		12.00 12.00 - 12.50	U B	Ublow=20				
		13.00	D					
		13.50		N=14 (2,3/3,3,4,4)				
		14.50	D		14.50	-12.50		Soft dark brown gravelly CLAY mottled with grey. Gravel is fine to coarse, subangular of chalk and unidentified black stone.
		15.00 15.00 - 15.50	U B	Ublow=39				
					15.50	-13.50		Soft dark brown gravelly CLAY. Gravel is fine to coarse, subangular of chalk. (Recovered as slurry)
		16.50 16.50	D	N=23 (2,4/5,6,6,6)	16.50	-14.50		Firm dark brown slightly gravelly CALY with grey mottling. Gravel is fine to coarse, subangular of chalk.
		17.50 17.50	D	N=50 (3,5/50 for 275mm)	17.50	-15.50		Very soft dark brown slightly gravelly CLAY. Gravels are fine to coarse, subangular of chalk.
		18.00	ES		18.00	-16.00		End of borehole at 18.00 m

Remarks
Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH205** Sheet 1 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523692.20 - 412733.25	Hole Type CP
Location:	DN31 2TT		Level:	1.97	Scale 1:50
Client:	GRG		Dates:	17/06/2024 - 19/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D					Stiff dark brown CLAY with occasional fine gravel of chalk.
		0.50	D					
		1.50	U	Ublow=3	1.50	0.47		
		1.50 - 2.00	B					Soft dark brown CLAY with grey mottling. Occasional fine chalk gravel present.
		2.20	D					
		3.00		N=2 (1,0/1,0,1,0)				
		3.50	D					
		4.50	D		4.50	-2.53		
		4.50	U	Ublow=3				Grey soft CLAY with occasional black peat deposits.
		5.50	D					
		6.00		N=1 (1,0/0,1,0,0)				
		7.00	D		7.00	-5.03		
		7.50	U	Ublow=10				Greyish brown slightly gravelly CLAY with grey mottling. Gravels are fine of chalk.
		8.00	D					
		8.10	D					
		9.00		N=1 (1,0/1,0,0,0)				
		9.50	D					
								Continued on next sheet

Remarks
Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Borehole Log

Borehole No. **BH205**

Sheet 2 of 2

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523692.20 - 412733.25	Hole Type CP
Location:	DN31 2TT		Level:	1.97	Scale 1:50
Client:	GRG		Dates:	17/06/2024 - 19/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50	D		10.50	-8.53		Soft grey gravelly CLAY. Gravel is fine to coarse, subangular of chalk and unidentified black stone. (Wet)
		10.50	U	Ublow=15				
		10.50 - 11.00	B					
		11.50	D					
		12.00		N=18 (2,3/3,4,5,6)				
		13.00	D					
		13.50	U	Ublow=18				
		13.50 - 14.00	B					
		14.50	D					
		15.00		N=21 (2,4/4,6,5,6)				
		15.50	D					
		16.50	U	Ublow=19	16.50	-14.53		Firm greyish brown gravelly CLAY with occasional red mottling. Gravels are fine to coarse of chalk and black stone
		16.50 - 17.00	B					
		17.50	D					
		17.50		N=21 (2,3/5,5,5,6)				
					18.00	-16.03		End of borehole at 18.00 m

Remarks

Hand excavated inspection pit from GL to 1.20m depth. Cable Percussive drilling from 1.20m to 18.00m depth.

Trial Pit Log

Trialpit No **TP201**

Sheet 1 of 1

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523645.50 - 412902.36 Level: 2.35	Date 10/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.00	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Stiff dark brown friable CLAY with occasional coarse gravel of flint. Vegetation / roots present to 0.2m.
				0.30	2.05		Stiff dark brown CLAY. *Shear Vane refusal*
				0.60	1.75		Firm dark brown CLAY with orange and grey mottling. *Shear Vane - 140 KPa*
				1.00	1.35		Firm dark brown CLAY with occasional dark grey mottling. *Shear Vane - 78 / 100 / 91 KPa*
				2.30	0.05		Soft dark grey CLAY. *Shear Vane - 66/58/56 KPa*
				3.70	-1.35		Soft black CLAY. *Shear Vane*
				4.00	-1.65		End of pit at 4.00 m

1 2 3 4

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No **TP202**

Sheet 1 of 1

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523646.16 - 412937.41 Level: 2.57	Date 10/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.00	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							Stiff dark brown friable CLAY. Vegetation / roots to 0.2m.
							Shear Vane - 120 KPa
							Red brick land drain at 1m
				1.00	1.57		Firm dark brown CLAY with grey and black mottling.
							Shear Vane - 148 KPa
				2.00	0.57		Firm grey /black CLAY occasionally mottled with brown.
							Shear Vane 126 KPa
				3.00	-0.43		Soft black CLAY.
							Shear Vane - 30KPa
				4.00	-1.43		End of pit at 4.00 m

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No **TP203**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523664.29 - 412966.37 Level: 2.39
Location:	DN31 2TT	Dimensions (m): Depth 4.00	Date 11/06/2024
Client:	GRG		Scale 1:20 Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	1.00	ES					Dark brown firm CLAY with grey mottling. Vegetation and roots present to 0.2m. *Shear Vane 150 KPa*
	2.00	ES		2.00	0.39		*Shear Vane 150 KPa* Black soft CLAY with occasional brown mottling. *Shear Vane 13 KPa*
	3.00	ES		3.00	-0.61		Black soft CLAY with visible water seepage. *Shear Vane 11 KPa*
	4.00	ES		4.00	-1.61		End of pit at 4.00 m

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No **TP204**

Sheet 1 of 2

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523671.14 - 412833.29 Level: 1.98	Date 11/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.10	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
	1.00	ES		1.00	0.98		Dark brown CLAY with grey mottling. *Shear Vane 150 KPa*	1
	2.00	ES		2.00	-0.02		Dark brown firm CLAY with occasional black inclusions and light grey mottling. *Shear Vane 98 KPa*	2
	3.00	ES		3.00	-1.02		Dark grey firm CLAY with mottled dark brown CLAY. *Shear Vane 72 KPa*	3
	4.00	ES		4.00	-2.02		Soft grey CLAY with peat inclusions and mottled with black. *Shear Vane 81 KPa*	4
							Continued on next sheet	

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No
TP204
Sheet 2 of 2

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523671.14 - 412833.29 Level: 1.98	Date 11/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.10	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							End of pit at 4.10 m

5
6
7
8

Remarks: JCB 3CX

Stability:

AGS

Trial Pit Log

Trialpit No **TP205**

Sheet 1 of 1

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523653.12 - 412821.32 Level: 2.14	Date 11/06/2024
Location: DN31 2TT		Dimensions (m): Depth 3.10	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							Firm dark brown CLAY with light grey mottling. *Shear Vane 150 KPa*
	1.00	ES		1.00	1.14		Firm dark brown CLAY with occasional black streaks and pockets of black clay. *Shear Vane 150 KPa*
	2.00	ES		2.00	0.14		
▼	3.00	ES		3.10	-0.96		Soft black grey CLAY with occasional peat deposits and dark brown mottling. End of pit at 3.10 m

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No **TP206**

Sheet 1 of 2

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523647.82 - 412769.09 Level: 2.11	Date 11/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.20	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
	1.00	ES		1.00	1.11		Stiff dark brown CLAY with light grey mottling and occasional fine gravel of chalk. *Shear Vane - 150 KPa*	
							Stiff dark brown CLAY with dark grey and black mottling. *Shear Vane - 124 KPa*	1
▼	2.00	ES		2.00	0.11		Soft black CLAY with brown mottling and rare peat inclusions. *Shear Vane - 40 KPa*	2
	3.00	ES		3.00	-0.89		Soft black CLAY occasionally mottled with brown. Occasional fine chalk gravel noted. *Shear Vane - 68 KPa*	3
	4.00	ES					Continued on next sheet	4

Remarks: JCB 3CX

Stability:

Trial Pit Log

Trialpit No
TP206
Sheet 2 of 2

Project Name: Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523647.82 - 412769.09 Level: 2.11	Date 11/06/2024
Location: DN31 2TT		Dimensions (m): Depth 4.20	Scale 1:20
Client: GRG			Logged

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				4.20	-2.09		End of pit at 4.20 m

5
6
7
8

Remarks: JCB 3CX

Stability:

AGS

Borehole Log

Borehole No. **WS201**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523762.21 - 412607.43	Hole Type WLS
Location:	DN31 2TT		Level:	2.59	Scale 1:50
Client:	GRG		Dates:	12/06/2024 - 12/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25	2.34		Black sandy ashy matrix with coarse gravels of clinker and anthracite. (MADE GROUND)
					0.40	2.19		Very firm black CLAY with fine gravel of clinker and anthracite. (MADE GROUND)
					0.80	1.79		Very firm black CLAY.
		1.00		N=9 (1,1/2,2,3,2)				Firm dark brown CLAY with grey mottling.
		2.00		N=4 (1,1/1,1,1,1)				
					2.35	0.24		Soft light grey CLAY with black mottling.
					2.65	-0.06		Firm dark brown CLAY.
		3.00		N=0 (0,0/0,0,0,0)	3.05	-0.46		Soft grey CLAY mottled with black.
					3.50	-0.91		
		4.00		N=0 (0,0/0,0,0,0)				
		5.00		N=3 (1,0/1,0,1,1)				End of borehole at 5.00 m

Remarks

Borehole Log

Borehole No. **WS202**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523737.25 - 412575.09	Hole Type WLS
Location:	DN31 2TT		Level:	2.81	Scale 1:50
Client:	GRG		Dates:	12/06/2024 - 12/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	2.71		Refused near surface. Two attempts in this area but no progress.
								End of borehole at 0.30 m

Remarks

AGS

Borehole Log

Borehole No. **WS203**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523730.16 - 412702.35	Hole Type WLS
Location:	DN31 2TT		Level: 2.73	Scale 1:50
Client:	GRG		Dates: 20/06/2024 - 20/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	2.53		Scrub vegetation over dark brown clay MADE GROUND with coarse gravels of chalk and red brick.
					0.40	2.33		Sandy gravel MADE GROUND. Gravel is fine to coarse of chalk.
		1.00		N=11 (2,2/3,3,2,3)	0.90	1.83		Firm dark brown CLAY mottled with grey. Occasional coarse gravels of chalk.
		2.00		N=3 (1,0/1,0,1,1)				Firm dark brown gravelly CLAY with grey mottling. Gravels are fine to medium, subangular of chalk.
		3.00		N=3 (1,0/1,0,1,1)	2.80	-0.07		Soft dark grey CLAY with brown mottling.
					3.10	-0.37		Soft black gravelly CLAY. Gravels are fine to medium, subangular of chalk.
					3.30	-0.57		Soft grey gravelly CLAY with brown mottling. Gravels are fine to coarse, subangular of chalk.
					3.50	-0.77		Firm dark brown gravelly CLAY with grey mottling. Gravels are fine to coarse, subangular of chalk.
		4.00		N=4 (1,1/1,1,1,1)	4.00	-1.27		Soft black CLAY with light brown mottling. Occasional fine gravel of chalk.
		5.00		N=0 (0,0/0,0,0,0)	5.00	-2.27		End of borehole at 5.00 m

Remarks

Second attempt. First attempt refused.

Borehole Log

Borehole No. **WS204**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523723.17 - 412875.99	Hole Type WLS
Location:	DN31 2TT		Level: 2.20	Scale 1:50
Client:	GRG		Dates: 20/06/2024 - 20/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.90	1.30		Stiff dark brown CLAY with grey mottling. Vegetation / roots present until 0.2.
		1.00		N=7 (1,1/1,2,2,2)				Firm brown CLAY with grey mottling.
		2.00		N=4 (1,1/1,1,1,1)				
					2.40	-0.20		Soft brown CLAY with grey and occasional black mottling.
		3.00		N=0 (0,0/0,0,0,0)	3.00	-0.80		Very soft dark grey CLAY with occasional grey mottling.
		4.00		N=0 (0,0/0,0,0,0)				
					5.00	-2.80		End of borehole at 5.00 m

Remarks

AGS

Borehole Log

Borehole No.	**WS205**	Sheet 1 of 1	
Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	
Co-ords:	523675.49 - 412833.47	Hole Type WLS	
Location:	DN31 2TT	Level: 2.19	Scale 1:50
Client:	GRG	Dates: 20/06/2024 - 20/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.00		N=6 (1,1/1,1,2,2)				Firm dark brown with grey mottling. Occasional medium to coarse chalk gravel. Vegetation and roots present to 0.2m.
		2.00		N=4 (1,1/1,1,1,1)				
					2.40	-0.21		Soft greyish brown CLAY with black mottling.
		3.00		N=0 (0,0/0,0,0,0)	3.00	-0.81		Very soft dark grey CLAY with brown mottling.
		4.00		N=0 (0,0/0,0,0,0)				*Black peat deposits*
					5.00	-2.81		End of borehole at 5.00 m

Remarks

Borehole Log

Borehole No. **WS206**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords:	523651.91 - 412815.16	Hole Type WLS
Location:	DN31 2TT		Level:	2.17	Scale 1:50
Client:	GRG		Dates:	20/06/2024 - 20/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES					Firm dark brown CLAY with grey mottling. Occasional fine to medium gravels of chalk. Vegetation/roots present to 0.15m.
		1.00		N=6 (1,1/1,2,1,2)	0.90	1.27		Firm dark brown CLAY with grey mottling.
		2.00		N=4 (1,0/1,1,1,1)	1.80	0.37		Soft dark brown CLAY with occasional black and grey mottling.
					2.50	-0.33		Soft grey CLAY with black and brown mottling.
		3.00		N=0 (0,0/0,0,0,0)	2.70	-0.53		Soft grey CLAY with greyish brown and black mottling.
		4.00		N=0 (0,0/0,0,0,0)				
					5.00	-2.83		End of borehole at 5.00 m

Remarks

Borehole Log

Borehole No. **WS207**

Sheet 1 of 1

Project Name:	Humber Gate (HTI), Grimsby - Additional Works	Project No. 129-003084	Co-ords: 523635.80 - 412837.40	Hole Type WLS
Location:	DN31 2TT		Level: 2.16	Scale 1:50
Client:	GRG		Dates: 20/06/2024 - 20/06/2024	Logged By

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.85	1.31		Stiff dark brown CLAY with grey mottling. Occasional fine to medium gravel of chalk. Vegetation / roots present to 0.2m.
		1.00		N=9 (1,1/2,2,3,2)				Firm dark brown CLAY with grey mottling. Occasional fine to medium gravels of chalk and black stone.
		2.00		N=4 (1,0/1,1,1,1)				
					2.40	-0.24		Soft greyish brown CLAY with black mottling.
					2.60	-0.44		Very soft black CLAY with brown mottling. (wet)
		3.00		N=0 (0,0/0,0,0,0)				
		4.00		N=0 (0,0/0,0,0,0)				
					5.00	-2.84		End of borehole at 5.00 m

Remarks

Appendix C

Cross Sections

Project Id:	129-003084	Title:	Site Plan
Project Title:	Humber Gate (HTI), Grimsby - Additional Works	Scale:	1:2000
Location:	DN31 2TT	Engineer:	Rebecca Beddard
Client:	GRG	Contractor:	Mayer Environmental Ltd

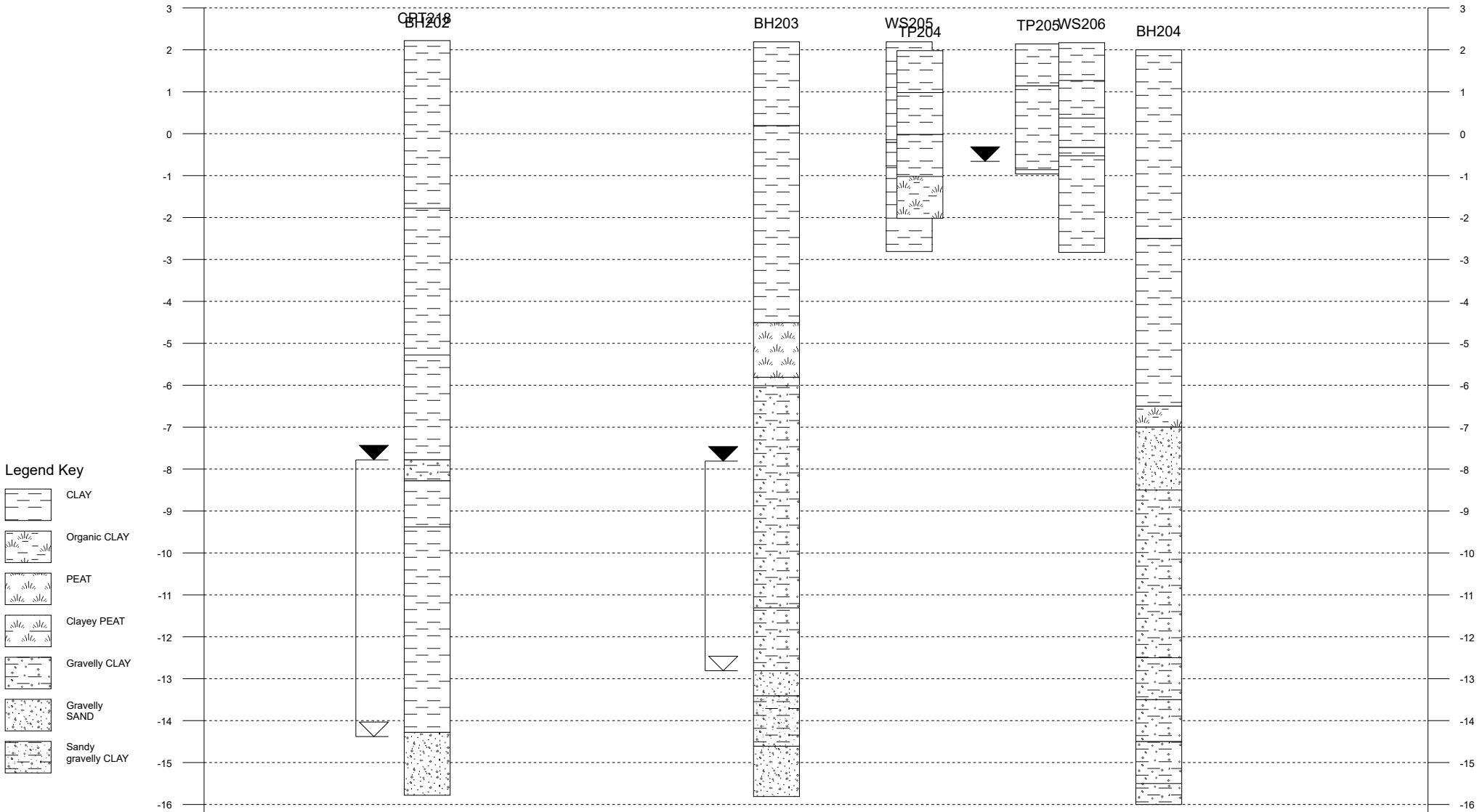
mayer

Legend Key

- Sections - Section line 1
- Locations By Type - Empty
- Locations By Type - TP
- Locations By Type - CP
- Locations By Type - WLS

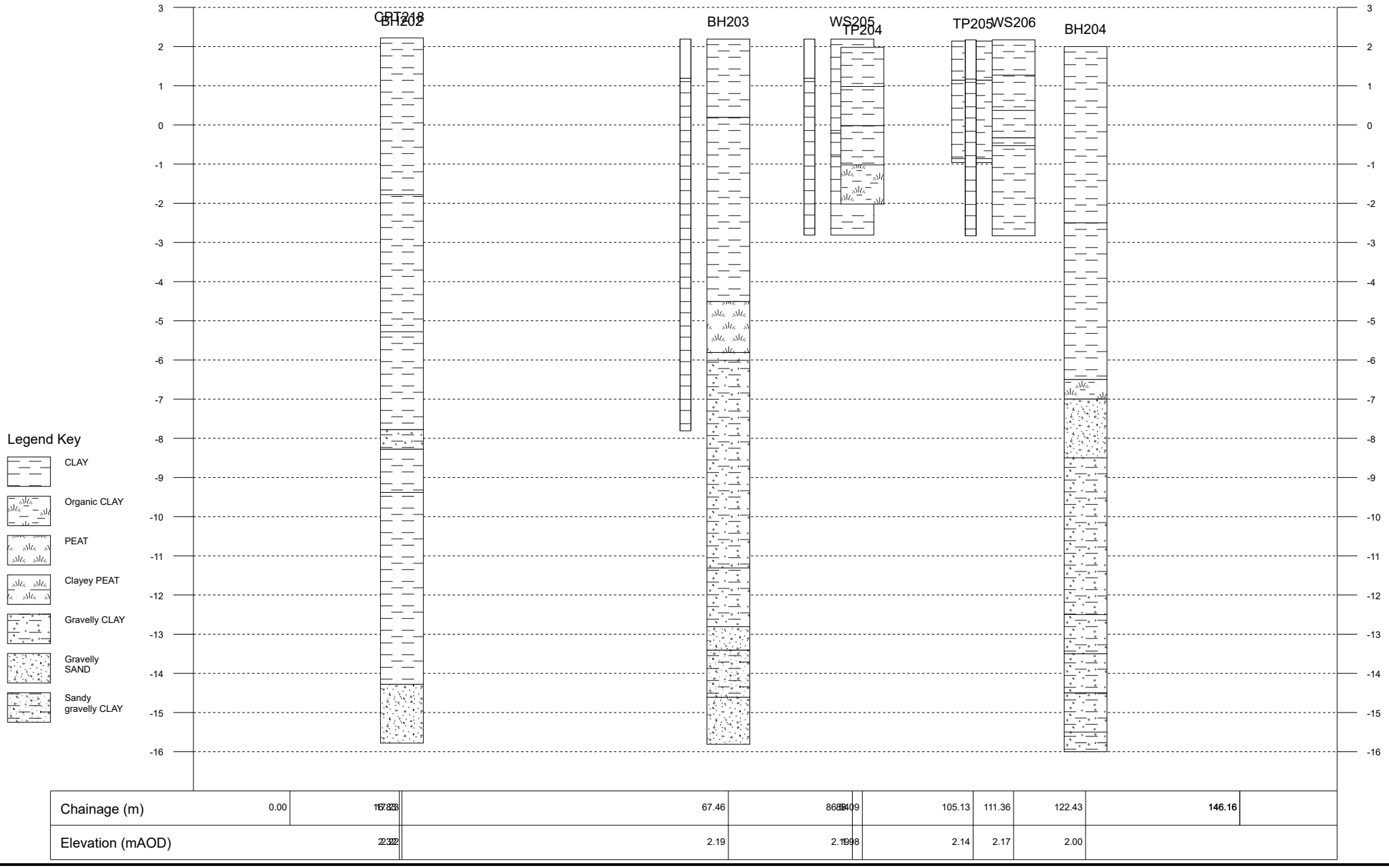


Project Id: 129-003084	Title: Section line 1
Project Title: Humber Gate (HTI), Grimsby - Additional Works	Vertical Scale: 1:131
Location: DN31 2TT	Horizontal Scale: 1:790
Client: GRG	Engineer: Rebecca Beddard



Chainage (m)	0.00	16.83	67.46	86.09	105.13	111.36	122.43	146.16	
Elevation (mAOD)	2.32	2.22	2.19	2.19	2.14	2.17	2.00		

Project Id: 129-003084	Title: Cross Section 1 with Groundwater Levels
Project Title: Humber Gate (HTI), Grimsby - Additional Works	Vertical Scale: 1:131
Location: DN31 2TT	Horizontal Scale: 1:790
Client: GRG	Engineer: Rebecca Beddard



Chainage (m)	0.00		67.46		105.13	111.36	122.43	146.16	
Elevation (mAOD)			2.19		2.14	2.17	2.00		

Appendix D

Laboratory Certificates – Soils

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

Final Report

Report No.:	24-18926-1
Initial Date of Issue:	01-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	14-Jun-2024
Order No.:	101330976	**Date Instructed:**	14-Jun-2024
No. of Samples:	6		
Turnaround (Wkdays):	8	**Results Due:**	25-Jun-2024
Date Approved:	01-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:				**Chemtest Sample ID.:**		1821367	1821370	1821377	1821379	1821384	1821393
				Sample Location:		TP201	TP202	TP203	TP204	TP206	TP205
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		1.00	1.00	3.00	2.00	1.00	1.00
				Date Sampled:		10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type		U	2192		N/A	-	-			-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected			No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	27	22	34	24	23	21
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	None	Roots	None	None	None	Stones
Soil Texture		N	2040		N/A	Clay	Clay	Loam	Clay	Clay	Sand
pH at 20C		M	2010		4.0	8.4	8.7	9.1	8.2	8.5	9.1
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	680	110	1500	560	400	440
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	3.0	3.8	< 0.40	0.55	< 0.40	2.5
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.27	0.033	< 0.010	0.062	< 0.010	0.11
Total Sulphur		U	2175	%	0.010	0.090	0.024	0.42	0.051	0.032	0.038
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	3.6	7.0	5.8	3.7	5.6	3.5
Arsenic		M	2455	mg/kg	0.5	3.5	6.8	7.1	5.0	12	15
Cadmium		M	2455	mg/kg	0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	9.5	21	19	14	21	32
Copper		M	2455	mg/kg	0.50	11	9.3	10	7.6	9.8	19
Mercury		M	2455	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	16	20	19	14	26	34
Lead		M	2455	mg/kg	0.50	6.6	13	11	8.0	12	19
Selenium		M	2455	mg/kg	0.25	0.94	0.49	0.40	0.32	< 0.25	0.42
Zinc		M	2455	mg/kg	0.50	18	49	43	32	62	72
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[C] < 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[C] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.7
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	4.1
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] < 2.0	< 2.0	2.1	< 2.0	< 2.0	2.9
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[C] 4.1	< 3.0	< 3.0	< 3.0	< 3.0	8.3
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] < 10	< 10	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[C] < 5.0	< 5.0	< 5.0	< 5.0	< 5.0	19
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] < 10	< 10	< 10	< 10	< 10	19
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:				**Chemtest Sample ID.:**		1821367	1821370	1821377	1821379	1821384	1821393
				Sample Location:		TP201	TP202	TP203	TP204	TP206	TP205
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		1.00	1.00	3.00	2.00	1.00	1.00
				Date Sampled:		10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[C] < 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] 3.2	3.2	6.0	4.1	2.6	3.9
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.6
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[C] < 5.0	< 5.0	6.0	< 5.0	< 5.0	< 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[C] < 10	< 10	< 10	< 10	< 10	< 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[C] < 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[C] < 10	< 10	< 10	< 10	< 10	23
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[C] < 10	< 10	< 10	< 10	< 10	25
Organic Matter		M	2625	%	0.40	2.0	3.3	2.2	1.5	1.6	1.0
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.77	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.21	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.88	0.14	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.85	0.22	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.26	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.4	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	4.4	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane		M	2760	µg/kg	20	[C] < 20	< 20	< 20	< 20	< 20	< 20
Chloroethane		U	2760	µg/kg	2.0	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:				**Chemtest Sample ID.:**		1821367	1821370	1821377	1821379	1821384	1821393
				Sample Location:		TP201	TP202	TP203	TP204	TP206	TP205
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		1.00	1.00	3.00	2.00	1.00	1.00
				Date Sampled:		10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
Dichloromethane		N	2760	µg/kg	50	[C] < 50	< 50	< 50	< 50	< 50	< 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[C] < 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloromethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichloroethene		N	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[C] < 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	< 10	< 10	< 10	< 10	< 10
Toluene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	< 10	< 10	< 10	< 10	< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[C] < 10	< 10	< 10	< 10	< 10	< 10
Tetrachloroethene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	2760	µg/kg	10	[C] < 10	< 10	< 10	< 10	< 10	< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[C] < 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[C] < 50	< 50	< 50	< 50	< 50	< 50
N-Propylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:				**Chemtest Sample ID.:**		1821367	1821370	1821377	1821379	1821384	1821393
				Sample Location:		TP201	TP202	TP203	TP204	TP206	TP205
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		1.00	1.00	3.00	2.00	1.00	1.00
				Date Sampled:		10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[C] < 50	< 50	< 50	< 50	< 50	< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[C] < 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[C] < 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodimethylamine		M	2790	mg/kg	0.50		< 0.50				
Phenol		M	2790	mg/kg	0.50		< 0.50				
2-Chlorophenol		N	2790	mg/kg	0.50		< 0.50				
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50		< 0.50				
1,3-Dichlorobenzene		M	2790	mg/kg	0.50		< 0.50				
1,4-Dichlorobenzene		N	2790	mg/kg	0.50		< 0.50				
1,2-Dichlorobenzene		M	2790	mg/kg	0.50		< 0.50				
2-Methylphenol		M	2790	mg/kg	0.50		< 0.50				
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50		< 0.50				
Hexachloroethane		N	2790	mg/kg	0.50		< 0.50				
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50		< 0.50				
4-Methylphenol		M	2790	mg/kg	0.50		< 0.50				
Nitrobenzene		N	2790	mg/kg	0.50		< 0.50				
Isophorone		M	2790	mg/kg	0.50		< 0.50				
2-Nitrophenol		N	2790	mg/kg	0.50		< 0.50				
2,4-Dimethylphenol		N	2790	mg/kg	0.50		< 0.50				
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50		< 0.50				
2,4-Dichlorophenol		N	2790	mg/kg	0.50		< 0.50				
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50		< 0.50				
Naphthalene		M	2790	mg/kg	0.50		< 0.50				
4-Chloroaniline		N	2790	mg/kg	0.50		< 0.50				
Hexachlorobutadiene		M	2790	mg/kg	0.50		< 0.50				
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50		< 0.50				
2-Methylnaphthalene		M	2790	mg/kg	0.50		< 0.50				
4-Nitrophenol		N	2790	mg/kg	0.50		< 0.50				
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50		< 0.50				

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd			**Chemtest Job No.:**	24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:			**Chemtest Sample ID.:**	1821367	1821370	1821377	1821379	1821384	1821393
			Sample Location:	TP201	TP202	TP203	TP204	TP206	TP205
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):	0.60	0.00	0.00	0.00	0.00	0.00
			Bottom Depth (m):	1.00	1.00	3.00	2.00	1.00	1.00
			Date Sampled:	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
			Asbestos Lab:	DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50		< 0.50				
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50		< 0.50				
2-Chloronaphthalene		M	2790	mg/kg	0.50		< 0.50				
2-Nitroaniline		N	2790	mg/kg	0.50		< 0.50				
Acenaphthylene		M	2790	mg/kg	0.50		< 0.50				
Dimethylphthalate		M	2790	mg/kg	0.50		< 0.50				
2,6-Dinitrotoluene		N	2790	mg/kg	0.50		< 0.50				
Acenaphthene		M	2790	mg/kg	0.50		< 0.50				
3-Nitroaniline		N	2790	mg/kg	0.50		< 0.50				
Dibenzofuran		M	2790	mg/kg	0.50		< 0.50				
4-Chlorophenylphenylether		M	2790	mg/kg	0.50		< 0.50				
2,4-Dinitrotoluene		N	2790	mg/kg	0.50		< 0.50				
Fluorene		M	2790	mg/kg	0.50		< 0.50				
Diethyl Phthalate		M	2790	mg/kg	0.50		< 0.50				
4-Nitroaniline		N	2790	mg/kg	0.50		< 0.50				
Azobenzene		M	2790	mg/kg	0.50		< 0.50				
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50		< 0.50				
Hexachlorobenzene		M	2790	mg/kg	0.50		< 0.50				
Phenanthrene		M	2790	mg/kg	0.50		< 0.50				
Anthracene		M	2790	mg/kg	0.50		< 0.50				
Carbazole		M	2790	mg/kg	0.50		< 0.50				
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50		< 0.50				
Fluoranthene		M	2790	mg/kg	0.50		< 0.50				
Pyrene		M	2790	mg/kg	0.50		< 0.50				
Butylbenzyl Phthalate		N	2790	mg/kg	0.50		< 0.50				
Benzo[a]anthracene		M	2790	mg/kg	0.50		< 0.50				
Chrysene		M	2790	mg/kg	0.50		< 0.50				
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50		< 0.50				
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50		< 0.50				
Benzo[b]fluoranthene		M	2790	mg/kg	0.50		< 0.50				
Benzo[k]fluoranthene		M	2790	mg/kg	0.50		< 0.50				
Benzo[a]pyrene		M	2790	mg/kg	0.50		< 0.50				
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50		< 0.50				
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50		< 0.50				
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50		< 0.50				
PCB 28		U	2815	mg/kg	0.010		< 0.010				
PCB 52		U	2815	mg/kg	0.010		< 0.010				
PCB 101		U	2815	mg/kg	0.010		< 0.010				

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd			**Chemtest Job No.:**			24-18926	24-18926	24-18926	24-18926	24-18926	24-18926
Quotation No.:			**Chemtest Sample ID.:**			1821367	1821370	1821377	1821379	1821384	1821393
				Sample Location:		TP201	TP202	TP203	TP204	TP206	TP205
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		1.00	1.00	3.00	2.00	1.00	1.00
				Date Sampled:		10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024	10-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM			DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**						
PCB 118		U	2815	mg/kg	0.010		< 0.010				
PCB 153		U	2815	mg/kg	0.010		< 0.010				
PCB 138		U	2815	mg/kg	0.010		< 0.010				
PCB 180		U	2815	mg/kg	0.010		< 0.010				
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10		< 0.10				
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1821367			TP201	10-Jun-2024	C	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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Final Report

Report No.:	24-19438-1
Initial Date of Issue:	04-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	19-Jun-2024
Order No.:	101330976	**Date Instructed:**	19-Jun-2024
No. of Samples:	4		
Turnaround (Wkdays):	6	**Results Due:**	26-Jun-2024
Date Approved:	04-Jul-2024	**Subcon Results Due:**	10-Jul-2024

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19438	24-19438	24-19438	24-19438
Quotation No.:				**Chemtest Sample ID.:**		1823478	1823479	1823480	1823481
				Sample Location:		TP211	TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.25	0.40	0.40
				Bottom Depth (m):		0.10			
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type		U	2192		N/A		-	-	-
Asbestos Identification		U	2192		N/A		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	20	23	23	28
Soil Colour		N	2040		N/A		Brown	Brown	Brown
Other Material		N	2040		N/A		Stones and Roots	Stones and Roots	Stones and Roots
Soil Texture		N	2040		N/A		Clay	Clay	Clay
pH at 20C		M	2010		4.0		8.1	8.2	8.1
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0		360	320	500
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40		6.5	3.3	4.0
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010		0.015	< 0.010	0.042
Total Sulphur		U	2175	%	0.010		0.049	0.034	0.081
Cyanide (Total)		M	2300	mg/kg	0.50		1.0	0.60	1.1
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50		5.6	27	10
Arsenic		M	2455	mg/kg	0.5		18	15	20
Cadmium		M	2455	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5		44	35	40
Copper		M	2455	mg/kg	0.50		60	20	78
Mercury		M	2455	mg/kg	0.05		0.19	0.06	0.55
Nickel		M	2455	mg/kg	0.50		45	40	41
Lead		M	2455	mg/kg	0.50		86	32	190
Selenium		M	2455	mg/kg	0.25		< 0.25	< 0.25	< 0.25
Zinc		M	2455	mg/kg	0.50		140	83	170
Chromium (Hexavalent)		N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25		< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		3.6	7.7	8.8
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00		2.5	2.5	4.3
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00		< 2.0	< 2.0	< 2.0
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00		6.9	13	13
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00		14	14	14
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00		13	25	27
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00		27	39	40

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19438	24-19438	24-19438	24-19438
Quotation No.:				**Chemtest Sample ID.:**		1823478	1823479	1823480	1823481
				Sample Location:		TP211	TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.25	0.40	0.40
				Bottom Depth (m):		0.10			
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05		< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25		< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00		< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		2.9	2.3	3.8
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00		7.5	20	33
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00		3.1	6.1	5.2
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00		10	22	36
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00		13	28	42
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00		23	47	63
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00		41	67	82
Organic Matter		M	2625	%	0.40		4.8	3.9	5.5
Naphthalene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10		0.34	< 0.10	0.27
Pyrene		M	2700	mg/kg	0.10		0.32	< 0.10	0.36
Benzo[a]anthracene		M	2700	mg/kg	0.10		0.18	< 0.10	0.12
Chrysene		M	2700	mg/kg	0.10		0.44	< 0.10	0.52
Benzo[b]fluoranthene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0		< 2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Chloromethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Bromomethane		M	2760	µg/kg	20		< 20	< 20	< 20
Chloroethane		U	2760	µg/kg	2.0		< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19438	24-19438	24-19438	24-19438
Quotation No.:				**Chemtest Sample ID.:**		1823478	1823479	1823480	1823481
				Sample Location:		TP211	TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.25	0.40	0.40
				Bottom Depth (m):		0.10			
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
1,1-Dichloroethene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Dichloromethane		N	2760	µg/kg	50		< 50	< 50	< 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Bromochloromethane		U	2760	µg/kg	5.0		< 5.0	< 5.0	< 5.0
Trichloromethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Benzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0		< 2.0	< 2.0	< 2.0
Trichloroethene		N	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Dibromomethane		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0		< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10		< 10	< 10	< 10
Toluene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10		< 10	< 10	< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10		< 10	< 10	< 10
Tetrachloroethene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0		< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	2760	µg/kg	10		< 10	< 10	< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0		< 5.0	< 5.0	< 5.0
Chlorobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0		< 2.0	< 2.0	< 2.0
Ethylbenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Styrene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Tribromomethane		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Bromobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50		< 50	< 50	< 50
N-Propylbenzene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd			**Chemtest Job No.:**			24-19438	24-19438	24-19438	24-19438
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				Sample Location:		TP211	TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.25	0.40	0.40
				Bottom Depth (m):		0.10			
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:			DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Tert-Butylbenzene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50		< 50	< 50	< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0		< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0		< 1.0	< 1.0	< 1.0
PCB 28		U	2815	mg/kg	0.010			< 0.010	
PCB 52		U	2815	mg/kg	0.010			< 0.010	
PCB 101		U	2815	mg/kg	0.010			< 0.010	
PCB 118		U	2815	mg/kg	0.010			< 0.010	
PCB 153		U	2815	mg/kg	0.010			< 0.010	
PCB 138		U	2815	mg/kg	0.010			< 0.010	
PCB 180		U	2815	mg/kg	0.010			< 0.010	
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10			< 0.10	
Total Phenols		M	2920	mg/kg	0.10		< 0.10	< 0.10	< 0.10

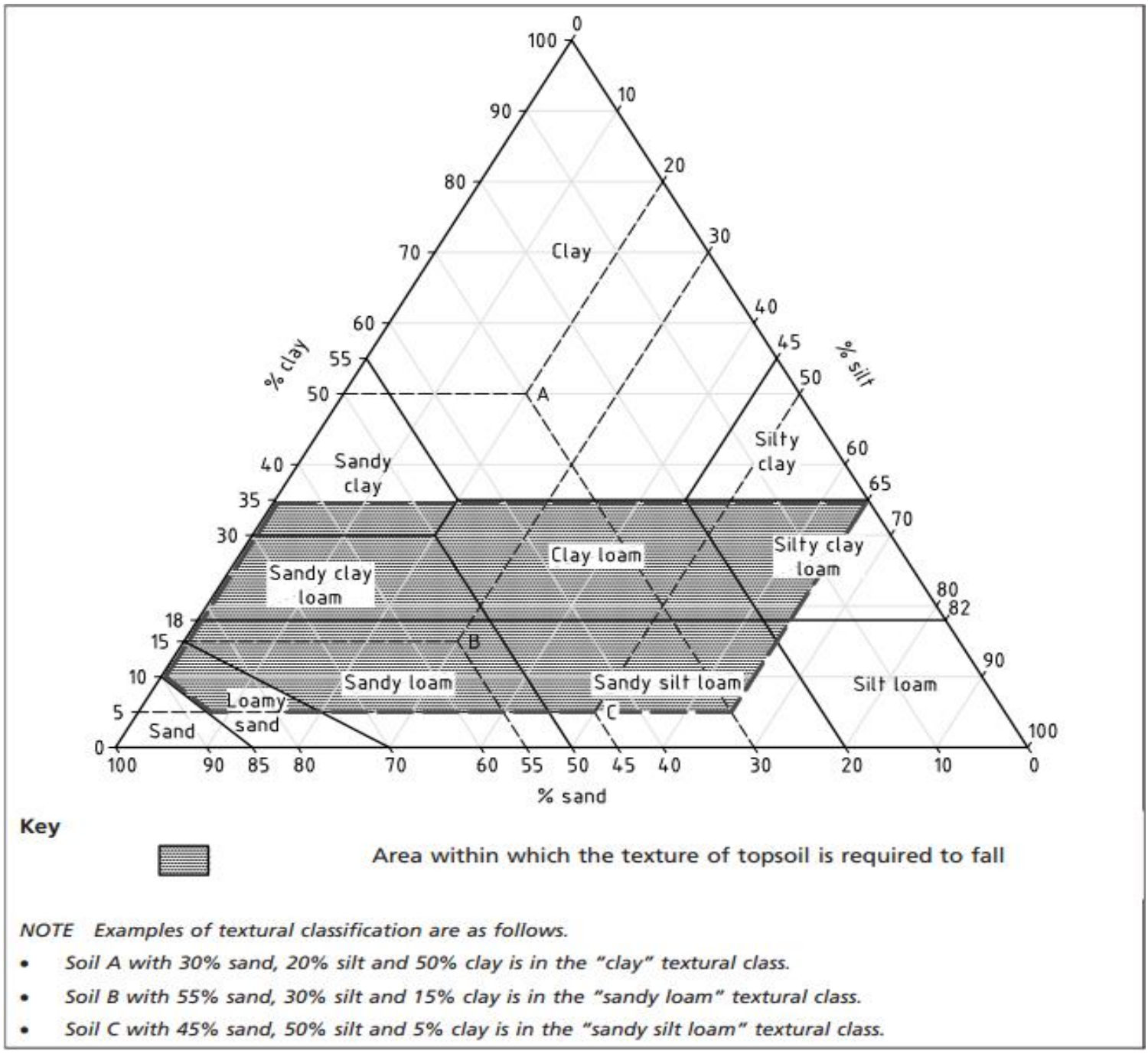
Results - Topsoil Report

BS3882:2015

Chemtest Job No.: 24-19438
Chemtest Sample ID.: 1823478
Client Sample Ref.:
Sample Location: TP211
Client Sample ID.:
Top Depth (m): 0.25
Bottom Depth (m): 0.10
Date Sampled: 13-Jun-2024
Time Sampled:

Parameter	Units	Multipurpose Range	Result	Compliant with Multipurpose Range? (Y/N)	Compliant with Specific Purpose Range? (Y/N)		
Texture					**Acid**	**Low F**	**Calc.**
Clay content (Sub Contracted)	%		41				
Silt content (Sub Contracted)	%		55				
Sand content (Sub Contracted)	%		3.9				
Soil texture class		See Attached Chart	Silty Clay	NO			
Mass Loss on Ignition							
Clay 5-20%		3.0-20	4.3	NO	NO	YES	NO
Clay 20-35%		5.0-20					
Stone Content	**% m/m**						
>2mm (Sub Contracted)		0-30	0.80	YES			
>20mm (Sub Contracted)		0-10	< 100	YES			
>50mm (Sub Contracted)		0	< 100	YES			
Soil pH value		5.5-8.5	7.5	YES	NO	YES	YES
Carbonate (Calcareous only)	%		1.6				YES
Electrical Conductivity	µS/cm	If >3300 do ESP	2100	YES			
Available Nutrient Content							
Nitrogen %		>0.15	0.19	YES	YES		YES
Extractable phosphorus	mg/l	16-140	3.0	NO	NO	YES	NO
Extractable potassium	mg/l	121-1500	460	YES	YES		YES
Extractable magnesium	mg/l	51-600	770	NO	NO		NO
Carbon : Nitrogen Ratio		<20:1	13.2/1	YES	YES	YES	YES
Exchangeable sodium	**%**	<15	1.6				
Available Calcium	mg/l		870				
Available Sodium	mg/l		110				
Phytotoxic Contaminants (by soil pH)		**< 6.0** / **6.0-7.0** / **> 7.0**					
Zinc (Nitric Acid extract)	mg/kg	<200 / <200 / <300	85	YES			
Copper (Nitric Acid extract)	mg/kg	<100 / <135 / <200	19	YES			
Nickel (Nitric Acid extract)	mg/kg	<60 / <75 / <110	38	YES			
Visible Contaminants	**% mm**						
>2mm		<0.5	0.000	YES			
….. of which plastics		<0.25	0.000	YES			
….. man-made sharps		zero in 1kg	0.000	YES			

Topsoil: BS3882:2015
Texture Classification Chart



Key

Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- *Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.*
- *Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.*
- *Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.*

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Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°C.	
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930	
2115	Total Nitrogen in Soils	Nitrogen	Determination by elemental analyser	
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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2260	Carbonate	Carbonate	Titration	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by ‘Aquakem 600’ Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2400	Cations	Cations	ICP-MS	
2420	Phosphate	Phosphate	Spectrophotometry - Discrete analyser	
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by ‘Aquakem 600’ Discrete Analyser using 1,5-diphenylcarbazide.	
2620	LOI 440	LOI 440 Trommel Fines	Determination of the proportion by mass that is lost from a soil by ignition at 440°C.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-19453-1
Initial Date of Issue:	01-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	14-Jun-2024
Order No.:	101330976	**Date Instructed:**	19-Jun-2024
No. of Samples:	4		
Turnaround (Wkdays):	8	**Results Due:**	28-Jun-2024
Date Approved:	01-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19453	24-19453	24-19453	24-19453
Quotation No.:				**Chemtest Sample ID.:**		1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type		U	2192		N/A	-	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	17	19	26	22
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones and Roots	Stones and Roots
Soil Texture		N	2040		N/A	Clay	Sand	Sand	Sand
pH at 20C		M	2010		4.0	7.8	8.3	7.7	8.0
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	350	370	370	480
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	2.6	2.9	2.1	3.1
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.10	0.055	< 0.010	0.11
Total Sulphur		U	2175	%	0.010	0.15	0.13	0.051	0.11
Cyanide (Total)		M	2300	mg/kg	0.50	1.2	< 0.50	< 0.50	1.1
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	42	96	3.3	31
Arsenic		M	2455	mg/kg	0.5	16	15	17	26
Cadmium		M	2455	mg/kg	0.10	< 0.10	0.11	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	36	34	45	49
Copper		M	2455	mg/kg	0.50	36	79	22	35
Mercury		M	2455	mg/kg	0.05	0.10	0.08	0.11	0.10
Nickel		M	2455	mg/kg	0.50	32	29	36	51
Lead		M	2455	mg/kg	0.50	52	31	44	44
Selenium		M	2455	mg/kg	0.25	1.7	2.3	1.1	1.6
Zinc		M	2455	mg/kg	0.50	240	560	110	150
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	10	11	11	10
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	7.7	9.2	9.9	7.2
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	4.4	10	8.2	2.4
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	9.0	10	13	8.7
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	31	40	42	29
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	31	40	42	29

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19453	24-19453	24-19453	24-19453
Quotation No.:				**Chemtest Sample ID.:**		1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	1.2	1.2	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	13	13	16	6.8
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	22	< 2.0	< 2.0	12
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	6.3	3.6	7.3	3.6
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	36	14	17	19
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	43	18	24	23
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	68	55	59	48
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	74	58	66	51
Organic Matter		M	2625	%	0.40	4.4	7.7	5.8	5.8
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane		M	2760	µg/kg	20	< 20	< 20	< 20	< 20
Chloroethane		U	2760	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19453	24-19453	24-19453	24-19453
Quotation No.:				**Chemtest Sample ID.:**		1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
1,1-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane		N	2760	µg/kg	50	< 50	< 50	< 50	< 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane		U	2760	µg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichloroethene		N	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	< 10	< 10	< 10	< 10
Toluene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	< 10	< 10	< 10	< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	< 10	< 10	< 10	< 10
Tetrachloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	2760	µg/kg	10	< 10	< 10	< 10	< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	< 50	< 50	< 50	< 50
N-Propylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19453	24-19453	24-19453	24-19453
Quotation No.:				**Chemtest Sample ID.:**		1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Tert-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	< 50	< 50	< 50	< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Nitrosodimethylamine		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Phenol		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Chlorophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
1,3-Dichlorobenzene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
1,4-Dichlorobenzene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
1,2-Dichlorobenzene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Methylphenol		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Hexachloroethane		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Methylphenol		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Nitrobenzene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Isophorone		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Nitrophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,4-Dimethylphenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,4-Dichlorophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Naphthalene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Chloroaniline		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Hexachlorobutadiene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Methylnaphthalene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Nitrophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19453	24-19453	24-19453	24-19453
Quotation No.:				**Chemtest Sample ID.:**		1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Chloronaphthalene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2-Nitroaniline		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Acenaphthylene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Dimethylphthalate		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,6-Dinitrotoluene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Acenaphthene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
3-Nitroaniline		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Dibenzofuran		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Chlorophenylphenylether		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
2,4-Dinitrotoluene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Fluorene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Diethyl Phthalate		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Nitroaniline		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Azobenzene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Hexachlorobenzene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Phenanthrene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Anthracene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Carbazole		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Fluoranthene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Pyrene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Butylbenzyl Phthalate		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Benzo[a]anthracene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Chrysene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Benzo[b]fluoranthene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Benzo[k]fluoranthene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Benzo[a]pyrene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50		< 0.50	< 0.50	< 0.50
PCB 28		U	2815	mg/kg	0.010				< 0.010
PCB 52		U	2815	mg/kg	0.010				< 0.010

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd			**Chemtest Job No.:**			24-19453	24-19453	24-19453	24-19453
Quotation No.:			**Chemtest Sample ID.:**			1823540	1823542	1823543	1823544
				Sample Location:		TP207	TP208	TP209	TP210
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.2	0.15	0	0
				Bottom Depth (m):		0.25	0.25	0.35	0.25
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
PCB 101		U	2815	mg/kg	0.010				< 0.010
PCB 118		U	2815	mg/kg	0.010				< 0.010
PCB 153		U	2815	mg/kg	0.010				< 0.010
PCB 138		U	2815	mg/kg	0.010				< 0.010
PCB 180		U	2815	mg/kg	0.010				< 0.010
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10				< 0.10
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Interim Report

Report No.:	24-20320-0
Initial Date of Issue:	
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI - Additional Works

Quotation No.:		**Date Received:**	26-Jun-2024
Order No.:	101330976	**Date Instructed:**	26-Jun-2024
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	02-Jul-2024
Date Approved:		**Subcon Results Due:**	17-Jul-2024
Approved By:			

Details:
For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Please note that the interim data available has passed our Quality Control Criteria but has not been verified by an approved signatory and may be subject to amendment on approval. Chemtest cannot therefore be held responsible for decisions made on interim data sets but only for the data submitted on a final report containing an approval date and signature.

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20320
Quotation No.:				**Chemtest Sample ID.:**		1826856
				Sample Location:		WS205
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.20
				Date Sampled:		20-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type		U	2192		N/A	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected
Moisture		N	2030	%	0.020	33
Soil Colour		N	2040		N/A	Brown
Other Material		N	2040		N/A	Stones and Roots
Soil Texture		N	2040		N/A	Clay
pH at 20C		M	2010		4.0	8.1
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	590
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.68
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010
Total Sulphur		U	2175	%	0.010	0.064
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	17
Arsenic		M	2455	mg/kg	0.5	14
Cadmium		M	2455	mg/kg	0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	30
Copper		M	2455	mg/kg	0.50	19
Mercury		M	2455	mg/kg	0.05	0.08
Nickel		M	2455	mg/kg	0.50	32
Lead		M	2455	mg/kg	0.50	30
Selenium		M	2455	mg/kg	0.25	0.87
Zinc		M	2455	mg/kg	0.50	98
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	13
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	14
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	5.4
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	31
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	18
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	64
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	82

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20320
Quotation No.:				**Chemtest Sample ID.:**		1826856
				Sample Location:		WS205
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.20
				Date Sampled:		20-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	6.7
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	2.6
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	3.1
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	30
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	22
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	42
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	64
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	110
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	150
Organic Matter		M	2625	%	0.40	8.0
Naphthalene		M	2700	mg/kg	0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	< 1.0
Chloromethane		M	2760	µg/kg	1.0	< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	< 1.0
Bromomethane		M	2760	µg/kg	20	< 20
Chloroethane		U	2760	µg/kg	2.0	< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20320
Quotation No.:				**Chemtest Sample ID.:**		1826856
				Sample Location:		WS205
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.20
				Date Sampled:		20-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
1,1-Dichloroethene		M	2760	µg/kg	1.0	< 1.0
Dichloromethane		N	2760	µg/kg	50	< 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0
Bromochloromethane		U	2760	µg/kg	5.0	< 5.0
Trichloromethane		M	2760	µg/kg	1.0	< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	< 1.0
Benzene		M	2760	µg/kg	1.0	< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	< 2.0
Trichloroethene		N	2760	µg/kg	1.0	< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	< 1.0
Dibromomethane		M	2760	µg/kg	1.0	< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	< 10
Toluene		M	2760	µg/kg	1.0	< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	< 10
Tetrachloroethene		M	2760	µg/kg	1.0	< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	< 2.0
Dibromochloromethane		U	2760	µg/kg	10	< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	< 5.0
Chlorobenzene		M	2760	µg/kg	1.0	< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	< 2.0
Ethylbenzene		M	2760	µg/kg	1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	< 1.0
Styrene		M	2760	µg/kg	1.0	< 1.0
Tribromomethane		U	2760	µg/kg	1.0	< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	< 1.0
Bromobenzene		M	2760	µg/kg	1.0	< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	< 50
N-Propylbenzene		U	2760	µg/kg	1.0	< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20320
Quotation No.:				**Chemtest Sample ID.:**		1826856
				Sample Location:		WS205
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.20
				Date Sampled:		20-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Tert-Butylbenzene		U	2760	µg/kg	1.0	< 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	< 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	< 1.0
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/kg	N/A	To Follow
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/kg	N/A	To Follow
Total Phenols		M	2920	mg/kg	0.10	0.37

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by ‘Aquakem 600’ Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by ‘Aquakem 600’ Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20445-1
Initial Date of Issue:	04-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI- Additional Works

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:	101330976	**Date Instructed:**	27-Jun-2024
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	04-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20445	24-20445	24-20445
Quotation No.:				**Chemtest Sample ID.:**		1827193	1827194	1827195
				Sample Location:		TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.4	0.4
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type		U	2192		N/A	-	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	18	21	21
Soil Colour		N	2040		N/A	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones	Stones and Roots
Soil Texture		N	2040		N/A	Sand	Sand	Sand
pH at 20C		M	2010		4.0	8.2	8.3	8.3
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	300	370	410
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	1.1	3.9	3.7
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	< 0.010	< 0.010	0.022
Total Sulphur		U	2175	%	0.010	0.025	0.076	0.064
Cyanide (Total)		M	2300	mg/kg	0.50	0.70	0.60	0.60
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	7.3	3.8	3.7
Arsenic		M	2455	mg/kg	0.5	21	22	20
Cadmium		M	2455	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	47	57	45
Copper		M	2455	mg/kg	0.50	25	37	29
Mercury		M	2455	mg/kg	0.05	< 0.05	0.11	0.08
Nickel		M	2455	mg/kg	0.50	54	54	43
Lead		M	2455	mg/kg	0.50	32	62	110
Selenium		M	2455	mg/kg	0.25	0.80	1.2	0.72
Zinc		M	2455	mg/kg	0.50	110	140	160
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[C] < 0.10	[C] < 0.10	[C] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[C] < 0.25	[C] < 0.25	[C] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] 9.9	[C] 9.3	[C] 10
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[C] 4.0	[C] 2.0	[C] 2.5
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] 5.4	[C] < 2.0	[C] 3.9
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[C] 16	[C] 6.6	[C] 12
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] < 10	[C] < 10	[C] < 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[C] 35	[C] 19	[C] 28
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] 35	[C] 19	[C] 28
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20445	24-20445	24-20445
Quotation No.:				**Chemtest Sample ID.:**		1827193	1827194	1827195
				Sample Location:		TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.4	0.4
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05	[C] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[C] < 0.25	[C] < 0.25	[C] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] < 1.0	[C] < 1.0	[C] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] < 2.0	[C] < 2.0	[C] < 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] 19	[C] 8.8	[C] 15
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[C] 5.0	[C] 4.6	[C] 5.1
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[C] 20	[C] 8.8	[C] 16
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[C] 25	[C] 13	[C] 22
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[C] < 0.50	[C] < 0.50	[C] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[C] 56	[C] 28	[C] 45
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[C] 61	[C] 32	[C] 50
Organic Matter		M	2625	%	0.40	2.6	5.2	9.6
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.48
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.12
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.25
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	0.45
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Bromomethane		M	2760	µg/kg	20	[C] < 20	[C] < 20	[C] < 20
Chloroethane		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Dichloromethane		N	2760	µg/kg	50	[C] < 50	[C] < 50	[C] < 50

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20445	24-20445	24-20445
Quotation No.:				**Chemtest Sample ID.:**		1827193	1827194	1827195
				Sample Location:		TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.4	0.4
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0	[C] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Benzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0	[C] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	[C] < 10	[C] < 10
Toluene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	[C] < 10	[C] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[C] < 10	[C] < 10	[C] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[C] < 10	[C] < 10	[C] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0	[C] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Styrene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[C] < 50	[C] < 50	[C] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20445	24-20445	24-20445
Quotation No.:				**Chemtest Sample ID.:**		1827193	1827194	1827195
				Sample Location:		TP212	TP213	TP214
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.25	0.4	0.4
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**			
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[C] < 50	[C] < 50	[C] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0	[C] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0	[C] < 1.0
PCB 28		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 52		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 101		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 118		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 153		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 138		U	2815	mg/kg	0.010		[C] < 0.010	
PCB 180		U	2815	mg/kg	0.010		[C] < 0.010	
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10		[C] < 0.10	
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827193			TP212	13-Jun-2024	C	Plastic Bag
1827194			TP213	13-Jun-2024	C	Plastic Bag
1827195			TP214	13-Jun-2024	C	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20448-1
Initial Date of Issue:	04-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI- Additional Works

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:	101330976	**Date Instructed:**	27-Jun-2024
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	04-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20448	24-20448
Quotation No.:				**Chemtest Sample ID.:**		1827200	1827201
				Sample Location:		WS206	WS207
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.2	0.7
				Date Sampled:		20-Jun-2024	20-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type		U	2192		N/A	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	20	1.6
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	Stones	Roots and Stones
Soil Texture		N	2040		N/A	Clay	Sand
pH at 20C		M	2010		4.0	9.4	9.0
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	850	280
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	< 0.40	1.6
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.15	< 0.010
Total Sulphur		U	2175	%	0.010	0.079	0.051
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	6.4	8.2
Arsenic		M	2455	mg/kg	0.5	16	17
Cadmium		M	2455	mg/kg	0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	34	35
Copper		M	2455	mg/kg	0.50	19	23
Mercury		M	2455	mg/kg	0.05	0.07	0.06
Nickel		M	2455	mg/kg	0.50	34	34
Lead		M	2455	mg/kg	0.50	32	27
Selenium		M	2455	mg/kg	0.25	0.49	0.90
Zinc		M	2455	mg/kg	0.50	100	99
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	< 0.10	< 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	< 0.05	< 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	< 0.25	< 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	11	8.2
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	2.7	2.2
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	< 2.0	< 2.0
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	< 3.0	< 3.0
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	< 10	< 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	17	12
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	17	12
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20448	24-20448
Quotation No.:				**Chemtest Sample ID.:**		1827200	1827201
				Sample Location:		WS206	WS207
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.2	0.7
				Date Sampled:		20-Jun-2024	20-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	< 0.05	< 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	< 0.25	< 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	< 1.0	< 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	< 2.0	< 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	3.7	2.5
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	2.3	< 1.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	< 5.0	< 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	< 10	< 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	< 0.50	< 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	20	15
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	23	15
Organic Matter		M	2625	%	0.40	4.2	3.2
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	< 1.0	< 1.0
Chloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromomethane		M	2760	µg/kg	20	< 20	< 20
Chloroethane		U	2760	µg/kg	2.0	< 2.0	< 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Dichloromethane		N	2760	µg/kg	50	< 50	< 50

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20448	24-20448
Quotation No.:				**Chemtest Sample ID.:**		1827200	1827201
				Sample Location:		WS206	WS207
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.2	0.7
				Date Sampled:		20-Jun-2024	20-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromochloromethane		U	2760	µg/kg	5.0	< 5.0	< 5.0
Trichloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	< 1.0	< 1.0
Benzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	< 2.0	< 2.0
Trichloroethene		N	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	< 1.0	< 1.0
Dibromomethane		M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	< 10	< 10
Toluene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	< 10	< 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	< 10	< 10
Tetrachloroethene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	< 2.0	< 2.0
Dibromochloromethane		U	2760	µg/kg	10	< 10	< 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	< 5.0	< 5.0
Chlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	< 2.0	< 2.0
Ethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0
o-Xylene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Styrene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Tribromomethane		U	2760	µg/kg	1.0	< 1.0	< 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	< 50	< 50
N-Propylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI- Additional Works

Client: Mayer Environmental Ltd			**Chemtest Job No.:**			24-20448	24-20448
Quotation No.:			**Chemtest Sample ID.:**			1827200	1827201
				Sample Location:		WS206	WS207
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0.2	0.7
				Date Sampled:		20-Jun-2024	20-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	< 50	< 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	< 1.0	< 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	< 1.0	< 1.0
PCB 28		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 52		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 101		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 118		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 153		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 138		U	2815	mg/kg	0.010	< 0.010	< 0.010
PCB 180		U	2815	mg/kg	0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10	< 0.10	< 0.10
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20499-1
Initial Date of Issue:	04-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI - Additional Works

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:		**Date Instructed:**	27-Jun-2024
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	04-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20499
Quotation No.:				**Chemtest Sample ID.:**		1827415
				Sample Location:		TP205
				Sample Type:		SOIL
				Top Depth (m):		1
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type		U	2192		N/A	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected
Moisture		N	2030	%	0.020	22
Soil Colour		N	2040		N/A	Brown
Other Material		N	2040		N/A	Roots
Soil Texture		N	2040		N/A	Clay
pH at 20C		M	2010		4.0	8.6
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	530
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	2.4
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.092
Total Sulphur		U	2175	%	0.010	0.030
Cyanide (Total)		M	2300	mg/kg	0.50	[B] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	3.6
Arsenic		M	2455	mg/kg	0.5	19
Cadmium		M	2455	mg/kg	0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	40
Copper		M	2455	mg/kg	0.50	20
Mercury		M	2455	mg/kg	0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	43
Lead		M	2455	mg/kg	0.50	25
Selenium		M	2455	mg/kg	0.25	0.81
Zinc		M	2455	mg/kg	0.50	95
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[BC] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[BC] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] 8.7
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[BC] 7.8
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] 3.8
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[BC] 6.2
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] < 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[BC] 26
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] 26
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20499
Quotation No.:				**Chemtest Sample ID.:**		1827415
				Sample Location:		TP205
				Sample Type:		SOIL
				Top Depth (m):		1
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[BC] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] < 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] 2.6
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] 3.4
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[BC] 2.1
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[BC] 6.4
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[BC] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[BC] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[BC] 33
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[BC] 35
Organic Matter		M	2625	%	0.40	1.7
Naphthalene		M	2700	mg/kg	0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[BC] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[BC] < 1.0
Bromomethane		M	2760	µg/kg	20	[BC] < 20
Chloroethane		U	2760	µg/kg	2.0	[BC] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[BC] < 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
Dichloromethane		N	2760	µg/kg	50	[BC] < 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20499
Quotation No.:				**Chemtest Sample ID.:**		1827415
				Sample Location:		TP205
				Sample Type:		SOIL
				Top Depth (m):		1
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
1,1-Dichloroethane		M	2760	µg/kg	1.0	[BC] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[BC] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[BC] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[BC] < 1.0
Benzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[BC] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[BC] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[BC] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[BC] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[BC] < 10
Toluene		M	2760	µg/kg	1.0	[BC] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[BC] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[BC] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[BC] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[BC] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[BC] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[BC] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
Styrene		M	2760	µg/kg	1.0	[BC] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[BC] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[BC] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[BC] < 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[BC] < 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20499
Quotation No.:				**Chemtest Sample ID.:**		1827415
				Sample Location:		TP205
				Sample Type:		SOIL
				Top Depth (m):		1
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
4-Isopropyltoluene		U	2760	µg/kg	1.0	[BC] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[BC] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[BC] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[BC] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[BC] < 1.0
Total Phenols		M	2920	mg/kg	0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827415			TP205	10-Jun-2024	BC	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by ‘Aquakem 600’ Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by ‘Aquakem 600’ Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20511-1
Initial Date of Issue:	08-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:	101330976	**Date Instructed:**	27-Jun-2024
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	08-Jul-2024	**Subcon Results Due:**	18-Jul-2024

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20511	24-20511
Quotation No.:				**Chemtest Sample ID.:**		1827443	1827447
				Sample Location:		BH204	BH205
				Sample Type:		SOIL	SOIL
				Top Depth (m):		4.50	1.50
				Date Sampled:		12-Jun-2024	12-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type		U	2192		N/A	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	27	26
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	Stones	Stones and Roots
Soil Texture		N	2040		N/A	Clay	Clay
pH at 20C		M	2010		4.0	8.9	9.0
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	890	520
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	2.9	2.7
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.18	0.10
Total Sulphur		U	2175	%	0.010	0.59	0.10
Cyanide (Total)		M	2300	mg/kg	0.50	[B] 1.1	[B] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	34	22
Arsenic		M	2455	mg/kg	0.5	18	10
Cadmium		M	2455	mg/kg	0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	30	29
Copper		M	2455	mg/kg	0.50	17	15
Mercury		M	2455	mg/kg	0.05	< 0.05	< 0.05
Nickel		M	2455	mg/kg	0.50	35	31
Lead		M	2455	mg/kg	0.50	21	19
Selenium		M	2455	mg/kg	0.25	0.53	0.52
Zinc		M	2455	mg/kg	0.50	86	68
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] 9.9	[B] 11
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[B] 5.9	[B] 7.1
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] 3.9	[B] 4.1
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[B] 4.9	[B] 5.6
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[B] 25	[B] 28
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] 25	[B] 28
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20511	24-20511
Quotation No.:				**Chemtest Sample ID.:**		1827443	1827447
				Sample Location:		BH204	BH205
				Sample Type:		SOIL	SOIL
				Top Depth (m):		4.50	1.50
				Date Sampled:		12-Jun-2024	12-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] 1.2	[B] 1.7
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] < 2.0	[B] < 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] 2.4	[B] 3.1
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[B] < 1.0	[B] 3.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[B] < 5.0	[B] 5.1
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[B] 28	[B] 33
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[B] 28	[B] 36
Organic Matter		M	2625	%	0.40	2.8	2.1
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Bromomethane		M	2760	µg/kg	20	[B] < 20	[B] < 20
Chloroethane		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Dichloromethane		N	2760	µg/kg	50	[B] < 50	[B] < 50

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20511	24-20511
Quotation No.:				**Chemtest Sample ID.:**		1827443	1827447
				Sample Location:		BH204	BH205
				Sample Type:		SOIL	SOIL
				Top Depth (m):		4.50	1.50
				Date Sampled:		12-Jun-2024	12-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Benzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[B] < 10	[B] < 10
Toluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[B] < 10	[B] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[B] < 10	[B] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[B] < 10	[B] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Styrene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[B] < 50	[B] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20511	24-20511
Quotation No.:				**Chemtest Sample ID.:**		1827443	1827447
				Sample Location:		BH204	BH205
				Sample Type:		SOIL	SOIL
				Top Depth (m):		4.50	1.50
				Date Sampled:		12-Jun-2024	12-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[B] < 50	[B] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/kg	N/A	See Attached	See Attached
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/kg	N/A	See Attached	See Attached
N-Nitrosodimethylamine		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Phenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Chlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
1,3-Dichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
1,4-Dichlorobenzene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
1,2-Dichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Methylphenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Hexachloroethane		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Methylphenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Nitrobenzene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Isophorone		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Nitrophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2,4-Dimethylphenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2,4-Dichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Naphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Chloroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Hexachlorobutadiene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Methylnaphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Nitrophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20511	24-20511
Quotation No.:				**Chemtest Sample ID.:**		1827443	1827447
				Sample Location:		BH204	BH205
				Sample Type:		SOIL	SOIL
				Top Depth (m):		4.50	1.50
				Date Sampled:		12-Jun-2024	12-Jun-2024
				Asbestos Lab:		DURHAM	DURHAM
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Chloronaphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Acenaphthylene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Dimethylphthalate		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2,6-Dinitrotoluene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Acenaphthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
3-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Dibenzofuran		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Chlorophenylphenylether		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
2,4-Dinitrotoluene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Fluorene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Diethyl Phthalate		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Azobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Hexachlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Phenanthrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Anthracene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Carbazole		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Pyrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Butylbenzyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Benzo[a]anthracene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Chrysene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Benzo[b]fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Benzo[k]fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Benzo[a]pyrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50	[B] < 0.50	[B] < 0.50
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827443			BH204	12-Jun-2024	B	Amber Glass 250ml
1827443			BH204	12-Jun-2024	B	Plastic Bag
1827447			BH205	12-Jun-2024	B	Amber Glass 250ml
1827447			BH205	12-Jun-2024	B	Amber Glass 60ml
1827447			BH205	12-Jun-2024	B	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by ‘Aquakem 600’ Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by ‘Aquakem 600’ Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20512-1
Initial Date of Issue:	04-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:	101330976	**Date Instructed:**	27-Jun-2024
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	04-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type		U	2192		N/A	-	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected
Moisture		N	2030	%	0.020	23	19
Soil Colour		N	2040		N/A	Brown	Brown
Other Material		N	2040		N/A	Roots	Roots
Soil Texture		N	2040		N/A	Clay	Clay
pH at 20C		M	2010		4.0	8.8	9.0
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	400	340
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	0.80	2.4
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.054	0.12
Total Sulphur		U	2175	%	0.010	0.41	0.18
Cyanide (Total)		M	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	48	8.6
Arsenic		M	2455	mg/kg	0.5	13	15
Cadmium		M	2455	mg/kg	0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	43	26
Copper		M	2455	mg/kg	0.50	21	32
Mercury		M	2455	mg/kg	0.05	0.06	0.09
Nickel		M	2455	mg/kg	0.50	24	29
Lead		M	2455	mg/kg	0.50	29	36
Selenium		M	2455	mg/kg	0.25	3.4	0.57
Zinc		M	2455	mg/kg	0.50	75	220
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[C] < 0.10	[C] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[C] < 0.25	[C] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] 9.3	[C] 9.4
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[C] 3.6	[C] 4.5
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[C] < 2.0	[C] < 2.0
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[C] 14	[C] 3.8
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] < 10	[C] < 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[C] 27	[C] 19
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[C] 27	[C] 19
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[C] < 0.05	[C] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[C] < 0.25	[C] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] 1.2	[C] 1.2
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[C] < 1.0	[C] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] < 2.0	[C] < 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[C] 16	[C] < 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[C] < 1.0	[C] < 1.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[C] 17	[C] < 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[C] 17	[C] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[C] 44	[C] 22
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[C] 44	[C] 22
Organic Matter		M	2625	%	0.40	5.5	5.5
Naphthalene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	0.27	0.28
Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	0.22	0.33
Pyrene		M	2700	mg/kg	0.10	0.41	0.38
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Bromomethane		M	2760	µg/kg	20	[C] < 20	[C] < 20
Chloroethane		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
Dichloromethane		N	2760	µg/kg	50	[C] < 50	[C] < 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Benzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	[C] < 10
Toluene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[C] < 10	[C] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[C] < 10	[C] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[C] < 10	[C] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[C] < 5.0	[C] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Styrene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[C] < 50	[C] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[C] < 50	[C] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[C] < 2.0	[C] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[C] < 1.0	[C] < 1.0
N-Nitrosodimethylamine		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Phenol		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Chlorophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
1,3-Dichlorobenzene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
1,4-Dichlorobenzene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
1,2-Dichlorobenzene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Methylphenol		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Hexachloroethane		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Methylphenol		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Nitrobenzene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Isophorone		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Nitrophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2,4-Dimethylphenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2,4-Dichlorophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Naphthalene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Chloroaniline		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Hexachlorobutadiene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Methylnaphthalene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Nitrophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Chloronaphthalene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2-Nitroaniline		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Acenaphthylene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Dimethylphthalate		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2,6-Dinitrotoluene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Acenaphthene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
3-Nitroaniline		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Dibenzofuran		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Chlorophenylphenylether		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
2,4-Dinitrotoluene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Fluorene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Diethyl Phthalate		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Nitroaniline		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Azobenzene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Hexachlorobenzene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Phenanthrene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Anthracene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Carbazole		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Fluoranthene		M	2790	mg/kg	0.50	[C] < 0.50	[C] 0.65
Pyrene		M	2790	mg/kg	0.50	[C] < 0.50	[C] 0.62
Butylbenzyl Phthalate		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Benzo[a]anthracene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Chrysene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Benzo[b]fluoranthene		M	2790	mg/kg	0.50	[C] < 0.50	[C] 0.57
Benzo[k]fluoranthene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Benzo[a]pyrene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50	[C] < 0.50	[C] < 0.50
PCB 28		U	2815	mg/kg	0.010		[C] < 0.010
PCB 52		U	2815	mg/kg	0.010		[C] < 0.010
PCB 101		U	2815	mg/kg	0.010		[C] < 0.010

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20512	24-20512
Quotation No.:				**Chemtest Sample ID.:**		1827449	1827450
				Sample Location:		TP209	TP210
				Sample Type:		SOIL	SOIL
				Top Depth (m):		0	0
				Bottom Depth (m):		0.35	0.20
				Date Sampled:		13-Jun-2024	13-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**		
PCB 118		U	2815	mg/kg	0.010		[C] < 0.010
PCB 153		U	2815	mg/kg	0.010		[C] < 0.010
PCB 138		U	2815	mg/kg	0.010		[C] < 0.010
PCB 180		U	2815	mg/kg	0.010		[C] < 0.010
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10		[C] < 0.10
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827449			TP209	13-Jun-2024	C	Plastic Bag
1827450			TP210	13-Jun-2024	C	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Final Report

Report No.:	24-20513-1
Initial Date of Issue:	05-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	27-Jun-2024
Order No.:	101330976	**Date Instructed:**	27-Jun-2024
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	03-Jul-2024
Date Approved:	05-Jul-2024		

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type		U	2192		N/A	-
Asbestos Identification		U	2192		N/A	No Asbestos Detected
Moisture		N	2030	%	0.020	18
Soil Colour		N	2040		N/A	Brown
Other Material		N	2040		N/A	Stones and Roots
Soil Texture		N	2040		N/A	Clay
pH at 20C		M	2010		4.0	9.1
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	660
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	2.5
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.014
Total Sulphur		U	2175	%	0.010	0.042
Cyanide (Total)		M	2300	mg/kg	0.50	[B] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	4.4
Arsenic		M	2455	mg/kg	0.5	21
Cadmium		M	2455	mg/kg	0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	46
Copper		M	2455	mg/kg	0.50	28
Mercury		M	2455	mg/kg	0.05	0.08
Nickel		M	2455	mg/kg	0.50	47
Lead		M	2455	mg/kg	0.50	43
Selenium		M	2455	mg/kg	0.25	1.1
Zinc		M	2455	mg/kg	0.50	140
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[BC] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[BC] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] 9.3
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[BC] 2.8
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] < 2.0
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[BC] < 3.0
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] < 10
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[BC] 15
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] 15

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[BC] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] 1.2
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] < 2.0
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] < 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[BC] < 1.0
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[BC] < 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[BC] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[BC] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[BC] 19
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[BC] 19
Organic Matter		M	2625	%	0.40	4.0
Naphthalene		M	2700	mg/kg	0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[BC] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[BC] < 1.0
Bromomethane		M	2760	µg/kg	20	[BC] < 20
Chloroethane		U	2760	µg/kg	2.0	[BC] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[BC] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
1,1-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
Dichloromethane		N	2760	µg/kg	50	[BC] < 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[BC] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[BC] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[BC] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[BC] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[BC] < 1.0
Benzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[BC] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[BC] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[BC] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[BC] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[BC] < 10
Toluene		M	2760	µg/kg	1.0	[BC] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[BC] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[BC] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[BC] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[BC] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[BC] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[BC] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[BC] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
Styrene		M	2760	µg/kg	1.0	[BC] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[BC] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[BC] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[BC] < 1.0
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[BC] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Tert-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[BC] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[BC] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[BC] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[BC] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[BC] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[BC] < 1.0
N-Nitrosodimethylamine		M	2790	mg/kg	0.50	[BC] < 0.50
Phenol		M	2790	mg/kg	0.50	[BC] < 0.50
2-Chlorophenol		N	2790	mg/kg	0.50	[BC] < 0.50
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50	[BC] < 0.50
1,3-Dichlorobenzene		M	2790	mg/kg	0.50	[BC] < 0.50
1,4-Dichlorobenzene		N	2790	mg/kg	0.50	[BC] < 0.50
1,2-Dichlorobenzene		M	2790	mg/kg	0.50	[BC] < 0.50
2-Methylphenol		M	2790	mg/kg	0.50	[BC] < 0.50
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50	[BC] < 0.50
Hexachloroethane		N	2790	mg/kg	0.50	[BC] < 0.50
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50	[BC] < 0.50
4-Methylphenol		M	2790	mg/kg	0.50	[BC] < 0.50
Nitrobenzene		N	2790	mg/kg	0.50	[BC] < 0.50
Isophorone		M	2790	mg/kg	0.50	[BC] < 0.50
2-Nitrophenol		N	2790	mg/kg	0.50	[BC] < 0.50
2,4-Dimethylphenol		N	2790	mg/kg	0.50	[BC] < 0.50
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50	[BC] < 0.50
2,4-Dichlorophenol		N	2790	mg/kg	0.50	[BC] < 0.50
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50	[BC] < 0.50
Naphthalene		M	2790	mg/kg	0.50	[BC] < 0.50
4-Chloroaniline		N	2790	mg/kg	0.50	[BC] < 0.50
Hexachlorobutadiene		M	2790	mg/kg	0.50	[BC] < 0.50
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50	[BC] < 0.50
2-Methylnaphthalene		M	2790	mg/kg	0.50	[BC] < 0.50
4-Nitrophenol		N	2790	mg/kg	0.50	[BC] < 0.50

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50	[BC] < 0.50
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50	[BC] < 0.50
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50	[BC] < 0.50
2-Chloronaphthalene		M	2790	mg/kg	0.50	[BC] < 0.50
2-Nitroaniline		N	2790	mg/kg	0.50	[BC] < 0.50
Acenaphthylene		M	2790	mg/kg	0.50	[BC] < 0.50
Dimethylphthalate		M	2790	mg/kg	0.50	[BC] < 0.50
2,6-Dinitrotoluene		N	2790	mg/kg	0.50	[BC] < 0.50
Acenaphthene		M	2790	mg/kg	0.50	[BC] < 0.50
3-Nitroaniline		N	2790	mg/kg	0.50	[BC] < 0.50
Dibenzofuran		M	2790	mg/kg	0.50	[BC] < 0.50
4-Chlorophenylphenylether		M	2790	mg/kg	0.50	[BC] < 0.50
2,4-Dinitrotoluene		N	2790	mg/kg	0.50	[BC] < 0.50
Fluorene		M	2790	mg/kg	0.50	[BC] < 0.50
Diethyl Phthalate		M	2790	mg/kg	0.50	[BC] < 0.50
4-Nitroaniline		N	2790	mg/kg	0.50	[BC] < 0.50
Azobenzene		M	2790	mg/kg	0.50	[BC] < 0.50
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50	[BC] < 0.50
Hexachlorobenzene		M	2790	mg/kg	0.50	[BC] < 0.50
Phenanthrene		M	2790	mg/kg	0.50	[BC] < 0.50
Anthracene		M	2790	mg/kg	0.50	[BC] < 0.50
Carbazole		M	2790	mg/kg	0.50	[BC] < 0.50
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50	[BC] < 0.50
Fluoranthene		M	2790	mg/kg	0.50	[BC] < 0.50
Pyrene		M	2790	mg/kg	0.50	[BC] < 0.50
Butylbenzyl Phthalate		N	2790	mg/kg	0.50	[BC] < 0.50
Benzo[a]anthracene		M	2790	mg/kg	0.50	[BC] < 0.50
Chrysene		M	2790	mg/kg	0.50	[BC] < 0.50
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50	[BC] < 0.50
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50	[BC] < 0.50
Benzo[b]fluoranthene		M	2790	mg/kg	0.50	[BC] < 0.50
Benzo[k]fluoranthene		M	2790	mg/kg	0.50	[BC] < 0.50
Benzo[a]pyrene		M	2790	mg/kg	0.50	[BC] < 0.50
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50	[BC] < 0.50
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50	[BC] < 0.50
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50	[BC] < 0.50
PCB 28		U	2815	mg/kg	0.010	[C] < 0.010
PCB 52		U	2815	mg/kg	0.010	[C] < 0.010

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20513
Quotation No.:				**Chemtest Sample ID.:**		1827451
				Sample Location:		TP201
				Sample Type:		SOIL
				Top Depth (m):		0
				Bottom Depth (m):		0.3
				Date Sampled:		10-Jun-2024
				Asbestos Lab:		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
PCB 101		U	2815	mg/kg	0.010	[C] < 0.010
PCB 118		U	2815	mg/kg	0.010	[C] < 0.010
PCB 153		U	2815	mg/kg	0.010	[C] < 0.010
PCB 138		U	2815	mg/kg	0.010	[C] < 0.010
PCB 180		U	2815	mg/kg	0.010	[C] < 0.010
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10	[C] < 0.10
Total Phenols		M	2920	mg/kg	0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827451			TP201	10-Jun-2024	BC	Plastic Tub 1000g

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

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

Interim Report

Report No.:	24-20633-0
Initial Date of Issue:	
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	28-Jun-2024
Order No.:	101330976	**Date Instructed:**	28-Jun-2024
No. of Samples:	8		
Turnaround (Wkdays):	5	**Results Due:**	04-Jul-2024
Date Approved:		**Subcon Results Due:**	19-Jul-2024
Approved By:			

Details:
For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Please note that the interim data available has passed our Quality Control Criteria but has not been verified by an approved signatory and may be subject to amendment on approval. Chemtest cannot therefore be held responsible for decisions made on interim data sets but only for the data submitted on a final report containing an approval date and signature.

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
ACM Type		U	2192		N/A	-	-	-	-	-		-
Asbestos Identification		U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture		N	2030	%	0.020	30	14	40	10	21	13	26
Soil Colour		N	2040		N/A	Brown	Brown	Brown	Black	Brown	Brown	Brown
Other Material		N	2040		N/A	Stones and Roots	Stones and Roots	Stones and Roots	Stones	Stones and Roots	Stones	Stones and Roots
Soil Texture		N	2040		N/A	Clay	Clay	Clay	Loam	Clay	Clay	Clay
PFOS		SN		µg/kg	1.00	To Follow	To Follow					
PFOA		SN		µg/kg	1.00	To Follow	To Follow					
pH at 20C		M	2010		4.0	8.0	8.4	8.4	7.1	8.1	7.8	8.0
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	1100	240	220	1700	680	550	270
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	3.4	1.4	< 0.40	0.51	1.6	1.4	0.48
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.43	0.018	< 0.010	0.71	< 0.010	< 0.010	0.021
Total Sulphur		U	2175	%	0.010	0.076	0.20	0.21	1.3	0.020	0.030	0.042
Cyanide (Total)		M	2300	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	3.4	12	4.1	3.0	6.2	3.6	3.5
Arsenic		M	2455	mg/kg	0.5	9.0	36	31	9.5	15	14	18
Cadmium		M	2455	mg/kg	0.10	< 0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chromium		M	2455	mg/kg	0.5	24	41	32	3.1	41	36	45
Copper		M	2455	mg/kg	0.50	12	92	56	23	19	20	27
Mercury		M	2455	mg/kg	0.05	< 0.05	0.23	0.17	0.07	0.05	< 0.05	0.09
Nickel		M	2455	mg/kg	0.50	24	33	25	11	37	35	42
Lead		M	2455	mg/kg	0.50	13	81	71	13	27	22	37
Selenium		M	2455	mg/kg	0.25	0.42	1.2	0.85	0.67	0.68	0.69	0.94
Zinc		M	2455	mg/kg	0.50	55	380	260	17	95	76	170
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	[B] < 0.10	[BC] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[BC] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] 13	[B] 11	[B] 13	[B] 13	[B] 10	[B] 8.3	[BC] 9.2
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[B] 13	[B] 11	[B] 6.0	[B] 26	[B] 6.3	[B] 8.2	[BC] 8.5
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[B] 8.4	[B] 7.3	[B] 6.5	[B] 31	[B] 3.7	[B] 4.1	[BC] 7.7
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[B] 14	[B] 10	[B] 13	[B] 43	[B] 8.5	[B] 6.5	[BC] 26
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] < 10	[B] < 10	[B] < 10	[B] 10	[B] < 10	[B] < 10	[BC] < 10

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[B] 49	[B] 39	[B] 39	[B] 110	[B] 29	[B] 27	[BC] 52
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[B] 49	[B] 39	[B] 39	[B] 120	[B] 29	[B] 27	[BC] 52
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[B] < 0.05	[BC] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[B] < 0.25	[BC] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] 4.7	[B] < 1.0	[B] 41	[B] < 1.0	[B] < 1.0	[BC] 1.5
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[B] < 1.0	[B] 7.1	[B] < 1.0	[B] 150	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] 3.4	[B] 17	[B] 5.5	[B] 160	[B] 3.0	[B] 2.4	[BC] 6.5
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[B] 8.6	[B] 28	[B] 35	[B] 5.3	[B] 5.3	[B] < 2.0	[BC] < 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[B] 5.3	[B] 15	[B] 11	[B] 16	[B] 34	[B] 1.6	[BC] 10
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[B] 12	[B] 57	[B] 41	[B] 360	[B] 8.5	[B] < 5.0	[BC] 9.8
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[B] 18	[B] 72	[B] 52	[B] 370	[B] 42	[B] < 10	[BC] 20
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[B] < 0.50	[BC] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[B] 61	[B] 96	[B] 80	[B] 470	[B] 37	[B] 30	[BC] 61
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[B] 67	[B] 110	[B] 91	[B] 500	[B] 71	[B] 31	[BC] 72
Organic Matter		M	2625	%	0.40	2.1	32	7.7	100	2.1	2.3	4.0
Naphthalene		M	2700	mg/kg	0.10	< 0.10	1.4	< 0.10	28	< 0.10	< 0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10	0.43	< 0.10	4.7	< 0.10	< 0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10	0.24	< 0.10	3.8	< 0.10	< 0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10	0.73	< 0.10	10	< 0.10	< 0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10	1.2	< 0.10	8.2	< 0.10	< 0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10	0.15	< 0.10	1.4	< 0.10	< 0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10	1.9	< 0.10	2.4	< 0.10	< 0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10	2.0	< 0.10	2.7	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10	1.5	< 0.10	1.4	< 0.10	< 0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10	2.2	< 0.10	4.9	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10	1.9	< 0.10	1.0	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10	1.0	< 0.10	3.2	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10	1.1	< 0.10	0.76	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10	0.78	< 0.10	0.44	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10	0.46	< 0.10	0.79	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10	0.88	< 0.10	1.5	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0	18	< 2.0	75	< 2.0	< 2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Chloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Vinyl Chloride		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Bromomethane		M	2760	µg/kg	20	[B] < 20	[B] < 20		[B] < 20	[B] < 20	[B] < 20	[BC] < 20

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Chloroethane		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0		[B] < 2.0	[B] < 2.0	[B] < 2.0	[BC] < 2.0
Trichlorofluoromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,1-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Dichloromethane		N	2760	µg/kg	50	[B] < 50	[B] < 50		[B] < 50	[B] < 50	[B] < 50	[BC] < 50
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,1-Dichloroethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Bromochloromethane		U	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[BC] < 5.0
Trichloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Tetrachloromethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,1-Dichloropropene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Benzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0		[B] < 2.0	[B] < 2.0	[B] < 2.0	[BC] < 2.0
Trichloroethene		N	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2-Dichloropropane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Dibromomethane		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Bromodichloromethane		M	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[BC] < 5.0
cis-1,3-Dichloropropene		N	2760	µg/kg	10	[B] < 10	[B] < 10		[B] < 10	[B] < 10	[B] < 10	[BC] < 10
Toluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] 3.8	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	[B] < 10	[B] < 10		[B] < 10	[B] < 10	[B] < 10	[BC] < 10
1,1,2-Trichloroethane		M	2760	µg/kg	10	[B] < 10	[B] < 10		[B] < 10	[B] < 10	[B] < 10	[BC] < 10
Tetrachloroethene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,3-Dichloropropane		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0		[B] < 2.0	[B] < 2.0	[B] < 2.0	[BC] < 2.0
Dibromochloromethane		U	2760	µg/kg	10	[B] < 10	[B] < 10		[B] < 10	[B] < 10	[B] < 10	[BC] < 10
1,2-Dibromoethane		M	2760	µg/kg	5.0	[B] < 5.0	[B] < 5.0		[B] < 5.0	[B] < 5.0	[B] < 5.0	[BC] < 5.0
Chlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0		[B] < 2.0	[B] < 2.0	[B] < 2.0	[BC] < 2.0
Ethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Styrene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Tribromomethane		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Isopropylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Bromobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2,3-Trichloropropane		N	2760	µg/kg	50	[B] < 50	[B] < 50		[B] < 50	[B] < 50	[B] < 50	[BC] < 50
N-Propylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
2-Chlorotoluene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
4-Chlorotoluene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Tert-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Sec-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
4-Isopropyltoluene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
N-Butylbenzene		U	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	[B] < 50	[B] < 50		[B] < 50	[B] < 50	[B] < 50	[BC] < 50
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Hexachlorobutadiene		N	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0		[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	[B] < 2.0	[B] < 2.0		[B] < 2.0	[B] < 2.0	[B] < 2.0	[BC] < 2.0
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[B] < 1.0	[BC] < 1.0
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/kg	N/A	To Follow	To Follow					
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/kg	N/A	To Follow	To Follow					
N-Nitrosodimethylamine		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Phenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Chlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
1,3-Dichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
1,4-Dichlorobenzene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
1,2-Dichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Methylphenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Hexachloroethane		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
4-Methylphenol		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Nitrobenzene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Isophorone		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Nitrophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,4-Dimethylphenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,4-Dichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Naphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] 2.4	[B] < 0.50		
4-Chloroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Hexachlorobutadiene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Methylnaphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] 3.7	[B] < 0.50		
4-Nitrophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Chloronaphthalene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Acenaphthylene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Dimethylphthalate		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,6-Dinitrotoluene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Acenaphthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
3-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Dibenzofuran		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
4-Chlorophenylphenylether		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
2,4-Dinitrotoluene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Fluorene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Diethyl Phthalate		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
4-Nitroaniline		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Azobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Hexachlorobenzene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Phenanthrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] 1.8	[B] < 0.50		
Anthracene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Carbazole		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Pyrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] 0.53	[B] < 0.50		
Butylbenzyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Benzo[a]anthracene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Chrysene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Benzo[b]fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Benzo[k]fluoranthene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Benzo[a]pyrene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633	24-20633	24-20633	24-20633	24-20633	24-20633	24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827949	1827951	1827953	1827958	1827960	1827962	1827964
				Sample Location:		BH202	WS203	WS204	WS201	BH201	BH201	TP207
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.00	0.00	0.00	0.00	0.00	0.00	0.00
				Bottom Depth (m):		3.00	0.20	0.20	0.25	0.60	10.00	0.25
				Date Sampled:		12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024	12-Jun-2024
				Asbestos Lab:		NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB	NEW-ASB		NEW-ASB
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**							
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50	[B] < 0.50	[B] I/S		[B] < 0.50	[B] < 0.50		
PCB 28		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 52		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 101		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 118		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 153		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 138		U	2815	mg/kg	0.010				< 0.010	< 0.010		
PCB 180		U	2815	mg/kg	0.010				< 0.010	< 0.010		
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10				< 0.10	< 0.10		
Total Phenols		M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.73	< 0.10	< 0.10	< 0.10

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type		U	2192		N/A	
Asbestos Identification		U	2192		N/A	
Moisture		N	2030	%	0.020	18
Soil Colour		N	2040		N/A	Brown
Other Material		N	2040		N/A	Stones and Roots
Soil Texture		N	2040		N/A	Clay
PFOS		SN		µg/kg	1.00	
PFOA		SN		µg/kg	1.00	
pH at 20C		M	2010		4.0	8.1
Electrical Conductivity (2:1)		N	2020	µS/cm	1.0	300
Boron (Hot Water Soluble)		M	2120	mg/kg	0.40	4.4
Sulphate (2:1 Water Soluble) as SO4		M	2120	g/l	0.010	0.072
Total Sulphur		U	2175	%	0.010	0.14
Cyanide (Total)		M	2300	mg/kg	0.50	[B] < 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50	10
Arsenic		M	2455	mg/kg	0.5	21
Cadmium		M	2455	mg/kg	0.10	0.15
Chromium		M	2455	mg/kg	0.5	41
Copper		M	2455	mg/kg	0.50	67
Mercury		M	2455	mg/kg	0.05	0.12
Nickel		M	2455	mg/kg	0.50	44
Lead		M	2455	mg/kg	0.50	44
Selenium		M	2455	mg/kg	0.25	1.0
Zinc		M	2455	mg/kg	0.50	1300
Chromium (Hexavalent)		N	2490	mg/kg	0.50	< 0.50
Aliphatic VPH >C5-C6	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C7	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C7-C8	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Aliphatic VPH >C6-C8 (Sum)	HS_2D_AL	N	2780	mg/kg	0.10	[BC] < 0.10
Aliphatic VPH >C8-C10	HS_2D_AL	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aliphatic VPH >C5-C10	HS_2D_AL	U	2780	mg/kg	0.25	[BC] < 0.25
Aliphatic EPH >C10-C12 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] 10
Aliphatic EPH >C12-C16 MC	EH_2D_AL_#1	M	2690	mg/kg	1.00	[BC] 13
Aliphatic EPH >C16-C21 MC	EH_2D_AL_#1	M	2690	mg/kg	2.00	[BC] 7.2
Aliphatic EPH >C21-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	3.00	[BC] 19
Aliphatic EPH >C35-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] < 10

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Total Aliphatic EPH >C10-C35 MC	EH_2D_AL_#1	M	2690	mg/kg	5.00	[BC] 50
Total Aliphatic EPH >C10-C40 MC	EH_2D_AL_#1	N	2690	mg/kg	10.00	[BC] 50
Aromatic VPH >C5-C7	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Aromatic VPH >C7-C8	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Aromatic VPH >C8-C10	HS_2D_AR	U	2780	mg/kg	0.05	[BC] < 0.05
Total Aromatic VPH >C5-C10	HS_2D_AR	U	2780	mg/kg	0.25	[BC] < 0.25
Aromatic EPH >C10-C12 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] < 1.0
Aromatic EPH >C12-C16 MC	EH_2D_AR_#1	U	2690	mg/kg	1.00	[BC] < 1.0
Aromatic EPH >C16-C21 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] 3.1
Aromatic EPH >C21-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	2.00	[BC] < 2.0
Aromatic EPH >C35-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	1.00	[BC] 7.2
Total Aromatic EPH >C10-C35 MC	EH_2D_AR_#1	U	2690	mg/kg	5.00	[BC] < 5.0
Total Aromatic EPH >C10-C40 MC	EH_2D_AR_#1	N	2690	mg/kg	10.00	[BC] < 10
Total VPH >C5-C10	HS_2D_Total	U	2780	mg/kg	0.50	[BC] < 0.50
Total EPH >C10-C35 MC	EH_2D_Total_#1	U	2690	mg/kg	10.00	[BC] 54
Total EPH >C10-C40 MC	EH_2D_Total_#1	N	2690	mg/kg	10.00	[BC] 61
Organic Matter		M	2625	%	0.40	9.1
Naphthalene		M	2700	mg/kg	0.10	< 0.10
Acenaphthylene		M	2700	mg/kg	0.10	< 0.10
Acenaphthene		M	2700	mg/kg	0.10	< 0.10
Fluorene		M	2700	mg/kg	0.10	< 0.10
Phenanthrene		M	2700	mg/kg	0.10	< 0.10
Anthracene		M	2700	mg/kg	0.10	< 0.10
Fluoranthene		M	2700	mg/kg	0.10	< 0.10
Pyrene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]anthracene		M	2700	mg/kg	0.10	< 0.10
Chrysene		M	2700	mg/kg	0.10	< 0.10
Benzo[b]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[k]fluoranthene		M	2700	mg/kg	0.10	< 0.10
Benzo[a]pyrene		M	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		M	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)Anthracene		M	2700	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene		M	2700	mg/kg	0.10	< 0.10
Total Of 16 PAH's		M	2700	mg/kg	2.0	< 2.0
Dichlorodifluoromethane		U	2760	µg/kg	1.0	
Chloromethane		M	2760	µg/kg	1.0	
Vinyl Chloride		M	2760	µg/kg	1.0	
Bromomethane		M	2760	µg/kg	20	

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Chloroethane		U	2760	µg/kg	2.0	
Trichlorofluoromethane		M	2760	µg/kg	1.0	
1,1-Dichloroethene		M	2760	µg/kg	1.0	
Dichloromethane		N	2760	µg/kg	50	
Trans 1,2-Dichloroethene		M	2760	µg/kg	1.0	
1,1-Dichloroethane		M	2760	µg/kg	1.0	
cis 1,2-Dichloroethene		M	2760	µg/kg	1.0	
Bromochloromethane		U	2760	µg/kg	5.0	
Trichloromethane		M	2760	µg/kg	1.0	
1,1,1-Trichloroethane		M	2760	µg/kg	1.0	
Tetrachloromethane		M	2760	µg/kg	1.0	
1,1-Dichloropropene		U	2760	µg/kg	1.0	
Benzene		M	2760	µg/kg	1.0	[BC] < 1.0
1,2-Dichloroethane		M	2760	µg/kg	2.0	
Trichloroethene		N	2760	µg/kg	1.0	
1,2-Dichloropropane		M	2760	µg/kg	1.0	
Dibromomethane		M	2760	µg/kg	1.0	
Bromodichloromethane		M	2760	µg/kg	5.0	
cis-1,3-Dichloropropene		N	2760	µg/kg	10	
Toluene		M	2760	µg/kg	1.0	[BC] < 1.0
Trans-1,3-Dichloropropene		N	2760	µg/kg	10	
1,1,2-Trichloroethane		M	2760	µg/kg	10	
Tetrachloroethene		M	2760	µg/kg	1.0	
1,3-Dichloropropane		U	2760	µg/kg	2.0	
Dibromochloromethane		U	2760	µg/kg	10	
1,2-Dibromoethane		M	2760	µg/kg	5.0	
Chlorobenzene		M	2760	µg/kg	1.0	
1,1,1,2-Tetrachloroethane		M	2760	µg/kg	2.0	
Ethylbenzene		M	2760	µg/kg	1.0	[BC] < 1.0
m & p-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
o-Xylene		M	2760	µg/kg	1.0	[BC] < 1.0
Styrene		M	2760	µg/kg	1.0	
Tribromomethane		U	2760	µg/kg	1.0	
Isopropylbenzene		M	2760	µg/kg	1.0	
Bromobenzene		M	2760	µg/kg	1.0	
1,2,3-Trichloropropane		N	2760	µg/kg	50	
N-Propylbenzene		U	2760	µg/kg	1.0	
2-Chlorotoluene		M	2760	µg/kg	1.0	

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
1,3,5-Trimethylbenzene		M	2760	µg/kg	1.0	
4-Chlorotoluene		U	2760	µg/kg	1.0	
Tert-Butylbenzene		U	2760	µg/kg	1.0	
1,2,4-Trimethylbenzene		M	2760	µg/kg	1.0	
Sec-Butylbenzene		U	2760	µg/kg	1.0	
1,3-Dichlorobenzene		M	2760	µg/kg	1.0	
4-Isopropyltoluene		U	2760	µg/kg	1.0	
1,4-Dichlorobenzene		M	2760	µg/kg	1.0	
N-Butylbenzene		U	2760	µg/kg	1.0	
1,2-Dichlorobenzene		M	2760	µg/kg	1.0	
1,2-Dibromo-3-Chloropropane		U	2760	µg/kg	50	
1,2,4-Trichlorobenzene		M	2760	µg/kg	1.0	
Hexachlorobutadiene		N	2760	µg/kg	1.0	
1,2,3-Trichlorobenzene		U	2760	µg/kg	2.0	
Methyl Tert-Butyl Ether		M	2760	µg/kg	1.0	[BC] < 1.0
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/kg	N/A	
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/kg	N/A	
N-Nitrosodimethylamine		M	2790	mg/kg	0.50	
Phenol		M	2790	mg/kg	0.50	
2-Chlorophenol		N	2790	mg/kg	0.50	
Bis-(2-Chloroethyl)Ether		M	2790	mg/kg	0.50	
1,3-Dichlorobenzene		M	2790	mg/kg	0.50	
1,4-Dichlorobenzene		N	2790	mg/kg	0.50	
1,2-Dichlorobenzene		M	2790	mg/kg	0.50	
2-Methylphenol		M	2790	mg/kg	0.50	
Bis(2-Chloroisopropyl)Ether		M	2790	mg/kg	0.50	
Hexachloroethane		N	2790	mg/kg	0.50	
N-Nitrosodi-n-propylamine		M	2790	mg/kg	0.50	
4-Methylphenol		M	2790	mg/kg	0.50	
Nitrobenzene		N	2790	mg/kg	0.50	
Isophorone		M	2790	mg/kg	0.50	
2-Nitrophenol		N	2790	mg/kg	0.50	
2,4-Dimethylphenol		N	2790	mg/kg	0.50	
Bis(2-Chloroethoxy)Methane		M	2790	mg/kg	0.50	
2,4-Dichlorophenol		N	2790	mg/kg	0.50	
1,2,4-Trichlorobenzene		M	2790	mg/kg	0.50	
Naphthalene		M	2790	mg/kg	0.50	
4-Chloroaniline		N	2790	mg/kg	0.50	

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Hexachlorobutadiene		M	2790	mg/kg	0.50	
4-Chloro-3-Methylphenol		N	2790	mg/kg	0.50	
2-Methylnaphthalene		M	2790	mg/kg	0.50	
4-Nitrophenol		N	2790	mg/kg	0.50	
Hexachlorocyclopentadiene		N	2790	mg/kg	0.50	
2,4,6-Trichlorophenol		N	2790	mg/kg	0.50	
2,4,5-Trichlorophenol		N	2790	mg/kg	0.50	
2-Chloronaphthalene		M	2790	mg/kg	0.50	
2-Nitroaniline		N	2790	mg/kg	0.50	
Acenaphthylene		M	2790	mg/kg	0.50	
Dimethylphthalate		M	2790	mg/kg	0.50	
2,6-Dinitrotoluene		N	2790	mg/kg	0.50	
Acenaphthene		M	2790	mg/kg	0.50	
3-Nitroaniline		N	2790	mg/kg	0.50	
Dibenzofuran		M	2790	mg/kg	0.50	
4-Chlorophenylphenylether		M	2790	mg/kg	0.50	
2,4-Dinitrotoluene		N	2790	mg/kg	0.50	
Fluorene		M	2790	mg/kg	0.50	
Diethyl Phthalate		M	2790	mg/kg	0.50	
4-Nitroaniline		N	2790	mg/kg	0.50	
Azobenzene		M	2790	mg/kg	0.50	
4-Bromophenylphenyl Ether		M	2790	mg/kg	0.50	
Hexachlorobenzene		M	2790	mg/kg	0.50	
Phenanthrene		M	2790	mg/kg	0.50	
Anthracene		M	2790	mg/kg	0.50	
Carbazole		M	2790	mg/kg	0.50	
Di-N-Butyl Phthalate		N	2790	mg/kg	0.50	
Fluoranthene		M	2790	mg/kg	0.50	
Pyrene		M	2790	mg/kg	0.50	
Butylbenzyl Phthalate		N	2790	mg/kg	0.50	
Benzo[a]anthracene		M	2790	mg/kg	0.50	
Chrysene		M	2790	mg/kg	0.50	
Bis(2-Ethylhexyl)Phthalate		N	2790	mg/kg	0.50	
Di-N-Octyl Phthalate		N	2790	mg/kg	0.50	
Benzo[b]fluoranthene		M	2790	mg/kg	0.50	
Benzo[k]fluoranthene		M	2790	mg/kg	0.50	
Benzo[a]pyrene		M	2790	mg/kg	0.50	
Indeno(1,2,3-c,d)Pyrene		N	2790	mg/kg	0.50	

Results - Soil

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-20633
Quotation No.:				**Chemtest Sample ID.:**		1827965
				Sample Location:		TP208
				Sample Type:		SOIL
				Top Depth (m):		0.00
				Bottom Depth (m):		0.15
				Date Sampled:		12-Jun-2024
				Asbestos Lab:		
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**	
Dibenz(a,h)Anthracene		N	2790	mg/kg	0.50	
Benzo[g,h,i]perylene		M	2790	mg/kg	0.50	
PCB 28		U	2815	mg/kg	0.010	
PCB 52		U	2815	mg/kg	0.010	
PCB 101		U	2815	mg/kg	0.010	
PCB 118		U	2815	mg/kg	0.010	
PCB 153		U	2815	mg/kg	0.010	
PCB 138		U	2815	mg/kg	0.010	
PCB 180		U	2815	mg/kg	0.010	
Total PCBs (7 Congeners)		N	2815	mg/kg	0.10	
Total Phenols		M	2920	mg/kg	0.10	< 0.10

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1827949			BH202	12-Jun-2024	B	Amber Glass 250ml
1827949			BH202	12-Jun-2024	B	Amber Glass 60ml
1827949			BH202	12-Jun-2024	B	Plastic Bag
1827951			WS203	12-Jun-2024	B	Amber Glass 250ml
1827951			WS203	12-Jun-2024	B	Amber Glass 60ml
1827951			WS203	12-Jun-2024	B	Plastic Bag
1827953			WS204	12-Jun-2024	B	Amber Glass 250ml
1827953			WS204	12-Jun-2024	B	Plastic Bag
1827958			WS201	12-Jun-2024	B	Amber Glass 250ml
1827958			WS201	12-Jun-2024	B	Amber Glass 60ml
1827958			WS201	12-Jun-2024	B	Plastic Bag
1827960			BH201	12-Jun-2024	B	Amber Glass 250ml
1827960			BH201	12-Jun-2024	B	Amber Glass 60ml
1827960			BH201	12-Jun-2024	B	Plastic Bag
1827962			BH201	12-Jun-2024	B	Amber Glass 250ml
1827962			BH201	12-Jun-2024	B	Amber Glass 60ml
1827962			BH201	12-Jun-2024	B	Plastic Bag
1827964			TP207	12-Jun-2024	BC	Plastic Bag
1827965			TP208	12-Jun-2024	BC	Plastic Bag

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
2010	pH Value of Soils	pH at 20°C	pH Meter	
2020	Electrical Conductivity	Electrical conductivity (EC) of aqueous extract or calcium sulphate solution for topsoil	Measurement of the electrical resistance of a 2:1 water/soil extract.	
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 <30°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.	
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry	
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.	
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.	
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.	
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.	
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.	
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection	
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)	
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.	
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection	
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS	
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS. Reported PCB 101 results may contain contributions from PCB 90 due to inseparable chromatography.	
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.	

Report Information

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SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
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U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

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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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

GQF-008-66
Issue 011- Oct 23

Summary of Particle Size Distribution Results

Project No.	Project Name
J276890	24-19438

Hole No.	Sample				Stones >50mm %	Stones >20mm %	Stones >2mm %	Sand content %	Silt content %	Clay content %	Remarks
	Ref	Top	Base	Type							
1823478	TP211	0.00		B	0.0	0.0	0.8	3.9	54.9	40.4	

Key

Test performed in accordance with BS1377:Part2:1990, unless annotated otherwise

Date Printed	04/07/2024

UKAS TESTING 7758

PSD SUM

Appendix E

Laboratory Certificates – Waters

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

Final Report

Report No.:	24-19143-1
Initial Date of Issue:	05-Jul-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI - Additional Works

Quotation No.:		**Date Received:**	17-Jun-2024
Order No.:	101330976	**Date Instructed:**	17-Jun-2024
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	21-Jun-2024
Date Approved:	05-Jul-2024	**Subcon Results Due:**	08-Jul-2024

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19143	24-19143	24-19143	24-19143
Quotation No.:				**Chemtest Sample ID.:**		1822176	1822177	1822178	1822179
				Sample Location:		Lagoon	Old Fleet Down	Old Fleet Up	Pipe Ditch
				Sample Type:		WATER	WATER	WATER	WATER
				Sample Sub Type:					
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/l	N/A	See Attached	See Attached	See Attached	See Attached
pH at 20C		U	1010		4.0	8.8	8.6	8.5	8.5
Electrical Conductivity at 25C		U	1020	µS/cm	1.0	920	3500	3400	4900
Chemical Oxygen Demand		U	1100	mg O2/l	10	36	42	43	260
Alkalinity (Total)		U	1220	mg/l	10	310	200	360	2700
Ammonia (Free)		N	1220	mg/l	0.050	0.056	0.14	0.63	< 0.050
Nitrate as NO3		U	1220	mg/l	0.50	< 0.50	0.97	0.50	< 0.50
Phosphate		U	1220	mg/l	0.200	< 0.20	0.20	< 0.20	12
Sulphate		U	1220	mg/l	1.0	26	300	300	1400
Cyanide (Total)		U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Arsenic (Dissolved)		U	1455	µg/l	0.20	2.1	4.1	5.0	9.2
Boron (Dissolved)		U	1455	µg/l	10.0	270	440	420	330
Cadmium (Dissolved)		U	1455	µg/l	0.11	< 0.11	1.2	< 0.11	< 0.11
Chromium (Dissolved)		U	1455	µg/l	0.50	< 0.50	2.4	< 0.50	2.4
Copper (Dissolved)		U	1455	µg/l	0.50	< 0.50	3.2	0.84	< 0.50
Iron (Dissolved)		N	1455	µg/l	5.0	22	22	62	75
Mercury (Dissolved)		U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Manganese (Dissolved)		U	1455	µg/l	0.50	2.7	4.5	1.8	910
Nickel (Dissolved)		U	1455	µg/l	0.50	2.5	7.4	4.9	11
Lead (Dissolved)		U	1455	µg/l	0.50	< 0.50	1.1	< 0.50	< 0.50
Selenium (Dissolved)		U	1455	µg/l	0.50	< 0.50	1.0	< 0.50	12
Zinc (Dissolved)		U	1455	µg/l	2.5	3.9	5.6	11	13
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Water

Project: 129-003084-01 Grimsby HTI - Additional Works

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-19143	24-19143	24-19143	24-19143
Quotation No.:				**Chemtest Sample ID.:**		1822176	1822177	1822178	1822179
				Sample Location:		Lagoon	Old Fleet Down	Old Fleet Up	Pipe Ditch
				Sample Type:		WATER	WATER	WATER	WATER
				Sample Sub Type:					
				Date Sampled:		13-Jun-2024	13-Jun-2024	13-Jun-2024	13-Jun-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	< 10	< 10	< 10	< 10
Benzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/l	N/A	See Attached	See Attached	See Attached	See Attached
Total Phenols		U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	RE PW TE TS PL DW GW
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	TE TS PL LE SW GW
1100	Chemical Oxygen Demand	Chemical Oxygen demand (COD)	Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI].	TE TS PL LE GW
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	RE PW PL LE DW GW
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	GW
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.	PL LE GW
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.	PL GW
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	PL GW

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Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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customerservices@chemtest.com

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

Final Report

Report No.:	24-26851-1
Initial Date of Issue:	03-Sep-2024
Re-Issue Details:	
Client	Mayer Environmental Ltd
Client Address:	Transport Avenue Brentford TW8 9HA
Contact(s):	Brendan Pittman Rebecca Beddard
Project	129-003084-01 Grimsby HTI

Quotation No.:		**Date Received:**	21-Aug-2024
Order No.:	101343192	**Date Instructed:**	21-Aug-2024
No. of Samples:	4		
Turnaround (Wkdays):	9	**Results Due:**	03-Sep-2024
Date Approved:	03-Sep-2024	**Subcon Results Due:**	12-Sep-2024

Approved By:



Details: David Smith, Technical Director

For details about application of accreditation to specific matrix types, please refer to the Table at the back of this report

Results - Water

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-26851	24-26851	24-26851	24-26851
Quotation No.:				**Chemtest Sample ID.:**		1854286	1854287	1854288	1854289
				Client Sample ID.:		BH201	BH203	WS204	WS01
				Sample Location:		BH201	BH203	WS204	WS01
				Sample Type:		WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		15-Aug-2024	15-Aug-2024	15-Aug-2024	15-Aug-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Perfluoroctanoic Acid (PFOA) (Subcon)		SN		µg/l	N/A	See Attached	See Attached	See Attached	See Attached
pH at 20C		U	1010		4.0	8.3	7.6	7.9	7.6
Electrical Conductivity at 25C		U	1020	µS/cm	1.0	1100	3200	8500	7600
Chemical Oxygen Demand		U	1100	mg O2/l	10	23	43	110	83
Alkalinity (Total)		U	1220	mg/l	10	430	760	1400	1300
Ammonia (Free)		N	1220	mg/l	0.050	0.18	0.073	0.39	0.11
Nitrate as NO3		U	1220	mg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phosphate		U	1220	mg/l	0.200	< 0.20	< 0.20	5.3	1.7
Sulphate		U	1220	mg/l	1.0	26	49	1100	830
Cyanide (Total)		U	1300	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Sulphide		U	1325	mg/l	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Arsenic (Dissolved)		U	1455	µg/l	0.20	4.1	14	18	24
Boron (Dissolved)		U	1455	µg/l	10.0	390	1000	3000	2900
Cadmium (Dissolved)		U	1455	µg/l	0.11	< 0.11	< 0.11	< 0.11	< 0.11
Chromium (Dissolved)		U	1455	µg/l	0.50	2.0	3.7	7.1	6.1
Copper (Dissolved)		U	1455	µg/l	0.50	0.90	< 0.50	0.85	0.68
Iron (Dissolved)		N	1455	µg/l	5.0	26	5000	7500	9900
Mercury (Dissolved)		U	1455	µg/l	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Manganese (Dissolved)		U	1455	µg/l	0.50	510	1400	2600	1800
Nickel (Dissolved)		U	1455	µg/l	0.50	3.2	1.0	4.2	3.2
Lead (Dissolved)		U	1455	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Selenium (Dissolved)		U	1455	µg/l	0.50	5.1	5.7	10	6.8
Zinc (Dissolved)		U	1455	µg/l	2.5	7.1	2.7	2.8	< 2.5
Aliphatic TPH >C5-C6	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	3.9	< 0.10
Aliphatic TPH >C12-C16	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	9.7	< 0.10
Aliphatic TPH >C16-C21	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	7.9	< 0.10
Aliphatic TPH >C21-C35	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	30	< 0.10
Aliphatic TPH >C35-C44	EH_2D_AL_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	EH_2D_AL_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	52	< 5.0
Aromatic TPH >C5-C7	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10

Results - Water

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-26851	24-26851	24-26851	24-26851
Quotation No.:				**Chemtest Sample ID.:**		1854286	1854287	1854288	1854289
				Client Sample ID.:		BH201	BH203	WS204	WS01
				Sample Location:		BH201	BH203	WS204	WS01
				Sample Type:		WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		15-Aug-2024	15-Aug-2024	15-Aug-2024	15-Aug-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C35-C44	EH_2D_AR_#1	N	1675	µg/l	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	EH_2D_AR_#1	N	1675	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	EH_2D_Total_#1	N	1675	µg/l	10	< 10	< 10	52	< 10
Dichlorodifluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5
Chloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichlorofluoromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromochloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5
Trichloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Trichloroethene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10
Bromodichloromethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10
Toluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene		N	1760	µg/l	10	< 10	< 10	< 10	< 10
1,1,2-Trichloroethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10
Tetrachloroethene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Dibromochloromethane		U	1760	µg/l	10	< 10	< 10	< 10	< 10
1,2-Dibromoethane		U	1760	µg/l	5	< 5	< 5	< 5	< 5
Chlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results - Water

Project: 129-003084-01 Grimsby HTI

Client: Mayer Environmental Ltd				**Chemtest Job No.:**		24-26851	24-26851	24-26851	24-26851
Quotation No.:				**Chemtest Sample ID.:**		1854286	1854287	1854288	1854289
				Client Sample ID.:		BH201	BH203	WS204	WS01
				Sample Location:		BH201	BH203	WS204	WS01
				Sample Type:		WATER	WATER	WATER	WATER
				Sample Sub Type:		Ground Water	Ground Water	Ground Water	Ground Water
				Date Sampled:		15-Aug-2024	15-Aug-2024	15-Aug-2024	15-Aug-2024
Determinand	**HWOL Code**	**Accred.**	**SOP**	**Units**	**LOD**				
Isopropylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichloropropane		N	1760	µg/l	50	< 50	< 50	< 50	< 50
N-Propylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tert-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sec-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Isopropyltoluene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
N-Butylbenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane		U	1760	µg/l	50	< 50	< 50	< 50	< 50
1,2,4-Trichlorobenzene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene		U	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene		U	1760	µg/l	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether		N	1760	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Perfluorooctyl sulfonate (PFOS) (Subcon)		SN		µg/l	N/A	See Attached	See Attached	See Attached	See Attached
PCB 28		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 101		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 118		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 congeners)		N	1815	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Phenols		U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030	< 0.030

Test Methods

SOP	Title	Parameters included	Method summary	Water Accred.
1010	pH Value of Waters	pH at 20°C	pH Meter	RE PW TE TS PL DW GW
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter	TE TS PL LE SW GW
1100	Chemical Oxygen Demand	Chemical Oxygen demand (COD)	Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI].	TE TS PL LE GW
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.	RE PW PL LE DW GW
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.	GW
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N–dimethyl-pphenylenediamine.	PL LE GW
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).	RE PW PL SW DW GW
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5–C6, >C6–C8, >C8– C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Pentane extraction / GCxGC FID detection	
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.	PL GW
1815	Polychlorinated Biphenyls (PCB) ICES7 Congeners in Waters by GC-MS	ICES7 PCB congeners	Solvent extraction / GCMS detection	
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.	PL GW

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"
SOP	Standard operating procedure
LOD	Limit of detection

This report shall not be reproduced except in full, and only with the prior approval of the laboratory.
Any comments or interpretations are outside the scope of UKAS accreditation.
The Laboratory is not accredited for any sampling activities and reported results relate to the samples 'as received' at the laboratory.
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 EPH, VPH, TPH, BTEX, VOCs, SVOCs, PCBs, Phenols.

For all other tests the samples were dried at ≤ 30°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 30 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.

Water Sample Category Key for Accreditation

DW - Drinking Water
GW - Ground Water
LE - Land Leachate
NA - Not Applicable

Report Information

PL - Prepared Leachate
PW - Processed Water
RE - Recreational Water
SA - Saline Water
SW - Surface Water
TE - Treated Effluent
TS - Treated Sewage
UL - Unspecified Liquid

Clean Up Codes

NC - No Clean Up
MC - Mathematical Clean Up
FC - Florisil Clean Up

HWOL Acronym System

HS - Headspace analysis
EH - Extractable hydrocarbons – i.e. everything extracted by the solvent
CU - Clean-up – e.g. by Florisil, silica gel
1D - GC – Single coil gas chromatography
Total - Aliphatics & Aromatics
AL - Aliphatics only
AR - Aromatic only
2D - GC-GC – Double coil gas chromatography
#1 - EH_2D_Total but with humics mathematically subtracted
#2 - EH_2D_Total but with fatty acids mathematically subtracted
+ - Operator to indicate cumulative e.g. EH+EH_Total or EH_CU+HS_Total

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

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528777
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Eurofins Chemtest Limited
Willie Snaith Rd
Newmarket
Suffolk
CB8 7SQ

Attention: Subcontracting Lab

CERTIFICATE OF ANALYSIS

Date of report Generation:	02 September 2024
Customer:	Eurofins Chemtest Limited
Sample Delivery Group (SDG):	240822-66
Your Reference:	24-26851
Location:	Not Specified
Report No:	739179
Order Number:	24-26851

We received 4 samples on Thursday August 22, 2024 and 4 of these samples were scheduled for analysis which was completed on Monday September 02, 2024. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:



Lauren Ellis
General Manager Western Europe Environmental

CERTIFICATE OF ANALYSIS

SDG: 240822-66 **Report Number:** 739179 **Superseded Report:**
Client Ref.: 24-26851 **Location:** Not Specified

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
30259547	1854286 BH201			15/08/2024
30259548	1854287 BH203			15/08/2024
30259550	1854289 WS01			15/08/2024
30259549	1854288 WS204			15/08/2024

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

CERTIFICATE OF ANALYSIS

SDG: 240822-66 **Report Number:** 739179 **Superseded Report:**
Client Ref.: 24-26851 **Location:** Not Specified

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container	Sample Type
			30259547	1854286 BH201			1lplastic (ALE221)	UNL
			30259548	1854287 BH203			1lplastic (ALE221)	UNL
			30259550	1854289 WS01			1lplastic (ALE221)	UNL
			30259549	1854288 WS204			1lplastic (ALE221)	UNL
PFAS Liquids	All	NDPs: 0 Tests: 4					X	X	X	X

Validated

CERTIFICATE OF ANALYSIS

SDG: 240822-66 **Report Number:** 739179 **Superseded Report:**
Client Ref.: 24-26851 **Location:** Not Specified

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-4♦§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	1854286 BH201	1854287 BH203	1854289 WS01	1854288 WS204		
			Depth (m)	.	.	.	.		
			Sample Type	Water	Water	Water	Water		
			Date Sampled	15/08/2024	15/08/2024	15/08/2024	15/08/2024		
			Sample Time	.	.	.	.		
			Date Received	22/08/2024	22/08/2024	22/08/2024	22/08/2024		
			SDG Ref	240822-66	240822-66	240822-66	240822-66		
			Lab Sample No.(s)	30259547	30259548	30259550	30259549		
			AGS Reference						
PFOA (335-67-1)	<0.65 ng/l	TM337		<0.65	2.1	<3.25	<6.5		
Linear PFOS (1763-23-1)	<0.65 ng/l	TM337		1.45	1.42	<3.25	<6.5		
Branched PFOS	<0.65 ng/l	TM337		0.768	0.841	<3.25	<6.5		
Total PFOS	<0.65 ng/l	TM337		2.21	2.26	<3.25	<6.5		

Table of Results - Appendix

Method No	Description
TM337	Analysis of PFAS

NA = not applicable.
Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 240822-66 **Report Number:** 739179 **Superseded Report:**
Client Ref.: 24-26851 **Location:** Not Specified

Test Completion Dates

Lab Sample No(s)	30259547	30259548	30259550	30259549
Customer Sample Ref.	1854286 BH201	1854287 BH203	1854289 WS01	1854288 WS204
AGS Ref.				
Depth				
Type	Water	Water	Water	Water
PFAS Liquids	02-Sep-2024	02-Sep-2024	30-Aug-2024	30-Aug-2024

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as “mixed hydrocarbons”. Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

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Website: www.alsenvironmental.co.uk

Eurofins Chemtest Limited
Willie Snaith Rd
Newmarket
Suffolk
CB8 7SQ

Attention: Chemtest Subcontracting

CERTIFICATE OF ANALYSIS

Date of report Generation:	03 July 2024
Customer:	Eurofins Chemtest Limited
Sample Delivery Group (SDG):	240619-82
Your Reference:	24-19143
Location:	Not Specified
Report No:	733602
Order Number:	24-19143

We received 4 samples on Wednesday June 19, 2024 and 4 of these samples were scheduled for analysis which was completed on Wednesday July 03, 2024. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.
The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:



Sonia McWhan
Operations Manager

CERTIFICATE OF ANALYSIS

SDG: 240619-82 **Report Number:** 733602 **Superseded Report:**
Client Ref.: 24-19143 **Location:** Not Specified

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
29952353	24-19143 1822176			13/06/2024
29952354	24-19143 1822177			13/06/2024
29952355	24-19143 1822178			13/06/2024
29952356	24-19143 1822179			13/06/2024

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG: 240619-82 **Report Number:** 733602 **Superseded Report:**
Client Ref.: 24-19143 **Location:** Not Specified

Results Legend

X Test

N No Determination Possible

Sample Types -
S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water
Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

			Lab Sample No(s)	29952353	29952354	29952355	29952356
			Customer Sample Reference	24-19143 1822176	24-19143 1822177	24-19143 1822178	24-19143 1822179
			AGS Reference				
			Depth (m)				
			Container	1000ml glass bottle (ALE220)	1000ml glass bottle (ALE220)	1000ml glass bottle (ALE220)	1000ml glass bottle (ALE220)
			Sample Type	UNL	UNL	UNL	UNL
PFAS Liquids	All	NDPs: 0 Tests: 4		X	X	X	X

Validated

CERTIFICATE OF ANALYSIS

SDG: 240619-82 **Report Number:** 733602 **Superseded Report:**
Client Ref.: 24-19143 **Location:** Not Specified

Results Legend
- # ISO17025 accredited.
- M mCERTS accredited.
- aq Aqueous / settled sample.
- diss.filt Dissolved / filtered sample.
- tot.unfilt Total / unfiltered sample.
- * Subcontracted - refer to subcontractor report for accreditation status.
- ** % recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
- (F) Trigger breach confirmed
- 1-4♦§@ Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	24-19143 1822176	24-19143 1822177	24-19143 1822178	24-19143 1822179		
			Depth (m)	.	.	.	.		
			Sample Type	Water	Water	Water	Water		
			Date Sampled	13/06/2024	13/06/2024	13/06/2024	13/06/2024		
			Sample Time	.	.	.	.		
			Date Received	19/06/2024	19/06/2024	19/06/2024	19/06/2024		
			SDG Ref	240619-82	240619-82	240619-82	240619-82		
			Lab Sample No.(s)	29952353	29952354	29952355	29952356		
			AGS Reference						
PFOA (335-67-1)	<0.65 ng/l	TM337		2.61	17.1	17.3	1000		
Linear PFOS (1763-23-1)	<0.65 ng/l	TM337		1.33	3.45	<3.25	16.9		
Branched PFOS	<0.65 ng/l	TM337		1.35	2.96	<3.25	18.2		
Total PFOS	<0.65 ng/l	TM337		2.68	6.4	<3.25	35.2		

Table of Results - Appendix

Method No	Description
TM337	Analysis of PFAS

NA = not applicable.
Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).

CERTIFICATE OF ANALYSIS

SDG: 240619-82 **Report Number:** 733602 **Superseded Report:**
Client Ref.: 24-19143 **Location:** Not Specified

Test Completion Dates

Lab Sample No(s)	29952353	29952354	29952355	29952356
Customer Sample Ref.	24-19143 18221 76	24-19143 18221 77	24-19143 18221 78	24-19143 18221 79
AGS Ref.				
Depth				
Type	Water	Water	Water	Water
PFAS Liquids	01-Jul-2024	01-Jul-2024	03-Jul-2024	01-Jul-2024

Appendix General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of 15 days after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

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19. **Sample Deviations**

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1	**Container with Headspace provided for volatiles analysis**
2	**Incorrect container received**
3	**Deviation from method**
4	**Matrix interference**
♦	**Sample holding time exceeded in laboratory**
@	**Sample holding time exceeded due to late arrival of instructions or samples**
§	**Sampled on date not provided**

20. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as “Not detected”. If no asbestos fibre types are found all will be reported as “Not detected” and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials andd soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Appendix F

Gas & Groundwater Monitoring Data

SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**10/07/2024**	**Page**	:	**1 of 4**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**DD**

Date Monitored:

Parameter	Units	Method	LOD	WS01		WS02		WS03		WS04			
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	0.0	0.0	20.4	0.0	0.0	0.0	0.0	0.0		
Methane (LEL)	% v/v	GFM	1	0.0	0.0	>>	0.0	0.0	0.0	0.0	0.0		
Carbon Dioxide (CO2)	% v/v	GFM	0.1	3.1	3.1	5.6	1.6	4.2	5.9	5.9	5.9		
Oxygen (O2)	% v/v	GFM	0.1	19.1	17.7	19.1	15.1	19.1	8.9	19.4	8.9		
Hydrogen Sulfide (H2S)	ppm	GFM	1	0.0	x	0.0	x	0.0	x	0.0	x		
Carbon Monoxide (CO)	ppm	GFM	1	0.0	x	0.0	x	0.0	x	0.0	x		
Flow Rate	l/h	GFM	0.1	0.0	0.0	-87.0	0.0	0.0	0	-0.3	0.0		
Atmospheric Pressure	mb	GFM	1.0		1012		1012		1013		1013		
TVOC	ppm	PID	0.1										
Depth to Groundwater	metres	-	0.1	1.11		0.56		0.89		0.2			
Depth to Base of Well	metres	-	0.1	3.41		3.56		3.11		3.6			
Time:				14:05		0.61		11:40		13:53			
Notes:													

Weather Observations:	Sunny, 15°C
Pressure Trend:	Steady
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

mayer environmental

SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**10/07/2024**	**Page**	:	**2 of 4**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**DD**

Date Monitored:

Parameter	Units	Method	LOD	WS204		WS205		WS206		WS207			
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady		
Methane (CH4)	% v/v	GFM	0.1	6.2	6.2	0.0	0.0	0.0	0.0	9.5	9.5		
Methane (LEL)	% v/v	GFM	1	>>	>>	0.0	0.0	0.0	0.0	>>	>>		
Carbon Dioxide (CO2)	% v/v	GFM	0.1	3.4	3.4	0.2	0.0	2.4	2.3	4.0	4.0		
Oxygen (O2)	% v/v	GFM	0.1	19.0	16.0	19.4	19.4	21.1	18.2	18.5	15.2		
Hydrogen Sulfide (H2S)	ppm	GFM	1	0.0	x	0.0	x	0.0	x	0.0	x		
Carbon Monoxide (CO)	ppm	GFM	1	0.0	x	0.0	x	10.0	x	0.0	x		
Flow Rate	l/h	GFM	0.1	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0		
Atmospheric Pressure	mb	GFM	1.0		1008		1012		1012		1014		
TVOC	ppm	PID	0.1										
Depth to Groundwater	metres	-	0.1	0.8		0.83		0.91		0.85			
Depth to Base of Well	metres	-	0.1	4.52		4.62		5		4.65			
Time:				12:05		13:40		10:45		13:05			
Notes:				Monitored 09/07/24. Overcast and rain									

Weather Observations:	Sunny, 15°C
Pressure Trend:	Steady
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-0023084**
Report Date	:	**10/07/2024**	**Page**	:	**3 of 4**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**DD**

Date Monitored:

Parameter	Units	Method	LOD	WS201		WS203							
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	0.0	0.0	0.0	0.0						
Methane (LEL)	% v/v	GFM	1	0.0	0.0	0.0	0.0						
Carbon Dioxide (CO2)	% v/v	GFM	0.1	2.4	2.4	4.0	2.4						
Oxygen (O2)	% v/v	GFM	0.1	19.1	17.5	19.0	17.5						
Hydrogen Sulfide (H2S)	ppm	GFM	1	0.0	x	0.0	x						
Carbon Monoxide (CO)	ppm	GFM	1	0.0	x	0.0	x						
Flow Rate	l/h	GFM	0.1	0.0	0.0	0.0	0.0						
Atmospheric Pressure	mb	GFM	1.0		1013		1013						
TVOC	ppm	PID	0.1										
Depth to Groundwater	metres	-	0.1	1.22		1.54							
Depth to Base of Well	metres	-	0.1	4.74		4.75							
Time:				08:40		08:33							
Notes:													

Weather Observations:	Sunny, 15°C
Pressure Trend:	Steady
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**10/07/2024**	**Page**	:	**4 of 4**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**DD**

Date Monitored:

Parameter	Units	Method	LOD	BH01		BH03		BH05		BH201		BH203	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	x	x	x	x	x	x	x	x	x	x
Methane (LEL)	% v/v	GFM	1	x	x	x	x	x	x	x	x	x	x
Carbon Dioxide (CO2)	% v/v	GFM	0.1	x	x	x	x	x	x	x	x	x	x
Oxygen (O2)	% v/v	GFM	0.1	x	x	x	x	x	x	x	x	x	x
Hydrogen Sulfide (H2S)	ppm	GFM	1	x	x	x	x	x	x	x	x	x	x
Carbon Monoxide (CO)	ppm	GFM	1	x	x	x	x	x	x	x	x	x	x
Flow Rate	l/h	GFM	0.1	x	x	x	x	x	x	x	x	x	x
Atmospheric Pressure	mb	GFM	1.0	x	x	x	x	x	x	x	x	x	x
TVOC	ppm	PID	0.1	x	x	x	x	x	x	x	x	x	x
Depth to Groundwater	metres	-	0.1	0.00		0.87		2.35		0.47		0.52	
Depth to Base of Well	metres	-	0.1	6.00		5.18		9.04		10.00		6.67	
Time:				10:10		13:00		13:20		11:55		11:22	
Notes:				Sediment on dipmeter		Sediment on dipmeter		Sediment on dipmeter				Sediment on dipmeter	

Weather Observations:	Sunny, 15°C
Pressure Trend:	Steady
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client : **GRG** **Our Ref** : **129-003084**
Report Date : **25/07/2024** **Page** : **1 of 3**
Job Details : **Grimsby HTI** **Engineer** : **CF**

Date Monitored:

Parameter	Units	Method	LOD	WS01		WS02		WS04		WS201		WS203	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	1.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methane (LEL)	% v/v	GFM	1	10.6	1.0	-	-	-	-	-	-	-	-
Carbon Dioxide (CO2)	% v/v	GFM	0.1	0.4	0.4	2.1	2.1	0.3	0.3	0.4	0.4	0.4	0.4
Oxygen (O2)	% v/v	GFM	0.1	19.6	19.4	19.6	18.3	19.4	19.2	19.7	19.4	19.7	19.4
Hydrogen Sulfide (H2S)	ppm	GFM	1	<1	<1	<1	<1	-	-	<1	<1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	1.0	1.0	<1	<1	-	-	<1	<1	<1	<1
Flow Rate	l/h	GFM	0.1	-	-	-	-	-	-	-	-	-	-
Tide				Low		Mid H to L		Low		Low		Low	
Atmospheric Pressure	mb	GFM	1.0		1010		1010		1013		1010		1010
TVOC	ppm	PID	0.1	0.026	0.024	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Depth to Groundwater	metres	-	0.1	-		0.05		0.2		-		-	
Depth to Base of Well	metres	-	0.1	-		-		-		-		-	
Time:				14.35		12.35		14.20		14.50		15:00	
Notes:													

Weather Observations:	Sunny, 22°C
Pressure Trend:	Falling
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client : **GRG** **Our Ref** : **129-003084**
Report Date : **25/07/2024** **Page** : **2 of 3**
Job Details : **Grimsby HTI** **Engineer** : **CF**

Date Monitored:

Parameter	Units	Method	LOD	WS204		WS205		WS206		WS207		BH201	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	26.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.5	1.5
Methane (LEL)	% v/v	GFM	1	22.0	<1	<1	<1	<1	<1	<1	<1	34.6	34.6
Carbon Dioxide (CO2)	% v/v	GFM	0.1	6.0	6.0	0.2	0.2	0.3	0.3	0.1	0.1	0.9	0.9
Oxygen (O2)	% v/v	GFM	0.1	18.2	15.2	19.7	19.2	19.4	19.2	19.9	19.9	20.0	16.7
Hydrogen Sulfide (H2S)	ppm	GFM	1	-	-	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	-	-	<1	<1	<1	<1	<1	<1	<1	<1
Flow Rate	l/h	GFM	0.1	-	-	-	-	-	-	-	-	-	-
Tide				Mid H to L		Mid H to L		Mid H to L		Mid H to L		High	
Atmospheric Pressure	mb	GFM	1.0		1010		1010		1010		1010		1010
TVOC	ppm	PID	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.7	1.7
Depth to Groundwater	metres	-	0.1	-		-		-		-		-	
Depth to Base of Well	metres	-	0.1	-		-		-		-		-	
Time:				13.08		13.59		14.06		13.4		10:10	
Notes:													

Weather Observations:	Sunny, 22°C
Pressure Trend:	Falling
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

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LOD limit of detection

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**25/07/2024**	**Page**	:	**2 of 3**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**CF**

Date Monitored:

Parameter	Units	Method	LOD	BH203	
Infra Red Gas Analyser:				Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	1.7	<0.1
Methane (LEL)	% v/v	GFM	1	<1	<1
Carbon Dioxide (CO2)	% v/v	GFM	0.1	0.2	0.2
Oxygen (O2)	% v/v	GFM	0.1	19.7	19.2
Hydrogen Sulfide (H2S)	ppm	GFM	1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	<1	<1
Flow Rate	l/h	GFM	0.1	-	-
Tide				Mid H to L	
Atmospheric Pressure	mb	GFM	1.0		1010
TVOC	ppm	PID	0.1	1.0	1.0
Depth to Groundwater	metres	-	0.1	-	
Depth to Base of Well	metres	-	0.1	-	
Time:				13:50	
Notes:					

Weather Observations:	Sunny, 22°C
Pressure Trend:	Falling
Ground Conditions:	Dry
Remarks:	All groundwater measurements from ground level

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**15 - 16/08/2024**	**Page**	:	**1 of 3**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**CF / BP**

Date Monitored:

Parameter	Units	Method	LOD	WS01		WS02		WS03		WS04		WS201	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	<0.1	<0.1	2.3	<0.1	0.6	<0.1	0.5	<0.1	<0.1	<0.1
Methane (LEL)	% v/v	GFM	1	<1	<1	33.7	<1	15.1	<1	<1	<1	-	-
Carbon Dioxide (CO2)	% v/v	GFM	0.1	2.7	2.5	2.3	2.3	1.8	1.8	1.2	0.8	2.4	2.4
Oxygen (O2)	% v/v	GFM	0.1	20.0	19.6	19.9	19.9	20.2	20.2	22.3	20.9	20.9	17.1
Hydrogen Sulfide (H2S)	ppm	GFM	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Flow Rate	l/h	GFM	0.1	<0.1	<0.1	-	-	-	-	-	-	-	-
Tide				Low		Approaching H		Low		Mid L to H		Mid L to H	
Atmospheric Pressure	mb	GFM	1.0		1015		1010		1015		1015		1015
TVOC	ppm	PID	0.1	1.000	1.000	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Depth to Groundwater	metres	-	0.1	-		1.37		-		-		-	
Depth to Base of Well	metres	-	0.1	3.2		3.42		2.96		3.45		4.47	
Time:				10:55		14:20		10:45		11:05		11:30	
Notes:													

Weather Observations:	Overcast, light rain and wind
Pressure Trend:	Steady
Ground Conditions:	Damp
Remarks:	All groundwater measurements from ground level

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**15 - 16/08/2024**	**Page**	:	**2 of 3**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**CF / BP**

Date Monitored:

Parameter	Units	Method	LOD	WS203		WS204		WS205		WS206		WS207	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	<0.1	<0.1	15.5	13.3	0.8	<0.1	<0.1	<0.1	3.2	<0.1
Methane (LEL)	% v/v	GFM	1	<1	<1	<<<	<<<	33.0	<1	<1	<1	30.8	<1
Carbon Dioxide (CO2)	% v/v	GFM	0.1	4.0	4.0	8.6	7.5	1.5	1.5	2.3	2.3	2.8	2.8
Oxygen (O2)	% v/v	GFM	0.1	20.9	18.3	20.2	10.5	20.0	19.8	20.6	19.7	19.9	19.5
Hydrogen Sulfide (H2S)	ppm	GFM	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Flow Rate	l/h	GFM	0.1	-	-	-	-	-	-	-	-	-	-
Tide				Mid L to H		Mid L to H		Approaching H		High		High	
Atmospheric Pressure	mb	GFM	1.0		1015		1010		1010		1010		1010
TVOC	ppm	PID	0.1	1.000	1.000	-	-	1.5	1.0	1.0	1.0	1.2	1.0
Depth to Groundwater	metres	-	0.1	-		1.67		-		-		-	
Depth to Base of Well	metres	-	0.1	4.52		5.00		4.85		5.23		5.15	
Time:				11:25		13:35		15:10		15:15		15:35	
Notes:													

Weather Observations:	Overcast, light rain and wind
Pressure Trend:	Steady
Ground Conditions:	Damp
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

* Reading did not stabilise
LOD limit of detection

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SUMMARY OF GROUND GAS MONITORING RESULTS

Client	:	**GRG**	**Our Ref**	:	**129-003084**
Report Date	:	**15 - 16/08/2024**	**Page**	:	**3 of 3**
Job Details	:	**Grimsby HTI**	**Engineer**	:	**CF / BP**

Date Monitored:

Parameter	Units	Method	LOD	BH01		BH03		BH05		BH201		BH203	
Infra Red Gas Analyser:				Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady
Methane (CH4)	% v/v	GFM	0.1	4.3	<0.1	87.6	87.6	60.1	60.1	1.8	1.8	7.0	0.4
Methane (LEL)	% v/v	GFM	1	83.2	<1	<<<	<<<	<<<	<<<	41.4	41.4	91.3	18.0
Carbon Dioxide (CO2)	% v/v	GFM	0.1	0.4	0.2	4.1	4.1	7.7	7.6	1.6	1.6	3.9	3.8
Oxygen (O2)	% v/v	GFM	0.1	21.3	21.3	21.0	0.6	26.2	6.5	21.0	15.0	19.9	18.0
Hydrogen Sulfide (H2S)	ppm	GFM	1	<1	<1	<1	<1	10.0	<1	<1	<1	<1	<1
Carbon Monoxide (CO)	ppm	GFM	1	<1	<1	<1	<1	8.0	<1	<1	<1	<1	<1
Flow Rate	l/h	GFM	0.1	-	-	-	-	-	-	-	-	-	-
Tide				Low		Mid L to H		Low		Mid L to H		Mid L to H	
Atmospheric Pressure	mb	GFM	1.0		1015		1010		1015		1010		1010
TVOC	ppm	PID	0.1	4.100	1.000	-	-	<<<	<<<	1.9	1.9	6.0	1.1
Depth to Groundwater	metres	-	0.1	-		-		-		1.25		1.12	
Depth to Base of Well	metres	-	0.1	5.41		4.63		8.47		9.37		7.16	
Time:				11:10		14:55		10:30		12:05		12:40	
Notes:								Monitoring stopped as water in tube					

Weather Observations:	Overcast, light rain and wind
Pressure Trend:	Steady
Ground Conditions:	Damp
Remarks:	All groundwater measurements from ground level

GFM Gas Analyser (Model GFM 436); Serial No. 13729; Last Calibrated 21/08/2023 (Certificate No. 124471).

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Appendix G

Assessment of Soil Quality

ANNEX 4 OF R&D 66 (NHBC) – QUALITATIVE RISK ASSESSMENT

1.0 CLASSIFICATION OF CONSEQUENCE

Classification	Definition	Examples
Severe	Highly elevated concentrations **likely** to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA **Category 1** pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity). Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health **unlikely** to	Exposure could lead to slight short-

Classification	Definition	Examples
	lead to "significant harm". Equivalent to **EA Category 3** pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.	term effects (e.g. mild skin rash). Surface spalling of concrete.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.	The loss of plants in a landscaping scheme. Discoloration of concrete.

* For these purposes, disease is to be taken to mean an unhealthy condition of the body or a part of it and can include, for example, cancer, liver dysfunction or extensive skin ailments. Mental dysfunction is included only insofar as it is attributable to the effects of a pollutant on the body of the person concerned.

2.0 CLASSIFICATION OF PROBABILITY

Category	Definition	Examples
High likelihood	There is a pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	*a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *b) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50 years.*
Likely	There is a pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable,	*a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.*

Category	Definition	Examples
	but possible in the short-term and likely over the long-term.	*b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.*
Low likelihood	There is a pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.* *b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.*
Unlikely	There is a pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.	*a) Elevated concentrations of toxic contaminants are present below hardstanding.* *b) Light industrial unit <10 yrs old containing a doubleskinned UST with annual integrity testing results available.*

Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence.

For example if there is surface contamination and a major aquifer is present at depth, but this major aquifer is overlain by an aquiclude of significant thickness then there is no pollution linkage and the risks to the major aquifer are not assessed. The report should identify both the source and the receptor but state that because there is no linkage there are no potential risks.

3.0 THE CLASSIFICATION OF RISK

Probability (Likelihood)		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
	High likelihood	Very high risk	High risk	Moderate Risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk

	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

4.0 DESCRIPTION OF THE CLASSIFIED RISKS

Very high risk – There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

High risk – Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Low risk – It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

Very low risk – It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that this harm if realised would normally be mild or minor.

No potential risk – There is no potential risk if no pollution linkage has been established.

Definitions	
Hazard	A property or situation which in certain circumstances could lead to harm. [The properties of different hazards must be assessed in relation to their potential to affect the various different receptors].
Risk	A combination of the probability or frequency of the occurrences of a defined hazard AND the magnitude of the consequences of that occurrence.
Probability	The mathematical expression of the chance of a particular event in a given period of time [e.g. probability of 0.2 is equivalent to 20% or a 1 in 5 chance].

Likelihood	Probability; the state or fact of being likely.
Consequences	The adverse effects (or harm) arising from a defined hazard which impairs the quality of the environment or human health in the short or longer term.
Pollution Linkage	An identified pathway is capable of exposing a receptor to a contaminant and that contaminant is capable of harming the receptor.

MEL GUIDELINES FOR THE ASSESSMENT OF SOIL QUALITY

1.0 APPLICATION OF TIER 1 SCREENING VALUES

A number of sets of Tier 1 Screening Values are currently in the public domain and the information below outlines each of these sets and their basis for derivation.

The Contaminated Land Exposure Assessment (CLEA) guidance provides Soil Guideline Values (SGVs), for the assessment of the significance of contamination testing results in soils.

SGVs are intended for use as 'Minimal Risk' levels for human health risk assessment and are based in the regulatory framework for assessment of risk to human health in relation to land use. SGVs have been developed on the basis of many critical assumptions about possible exposure to soil contamination. It is important that an assessor understands these assumptions and limitations before applying SGVs to an area of land.

Their derivation is based on the regulatory framework for assessment of risk to human health in relation to land use. SGVs for selected contaminants (arsenic, mercury, nickel, selenium, phenol, polychlorinated biphenyls (PCBs) and BTEX) were published by the Environment Agency in 2009. Note that due to new research the SGVs and related documents for mercury and nickel have now been withdrawn. There are no plans to publish new SGVs for these two substances as the Environment Agency (EA) no longer undertake this work.

A document published by a joint venture between CL:AIRE (Contaminated Land: Applications in the Real Environment) and the EIC provides additional Generic Assessment Criteria (GACs) for selected contaminants not included within the SGV project. These GACs have been produced based on the same framework and assumptions as the SGVs.

In relation to revised Part 2A Statutory Guidance (April 2012), Category 4 Screening Levels (C4SLs) were produced to aid in providing a simple test for deciding when land is suitable for use and definitely not contaminated land with regard to Part 2A. The derivation of the C4SLs is based on a low level of risk and Low Level of Toxicological Concern (LLTC) instead of Minimal Risk and Health Criteria Values (HCVs) in order to make them more pragmatic than SGVs. In addition, the exposure factors considered in each generic land use have been assessed and changes made to made them more applicable to the way we live today. Currently C4SLs exist for a select number of parameters (arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead).

Subsequent to the C4SLs being published, Suitable 4 Use Levels (S4ULs) were published by Land Quality Management (LQM) to replace their existing GACs. The S4ULs have been developed by a collaborative effort between LQM and members of the UK contaminated land development and are based on updated toxicological information and updated exposure factors. The exposure factors considered are similar to those changed by the C4SL project, although it should be noted that not all changes were incorporated into the S4ULs.

The SGVs, GACs, S4ULs and C4SLs have all been calculated by considering the intended land use, standard soil parameters (pH, organic matter and particle size distribution), and depth from which the soils have been taken, which may not be appropriate for universal application or application to

these specific samples and interpretation is provided as an indicative guide only. Three generic land use scenarios are considered for SGVs, GACs, S4ULs and C4SLs; residential, allotments and commercial. In addition two types of public open space are also considered with regard to the C4SLs and S4ULs.

It should be noted that some of the contaminants included within the S4UL publication duplicate the contaminants where SGVs are available. Although the SGVs were published by the UK Government for use within the contaminated land industry, it may be seen that the SGVs are now out of date as they were published in 2009. The S4ULs are similar to the SGVs in the fact that they have been derived using HCVs but are non statutory due to their origin. However, it is considered that they should be utilised instead of the SGVs as the basis of the S4ULs are more up to date with regard to toxicological information and exposure factors.

It should be noted though that the GACs and S4ULs are non statutory by reason of their origin and should new SGVs be published these values will become redundant.

The GACs and S4ULs have been used as initial screening tools within this report. Where a contaminant has exceeded these values and a C4SL is available, a second assessment will be undertaken based on this value. The exception is for lead where only a C4SL is available and this will be used as the initial screening value.

The screening values for a **Commercial/Industrial** land use have been used where available. Below is a summary of this scenario.

Where SGVs have yet to be issued and GACs, C4SLs and S4ULs are unavailable and until formal guidance has been extended to other potential contaminants and land uses, other sources of guidance have been relied upon.

The information provided within this appendix is a brief summary of the current initial screening tools that are available for use and justification for utilising them. For full details please refer to the full documents referenced below.

Our contamination analytical package is suitable for assessing general contamination on brownfield sites. It was compiled in accordance with a general list of typical parameters.

COMMERCIAL/INDUSTRIAL LAND USE

There are may different kinds of workplace and work related activities. This lanf use assumes that work take place in a permanent single storey building, factory or warehouse where employees spend most of the time indoors involved in office based or relatively light physical work. This land use is not designated to consider those sites involving 100% hard cover (such as car parks) where the risk to the site user are from ingestion or skin contact because of the implausibility of such exposures arising while the constructed surface remains intact.

The S4ULs and C4SLs for a commercial (industrial) end use have been used as a n assessment tool within this report since this is appropriate *considering the development proposals for the site*.

2.0 PATHWAYS

Pathways used in the CLEA model include ingestion of dust, uptake by inhalation inside and outside a house (not considered for POS_{park}), direct contact with the skin, and for example the significance of consuming vegetables grown within the soils of interest (only considered in the residential scenario). Each of these pathways of exposure is considered and the significance of each weighted based upon the parameter of interest.

3.0 REFERENCES

Statutory Guidance

Final SC050021/SR3 Updated Technical Background to the CLEA Model

Final SC050021/SR2 Human Health Toxicological Assessment of Contaminants in Soil

Final SC050021/SR4 CLEA Software (Version 1.05) Handbook

Final SC050021/SR7 Compilation of Data for Priority Organic Pollutants for the Derivation of Soil Guideline Values

Soil Guideline Values (SGVs)

SC050021/ SGV Introduction

SC050021/ Inorganic Arsenic SGV

SC050021/ Mercury SGV *(withdrawn)*

SC050021/ Selenium SGV

SCO50021/ Nickel SGV *(withdrawn)*

SC050021/ Benzene SGV

SC050021/ Toluene SGV

SC050021/ Ethylbenzene SGV

SC050021/ Xylene SGV

SC050021/ Phenol SGV

SC050021/Cadmium SGV

SC050021/ Dioxins SGV

SC050021/TOX1 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Inorganic Arsenic

SC050021/TOX3 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Cadmium

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Mercury *(withdrawn)*

SC050021/TOX8 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Nickel *(withdrawn)*

SC050021/TOX9 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Phenol

SC050021/TOX12 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Dioxins, Furans and Dioxin-like PCBs

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Selenium

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Benzene

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Toluene

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Ethylbenzene

SC050021 Contaminants in Soil: Updated collation of toxicological data and intake values for humans. Xylene

SC050021 Supplementary information for the derivation of SGVs for Arsenic

SC050021 Supplementary information for the derivation of SGVs for Mercury *(withdrawn)*

SC050021 Supplementary information for the derivation of SGVs for Nickel *(withdrawn)*

SC050021 Supplementary information for the derivation of SGVs for Selenium

SC050021 Supplementary information for the derivation of SGVs for Benzene

SC050021 Supplementary information for the derivation of SGVs for Toluene

SC050021 Supplementary information for the derivation of SGVs for Ethylbenzene

SC050021 Supplementary information for the derivation of SGVs for Xylene

SC050021 Supplementary information for the derivation of SGVs for Cadmium

SC050021 Supplementary information for the derivation of SGVs for Phenol

SC050021 Supplementary information for the derivation of SGVs for Dioxins, Furans and Dioxin-like PCBs

Generic Assessment Criteria (GACs)

CLAIRE (2010). 'Soil Generic Assessment Criteria for Human Health Risk Assessment'. Contaminated Land: Applications in Real Environments (CLAIRE). January 2010.

Category 4 Screening Levels (C4SLs)

CL:AIRE. SP1010 Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination. Final Project Report. December 2013.

Appendix A Sensitivity Analysis Parameters

Appendix B Probability Modelling

Appendix C Arsenic

Appendix D Benzene

Appendix E Benzo(a)pyrene

Appendix F Cadmium

Appendix G Chromium VI

Appendix H Lead

Appendix I Statistics Review

DEFRA. SP1010 Development of Category 4 Screening Levels (C4SLs) for Assessment of Land Affected by Contamination – Policy Companion Document. March 2014

Suitable 4 Use Levels (S4ULs)

Land Quality Management (LQM). Nathanail, C.P, McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press. 2015.

ORGANIC PARAMETERS

All information below is to be read in conjunction with Mayer Environmental Ltd guidance document on the use of assessment criteria and their limitations.

All values cited here assume a sandy loam soil as defined in SR3.

All criteria values given below assume that no free phase contamination is present.

It should be noted that the parameters listed below are not an exhaustive list – additional parameters have been included within the LQM S4ULs and CL:AIRE GACs. However, the parameters listed below are considered to be the most commonly encountered.

Key:
[a] S4ULs presented exceed the vapour saturation limit, which is presented in brackets
[b] S4ULs presented exceed the solubility saturation limit, which is presented in brackets
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BTEX & MTBE

Benzene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	0.33	0.087	0.17	0.37	0.87	-
Residential without home-grown produce	-	0.38	0.70	1.4	3.3	-
Allotment	0.07	0.017	0.034	0.075	0.18	-
Commercial	95	27	47	90	98	-
POS_{Resi}	-	72	72	73	140	-
POS_{Park}	-	90	100	110	230	-

Toluene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	610	130	290	660	-	-
Residential without home-grown produce	-	880[a] (869)	1,900	3,900	-	-
Allotment	120	22	51	120	-	-
Commercial	4,400	56,000[a] (869)	110,000[a] (1,920)	180,000[a] (4,360)	-	-
POS $_{Resi}$	-	56,000	56,000	56,000	-	-
POS $_{Park}$	-	87,000[a] (869)	95,000[a] (1,920)	100,000[a] (4,360)	-	-

Ethylbenzene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	350	47	110	260	-	-
Residential without home-grown produce	-	83	190	440	-	-
Allotment	90	16	39	91	-	-
Commercial	2,800	5,700 (518)	13,000 (1,220)	27,000 (2,840)	-	-
POS $_{Resi}$	-	24,000	24,000	25,000	-	-
POS $_{Park}$	-	17,000 (518)	22,000 (1,220)	27,000 (2,840)	-	-

Xylene

If the source is suspected to be a fresh spill then the total xylene concentration can be compared to the m-xylene value. If composition of the source is unknown or weathered the most conservative value should be used.

o-Xylene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	250	60	140	330	-	-
Residential without home-grown produce	-	88	210	480	-	-
Allotment	160	28	67	160	-	-
Commercial	2,600	6,600[b] (478)	15,000[b] (1,120)	33,000[b] (2,620)	-	-
POS $_{Resi}$	-	41,000	42,000	43,000	-	-
POS $_{Park}$	-	17,000[b] (478)	24,000[b] (1,120)	33,000[b] (2,620)	-	-

m-Xylene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	240	59	140	320	-	-
Residential without home-grown produce	-	82	190	450	-	-
Allotment	180	31	74	170	-	-
Commercial	3,500	6,200a (625)	14,000[a] (1,470)	31,000[b] (3,460)	-	-
POS $_{Resi}$	-	41,000	42,000	43,000	-	-
POS $_{Park}$	-	17,000[a] (625)	24,000[a] (1,470)	32,000[b] (3,460)	-	-

p-Xylene

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	
Residential with home-grown produce	230	56	130	310	-	-
Residential without home-grown produce	-	79	180	430	-	-
Allotment	160	29	69	160	-	-
Commercial	3,200	5,900[b] (576)	14,000[b] (1,350)	30,000[b] (3,170)	-	-
POS $_{Resi}$	-	41,000	42,000	43,000	-	-
POS $_{Park}$	-	17,000[b] (576)	23,000[b] (1,350)	31,000[b] (3,170)	-	-

Methyl tert-butyl ether (MTBE)

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)		
	6.0% SOM	-	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM
Residential with home-grown produce	-		-	49	84	160
Residential without home-grown produce	-		-	73	120	220
Allotment	-		-	23	44	90
Commercial	-		-	7,900	13,000	24,000
POS $_{Resi}$	-		-	-	-	-
POS $_{Park}$	-		-	-	-	-

PETROLEUM HYDROCARBONS

Residential With Home Grown Produce Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	42	78	160	-	-
Aliphatic EC>6-8	-	100	230	530	-	-
Aliphatic EC >8-10	-	27	65	150	-	-
Aliphatic EC >10-12	-	130[a] (48)	330[b] (118)	760[a] (283)	-	-
Aliphatic EC >12-16	-	1,100[b] (24)	2,400[b] (59)	4,300[b] (142)	-	-
Aliphatic EC >16-35	-	65,000[b] (8.48)	92,000[b] (21)	110,000	-	-
Aliphatic EC >35-44	-	65,000[b] (8.48)	92,000[b] (21)	110,000	-	-
Aromatic EC 5-7 (benzene)	-	70	140	300	-	-
Aromatic EC>7-8 (toluene)	-	130	290	660	-	-
Aromatic EC>8-10	-	34	83	190	-	-
Aromatic EC >10-12	-	74	180	380	-	-
Aromatic EC >12-16	-	140	330	660	-	-
Aromatic EC >16-21	-	260	540	930	-	-
Aromatic EC >21-35	-	1,100	1,500	1,700	-	-
Aromatic >35-44	-	1,100	1,500	1,700	-	-
Aliphatic + Aromatic EC >44-70	-	1,600	1,800	1,900	-	-

Residential Without Home Grown Produce Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	42	78	160	-	-
Aliphatic EC>6-8	-	100	230	530	-	-
Aliphatic EC >8-10	-	27	65	150	-	-
Aliphatic EC >10-12	-	130[a] (48)	330[b] (118)	770[a] (283)	-	-
Aliphatic EC >12-16	-	1,100[b] (24)	2,400[b] (59)	4,400[b] (142)	-	-
Aliphatic EC >16-35	-	65,000[b] (8.48)	92,000[b] (21)	110,000	-	-
Aliphatic EC >35-44	-	65,000[b] (8.48)	92,000[b] (21)	110,000	-	-
Aromatic EC 5-7 (benzene)	-	370	690	1,400	-	-
Aromatic EC>7-8 (toluene)	-	860	1,800	3,900	-	-
Aromatic EC>8-10	-	47	110	270	-	-
Aromatic EC >10-12	-	250	590	1,200	-	-
Aromatic EC >12-16	-	1,800	2,300[b] (419)	2,500	-	-
Aromatic EC >16-21	-	1,900	1,900	1,900	-	-
Aromatic EC >21-35	-	1,900	1,900	1,900	-	-
Aromatic >35-44	-	1,900	1,900	1,900	-	-
Aliphatic + Aromatic EC >44-70	-	1,900	1,900	1,900	-	-

Allotment Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	730	1,700	3,900	-	-
Aliphatic EC>6-8	-	2,300	5,600	13,000	-	-
Aliphatic EC >8-10	-	320	770	1,700	-	-
Aliphatic EC >10-12	-	2,200	4,400	7,300	-	-
Aliphatic EC >12-16	-	11,000	13,000	13,000	-	-
Aliphatic EC >16-35	-	260,000	270,000	270,000	-	-
Aliphatic EC >35-44	-	260,000	270,000	270,000	-	-
Aromatic EC 5-7 (benzene)	-	13	27	57	-	-
Aromatic EC>7-8 (toluene)	-	22	51	120	-	-
Aromatic EC>8-10	-	8.6	21	51	-	-
Aromatic EC >10-12	-	13	31	74	-	-
Aromatic EC >12-16	-	23	57	130	-	-
Aromatic EC >16-21	-	46	110	260	-	-
Aromatic EC >21-35	-	370	820	1,600	-	-
Aromatic >35-44	-	370	820	1,600	-	-
Aliphatic + Aromatic EC >44-70	-	1,200	2,100	3,000	-	-

Commercial Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	3,200[b] (304)	5,900[b] (558)	12,000[b] (1,150)	-	-
Aliphatic EC>6-8	-	7,800[b] (144)	17,000[b] (322)	40,000[b] (736)	-	-
Aliphatic EC >8-10	-	2,000[b] (78)	4,800[a] (190)	11,000[a] (451)	-	-
Aliphatic EC >10-12	-	9,700[b] (48)	23,000[a] (118)	47,000[a] (283)	-	-
Aliphatic EC >12-16	-	59,000[b] (24)	82,000[b] (59)	90,000[b] (142)	-	-
Aliphatic EC >16-35	-	1,600,000	1,700,000	1,800,000	-	-
Aliphatic EC >35-44	-	1,600,000	1,700,000	1,800,000	-	-
Aromatic EC 5-7 (benzene)	-	26,000[b] (1,220)	46,000[b] (2,260)	86,000[b] (4,710)	-	-
Aromatic EC>7-8 (toluene)	-	56,000[a] (869)	110,000[b] (1,920)	180,000[a] (4,360)	-	-
Aromatic EC>8-10	-	3,500[a] (613)	8,100[a] (1,500)	17,000[a] (3,580)	-	-
Aromatic EC >10-12	-	16,000[b] (364)	28,000[b] (899)	34,000[b] (2,150)	-	-
Aromatic EC >12-16	-	36,000[b] (169)	37,000	38,000	-	-
Aromatic EC >16-21	-	28,000	28,000	28,000	-	-
Aromatic EC >21-35	-	28,000	28,000	28,000	-	-
Aromatic >35-44	-	28,000	28,000	28,000	-	-
Aliphatic + Aromatic EC >44-70	-	28,000	28,000	28,000	-	-

Public Open Space – Residential (POS_{resi}) Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	570,000[b] (304)	590,000	600,000	-	-
Aliphatic EC>6-8	-	600,000	610,000	620,000	-	-
Aliphatic EC >8-10	-	13,000	13,000	13,000	-	-
Aliphatic EC >10-12	-	13,000	13,000	13,000	-	-
Aliphatic EC >12-16	-	13,000	13,000	13,000	-	-
Aliphatic EC >16-35	-	250,000	250,000	250,000	-	-
Aliphatic EC >35-44	-	250,000	250,000	250,000	-	-
Aromatic EC 5-7 (benzene)	-	56,000	56,000	56,000	-	-
Aromatic EC>7-8 (toluene)	-	56,000	56,000	56,000	-	-
Aromatic EC>8-10	-	5,000	5,000	5,000	-	-
Aromatic EC >10-12	-	5,000	5,000	5,000	-	-
Aromatic EC >12-16	-	5,100	5,100	5,000	-	-
Aromatic EC >16-21	-	3,800	3,800	3,800	-	-
Aromatic EC >21-35	-	3,800	3,800	3,800	-	-
Aromatic >35-44	-	3,800	3,800	3,800	-	-
Aliphatic + Aromatic EC >44-70	-	3,800	3,800	3,800	-	-

Public Open Space – Public Park (POS_{park}) Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Aliphatic EC 5-6	-	95,000[b] (304)	130,000[b] (558)	180,000[b] (1,150)	-	-
Aliphatic EC>6-8	-	150,000[b] (144)	220,000[b] (322)	320,000[b] (736)	-	-
Aliphatic EC >8-10	-	14,000[b] (78)	18,000[a] (190)	21,000[a] (451)	-	-
Aliphatic EC >10-12	-	21,000[b] (48)	23,000[a] (118)	24,000[a] (283)	-	-
Aliphatic EC >12-16	-	25,000[b] (24)	25,000[b] (59)	26,000[b] (142)	-	-
Aliphatic EC >16-35	-	450,000	480,000	490,000	-	-
Aliphatic EC >35-44	-	450,000	480,000	490,000	-	-
Aromatic EC 5-7 (benzene)	-	76,000[b] (1,220)	84,000[b] (2,260)	92,000[b] (4,710)	-	-
Aromatic EC>7-8 (toluene)	-	87,000[a] (869)	95,000[b] (1,920)	100,000[a] (4,360)	-	-
Aromatic EC>8-10	-	7,200[a] (613)	8,500[a] (1,500)	9,300[a] (3,580)	-	-
Aromatic EC >10-12	-	9,200[b] (364)	9,700[b] (899)	10,000	-	-
Aromatic EC >12-16	-	10,000	10,000	10,000	-	-
Aromatic EC >16-21	-	7,800	7,700	7,800	-	-
Aromatic EC >21-35	-	7,800	7,800	7,900	-	-
Aromatic >35-44	-	7,800	7,800	7,900	-	-
Aliphatic + Aromatic EC >44-70	-	7,800	7,800	7,900	-	-

POLYCYCLIC AROMATIC HYDROCARBONS

There are two principle approaches considered suitable for the risk assessment of PAHs; a suitable surrogate marker (usually benzo(a)pyrene (BaP)) or the use of relative potency factors (RPFs). In this case S4ULs have been produced for both approaches. The surrogate marker approach involves using BaP as a marker compound as long as the PAH profile being assessed is within an order of magnitude for the coal tar mixture studied by Culp et al. (see S4UL document for full details).

RPFs are used in assessing risks from complex mixtures of PAHs. In some cases it is assumed that all of the carcinogenic PAH compounds are as potent as BaP. However, this is a highly conservative approach and approaches based on relative potency have been developed to assess risks from mixtures of PAH congeners. BaP is the most thoroughly studied of the congeners and so is usually used as a benchmark for estimating the relative carcinogenic potency of other PAH congeners.

Residential With Home Grown Produce Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Acenaphthene	-	210	510	1,100	-	-
Acenaphthylene	-	170	420	920	-	-
Anthracene	-	2,400	5,400	11,000	-	-
Benzo(a)anthracene	-	7.2	11	13	-	-
Benzo(a)pyrene (only)	-	2.2	2.7	3.0	5	-
Benzo(b)fluoranthene	-	2.6	3.3	3.7	-	-
Benzo(ghi)perylene	-	320	340	350	-	-
Benzo(k)fluoranthene	-	77	93	100	-	-
Chrysene	-	15	22	27	-	-
Dibenz(ah)anthracene	-	0.24	0.28	0.3	-	-
Fluoranthene	-	280	560	890	-	-
Fluorene	-	170	400	860	-	-
Indeno(123-cd)pyrene	-	27	36	41	-	-
Naphthalene	-	2.3	5.6	13	-	-
Phenanthrene	-	95	2220	440	-	-
Pyrene	-	620	1,200	2,000	-	-
Coal Tar (BaP as surrogate marker)	-	0.79	0.98	1.1	-	-

Residential Without Home Grown Produce Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Acenaphthene	-	3,000[b] (57)	4,700[b] (141)	6,000[b] (336)	-	-
Acenaphthylene	-	2,900[b] (86.1)	4,600[b] (212)	6,000[b] (506)	-	-
Anthracene	-	31,000[a] (1.17)	35,000	37,000	-	-
Benzo(a)anthracene	-	11	14	15	-	-
Benzo(a)pyrene (only)	-	3.2	3.2	3.2	5.3	-
Benzo(b)fluoranthene	-	3.9	4.0	4.0	-	-
Benzo(ghi)perylene	-	360	360	360	-	-
Benzo(k)fluoranthene	-	110	110	110	-	-
Chrysene	-	30	31	32	-	-
Dibenz(ah)anthracene	-	0.31	0.32	0.32	-	-
Fluoranthene	-	1,500	1,600	1,600	-	-
Fluorene	-	2,800[b] (30.9)	3,800[b] (76.5)	4,500[b] (1835)	-	-
Indeno(123-cd)pyrene	-	45	46	46	-	-
Naphthalene	-	2.3	5.6	13	-	-
Phenanthrene	-	1,300[b] (36)	1,500	1,500	-	-
Pyrene	-	3,700	3,800	3,800	-	-
Coal Tar (BaP as surrogate marker)	-	1.2	1.2	1.2	-	-

Allotment Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6.0% SOM	1.0% SOM	2.5% SOM	6.0% SOM	6.0% SOM	1.0% SOM
Acenaphthene	-	34	85	200	-	-
Acenaphthylene	-	28	69	160	-	-
Anthracene	-	380	950	2,200	-	-
Benzo(a)anthracene	-	2.9	6.5	13	-	-
Benzo(a)pyrene (only)	-	0.97	2.0	3.5	5.7	-
Benzo(b)fluoranthene	-	0.99	2.1	3.9	-	-
Benzo(ghi)perylene	-	290	470	640	-	-
Benzo(k)fluoranthene	-	37	75	130	-	-
Chrysene	-	4.1	9.4	19	-	-
Dibenz(ah)anthracene	-	0.14	0.27	0.43	-	-
Fluoranthene	-	52	130	290	-	-
Fluorene	-	27	67	160	-	-
Indeno(123-cd)pyrene	-	9.5	21	39	-	-
Naphthalene	-	4.1	10	24	-	-
Phenanthrene	-	15	38	90	-	-
Pyrene	-	110	270	620	-	-
Coal Tar (BaP as surrogate marker)	-	0.32	0.67	1.2	-	-

Commercial Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM
Acenaphthene	-	84,000[b] (57)	97,000[b] (141)	100,000	-	-
Acenaphthylene	-	83,900[b] (86.1)	97,000[b] (212)	100,000	-	-
Anthracene	-	520,000	540,000	540,000	-	-
Benzo(a)anthracene	-	170	170	180	-	-
Benzo(a)pyrene (only)	-	35	35	36	77	-
Benzo(b)fluoranthene	-	44	44	45	-	-
Benzo(ghi)perylene	-	3,900	4,000	4,000	-	-
Benzo(k)fluoranthene	-	1,200	1,200	1,200	-	-
Chrysene	-	350	350	350	-	-
Dibenz(ah)anthracene	-	3.5	3.6	3.6	-	-
Fluoranthene	-	23,000	23,000	23,000	-	-
Fluorene	-	63,000[b] (30.9)	68,000	71,000	-	-
Indeno(123-cd)pyrene	-	22,000	510	510	-	-
Naphthalene	-	190[b] (76.4)	460[b] (183)	1,100[b] (432)	-	-
Phenanthrene	-	22,000	22,000	23,000	-	-
Pyrene	-	54,000	54,000	54,000	-	-
Coal Tar (BaP as surrogate marker)	-	15	15	15	-	-

Public Open Space – Residential (POS_{resi}) Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM
Acenaphthene	-	15,000	15,000	15,000	-	-
Acenaphthylene	-	15,000	15,000	15,000	-	-
Anthracene	-	74,000	74,000	74,000	-	-
Benzo(a)anthracene	-	29	29	29	-	-
Benzo(a)pyrene (only)	-	5.7	5.7	5.7	21	-
Benzo(b)fluoranthene	-	7.1	7.2	7.2	-	-
Benzo(ghi)perylene	-	640	640	640	-	-
Benzo(k)fluoranthene	-	190	190	190	-	-
Chrysene	-	57	57	57	-	-
Dibenz(ah)anthracene	-	0.57	0.57	0.58	-	-
Fluoranthene	-	3,100	3,100	3,100	-	-
Fluorene	-	9,900	9,900	9,900	-	-
Indeno(123-cd)pyrene	-	82	82	82	-	-
Naphthalene	-	4,900	4,900	4,900	-	-
Phenanthrene	-	3,100	3,100	3,100	-	-
Pyrene	-	7,400	7,400	7,400	-	-
Coal Tar (BaP as surrogate marker)	-	2.2	2.2	2.2	-	-

Public Open Space – Public Park (POS_{park}) Scenario

Fraction	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM
Acenaphthene	-	29,000	30,000	30,000	-	-
Acenaphthylene	-	29,000	30,000	30,000	-	-
Anthracene	-	150,000	150,000	150,000	-	-
Benzo(a)anthracene	-	49	56	62	-	-
Benzo(a)pyrene (only)	-	11	12	13	10	-
Benzo(b)fluoranthene	-	13	15	16	-	-
Benzo(ghi)perylene	-	1,400	1,500	1,600	-	-
Benzo(k)fluoranthene	-	370	410	440	-	-
Chrysene	-	93	110	120	-	-
Dibenz(ah)anthracene	-	1.1	1.3	1.4	-	-
Fluoranthene	-	6,300	6,300	6,400	-	-
Fluorene	-	20,000	20,000	20,000	-	-
Indeno(123-cd)pyrene	-	150	170	180	-	-
Naphthalene	-	120[b] (76.4)	1,900[b] (183)	3,000	-	-
Phenanthrene	-	6,200	6,200	6,300	-	-
Pyrene	-	15,000	15,000	15,000	-	-
Coal Tar (BaP as surrogate marker)	-	4.4	4.7	4.8	-	-

CHLORINATED SOLVENTS

Residential With Home Grown Produce Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	0.016	0.034	0.075	-	-	-	-
Tetrachloroethene (PCE)	-	0.18	0.39	0.9	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	0.11	0.19	0.37
Trans-1,2 Dichloroethene	-	-	-	-	-	0.19	0.34	0.7
Vinyl Chloride (aka chloroethene)	-	0.00064	0.00087	0.0014	-	-	-	-

Residential Without Home Grown Produce Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	0.017	0.036	0.08	-	-	-	-
Tetrachloroethene (PCE)	-	0.18	0.4	0.92	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	0.12	0.2	0.39
Trans-1,2 Dichloroethene	-	-	-	-	-	0.19	0.35	0.71
Vinyl Chloride (aka chloroethene)	-	0.00077	0.001	0.0015	-	-	-	-

Allotment Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	0.041	0.091	0.21	-	-	-	-
Tetrachloroethene (PCE)	-	0.65	1.5	3.6	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	0.26	0.5	1.0
Trans-1,2 Dichloroethene	-	-	-	-	-	0.93	1.9	4
Vinyl Chloride (aka chloroethene)	-	0.00055	0.001	0.0018	-	-	-	-

Commercial Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	1.2	2.6	5.7	-	-	-	-
Tetrachloroethene (PCE)	-	19	42	95	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	14	24	47
Trans-1,2 Dichloroethene	-	-	-	-	-	22	40	81
Vinyl Chloride (aka chloroethene)	-	0.059	0.077	0.12	-	-	-	-

Public Open Space – Residential (POS_{resi}) Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	120	120	120	-	-	-	-
Tetrachloroethene (PCE)	-	1,400	1,400	1,400	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	-	-	-
Trans-1,2 Dichloroethene	-	-	-	-	-	-	-	-
Vinyl Chloride (aka chloroethene)	-	3.5	3.5	3.5	-	-	-	-

Public Open Space – Park (POS_{park}) Scenario

Chlorinated Solvent	SGV (mg/kg)	S4UL^ (mg/kg)			C4SL (mg/kg)	GAC* (mg/kg)		
	6% SOM	1% SOM	2.5% SOM	6% SOM	6% SOM	1% SOM	2.5% SOM	6% SOM
Trichloroethene (TCE)	-	70	91	120	-	-	-	-
Tetrachloroethene (PCE)	-	810[b] (424)	1,100[b] (951)	1,500	-	-	-	-
Cis-1,2 Dichloroethene	-	-	-	-	-	-	-	-
Trans-1,2 Dichloroethene	-	-	-	-	-	-	-	-
Vinyl Chloride (aka chloroethene)	-	4.8	5	5.4	-	-	-	-

INORGANIC PARAMETERS

All information below is to be read in conjunction with Mayer Environmental Ltd guidance document on the use of assessment criteria and their limitations.

All values cited here assume a sandy loam soil as defined in SR3.

It should be noted that the parameters listed below are not an exhaustive list – additional parameters have been included within the LQM S4ULs and CL:AIRE GACs. However, the parameters listed below are considered to be the most commonly encountered.

Key:
*CL:AIRE/EIC Publication
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Inorganic Arsenic

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	32	37	37	-
Residential without home-grown produce	-	40	40	-
Allotment	43	43	49	-
Commercial	640	640	640	-
POS $_{Resi}$	-	79	79	-
POS $_{Park}$	-	170	170	-

Boron

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	290	-	-
Residential without home-grown produce	-	11,000	-	-
Allotment	-	45	-	-
Commercial	-	240,000	-	-
POS $_{Resi}$	-	21,000	-	-
POS $_{Park}$	-	46,000	-	-

Cadmium

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	10	11	22	-
Residential without home-grown produce	-	85	150	-
Allotment	1.8	1.9	3.9	-
Commercial	230	190	410	-
POS $_{Resi}$	-	120	220	-
POS $_{Park}$	-	560	880	-

Chromium III

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	910	-	-
Residential without home-grown produce	-	910	-	-
Allotment	-	18,000	-	-
Commercial	-	8,600	-	-
POS $_{Resi}$	-	1,500	-	-
POS $_{Park}$	-	33,000	-	-

Hexavalent Chromium (Chromium VI)

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	6	21	-
Residential without home-grown produce	-	6	21	-
Allotment	-	1.8	170	-
Commercial	-	33	49	-
POS $_{Resi}$	-	7.7	21	-
POS $_{Park}$	-	220	250	-

Copper

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	2,400	-	-
Residential without home-grown produce	-	7,100	-	-
Allotment	-	520	-	-
Commercial	-	68,000	-	-
POS $_{Resi}$	-	12,000	-	-
POS $_{Park}$	-	44,000	-	-

Lead

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	-	200	-
Residential without home-grown produce	-	-	310	-
Allotment	-	-	80	-
Commercial	-	-	2,330	-
POS $_{Resi}$	-	-	630	-
POS $_{Park}$	-	-	1,300	-

Mercury

The criteria values for inorganic mercury can normally be compared to total mercury as the equilibrium concentration of elemental and methyl mercury is likely to be low. However, consideration should be given to determine if elemental or methyl mercury are likely to be present.

Inorganic Mercury

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	40	-	-
Residential without home-grown produce	-	56	-	-
Allotment	-	19	-	-
Commercial	-	1,100	-	-
POS $_{Resi}$	-	120	-	-
POS $_{Park}$	-	240	-	-

Elemental Mercury

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	1.2	-	-
Residential without home-grown produce	-	1.2	-	-
Allotment	-	21	-	-
Commercial	-	58 (25.8)	-	-
POS $_{Resi}$	-	16	-	-
POS $_{Park}$	-	30 (25.8)	-	-

The S4ULs provided for commercial and POS resi exceed the vapour saturation limit which is shown in brackets.

Methyl Mercury

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	11	-	-
Residential without home-grown produce	-	15	-	-
Allotment	-	6	-	-
Commercial	-	320	-	-
POS $_{Resi}$	-	40	-	-
POS $_{Park}$	-	68	-	-

Nickel

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	130	-	-
Residential without home-grown produce	-	180	-	-
Allotment	-	53	-	-
Commercial	-	980	-	-
POS $_{Resi}$	-	230	-	-
POS $_{Park}$	-	800	-	-

Selenium

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	350	250	-	-
Residential without home-grown produce	-	430	-	-
Allotment	120	88	-	-
Commercial	13,000	12,000	-	-
POS_{Resi}	-	1,100	-	-
POS_{Park}	-	1,800	-	-

Zinc

Generic Scenario	SGV (mg/kg)	S4UL^ (mg/kg)	C4SL (mg/kg)	GAC* (mg/kg)
Residential with home-grown produce	-	3,700	-	-
Residential without home-grown produce	-	40,000	-	-
Allotment	-	620	-	-
Commercial	-	730,000	-	-
POS_{Resi}	-	81,000	-	-
POS_{Park}	-	170,000	-	-

Appendix H

Photographs



Photograph 1: Lagoon in BNG mitigation area adjacent to Lenzing Factory



Photograph 2: Sampling from Pipe Ditch that runs between Plot C &Plot I



Photograph 3: Oldfleet Drain Upstream



Photograph 4: Oldfleet Drain - Downstream

Appendix I

Laboratory Certificates – Geotechnical Data

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

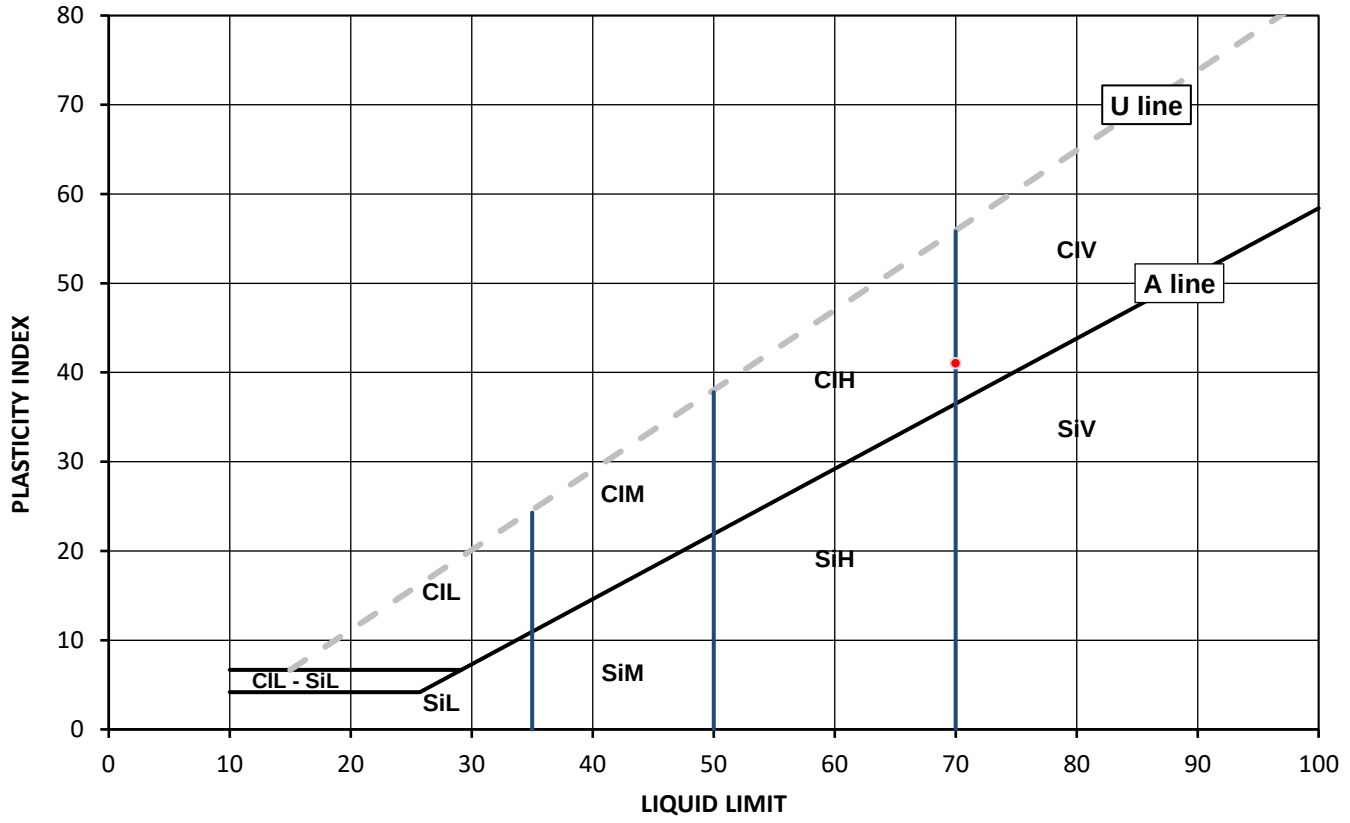
Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251524	Depth Top [m]:	1.00
Hole No.:	TP204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
35.6	70	29	41	0.17	0.83	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 337.13

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

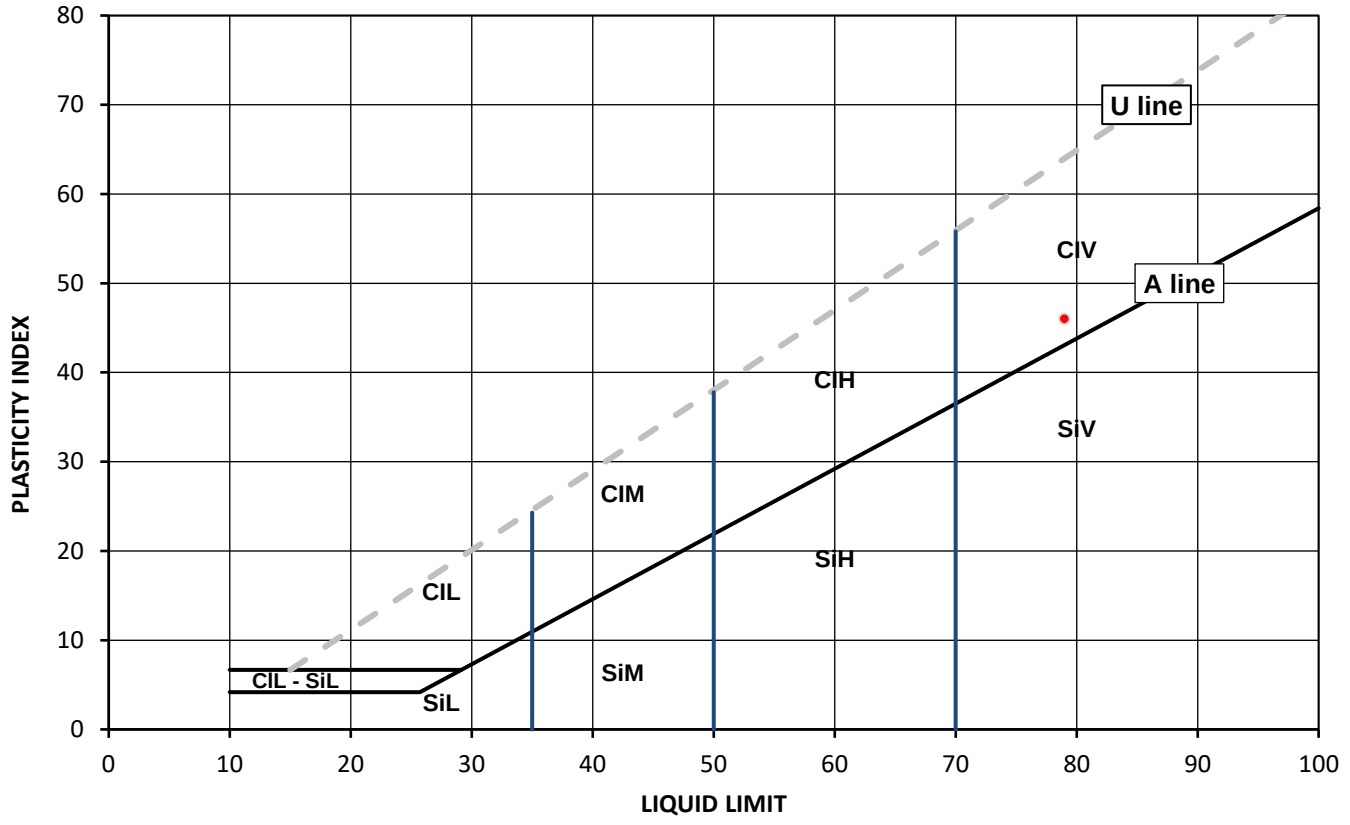
Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251525	Depth Top [m]:	4.00
Hole No.:	TP204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Greyish brown CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
69.6	79	33	46	0.80	0.20	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 337.13

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
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4041

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

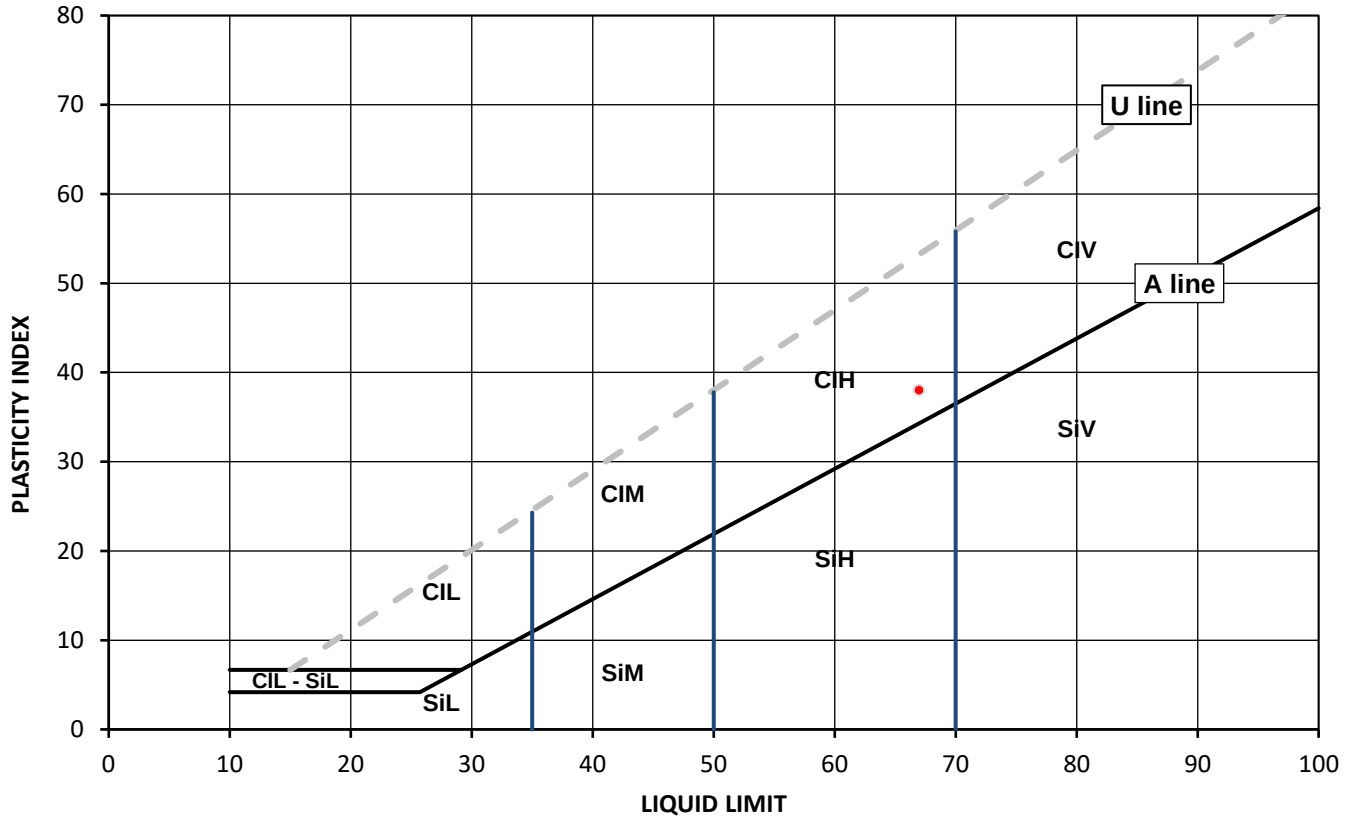
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251526	Depth Top [m]:	0.60
Hole No.:	BH201	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >0.425mm; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
32.5	67	29	38	0.11	0.89	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 337.13

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

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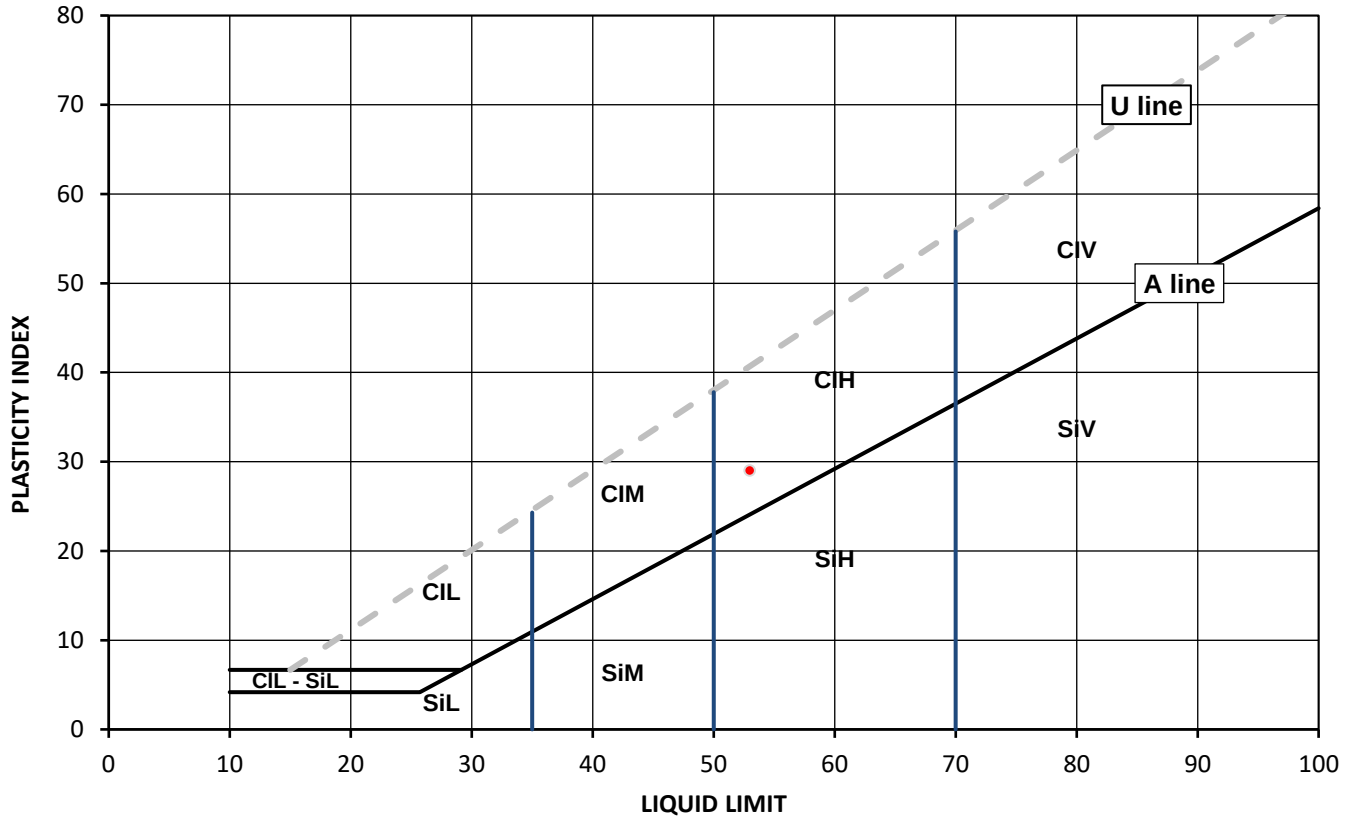
Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251527	Depth Top [m]:	3.00
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brownish grey slighty sandy CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
44.7	53	24	29	0.72	0.28	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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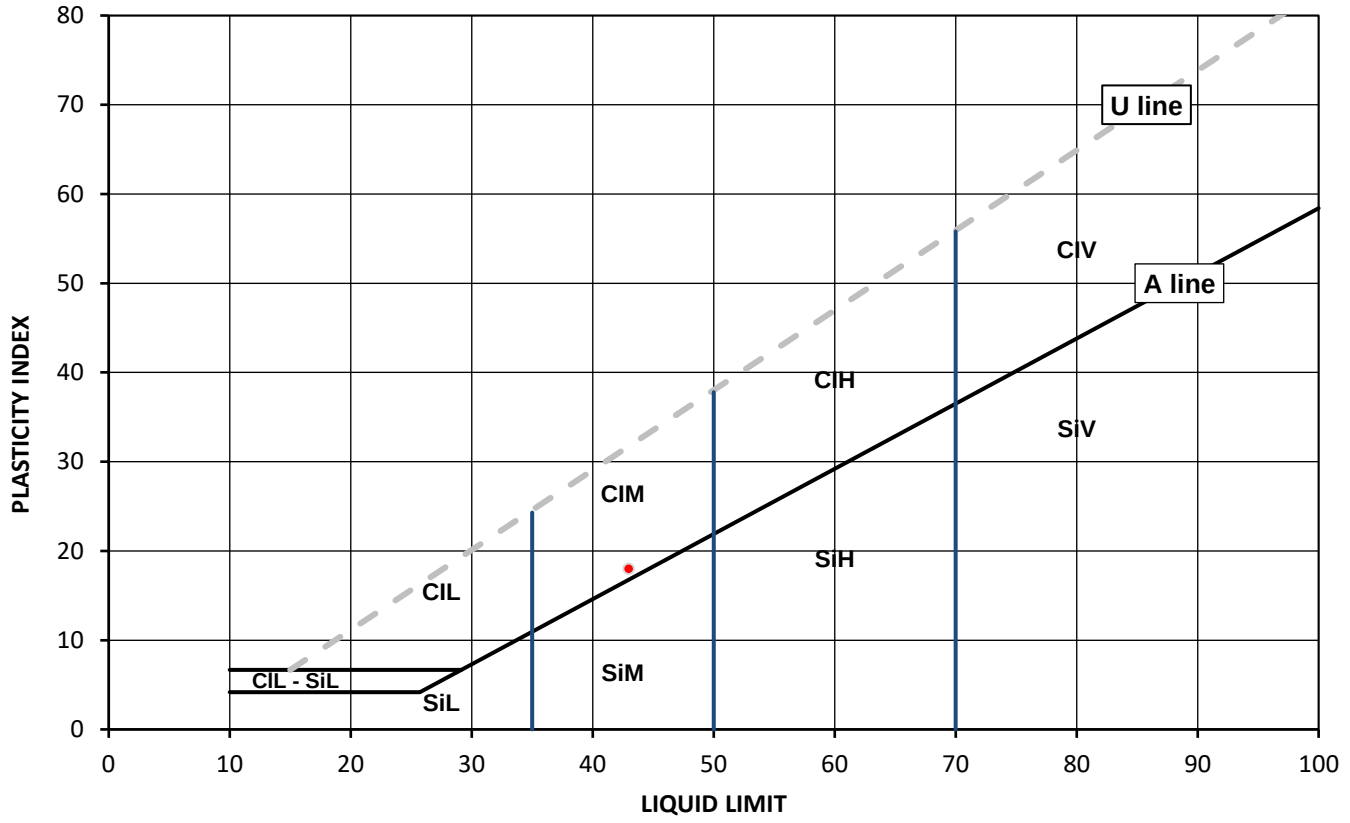
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Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251528	Depth Top [m]:	6.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Dark greyish brown sandy silty CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
40.5	43	25	18	0.89	0.11	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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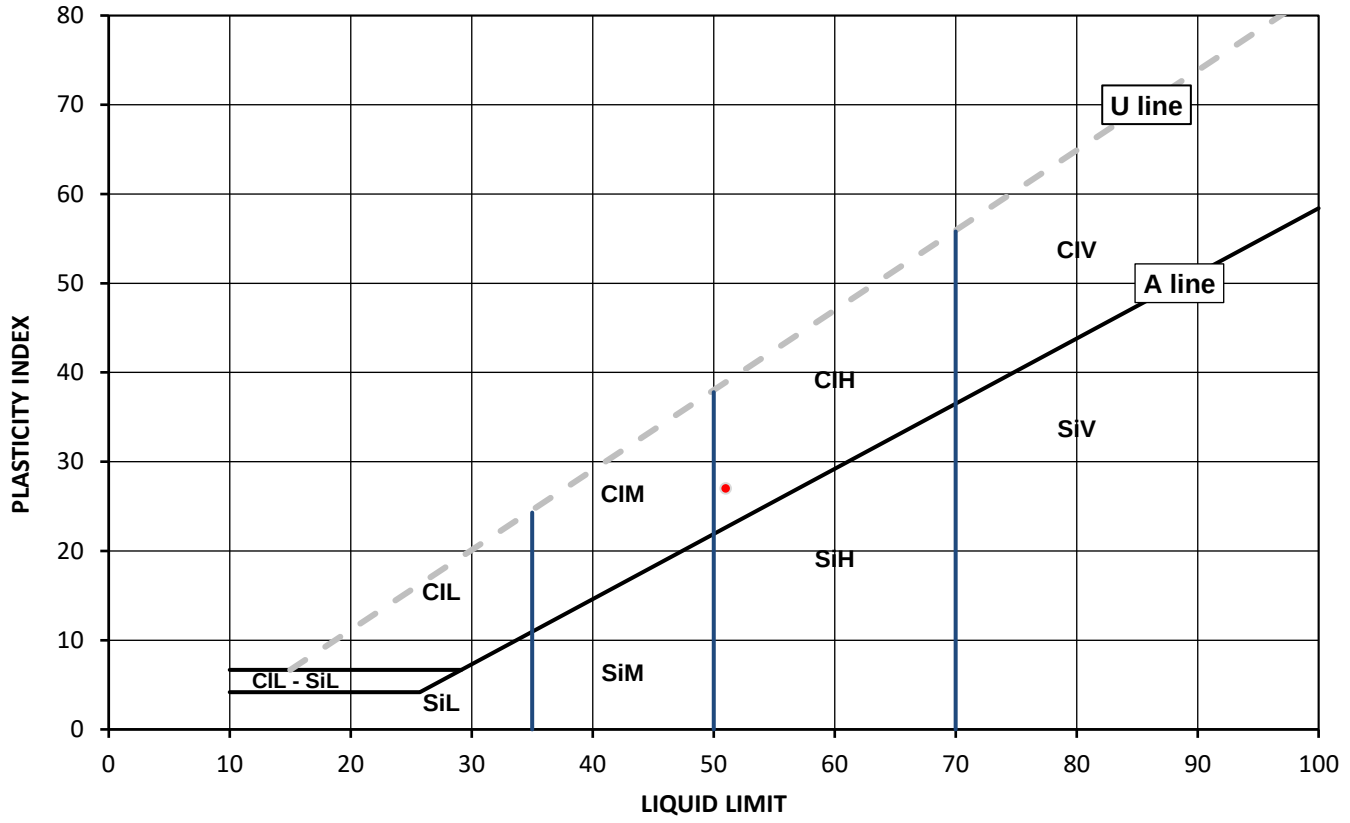
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Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251529	Depth Top [m]:	7.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
43.4	51	24	27	0.70	0.30	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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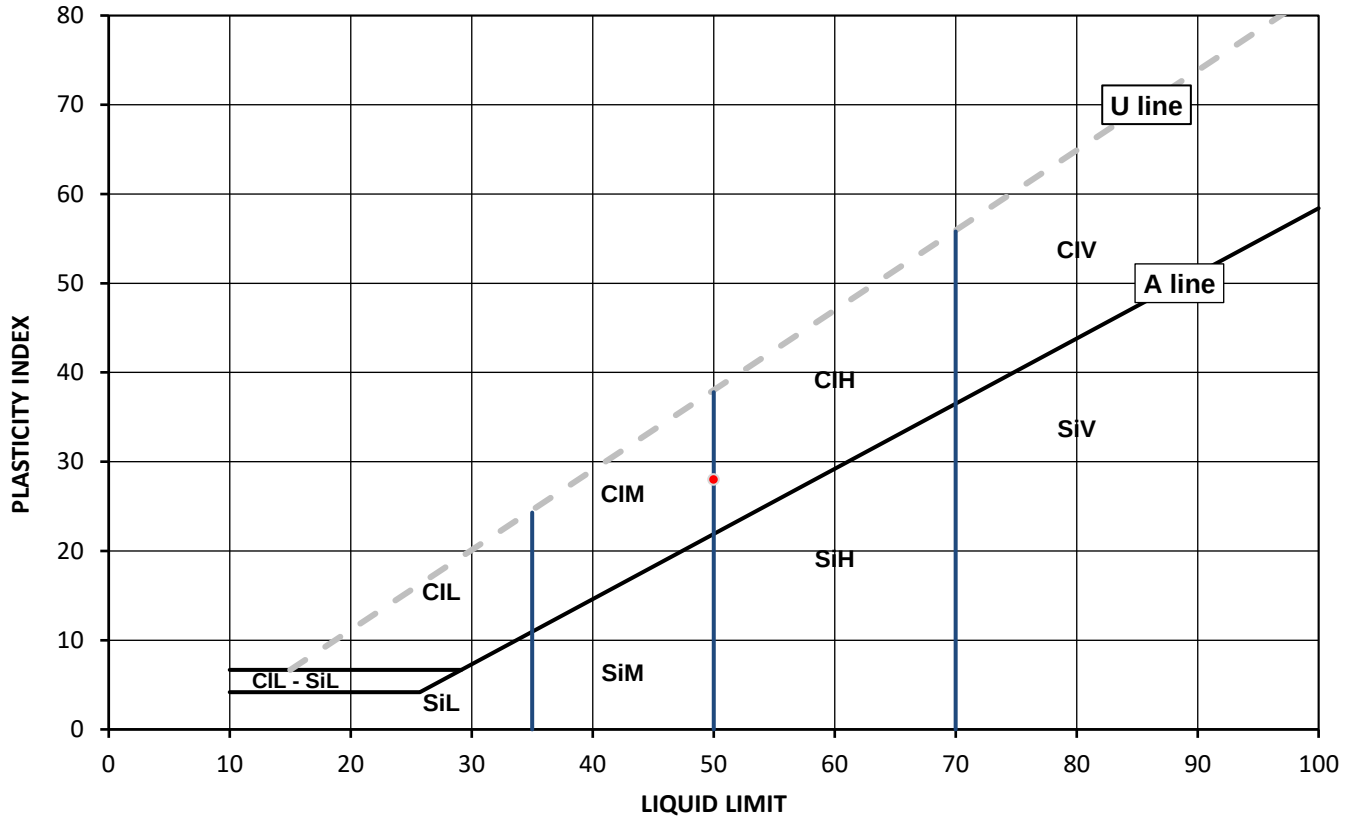
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Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251530	Depth Top [m]:	1.50
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly sandy CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
30.8	50	22	28	0.32	0.68	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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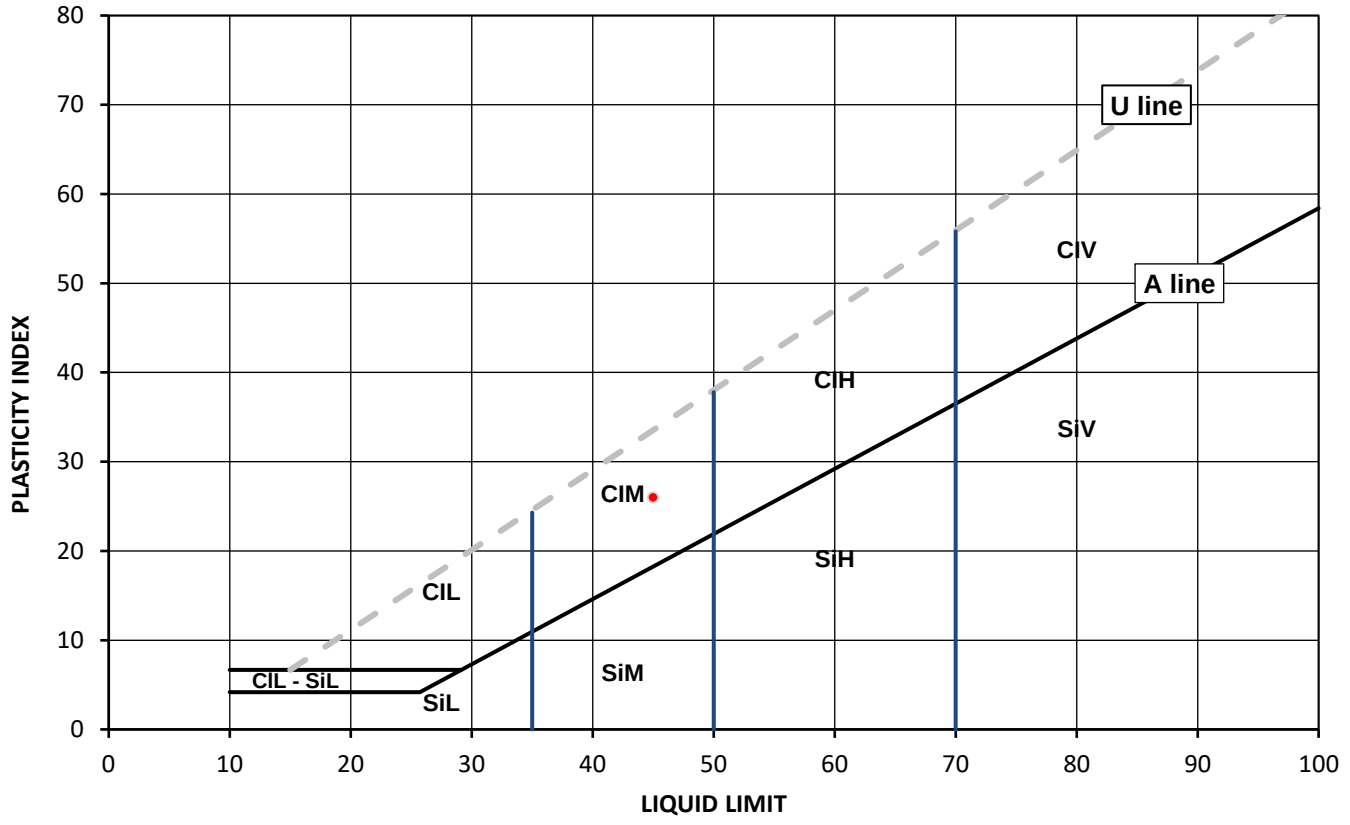
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Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251531	Depth Top [m]:	1.50
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
27.4	45	19	26	0.31	0.69	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

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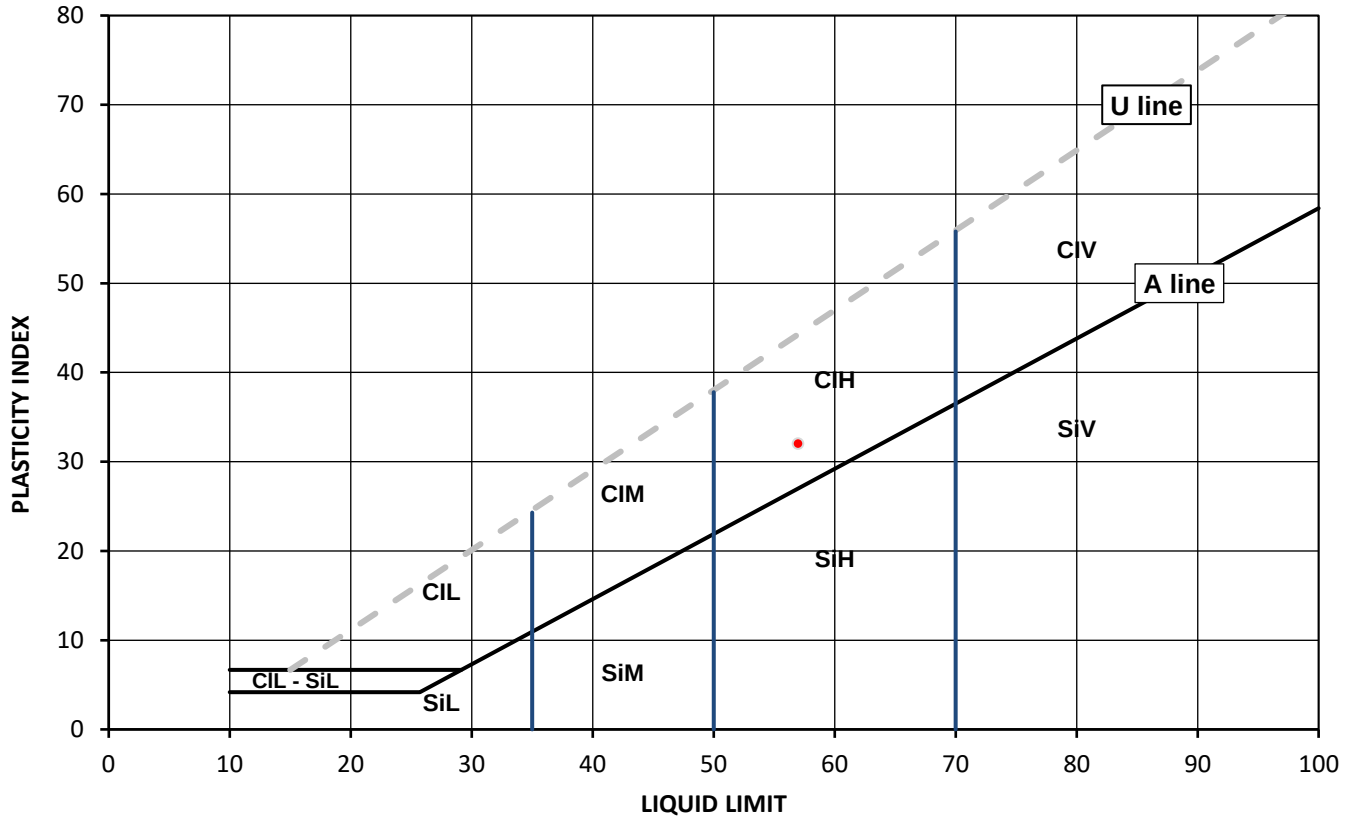
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Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251532	Depth Top [m]:	6.90
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
52.7	57	25	32	0.88	0.13	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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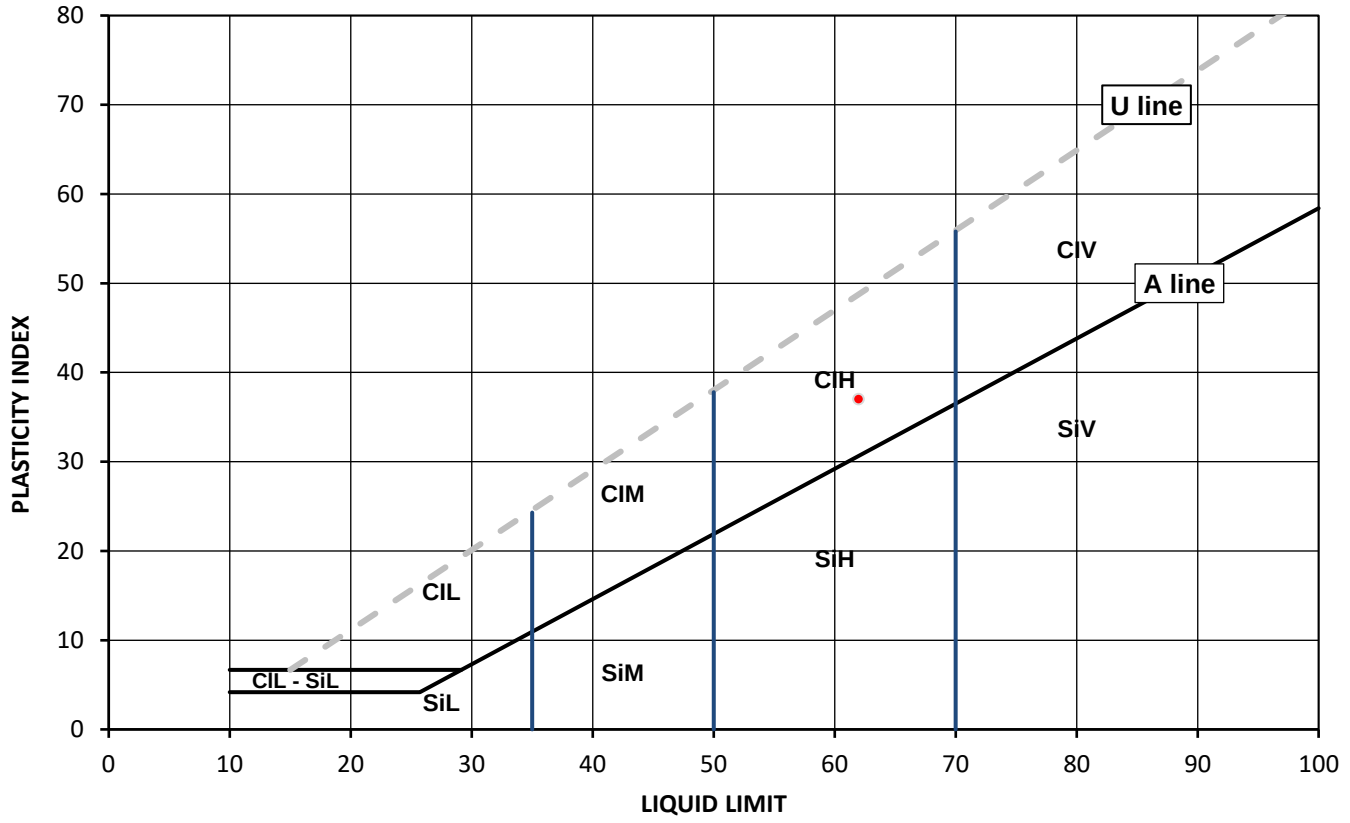
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251533	Depth Top [m]:	4.50
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Brown CLAY		

Sample Preparation: Tested in natural condition; The water content in the sample was increased
Cone Type: 80g/30deg

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
52.8	62	25	37	0.76	0.24	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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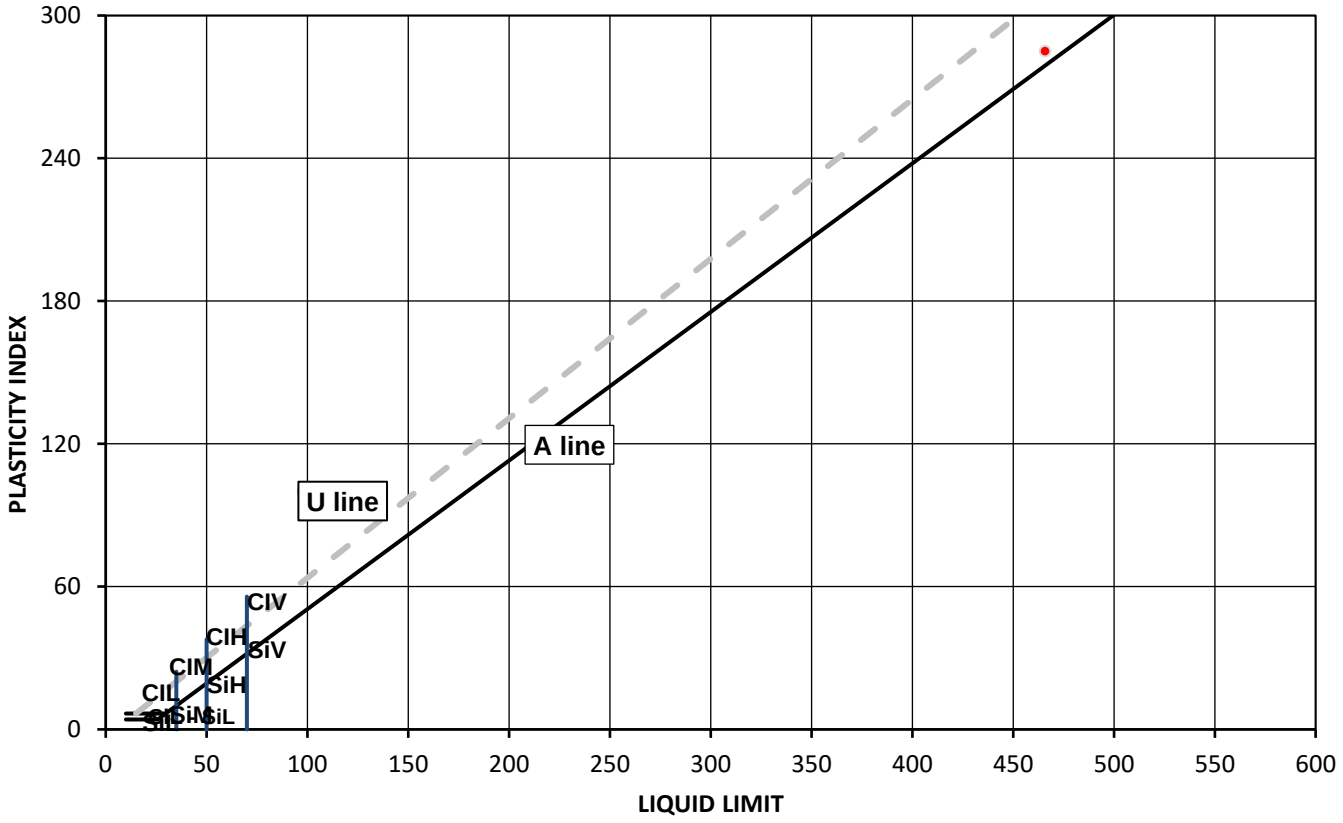
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Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251534	Depth Top [m]:	8.10
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Black PEAT		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
50.5	466	181	285	-0.46	1.46	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

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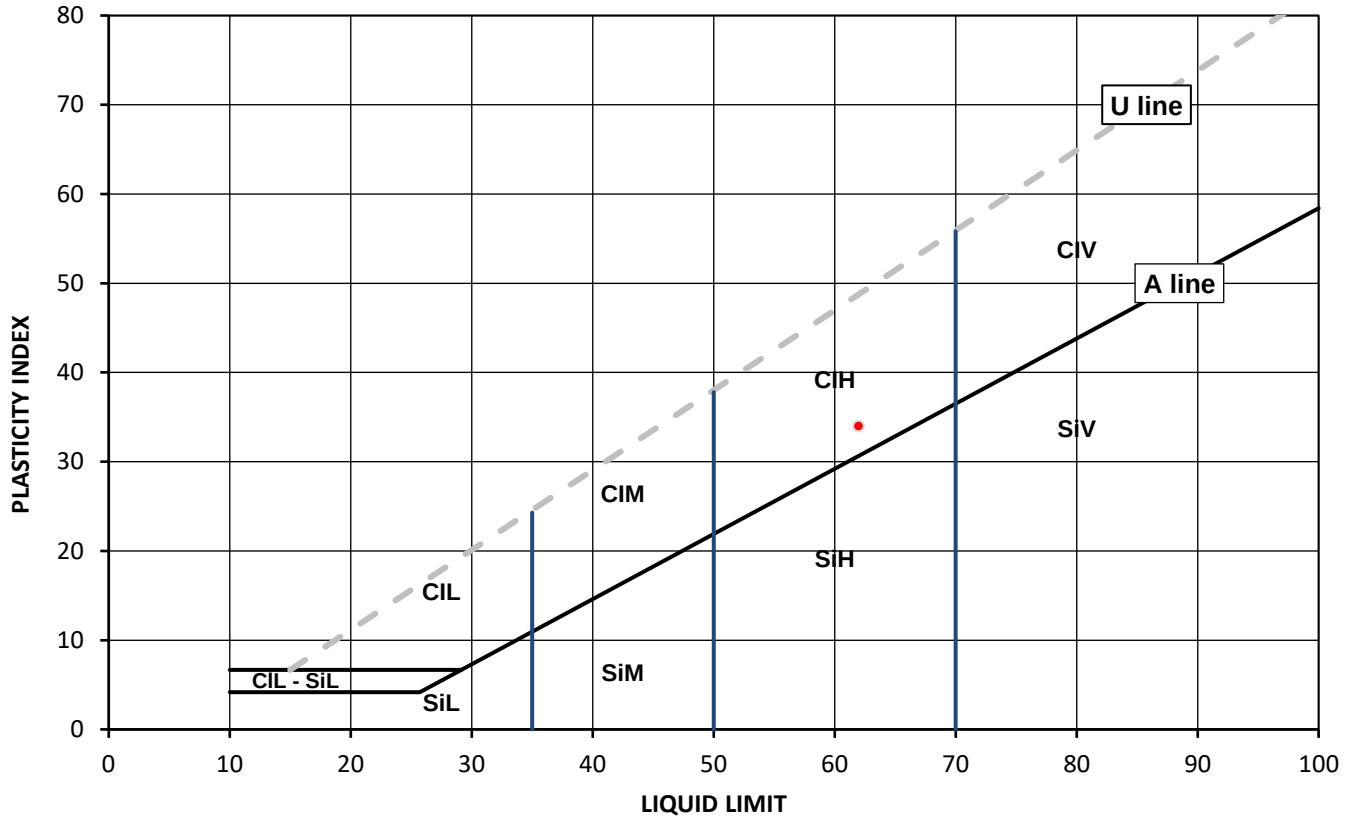
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Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251535	Depth Top [m]:	4.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
49.7	62	28	34	0.65	0.35	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
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GF 337.13

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

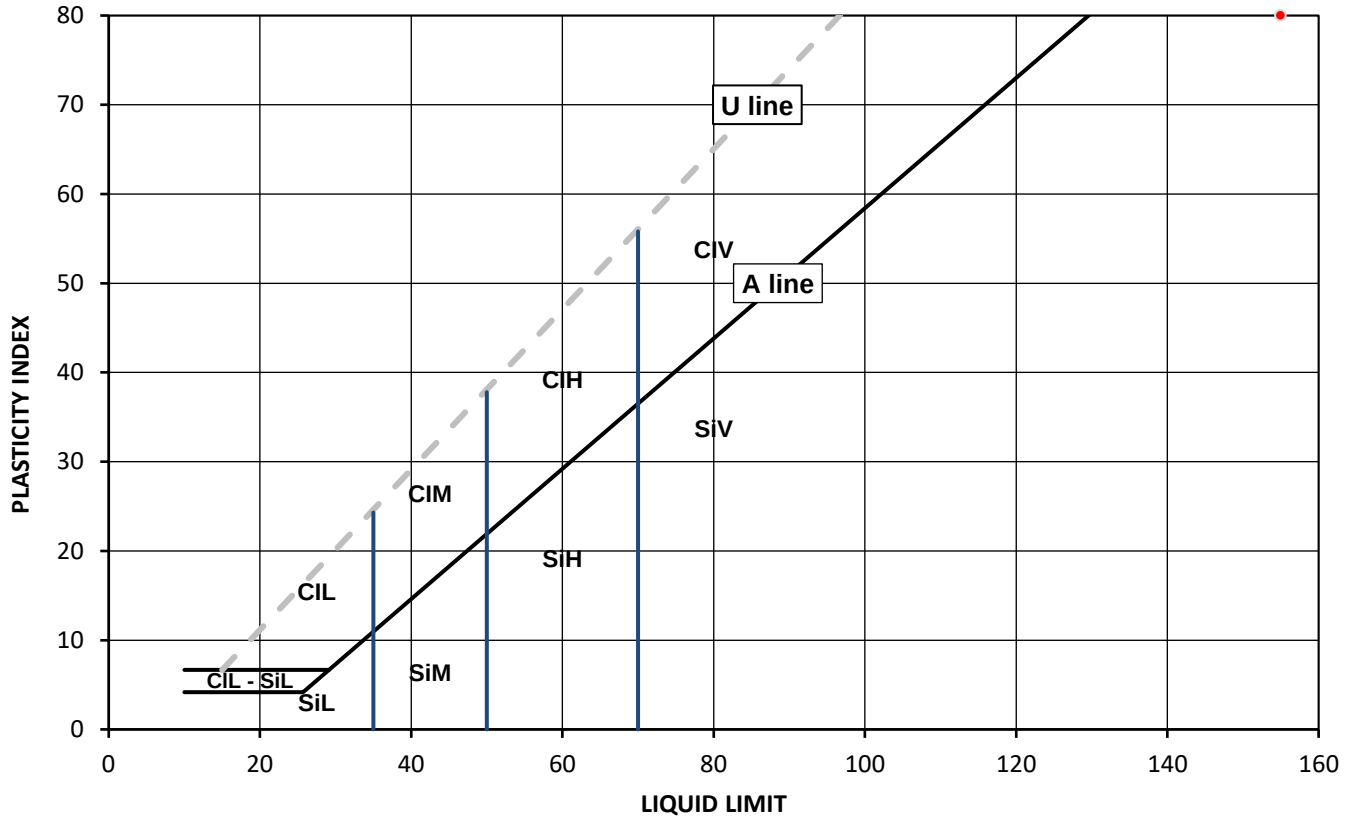
Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	16/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251536	Depth Top [m]:	7.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey organic CLAY		
Sample Preparation:	Tested in natural condition; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
109	155	75	80	0.43	0.58	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 337.13

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Mayer Environmental

Client Address: Transport Avenue, Brentford, Middlesex, TW8 9HA

Contact: Rebecca Beddard

Site Address: Humber Gate Additional Works

BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6. W by BS EN ISO 17892-1:2014+A1:2022. Particle Density by gas jar BS 1377-2:2022.

Client Reference: 129-003084-01
Job Number: 24-029679-1
Date Sampled: Not Given
Date Received: 20/06/2024
Date Tested: 18/07/2024
Sampled By: Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit						Density		
		Reference	Depth Top m	Depth Base m	Type			%	% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
251524	TP204	Not Given	1.00	Not Given	D	Brownish grey CLAY	Atterberg 4 Point	35.6	100	70	-	29	41	80g/30 deg	N / I			
251525	TP204	Not Given	4.00	Not Given	D	Greyish brown CLAY	Atterberg 4 Point	69.6	100	79	-	33	46	80g/30 deg	N / I			
251526	BH201	Not Given	0.60	Not Given	B	Brown slightly gravelly CLAY	Atterberg 4 Point	32.5	99	67	-	29	38	80g/30 deg	W / I			
251527	BH202	Not Given	3.00	Not Given	D	Brownish grey slighty sandy CLAY	Atterberg 4 Point	44.7	100	53	-	24	29	80g/30 deg	N / I			
251528	BH202	Not Given	6.50	Not Given	D	Dark greyish brown sandy silty CLAY	Atterberg 4 Point	40.5	100	43	-	25	18	80g/30 deg	N / I			
251529	BH202	Not Given	7.50	Not Given	U	Dark grey slightly sandy CLAY	Atterberg 4 Point	43.4	100	51	-	24	27	80g/30 deg	N / I			2.73
251530	BH203	Not Given	1.50	Not Given	D	Brown slightly sandy CLAY	Atterberg 4 Point	30.8	100	50	-	22	28	80g/30 deg	N / I			
251531	BH203	Not Given	1.50	Not Given	U	Brown slightly sandy CLAY	Atterberg 4 Point	27.4	100	45	-	19	26	80g/30 deg	N / I			2.76
251532	BH203	Not Given	6.90	Not Given	U	Dark grey slightly sandy CLAY	Atterberg 4 Point	52.7	100	57	-	25	32	80g/30 deg	N / I			2.67
251533	BH204	Not Given	4.50	Not Given	B	Brown CLAY	Atterberg 4 Point	52.8	100	62	-	25	37	80g/30 deg	N / I			

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased , D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

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Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024 **GF 362.15**

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Mayer Environmental

Client Address: Transport Avenue, Brentford, Middlesex, TW8 9HA

Contact: Rebecca Beddard

Site Address: Humber Gate Additional Works

BS EN ISO 17892-12:2018+A2:2022 cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6. W by BS EN ISO 17892-1:2014+A1:2022. Particle Density by gas jar BS 1377-2:2022.

Client Reference: 129-003084-01
Job Number: 24-029679-1
Date Sampled: Not Given
Date Received: 20/06/2024
Date Tested: 16/07/2024
Sampled By: Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit							Density		
		Reference	Depth Top m	Depth Base m	Type			%	% Passing 425um %	WL* %	Correlation Factor	Wp %	Ip %	Cone type	Sample Preparation	bulk Mg/m3	dry Mg/m3	PD Mg/m3
251534	BH204	Not Given	8.10	Not Given	U	Black PEAT	Atterberg 4 Point	185	100	466	-	181	285	80g/30 deg	N / I			1.38
251535	BH205	Not Given	4.50	Not Given	U	Dark grey CLAY	Atterberg 4 Point	49.7	100	62	-	28	34	80g/30 deg	N / I			2.70
251536	BH205	Not Given	7.50	Not Given	U	Dark grey organic CLAY	Atterberg 4 Point	109	100	155	-	75	80	80g/30 deg	N / I			2.53

Note: # Non accredited; NP - Non plastic; N - Tested in natural condition, R - Tested after >0,425mm removed by hand, W - Tested after washing to remove >425mm; I - The water content in the sample was increased , D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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Date Reported: 26/07/2024 **GF 362.15**

SUMMARY REPORT

DETERMINATION OF PARTICLE DENSITY - GAS JAR METHOD

Tested in Accordance with: BS 1377-2:2022, clause 9.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Mayer Environmental

Client Address: Transport Avenue, Brentford,
Middlesex, TW8 9HA

Contact: Rebecca Beddard

Site Address: Humber Gate Additional Works

Client Reference: 129-003084-01
Job Number: 24-029679-1
Date Sampled: Not Given
Date Received: 20/06/2024
Date Tested: 16/07/2024
Sampled By: Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	PD	Preparation				
		Reference	Depth Top m	Depth Base m	Type			Mg/m3					
251529	BH202	Not Given	7.50	Not Given	U	Dark grey slightly sandy CLAY		2.73	Quartered, natural condition				
251531	BH203	Not Given	1.50	Not Given	U	Brown slightly sandy CLAY		2.76	Quartered, natural condition				
251532	BH203	Not Given	6.90	Not Given	U	Dark grey slightly sandy CLAY		2.67	Quartered, natural condition				
251534	BH204	Not Given	8.10	Not Given	U	Black PEAT		1.38	Quartered, natural condition				
251535	BH205	Not Given	4.50	Not Given	U	Dark grey CLAY		2.70	Quartered, natural condition				
251536	BH205	Not Given	7.50	Not Given	U	Dark grey organic CLAY		2.53	Quartered, natural condition				

Note: PD - Particle Density

Comments:

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Signed:

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 591.1

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

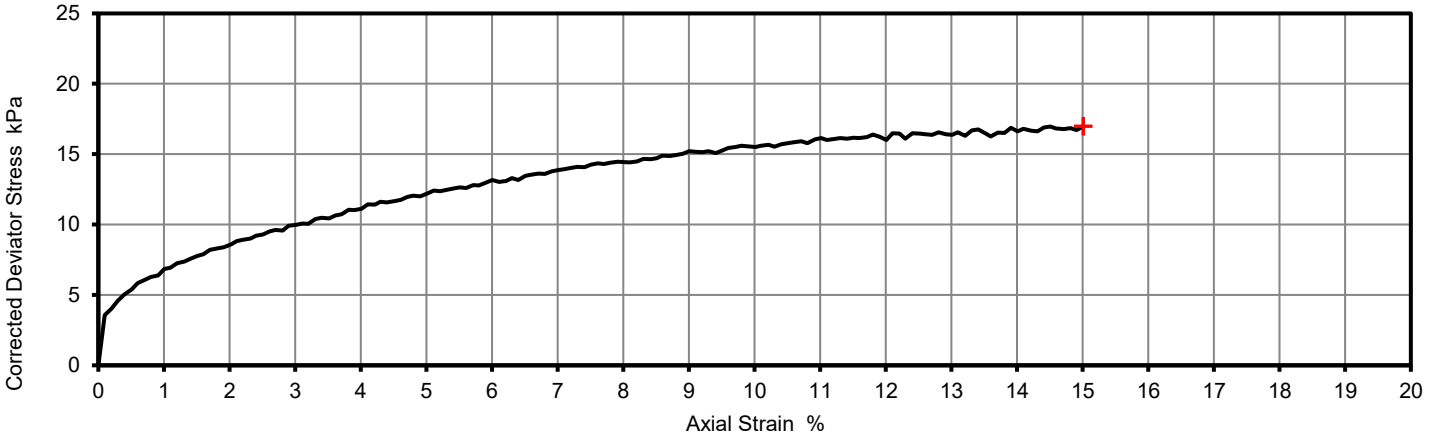
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

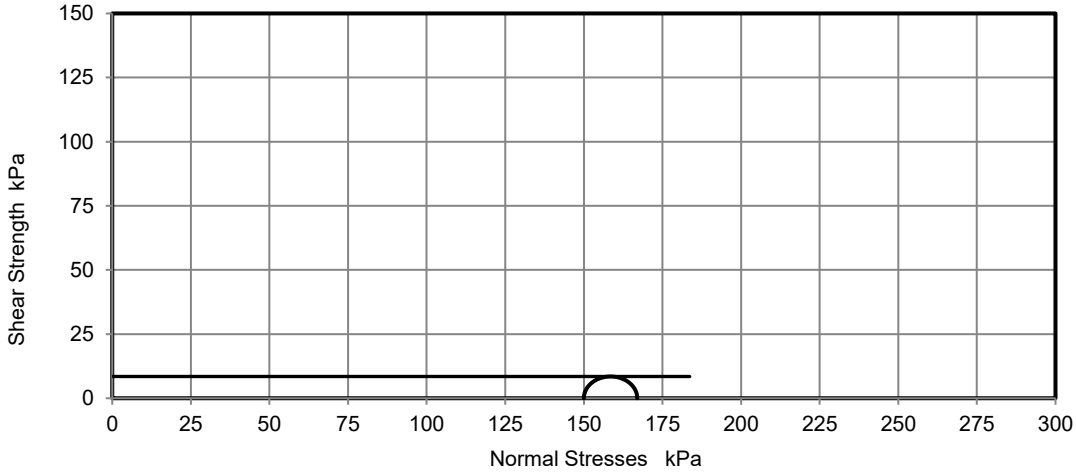
Laboratory Reference:	251529	Depth Top [m]:	7.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	150	kPa	
Length	202.66	mm	Axial Strain at Failure	15.0	%	
Diameter	103.04	mm	Deviator Stress, (σ1 - σ3)f	17	kPa	
Length Prior to Shearing	202.66	mm	Undrained Shear Strength, cu	8	kPa	½(σ1 - σ3)f
Bulk Density	1.77	Mg/m3	Mode of Failure	Plastic		
Initial Water Content	43.4	%	Membrane Thickness	0.27	mm	
Final Water Content	45.2	%	Membrane Correction	2.27	kPa	
Dry Density	1.24	Mg/m3				

Deviator Stress v Axial Strain

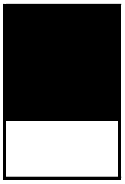


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

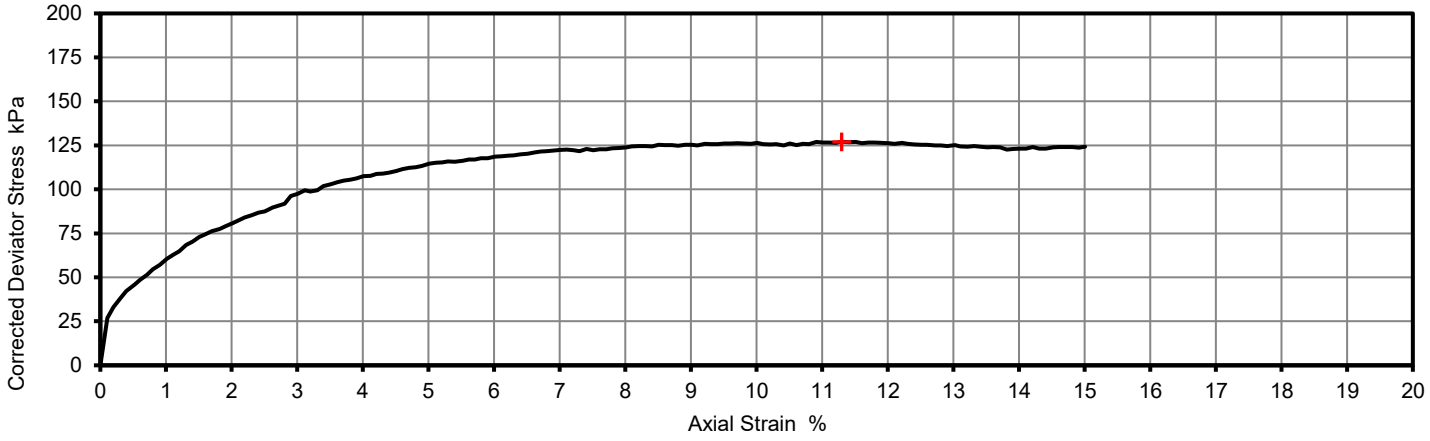
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

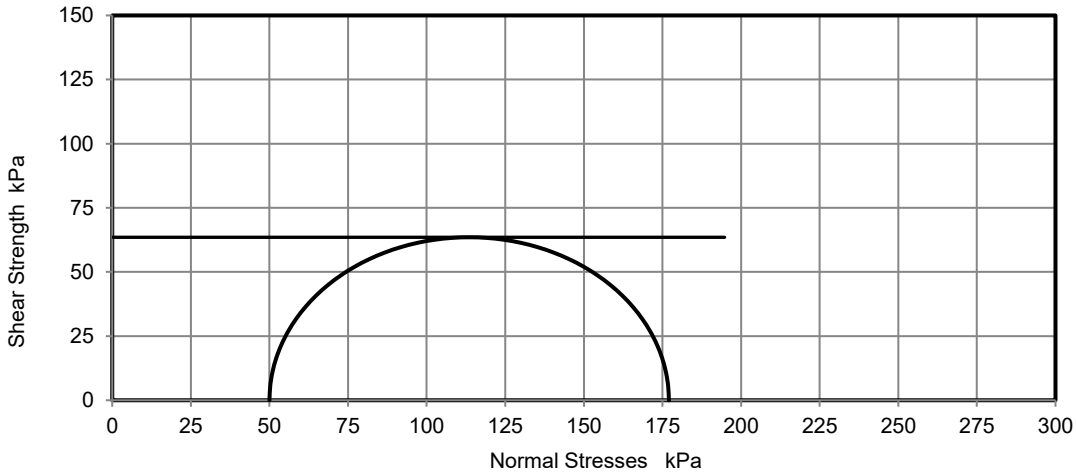
Laboratory Reference:	251531	Depth Top [m]:	1.50
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	50	kPa	
Length	139.16	mm	Axial Strain at Failure	11.3	%	
Diameter	70.13	mm	Deviator Stress, (σ1 - σ3)f	127	kPa	
Length Prior to Shearing	139.15	mm	Undrained Shear Strength, cu	64	kPa	½(σ1 - σ3)f
Bulk Density	1.92	Mg/m3	Mode of Failure	Brittle		
Initial Water Content	27.4	%	Membrane Thickness	0.24	mm	
Final Water Content	26.8	%	Membrane Correction	2.23	kPa	
Dry Density	1.50	Mg/m3				

Deviator Stress v Axial Strain

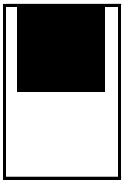


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

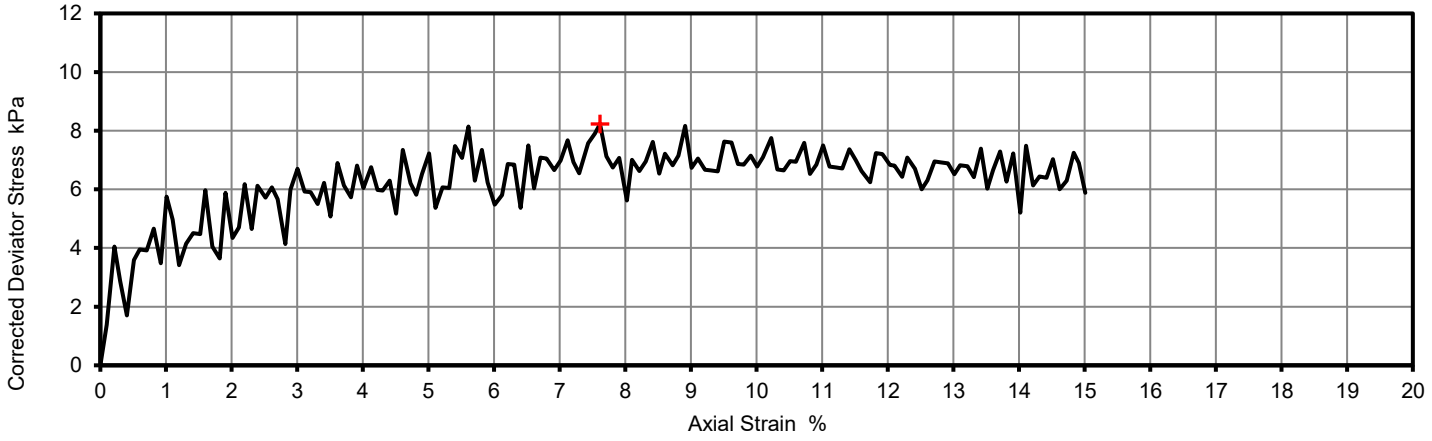
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

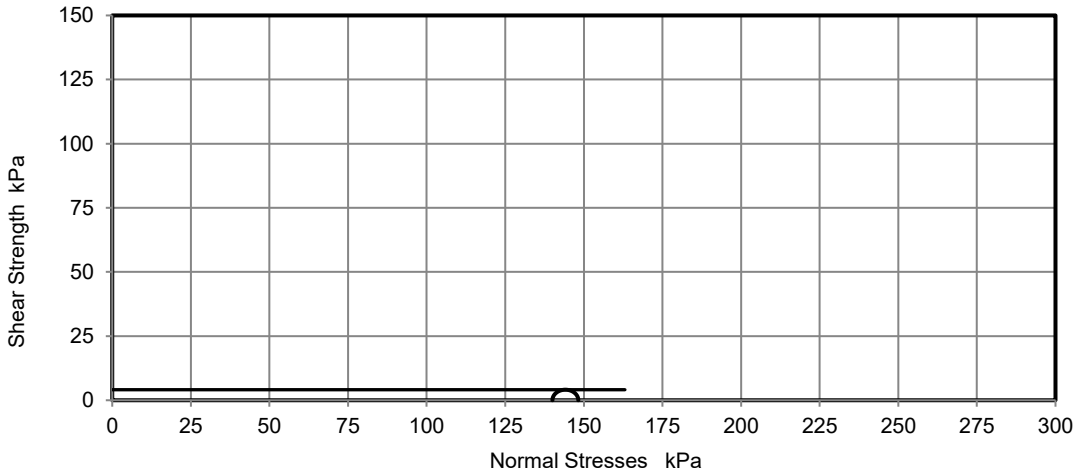
Laboratory Reference:	251532	Depth Top [m]:	6.90
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	140	kPa	
Length	101.82	mm	Axial Strain at Failure	7.6	%	
Diameter	57.52	mm	Deviator Stress, (σ1 - σ3)f	8	kPa	
Length Prior to Shearing	101.81	mm	Undrained Shear Strength, cu	4	kPa	½(σ1 - σ3)f
Bulk Density	1.21	Mg/m3	Mode of Failure	Compound		
Initial Water Content	52.6	%	Membrane Thickness	0.21	mm	
Final Water Content	52.0	%	Membrane Correction	1.60	kPa	
Dry Density	0.79	Mg/m3				

Deviator Stress v Axial Strain

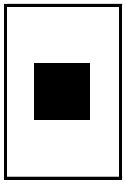


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

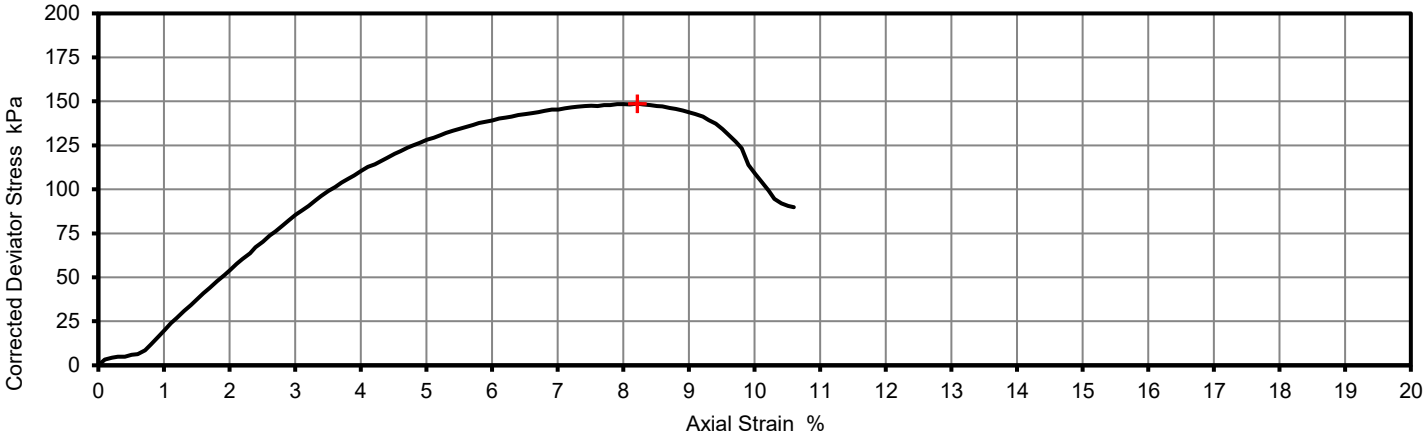
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

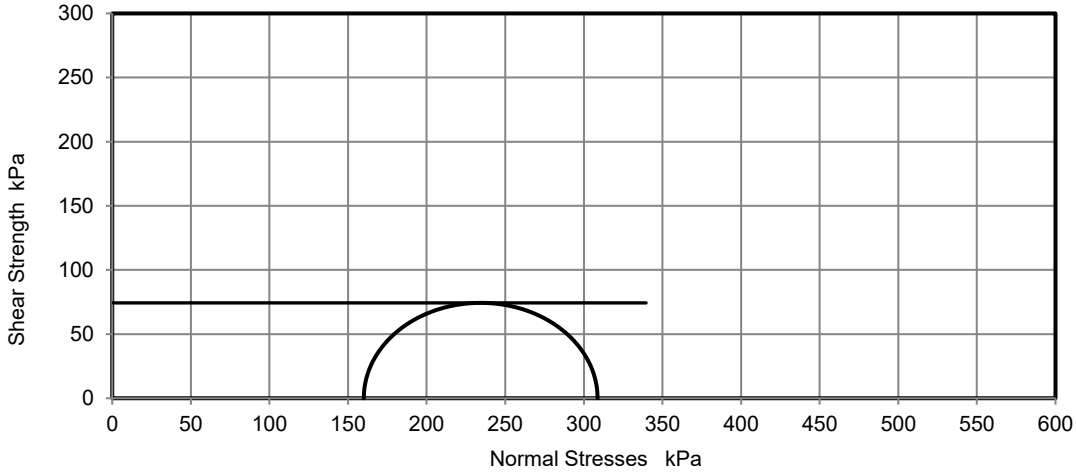
Laboratory Reference:	251534	Depth Top [m]:	8.10
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Black PEAT		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	160	kPa	
Length	205.80	mm	Axial Strain at Failure	8.2	%	
Diameter	101.66	mm	Deviator Stress, (σ1 - σ3)f	149	kPa	
Length Prior to Shearing	205.79	mm	Undrained Shear Strength, cu	74	kPa	½(σ1 - σ3)f
Bulk Density	1.05	Mg/m3	Mode of Failure	Brittle		
Initial Water Content	185	%	Membrane Thickness	0.27	mm	
Final Water Content	189	%	Membrane Correction	1.26	kPa	
Dry Density	0.70	Mg/m3				

Deviator Stress v Axial Strain

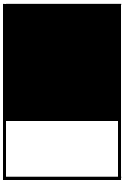


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

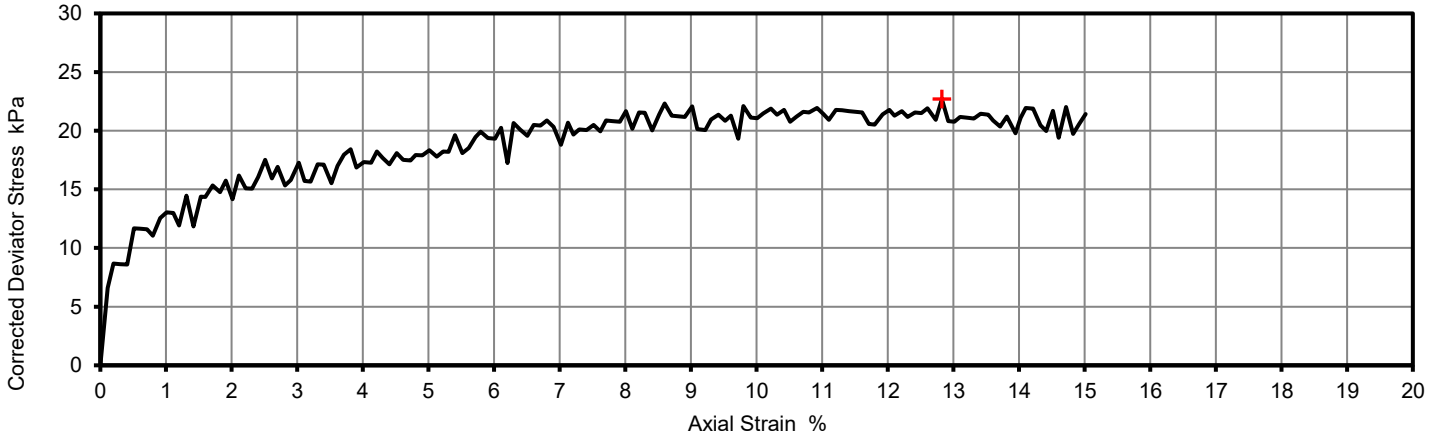
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

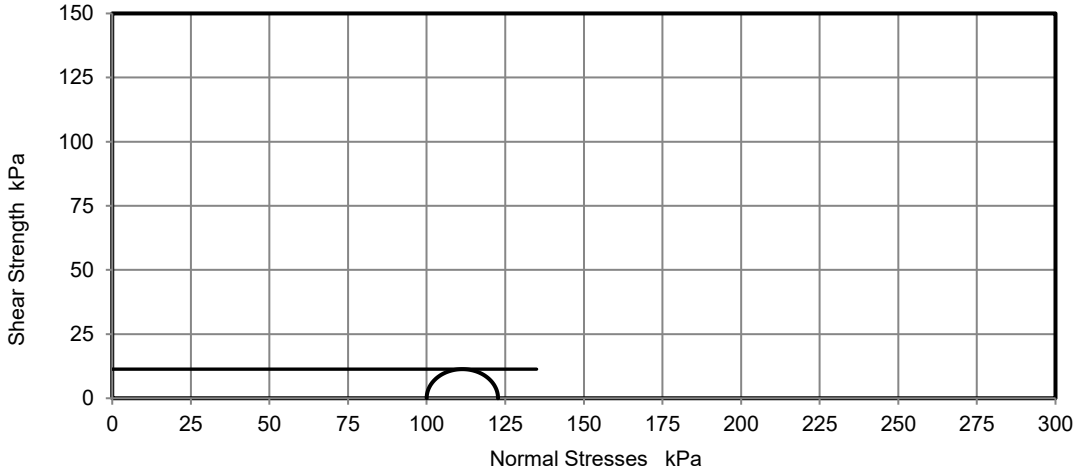
Laboratory Reference:	251535	Depth Top [m]:	4.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	100	kPa	
Length	99.91	mm	Axial Strain at Failure	12.8	%	
Diameter	49.26	mm	Deviator Stress, (σ1 - σ3)f	23	kPa	
Length Prior to Shearing	99.91	mm	Undrained Shear Strength, cu	11	kPa	½(σ1 - σ3)f
Bulk Density	1.70	Mg/m3	Mode of Failure	Compound		
Initial Water Content	49.6	%	Membrane Thickness	0.23	mm	
Final Water Content	48.4	%	Membrane Correction	3.68	kPa	
Dry Density	1.13	Mg/m3				

Deviator Stress v Axial Strain

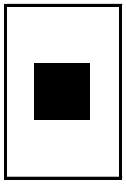


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

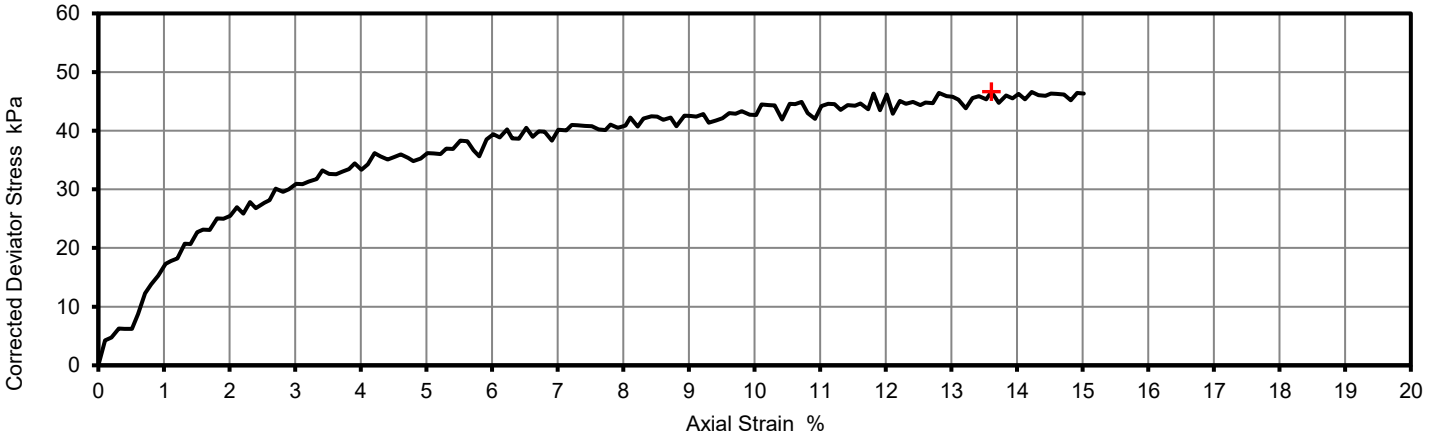
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

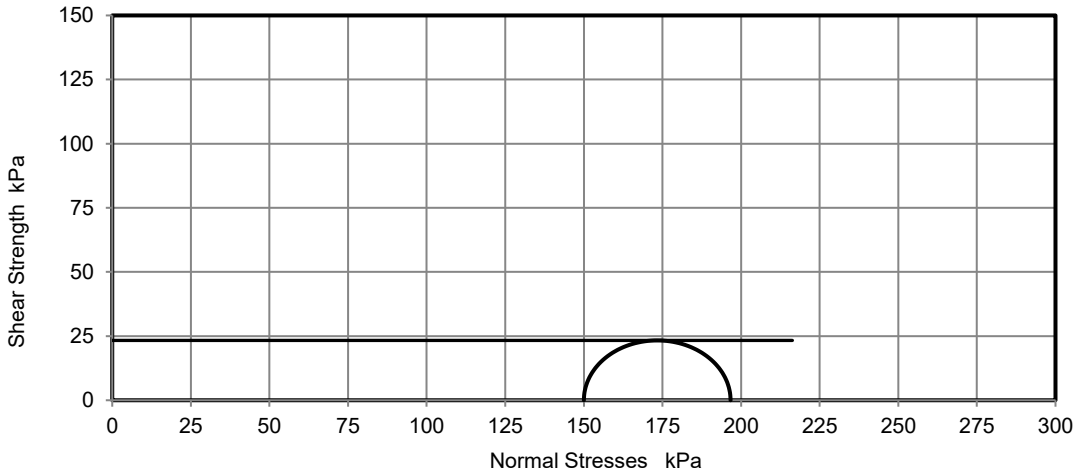
Laboratory Reference:	251536	Depth Top [m]:	7.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey organic CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	150	kPa	
Length	99.59	mm	Axial Strain at Failure	13.6	%	
Diameter	49.66	mm	Deviator Stress, (σ1 - σ3)f	47	kPa	
Length Prior to Shearing	99.56	mm	Undrained Shear Strength, cu	23	kPa	½(σ1 - σ3)f
Bulk Density	1.32	Mg/m3	Mode of Failure	Compound		
Initial Water Content	109	%	Membrane Thickness	0.22	mm	
Final Water Content	104	%	Membrane Correction	3.48	kPa	
Dry Density	0.63	Mg/m3				

Deviator Stress v Axial Strain

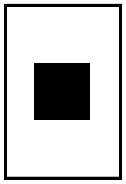


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

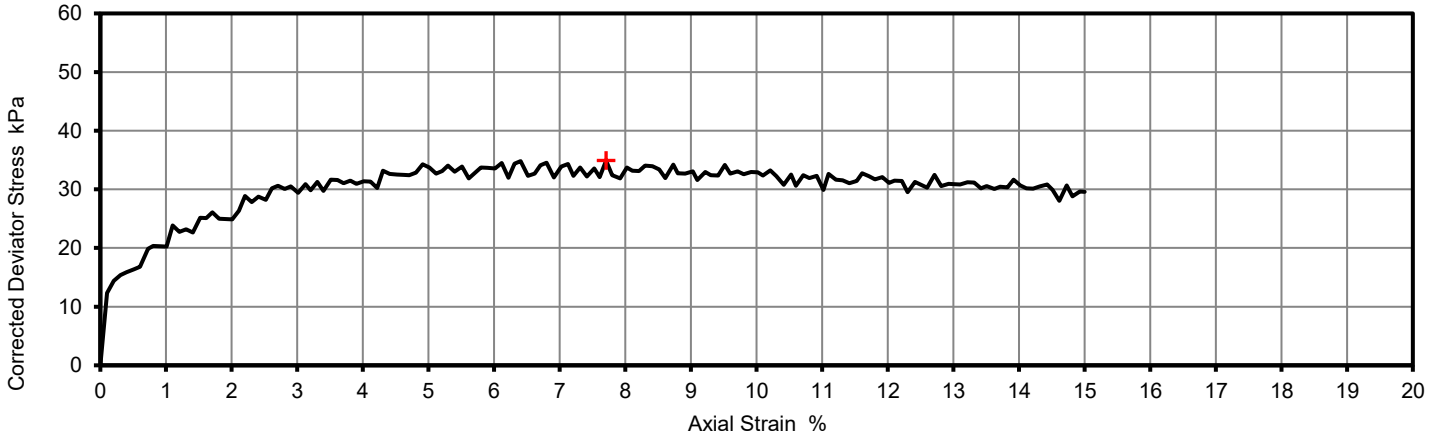
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

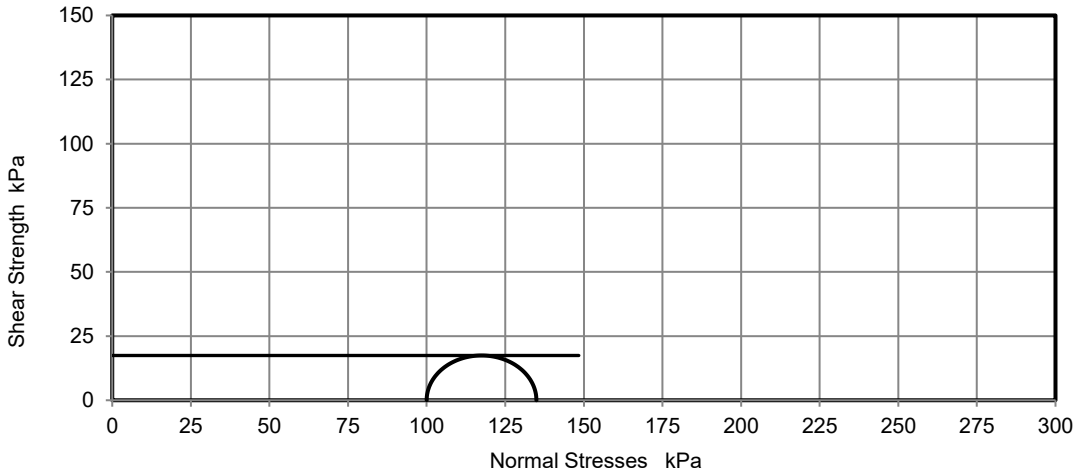
Laboratory Reference:	253610	Depth Top [m]:	4.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown silty CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	100	kPa	
Length	97.95	mm	Axial Strain at Failure	7.7	%	
Diameter	49.38	mm	Deviator Stress, (σ1 - σ3)f	35	kPa	
Length Prior to Shearing	97.94	mm	Undrained Shear Strength, cu	17	kPa	½(σ1 - σ3)f
Bulk Density	1.78	Mg/m3	Mode of Failure	Compound		
Initial Water Content	44.8	%	Membrane Thickness	0.23	mm	
Final Water Content	41.8	%	Membrane Correction	2.07	kPa	
Dry Density	1.23	Mg/m3				

Deviator Stress v Axial Strain

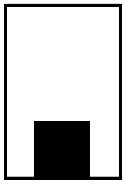


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

Remarks:

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Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

4041

TEST CERTIFICATE

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Tested in Accordance with: BS EN ISO 17982-8:2018, BS 1377-2 Cl. 28:2022

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	18/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

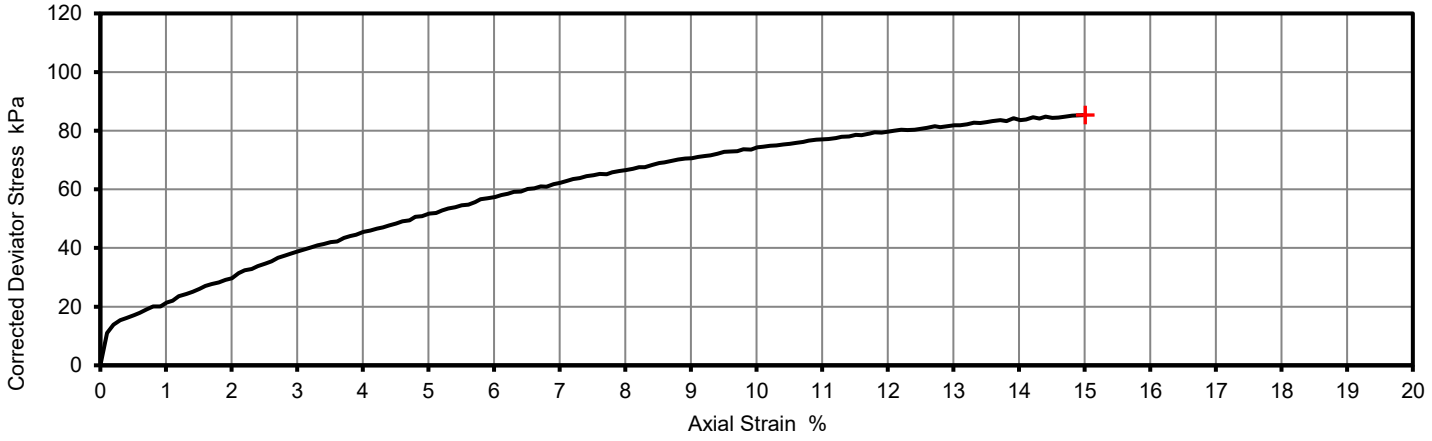
Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

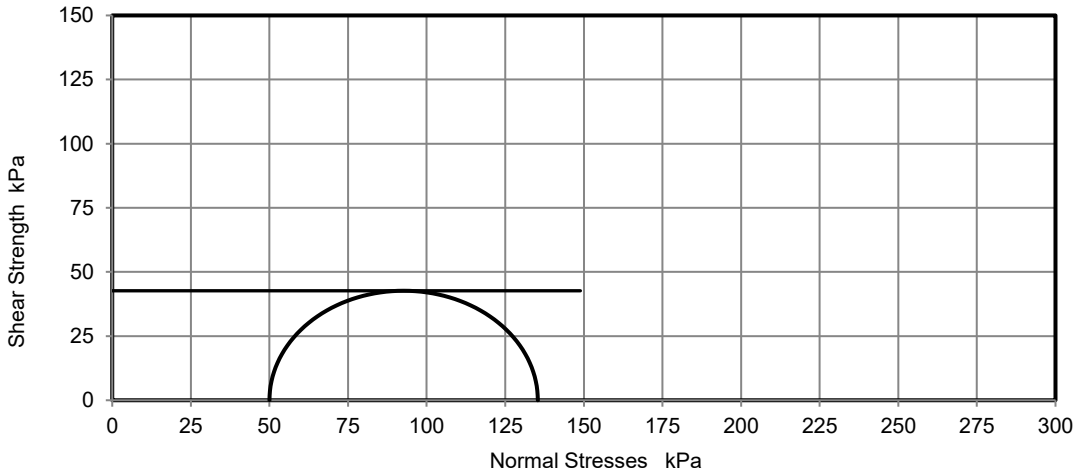
Laboratory Reference:	253611	Depth Top [m]:	1.50
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown silty CLAY		
Sample Preparation:	Sample prepared in accordance with BS EN ISO 17892-8: 2018 Clause 6.2.		

Test Number	1		Rate of Strain	2.00	%/min	
Depth within Sample	-	m	Cell Pressure	50	kPa	
Length	139.60	mm	Axial Strain at Failure	15.0	%	
Diameter	69.69	mm	Deviator Stress, (σ1 - σ3)f	85	kPa	
Length Prior to Shearing	139.60	mm	Undrained Shear Strength, cu	43	kPa	½(σ1 - σ3)f
Bulk Density	1.96	Mg/m3	Mode of Failure	Compound		
Initial Water Content	28.1	%	Membrane Thickness	0.25	mm	
Final Water Content	27.2	%	Membrane Correction	3.11	kPa	
Dry Density	1.53	Mg/m3				

Deviator Stress v Axial Strain

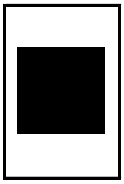


Mohr Circles





Position within sample



Note: Deviator stress corrected for area change and membrane effects.

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 463.4

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST

Tested in Accordance with: BS EN ISO 17892-5:2017, BS 1377-2:2022 Cl. 16 & 17

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

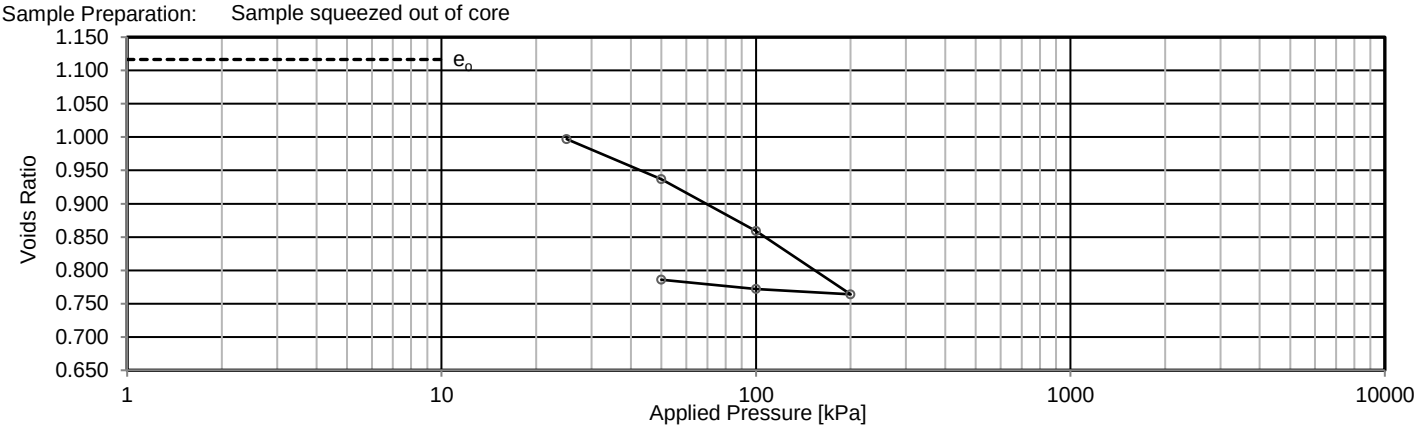
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251529	Depth Top [m]:	7.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.08	20.04	42.3	1.78	1.25	1.180	98	22	Not measured	6
Final	-	16.91	34.7	2.00	1.48	0.840	112			

Sample orientation: Vertical

Particle density: measured 2.73 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	1.116	-	-	-	-	-
25	0.997	0.4	2.3	0.31		0.0044
50	0.937	0.9	1.2	0.34	0.43	0.0047
100	0.859	1.3	0.81	0.37	0.52	0.0055
200	0.764	2.2	0.51	0.43	0.55	0.0079
100	0.772	26	0.046			
50	0.786	7.8	0.15			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 448.6

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST

Tested in Accordance with: BS EN ISO 17892-5:2017, BS 1377-2:2022 Cl. 16 & 17

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

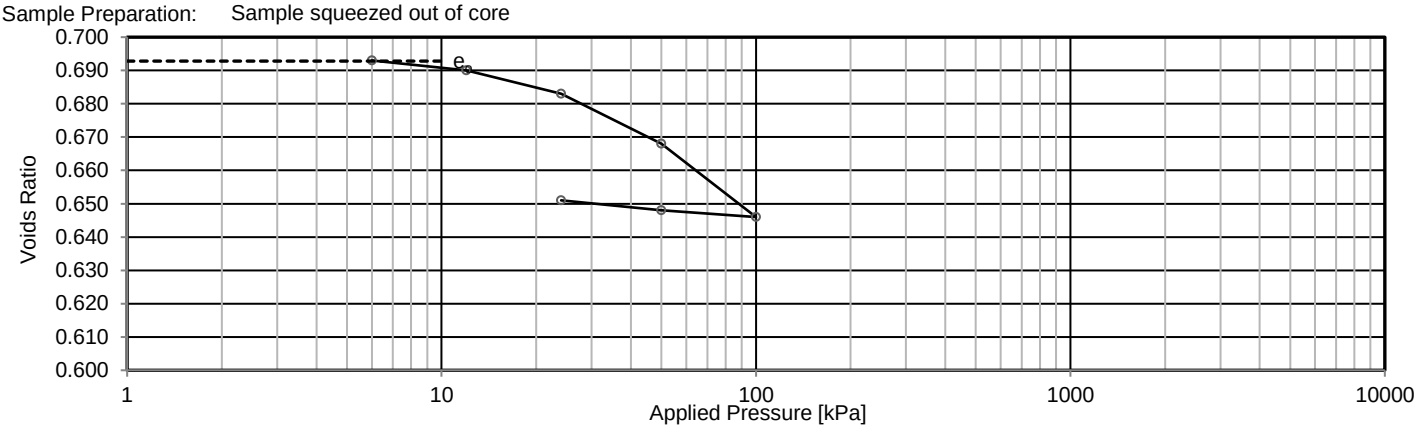
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251531	Depth Top [m]:	1.50
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly sandy CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.02	20.02	25.7	1.97	1.57	0.763	93	22	Not measured	6
Final	-	19.53	26.7	2.03	1.60	0.720	102			

Sample orientation: Vertical

Particle density: measured 2.76 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	0.693	-	-	-	-	-
6	0.693	N/A	0.017	N/A	N/A	N/A
12	0.69	3.5	0.28	0.75	1.1	N/A
24	0.683	2.8	0.35	5.5	0.91	0.00062
50	0.668	3	0.34	6.9	2.2	0.0008
100	0.646	3.9	0.26	10	2.1	0.001
50	0.648	38.5	0.027			
24	0.651	13	0.079			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 448.6

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST

Tested in Accordance with: BS EN ISO 17892-5:2017, BS 1377-2:2022 Cl. 16 & 17

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

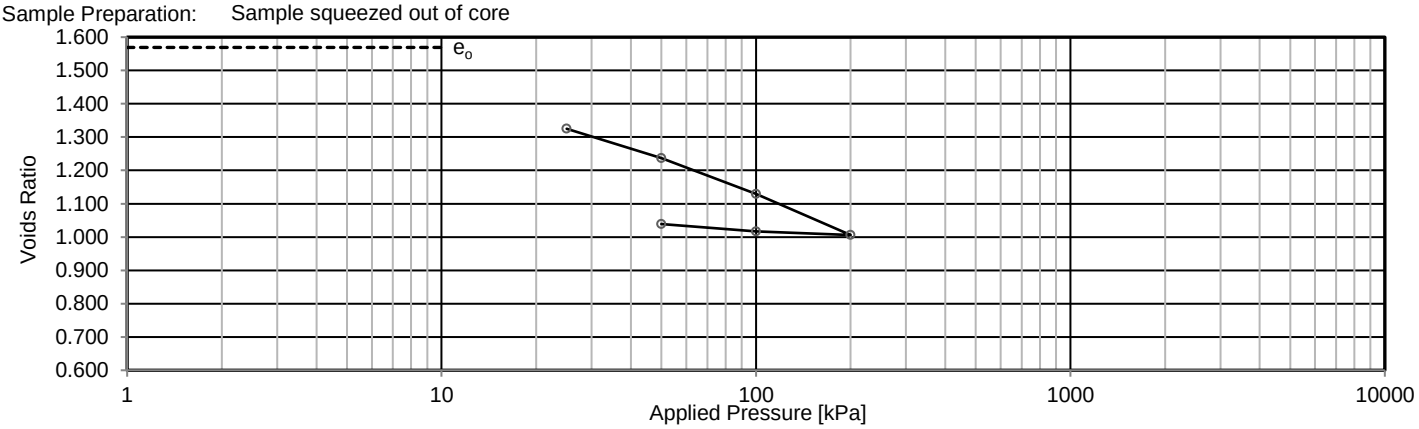
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251532	Depth Top [m]:	6.90
Hole No.:	BH203	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey slightly sandy CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.02	20.07	64.3	1.70	1.03	1.589	108	22	Not measured	6
Final	-	15.93	36.8	1.78	1.30	1.054	93			

Sample orientation: Vertical

Particle density: measured 2.67 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	1.569	-	-	-	-	-
25	1.325	0.3	3.8	0.1	0.094	0.0019
50	1.237	0.7	1.5	0.14	0.19	0.0042
100	1.129	1.2	0.97	0.15	0.2	0.0051
200	1.006	2.1	0.58	0.19	0.23	0.0076
100	1.017	22.1	0.058			
50	1.039	6	0.21			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

Remarks:

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for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

GF 448.6

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST

Tested in Accordance with: BS EN ISO 17892-5:2017, BS 1377-2:2022 Cl. 16 & 17

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

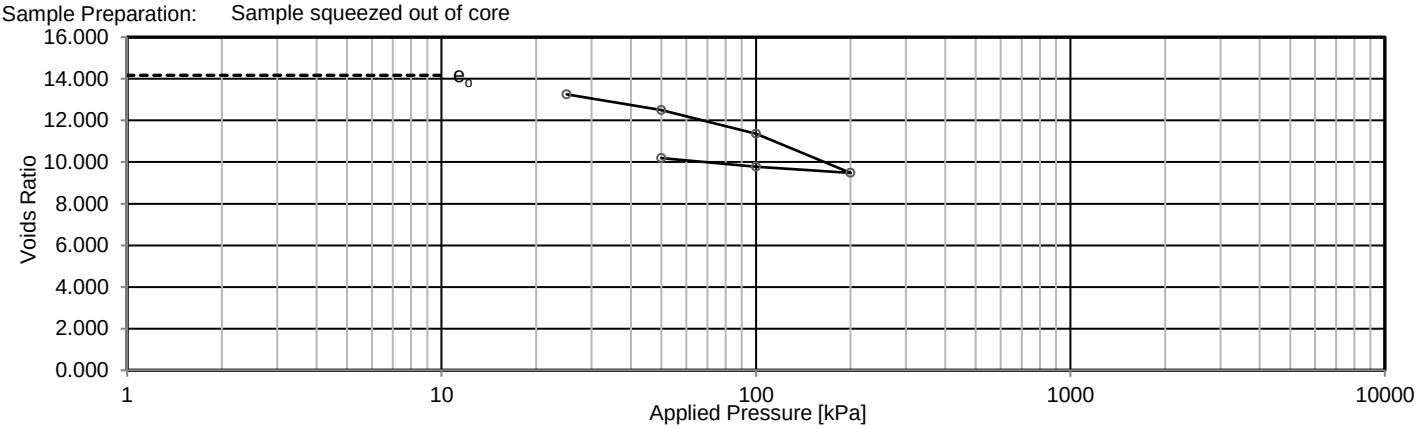
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251534	Depth Top [m]:	8.10
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Black PEAT		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.04	20.06	405	0.88	0.17	6.898	81	22	Not measured	6
Final	-	14.80	355	1.08	0.24	4.825	101			

Sample orientation: Vertical

Particle density: measured 1.38 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	14.167	-	-	-	-	-
25	13.252	0.4	2.4	6.7	4.1	0.0058
50	12.504	0.5	2.1	28	3.3	0.011
100	11.358	0.7	1.7	5.6	0.97	0.017
200	9.479	0.8	1.5	3.9	0.27	0.038
100	9.783	5	0.29			
50	10.186	1.9	0.75			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

Remarks:

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Date Reported: 26/07/2024

GF 448.6

TEST CERTIFICATE

INCREMENTAL LOADING OEDOMETER TEST

Tested in Accordance with: BS EN ISO 17892-5:2017, BS 1377-2:2022 Cl. 16 & 17

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

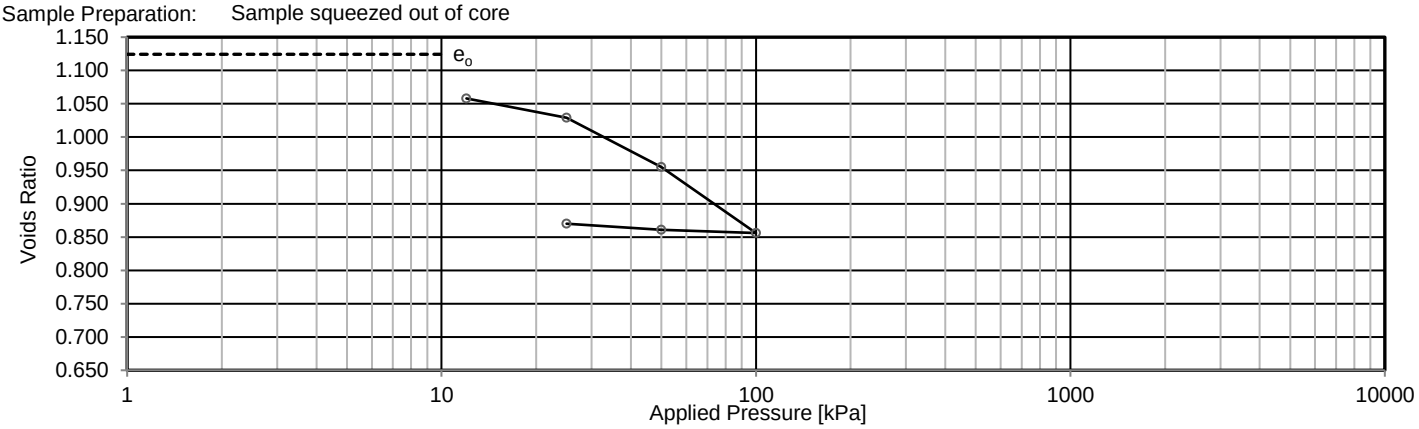
4041

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251535	Depth Top [m]:	4.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.02	20.10	46.3	1.83	1.25	1.164	107	22	Not measured	6
Final	-	17.69	37.2	1.95	1.42	0.905	111			

Sample orientation: Vertical

Particle density: measured 2.70 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	1.124	-	-	-	-	-
12	1.058	0.4	2.6	0.21	0.2	0.00062
25	1.029	1	1.1	0.77	0.62	0.0012
50	0.955	0.7	1.5	0.18	0.19	0.0023
100	0.856	1.1	1	0.3	0.25	0.0064
50	0.861	19.7	0.058			
25	0.87	6.1	0.19			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

Remarks:

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Signed: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

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Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

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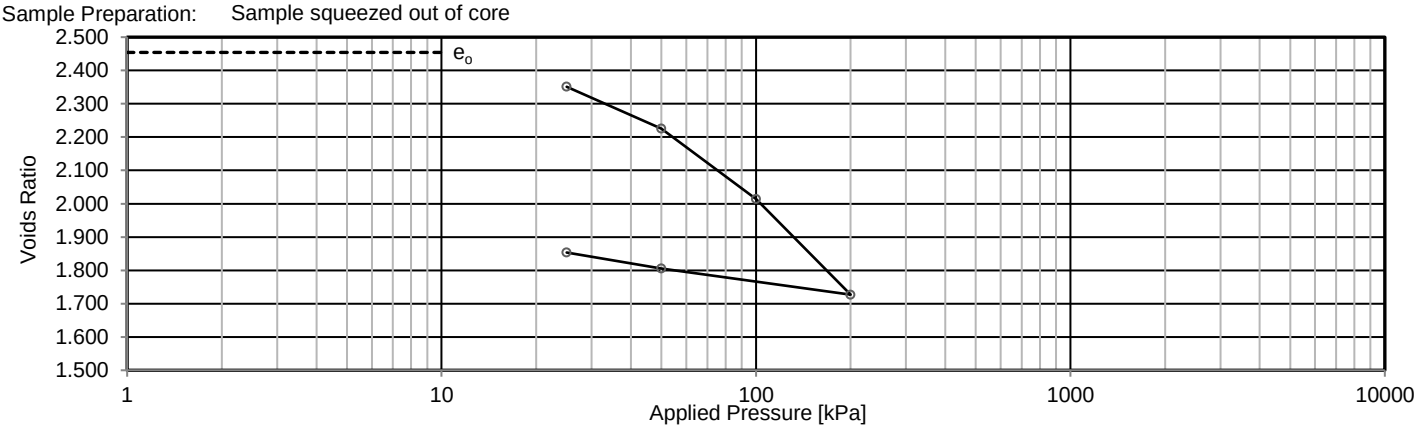
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	251536	Depth Top [m]:	7.50
Hole No.:	BH205	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark grey organic CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.05	20.03	84.1	1.41	0.77	2.298	92	22	Not measured	6
Final	-	16.54	78.2	1.66	0.93	1.724	115			

Sample orientation: Vertical

Particle density: measured 2.53 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	2.454	-	-	-	-	-
25	2.351	0.8	1.2	4.2	0.59	0.0048
50	2.225	0.7	1.5	0.51	0.47	0.0085
100	2.014	0.8	1.3	0.3	0.25	0.014
200	1.727	1.2	0.95	0.19	0.2	0.022
50	1.805	6.7	0.19			
25	1.853	1.8	0.68			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

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Date Reported: 26/07/2024

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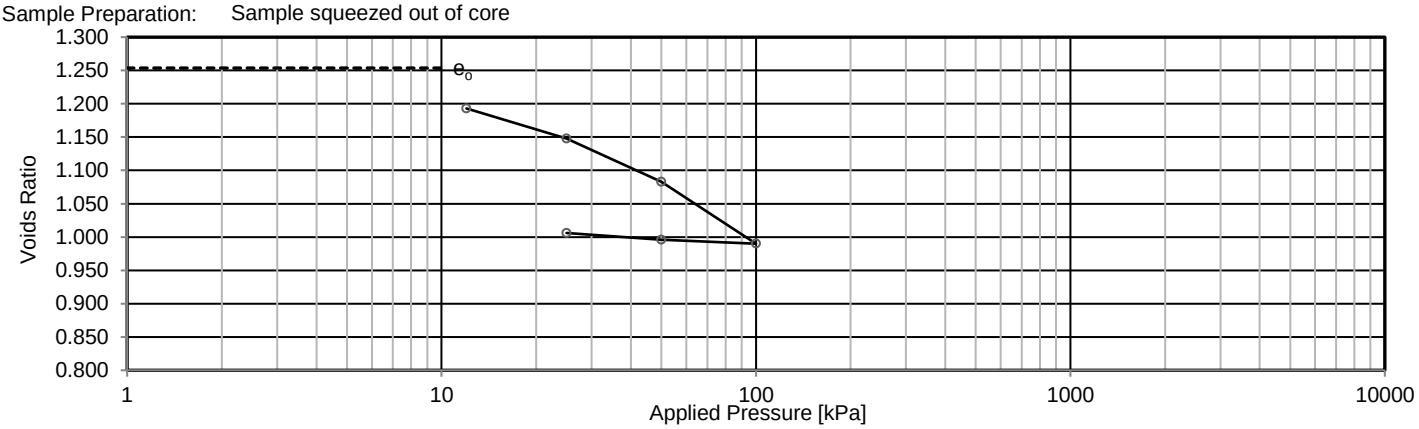
Environmental Science

Client:	Mayer Environmental	Client Reference:	129-003084-01
Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	253610	Depth Top [m]:	4.50
Hole No.:	BH202	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Greyish brown silty CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.03	20.11	43.9	1.69	1.18	1.254	92	22	Not measured	6
Final	-	17.90	38.4	1.83	1.32	1.006	101			

Sample orientation: Vertical

Particle density: assumed 2.65 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	1.254	-	-	-	-	-
12	1.193	0.4	2.2	0.72	0.64	0.0019
25	1.148	0.6	1.6	0.98	1.2	0.0032
50	1.083	0.9	1.2	0.96	1.4	0.0046
100	0.99	1.2	0.89	0.78	1.2	0.0061
50	0.996	17.6	0.064			
25	1.006	6	0.19			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

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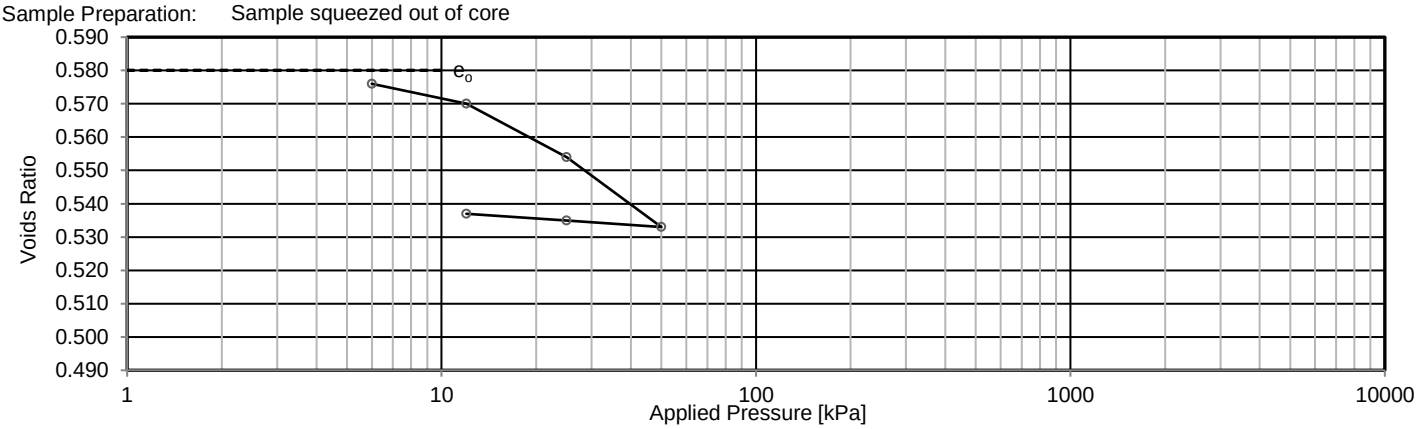
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Client Address:	Transport Avenue, Brentford, Middlesex, TW8 9HA	Job Number:	24-029679-1
		Date Sampled:	Not Given
		Date Received:	20/06/2024
Contact:	Rebecca Beddard	Date Tested:	17/07/2024
Site Address:	Humber Gate Additional Works	Sampled By:	Client - RB

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	253611	Depth Top [m]:	1.50
Hole No.:	BH204	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown silty CLAY		
Sample Preparation:	Sample squeezed out of core		



Specimen details	Diameter [mm]	Height [mm]	Water content [%]	Bulk density [Mg/m3]	Dry density [Mg/m3]	Voids ratio -	Degree of saturation [%]	Avg. temp for test [°C]	Swelling pressure [kPa]	Total test time [days]
Initial	50.01	20.05	23.3	2.07	1.68	0.580	106	22	Not measured	6
Final	-	19.50	20.3	2.07	1.72	0.537	100			

Sample orientation: Vertical

Particle density: assumed 2.65 Mg/m3

Pressure [kPa]	Voids ratio -	Eoed [MPa]	Mv [m2/MN]	Cv (t50, log) [m2/yr]	Cv (t90, root) [m2/yr]	Cα -
0	0.58	-	-	-	-	-
6	0.576	2.6	0.38	0.92	0.64	0.00036
12	0.57	1.5	0.66	0.35	0.33	0.00051
25	0.554	1.3	0.77	0.67	0.51	0.0013
50	0.533	1.9	0.55	0.91	0.68	0.0013
25	0.535	22.8	0.045			
12	0.537	9.7	0.11			

Note: Cv corrected to 20°C, results have been corrected for equipment deformation

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Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 26/07/2024

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Appendix J

CPT Data



Humber Gateway

Static Cone Penetration Testing Report

2390182

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CENTRAL ALLIANCE GENERAL NOTES

Project No.: 2390182

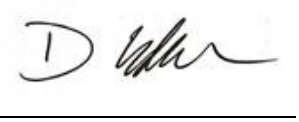
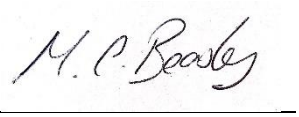
Title: Humber Gateway

Client: Mayer Environmental

Date: July 2024

Office: Central Alliance Preconstruction Services Limited, (Part of RSK Environment Limited), Alliance House, South Park Way, Wakefield 41 Business Park, Wakefield, WF2 0XJ

Status: 2390182-FAC-001-REV-01

Author	Daniel Halton	**Technical reviewer**	Thomas Goldsby-West
Signature		Signature	
Project manager	Maria Beasley	**Quality reviewer**	Sean Blaney
Signature		Signature	

Revision control sheet

Revision reference	Date	Reason for revision	Amended by:	Approved by:

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1 INTRODUCTION

1.1 Commissioning

Central Alliance Pre-Construction Services Limited (Central Alliance) was instructed by Mayer Environmental to undertake intrusive ground investigations.

The scope of the investigation was designed by the designer with final exploratory hole locations agreed between the client and Central Alliance, following consideration of the existing site conditions and site access restrictions.

1.2 Objectives

The aim of this report is to present the in situ Soil conditions and derived geotechnical parameters obtained, during the ground investigation, from 7 Static Piezocone Penetration Tests (CPTu) and 2 Seismic CPT Tests (SCPT).

1.3 Limitations

This report presents a description of the site at the time of the fieldwork, results of the fieldwork and in-situ testing undertaken, strata encountered and geotechnical test results.

Any of the comments and opinions contained within this report, are based on the information obtained by Central Alliance during the investigation.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been considered by this report. Responsibility cannot be accepted for conditions at the site not revealed by the investigation and confirmation of intermediate ground conditions between exploratory holes should be considered if deemed necessary.

Unless instructed by the client, Central Alliance is not obliged to and disclaims any obligation to update the report for events taking place after the date on which this investigation was undertaken.

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3 FIELD WORK

3.1 Completed Works

- 10 number of CPTu tests with real-time temperature compensation.
- 2 P- and S- seismic wave CPT tests.
- Factual Report with measure and interpreted parameters

3.1.1 Equipment Used

Type	ID	Date of Service / Calibration
200KN Crawler CPT Rig	CA17	08/01/2024
15cm² Piezocone (u2)	71447	21/11/2023
Seismic SDMT Cone	SN907	28/10/2023

3.1.2 Cone Calibration

The CPTu load cells and pore pressure transducer are calibrated regularly by the manufacturer adhering to BS EN ISO 224576-1:2012. Appendix (C) contains cone calibration certificates for all cones used on this project.

3.1.3 CPTu Pore Pressure Transducer Saturation

The u2 position was used with a HDPE filter which had been vacuum saturated with glycerine oil of viscosity 1412mPas.

3.1.4 Summary of Field Work

Testing was carried out by a 200kn tracked CPT rig. Where shallow refusals were met, the clients onsite represent was advised, retests were carried out as agreed with client. Appendix (A) includes final depths and refusal criteria as determined by the operator.

3.2 Methodology

All testing carried out adhered strictly to BS EN ISO 224576-1:2012.

Before each test is started the operator will take a zero value of the probe before loading, this will be compared with the unloaded zero values at the end of the test to ensure the sensors have not experienced any significant drift during the push. The push will be completed, at speeds not exceeding 2.2cm/s, in 1m stokes taking continuous readings. The readings on the probe are transmitted via the data cable to the datalogger and can be viewed in real-time on the computer.

The test is ended when the specified depth is reached or when the operator believes the equipment will be damaged by continuing.

3 DATA PROCESSING

3.1 Applied Corrections

3.1.1 Corrected Cone Resistance (q_t)

During the push excess pore pressure acts on the tip of the probe due to unequal area effect. Pore pressure acts behind the tip of the probe with an unequal force than on the tip affecting qc. The difference between qc and qt is largest when in low strength soils with a high excess pore pressure, such as very soft clays. This report uses the correction defined by Lunne et al., 1997:

$$qt = qc + \left(u_2(1-\alpha)\right)$$

Where a is the cone area ratio.

The cone area ratio for this project is 0.75. And can be found on the cone calibration sheet in appendix B.

3.1.2 Corrected sleeve friction, (f_t)

Sleeve friction corrected for pore water pressure effects at either end of the friction sleeve, due to the geometry of the sleeve, there is closer to equal pressures at either end therefore the effect is often negligible.

3.1.3 Depth Correction

An automatic depth correction is applied to all tests, to show the data relative to the vertical axis, accounting for inclination. This completed in accordance with ISO 22476-1:2012.

3.2 DERIVED PARAMETERS

The following table presents the derived parameters.

DGD Field Name	Symbol	Unit
Penetration Rate		
Bulk Unit Weight	γ_b	kN/m^3
In Situ Pore Pressure	u_o	kPa
Excess Pore Pressure	Δu	kPa
Normalised Excess Pore Pressure	Normalised Δu	
Slope Indicator	a	deg
Total Stress	σ_{vo}	kPa
Effective Stress	σ'_{vo}	kPa
Total Cone Resistance	q_t	MPa
Total Cone Resistance Moving Average		MPa
Total Cone Resistance Moving Average Inc		MPa

DGD Field Name	Symbol	Unit
Net Cone Resistance	q_n	MPa
Corrected Sleeve Friction	f_t	kPa
Friction Ratio	R_f	%
Normalised Friction Ratio	F_r	%
Normalised Cone Resistance	Q_t	-
Stress Normalised Cone Resistance	q_{t1}	-
Pore Pressure Ratio	B_q	-
Differential Pore Pressure Ratio	DPPR	-
Dimensionless Penetration Resistance	$Q_t(1-B_q)+1$	-
Shear Wave Velocity	Vs	m/s
Compressional Wave Velocity	Vp	m/s

3.3 Calculated Geotechnical Parameters

3.3.1 Soil Behaviour Type

The Soil behaviour type can be provided based on the following eight interpretation methods:

- Begemann 1965
- Eslami Fellenius 1997
- Ramsey 2002
- Robertson 1990
- Robertson 1990 Extrapolated (axis extrapolated out one order of magnitude)
- Robertson et al. 1986
- Schmertmann 1978
- Schneider et al. 2008 (defined by formula in paper's table 6)

The Default for reporting, unless otherwise stated is Robertson 1990 and Robertson et al. 1986.

3.3.2 Angle of friction

Soil friction angle is a shear strength parameter of soils. Its definition is derived from the Mohr-Coulomb failure criterion, and it is used to describe the friction shear resistance of soils together with the normal effective stress. φ' is derived for uncemented coarse grained soils by correlations with empirical data.

3.3.2.1 Friction Angle 1

The angle of internal friction of mixed soils (Φ') in Friction Angle 1 is defined as:

$$\Phi' = C_{1º} \cdot B_{C_{2q}} \cdot [C_3 + C_4 \cdot B_q + logQ_t]$$

Mayne and Campanella (2005), NCHRP Synthesis 368 pp 38-39

Where:

C1 is 29.5

*C*2 is 0.121

*C*3 is 0.256

*C*4 is 0.336

This correlation of *Φ'* is only applicable for 0.1<*Bq*<1.0 and hence will only be calculated if *Bq* in the Pore Pressure Ratio field on the same row lies within this range.

3.3.2.2 Friction Angle 2

The angle of internal friction of sands (Φ') in Friction Angle 2 is defined as:

$$\Phi' = \tan - 1(\mathrm{C1} + \mathrm{C2} \cdot \log({}^{\mathrm{qt}}/_{\sigma'\mathrm{v0}}))$$

Robertson and Campanella (1983), NCHRP Synthesis 368 p 38

Where:

C1 is 0.10

C2 is 0.38

This correlation of Φ' is only applicable for Sands and hence will only be calculated if the Soil Type is coarse or mixed.

3.3.2.3 Friction Angle 3

The angle of internal friction of sand (Φ') in Friction Angle 3 is defined as:

$$\Phi' = \mathrm{C1} + \mathrm{C2} \cdot \log(\mathrm{qt1})$$

Kulhawy and Mayne (1990), NCHRP Synthesis 368 p 38

Where:

C1 is 17.6°

C2 is 11.0°

This correlation of Φ' is only applicable for Sands and hence will only be calculated if the soil type is coarse or mixed.

3.3.3 Coefficient of Lateral Earth Pressure

3.3.3.1 Coefficient of Lateral Earth Pressure 1

Coefficient of Lateral Earth Pressure 1 *(K0)* for uncemented sands and well behaved clays in Coefficient Lateral Earth Pressure 1 is defined as:

$$\mathrm{K0} = (1 - \sin\Phi') \cdot \mathrm{OCR}^{\sin\Phi'}$$

$$\mathrm{MaximumK0} = \mathrm{KP} = 1 + \frac{\sin\Phi' 1}{\sin\Phi'}$$

Mayne (2007), NCHRP Synthesis 368 p 42

Where:

Φ' is taken from the Friction Angle 3 and Friction Angle 1.

3.3.3.2 Coefficient of Lateral Earth Pressure 2

Coefficient of Lateral Earth Pressure 2 (K0) for sand in Coefficient Lateral Earth Pressure 2 is defined as:

$$K0 = C1 \cdot (\frac{qt}{\sigma_{atm}})C2 \cdot (\frac{\sigma atm}{\sigma'_{v0}})C3 \cdot OCR^{C4}$$

Mayne (2007), NCHRP Synthesis 368 p 43

Where:

C1 is 0.192

C2 is 0.22

C3 is 0.31

C4 is 0.27

3.3.3.3 Coefficient of Lateral Earth Pressure 3

Coefficient of Lateral Earth Pressure 3 (K0) for fine grained soils in Coefficient_Lateral_Earth_Pressure_3 is defined as:

$$K_0 = C_1 \cdot \left(\frac{q_t - \sigma_{v0}}{\sigma'_{v0}}\right)$$

Kulhawy and Mayne (1990), CPT Guide p 32

Where:

C1 is 0.1

3.3.4 Coefficient of volume change

The coefficient of volume change 1 (mv) in Coefficent Volume Change 1 is defined as:

$$m_v = \frac{1}{M}$$

CPT in Geotechnical Practice p 71

Where:

M the constrained modulus.

3.3.5 Compression Index

The Compression Index 1 (Cc) in Compression Index 1 is defined as:

$$C_c = \frac{2.3(1+e) \cdot \sigma'_{v0}}{M}$$

CPT in Geotechnical Practice p 71

Where:

e is the Void Ratio and is stored in the Void Ratio field.

M is the constrained modulus and is taken from the Constrained Modulus 1 field.

3.3.6 Constrained Modulus

3.3.6.1 Constrained Modulus 1

The constrained modulus 1 (M) in Constrained Modulus 1 is defined as:

$$M = C_1 \cdot (q_t - \sigma_{vo})$$

Kulhawy and Mayne (1990), NCHRP Synthesis 368 p 33, CPT in Geotechnical Practice p 72

Where:

C1 is 8.25

3.3.6.2 Constrained Modulus 2

The constrained modulus 2 (M) in Constrained Modulus 2 is defined as:

$$M = C_1 \cdot G_0$$

Burns and Mayne (2002), NCHRP Synthesis 368 pp 33-34

Where:

C1 is 0.02 for organic plastic clays, up to 2 for over consolidated quartz sands in the published literature.

G0 is taken from Small Strain Shear Modulus 2.

3.3.7 Effective Cohesion

The cohesion *(c')* in Effective Cohesion 1 is defined as:

$$c' = C_1 \cdot \sigma'_p$$

Mayne and Stewart (1988), Mesri and Abdel-Ghaffar (1993), NCHRP Synthesis 368 p 44

Where:

C_1 is 0.02 in the published formula.

σ'_p is taken from Preconsolidation Stress.

3.3.8 Preconsolidation Stress and Overconsolidation Ratio

3.3.8.1 Preconsolidation Stress 1

The Preconsolidation Stress 1 (σ'_p) of clay defined as:

$$\sigma'_p = C_1 \cdot (q_t - \sigma_{v0})$$

Mayne (1995), Demers and Leroueil (2002), NCHRP Synthesis 368 p 34

Where:

C_1 is 0.33

3.3.8.2 *Preconsolidation Stress 2*

The Preconsolidation Stress 2 (σ'p) of clay is defined as:

$$\sigma'_p = C1 \cdot \Delta u$$

Chen and Mayne (1996), NCHRP Synthesis 368 p 34

Where:

C1 is 0.53

3.3.8.3 *Preconsolidation Stress 3*

The Preconsolidation Stress 3 (σ'p) of clay is defined as:

$$\sigma'_p = C_1 \cdot (q_t - u_2)$$

Mayne (2005), NCHRP Synthesis 368 p 35

Where:

C1 is 0.6.

3.3.8.4 *Preconsolidation Stress 4*

The Preconsolidation Stress 4 (σ'p) of clay is defined as:

$$\sigma' p = C1 \cdot Q_t^{C2} \cdot \sigma' v0$$

Robertson (2009), Guide to CPT p 31

Where:

C1 is 0.25.

C2 is 1.25.

3.3.8.5 *Preconsolidation Stress 5*

The Preconsolidation Stress 5 (σ'p) of sand is defined as:

$$\sigma' p = [\frac{C1 \cdot (qt/\sigma_{atm})C2}{(1 - sin\Phi') \cdot (\sigma' v0/\sigma_{atm})C3}]^{\frac{1}{sin\Phi' - C4}} \cdot \sigma'_{v0}$$

Mayne (2005), NCHRP Synthesis 368 p 35

Where:

C1 is 0.192.

C2 is 0.22.

C3 is 0.31.

C4 is 0.27.

Φ' is taken from Friction_Angle_3

3.3.8.6 *Preconsolidation Stress 6*

The Preconsolidation Stress 6 (σ'p) of all soil types is defined as:

$$\sigma'p = C1 \cdot \sigma_{atm}^{C2} \cdot (G0)^{C3} \cdot \sigma'^{C4}_{v0}$$

Mayne (2007), NCHRP Synthesis 368 pp 37

Where:

σ'p, σatm, G0 and σ'v0 are in kPa

C1 is 0.101

C2 is 0.102

C3 is 0.478

C4 is 0.420

G0 is taken from Small Strain Shear Modulus 2

3.3.8.7 *Overconsolidation Ratio*

Overconsolidation ratio is defined as the maximum historical effective stress and the current overburden effective stress.

The Overconsolidation ratio is defined as:

$$OCR = \frac{\sigma'p}{\sigma'v0}$$

OCR 1: σ'p is taken from Preconsolidation Stress 1.

OCR 2: σ'p is taken from Preconsolidation Stress 2.

OCR 3: σ'p is taken from Preconsolidation Stress 3.

OCR 4: σ'p is taken from Preconsolidation Stress 4.

OCR 5: σ'p is taken from Preconsolidation Stress 5.

OCR 6: σ'p is taken from Preconsolidation Stress 6.

3.3.9 Relative Density (D_r)

3.3.9.1 Relative Density 1

$$D_r = \frac{1}{C_2} \cdot \ln\left(\frac{q_c \cdot W_{ehr}}{C_0 \cdot (\sigma'_{v0})^{C_1}}\right) \cdot 100$$

Baldi et al. (1986) and Al-Homoud and Wehr (2006), CPT in Geotechnical Practice p 83

Where:

qc and σ'_{v0} are in kPa

C0 value for normally consolidated 157, over consolidated 181

C1 is 0.55.

C2 is 2.46

W_{ehr} is the Wehr Correction for Calcareous Soils, this constant was suggested in Al-Homoud and Wehr (2006). If the field is empty the default is 1.

3.3.9.2 Relative Density 2

$$D_r = 100 \cdot \left[C1 \cdot \ln\left(\frac{\frac{q_c}{\sigma_{atm}}}{\sqrt{\frac{\sigma_{v0}}{\sigma_{atm}}}}\right) + C2\right]$$

Jamiolkowski et al. (2001), NCHRP Synthesis 368 pp 41-42

Where:

C1 is 0.268 for all Sands

C2 is −0.675 , for high compressibility and sands of carbonate or calcareous composition: C2≤1.0, for low compressibility: C2≥2.0.

3.3.9.3 Relative Density 3

$$D_r = \left[\frac{q_{C1}}{305 \cdot OCR^{0.18} \cdot (12 + 0.5 \cdot Log\left(\frac{t}{100}\right))}\right]^{0.5} \cdot 100$$

Kulhawy and Mayne (1990), CPT in Geotechnical Practice p 84

Where:

$q_{c1} = q_c / \sqrt{(\sigma'_{vo} - \sigma_{atm})}$

C1 is 0.91 for low compressibility, 1.0 for medium compressible sands, to 1.09 for highly compressible

t is time in years

3.3.10 Rigidity index

3.3.10.1 Rigidity index 1

Rigidity index 1 (Ir) for fine material is defined as:

$$I_r = exp[(\frac{C_1}{M} + C_2) \cdot (\frac{q_t - \sigma_{v0}}{q_t - u_2}) - C_3]$$

Mayne (2001), NCHRP Synthesis 368 p 46

Where:

C1 is 1.5

C2 is 2.925

C3 is 2.925

M is the Cam clay constant, slope of the critical state line and is defined as:

$$M = \frac{6 \cdot sin\Phi'}{3 - sin\Phi'}$$

3.3.10.2 Rigidity index 2

Rigidity index 2 (Ir) for fine material based on plasticity is defined as:

$$I_r = \frac{exp[C_1 \cdot (C_2 - PI)]}{[1 + ln\{1 + C_3 \cdot (OCR - 1)_{C_4}\}]_{C_5}}$$

Keaveny and Mitchel (1986), NCHRP Synthesis 368 p 46

Where:

C1 is 0.0435

C2 is 137

C3 is 0.385

C4 is 3.2

C5 is 0.8

PI is the Plasticity Index

OCR is taken from OCR 4

This correlation of Ir is calculated only when the Soil Type is fine.

3.3.11 Sensitivity

3.3.11.1 Sensitivity 1

The Sensitivity (S_t) is defined as:

$$S_t = \frac{N_s}{R_f}$$

Schmertmann (1978), Rad and Lunne (1986), CPT in Geotechnical Practice p 68

Where:

Ns is a value between 5 and 10

3.3.11.2 Sensitivity 2

The Sensitivity (St) is defined as:

$$S_t = \frac{C1 \cdot (q_t - \sigma_{v0})}{f_s}$$

Mayne (2007), NCHRP Synthesis 368 p 41

C1 is 0.073

This correlation of St is based on the assumption of OCR<2, su=0.22·σ'p and σ'p=0.33(qt−σv0).

3.3.12 Shear Wave Velocity

3.3.12.1 Shear Wave Velocity 1

Shear Wave velocity (V_s) is defined as:

$$Vs = C1 \cdot log(fs) + C2$$

Mayne (2006), NCHRP Synthesis 368 p 30

Where:

fs is in kPa.

C1 is 118.8

C2is 18.5

3.3.12.2 Shear Wave Velocity 2

Shear Wave velocity 2 (V_s) is defined as:

$$Vs = (C1 \cdot log(qt) - C2)^{C3} \cdot (\frac{fs}{qt} \cdot 100)^{C4}$$

Hegazy and Mayne (1995), NCHRP Synthesis 368 p 30

qt and fs are in kPa.

C1 is 10.1

C2 is 11.4

C3 is 1.67

C4 is 0.3

3.3.12.3 Shear Wave Velocity 3 (CLAYS)

Shear Wave velocity 3 (V_s) is defined as:

$$\mathrm{Vs} = \mathrm{C1} \cdot (\mathrm{qt})^{\mathrm{C2}}$$

Mayne and Rix (1995), NCHRP Synthesis 368 p 30

Where:

qt and fs are in kPa

C1 is 1.75

C2 is 0.627

3.3.12.4 Shear Wave Velocity 4 (SANDS)

Shear Wave velocity 4 (Vs) is defined as:

$$Vs = C1 \cdot qt^{c2} \cdot (\sigma'_{v0})^{C3}$$

Baldi et al. (1989), NCHRP Synthesis 368 p 30

Where:

qt and σ'v0 are in MPa.

C1 is 277

C2 is 0.13

C3 is 0.27

3.3.13 Small-Strain Shear Modulus

3.3.13.1 Small-Strain Shear Modulus 1

Small-Strain Shear Modulus 1 (G_0) is defined as:

$$G_0 = C_1 \cdot \left(\frac{q_c}{\sqrt{\sigma'_{v0}}}\right)^{C_2} \cdot q_c$$

Rix and Stokoe (1992), CPT in Geotechnical Practice p 94

Where:

qc, σ'v0 and G0 are in kPa.

C1 is 1634

C2 is -0.75

This correlation of G0 is calculated only when the Soil Type is Coarse or Mixed.

3.3.13.2 Small-Strain Shear Modulus 2

Small-Strain Shear Modulus 2 (G0) is defined as:

$$G_0 = \frac{\gamma_{bulk}}{g} \cdot {V_s}^2$$

Elastic theory, CPT in Geotechnical Practice p 74 and 94, NCHRP Synthesis 368 p 31

Where:

Vs is taken from the Shear Wave Velocity 1, or extrapolated shear wave velocities.

γ_{bulk} is taken from Bulk Unit Weight

This correlation of G0 is applicable to all soil types.

3.3.14 Soil Behaviour Type Index

3.3.14.1 Soil Behaviour Type Index 1

The soil behaviour type index (Ic) is defined as:

$$Ic = ((C1 - log_{10}Qt)^2 + (log_{10}Fr + C2)^2)^{0.5}$$

$$Qt = qc - \sigma_{v0}Pa(\frac{Pa}{\sigma'_{v0}})^n$$

$$(\frac{Pa}{\sigma'_{v0}}) \leq 1.7$$

$$Fr = \frac{fs}{qt - \sigma_{v0}} \times 100\%$$

Ic is calculated using n=1, if Ic>Ic break, then it's been accepted, otherwise it's calculated using n=0.5. If Ic<Ic break break then it's accepted, otherwise it's calculated using n=0.7.

Robertson and Wride (1998)

Where:

C1 is 3.47

C2 is 1.22

3.3.14.2 Transition zones

A Transition Zone in Soil_Behaviour_Type_Index_Transition_1 for a certain depth is considered when:

2.3<Ic<2.9;

The rate of Ic change is rapid (slope of Ic vs. depth above and below of the current depth > 5) and crosses the Ic=2.6 line.

3.3.14.3 Soil Behaviour Type Index 2

The soil behaviour type index (Ic) is defined as:

$$I_c = \sqrt{[C_1 - log_{10}Q_t(1 - B_q)]_2 + [C_2 + C_3 \cdot log_{10}Fr]^2}$$

Jefferies and Davies (1993), NCHRP Synthesis 368 p 27

Where:

C1 is 3

C2 is 1.5

C3 is 1.3

3.3.14.4 Soil Behaviour Type Index 3

The non-normalised Soil Behaviour Type Index (ISBT) in is defined as:

$$((C_1 - log(\frac{(q_c)}{p_a}))^2 + (log(R_f) + C_2)^2)^{0.5}$$

Robertson (2010), CPT 10, paper 2-56

Where:

C1 is 3.47

pa is the Atmospheric pressure, 101.4 kPa

C2 is 1.22

3.3.14.5 Soil Behaviour Type Index 4

The soil behaviour type index (Ic):

$$I_c = \sqrt{[C_1 - log_{10}Q_t(1 - B_q) + 1]^2 + [C_2 + C_3 \cdot log_{10}F_r]^2}$$

Been and Jefferies (1992), Soil liquefaction, a critical state approach, pp. 206-207

Where:

C1 is 3

C2 is 1.5

C3 is 1.3

3.3.15 SPT N_{60} Value

3.3.15.1 SPT N_{60} Value 1

The SPT N_{60} is defined as:

$$N_{60} = \frac{qc}{C1 \cdot pa(1 - \frac{Ic}{C2})}$$

Robertson and Wride (1998), CPT in Geotechnical Practice p 151

Where:

C_1 is 8.5

C_2 is 4.6

p_a is the Atmospheric pressure, 100 kPa

3.3.15.2 SPT N_{60} Value 2

The SPT N_{60} is defined as:

$$N_{60} = \frac{qc}{C1 \cdot (1 - \frac{Ic}{C2})}$$

Jefferies and Davies (1993)

Where:

C1 is 0.85

C2 is 4.75

3.3.15.3 SPT Average N_{60} Value

The SPT average N_{60} value is a stepped average of SPT N_{60} for each defined depth interval step.

3.3.16 Undrained shear strength

3.3.16.1 Undrained shear Strength 1

Undrained Shear Strength 1 is defined as:

When qt has data,

$$su = \frac{(qt - \sigma_{v0})}{N_{kt}}$$

Otherwise,

$$su = \frac{(qc - \sigma_{v0})}{N_k}$$

NCHRP Synthesis 368 p 39

Different values for Nk and Nkt can be defined for when qc or qt is either greater than or equal to, or less than a defined break point.

3.3.16.2 Undrained shear Strength 2

Undrained Shear Strength 2 is defined as:

When qt has data,

$$su = \frac{(qt)}{N_{kt}}$$

Otherwise,

$$su = \frac{(qc - \sigma_{v0})}{N_{kt}}$$

3.3.16.3 Undrained shear Strength 3

Undrained Shear Strength 3 is defined as:

$$su = 0.5 \cdot sin\Phi' \cdot OCR^{\Lambda} \cdot \sigma'_{v0}$$

Wroth (1984), NCHRP Synthesis 368 p 39

Φ' is taken from Friction Angle 3 and Friction Angle 1

OCR is taken from Overconsolidation Ratio 1

Λ=1−CsCc , typically low to medium sensitivity clays are 0.7≤Λ≤0.8 , and sensitive and structured clays are 0.9≤Λ≤1.0, and is stored in the Undrained_Shear_Strength_3_Lambda field.

3.3.16.4 Undrained shear Strength 4

Undrained Shear Strength 4 is defined as:

$$su = C1 \cdot \sigma'_p$$

Trak et al. (1980), Terzaghi et al. (1996), NCHRP Synthesis 368 p 40

C1 is 0.22

3.3.16.5 Undrained shear Strength 5

Undrained Shear Strength 5 is defined as:

$$su = \frac{\Delta u}{N\Delta u}$$

Robertson (2009), pp 28-29

3.3.17 Unit Weight

3.3.17.1 Dry Unit Weight (γ_{dry})

Dry Unit Weight (γ_{dry}) is defined as:

$$\gamma_{dry} = C1 \cdot \log(qt) + C2$$

Mayne (2007), NCHRP Synthesis 368 p 31

Where:

C1 is 1.89

C2 is 11.8

3.3.17.2 Saturated Unit Weight 1

Saturated Unit Weight 1 (γ_{sat}) is defined as:

$$\gamma_{sat} = C1 \cdot log(Vs) - C2 \cdot log(z)$$

Mayne (2007), NCHRP Synthesis 368 p 31

Where:

Vs is in m/s and z is in m VS is taken from shear wave velocity 1 or extrapolated shear wave velocity.

C1 is 8.32

C2 is 1.61

z is Depth

3.3.17.3 Saturated Unit Weight 2

Saturated Unit Weight 2 (γ_{sat}) is defined as:

$$\gamma sat = C1 \cdot log(fs) + C2 \cdot Gs - C3$$

Mayne (2007), NCHRP Synthesis 368 p 32

Where:

fs is in kPa.

C1 is 2.6

C2 is 15

C3 is 26.5

Gs is Specific Gravity of Solids, typically 2.4 to 2.9

3.3.18 Young's Modulus

3.3.18.1 Small Strain Young's Modulus

Small Strain Young's Modulus 1 (E_0) is defined as:

$$E_0 = 2 \cdot (1 + v) \cdot G_0$$

Elastic theory, CPT in Geotechnical Practice p 74 and 94, NCHRP Synthesis 368 p 32

Where:

v = 0.2 is applied and can be varied in the Formula Tool. Published literature states: v'=0.2 applies for drained soils and vu=0.5 applies for undrained soils.

G0 is taken from Small Strain Shear Modulus 2.

This correlation of E0 is applicable to all soil types.

3.3.18.2 Young's Modulus 2

Young's Modulus2 (E_0) is defined as:

$$E_0 = \alpha q_c$$

CPT in Geotechnical Practice p 160, Figure 6.13

Where:

a is calculated from degree of loading, qc, effective stress and reduction factor

3.3.19 Liquid Fines Content

3.3.19.1 Fines content 1

Fines content 1 is based on the method by Robertson and Wride 1998.

$$I_c < 1.26 : FC = 0\%$$
$$1.26 \leq I_c \leq 3.5 : FC(\%) = 1.75 I_c^{3.25} - 3.7$$
$$3.5 < I_c : FC = 100\%$$

I_c is the soil behaviour type index 1, NCEER, and is stored in the *Soil_Behaviour_Type_Index_1_NCEER* on *CPT_DATA_LIQUEFACTION*.

3.3.19.2 Fines content 2

Fines content 2 is based on the method by Suzuki et al. 1998.

$$\mathrm{FC}(\%) = 2.8 \mathrm{I}_c^{2.6}$$

Soil liquefaction during earthquakes, p. 79

I_c is soil behaviour type index 1, NCEER, stored in the *Soil_Behaviour_Type_Index_1_NCEER* on *CPT_DATA_LIQUEFACTION*.

3.3.19.3 Fines content 3

Fines content 3 is based on the method by Boulanger and Idriss 2014.

$$FC(\%) = 80(I_c + C_{FC}) - 137$$

Soil liquefaction during earthquakes, p. 79

I_c is soil behaviour type index 1, NCEER, stored in the *Soil_Behaviour_Type_Index_1_NCEER* on *CPT_DATA_LIQUEFACTION*.

C_{FC} is a fitting parameter that can be adjusted based on site specific data and is stored in *Fines_Content_Fitting_Parameter* on *CPT_LIQ_POINT_PARAMETERS* / *CPT_LIQ_PROJECT_PARAMETERS*.

C_{FC} is varied between -0.29 and + 0.29 with $C_{FC} = 0.07$ approximates the Robinson et al. (2013) relationship for liquefiable soil along the Avon river in Christchurch, New Zealand.

3.3.20 Hydraulic Conductivity

3.3.20.1 Hydraulic conductivity 1

The hydraulic conductivity (permeability) method 1 ($K\ \ 1$) in *Hydraulic_Conductivity_1_Min* and *Hydraulic_Conductivity_1_Max* are defined in the following table. Soil Behaviour Type Robertson et al. 1986 q_c vs. R_f must be calculated for this correlation to be defined.

Zone	Soil Behaviour Type (SBT)	Range of hydraulic conductivity (Permeability) K (m/s)
1	Sensitive Fine grained	$3x10^{-9}$ to $3x10^{-8}$
2	Organic soils	$1x10^{-8}$ to $1x10^{-6}$
3	Clay	$1x10^{-10}$ to $1x10^{-9}$
4	Silty clay to clay	$1x10^{-9}$ to $1x10^{-8}$
5	Clayey silt to silty clay	$1x10^{-8}$ to $1x10^{-7}$
6	Sandy silt to clayey silt	$1x10^{-7}$ to $1x10^{-6}$
7	Silty sand to sandy silt	$1x10^{-6}$ to $1x10^{-5}$
8	Sand to silty sand	$1x10^{-5}$ to $1x10^{-4}$
9	Sand	$1x10^{-4}$ to $1x10^{-3}$
10	Gravelly sand to dense sand	$1x10^{-3}$ to 1
11	Very stiff fine-grained soil	$1x10^{-8}$ to $1x10^{-6}$
12	Very stiff sand to clayey sand	$3x10^{-7}$ to $3x10^{-4}$

3.3.20.2 Hydraulic conductivity 2

The hydraulic conductivity (permeability) method 2 ($K\ \ 2$) in *Hydraulic_Conductivity_2_Min* and *Hydraulic_Conductivity_2_Max* are defined in the following table. Soil Behaviour Type Robertson 1990 Extrapolated must be calculated for this correlation to be defined.

Zone	Soil Behaviour Type (SBT)	Range of hydraulic conductivity (Permeability) K (m/s)
1	Sensitive Fine grained	$3x10^{-9}$ to $3x10^{-8}$
2	Organic soils	$1x10^{-8}$ to $1x10^{-6}$
3	Clay	$1x10^{-10}$ to $1x10^{-9}$
4	Silty mixtures	$1x10^{-9}$ to $1x10^{-7}$
5	Sand mixtures	$1x10^{-7}$ to $1x10^{-5}$
6	Sands	$1x10^{-5}$ to $1x10^{-3}$
7	Gravelly sands to dense sands	$1x10^{-3}$ to 1
8	Very stiff sand to clayey sand	$1x10^{-8}$ to $1x10^{-6}$
9	Very stiff fine-grained soil	$1x10^{-8}$ to $1x10^{-6}$

3.3.20.3 Hydraulic conductivity 3

The hydraulic conductivity (permeability) method 3 ($K\ \ 3$) in *Hydraulic_Conductivity_3_Min* and *Hydraulic_Conductivity_3_Max* are defined in the following table. I_c is from *Soil_Behaviour_Type_Index_1*.

SBTn	Soil Behaviour Type	$K_{\min}\ (m/s)$	$K_{\max}\ (m/s)$	I_c
1	Sensitive Fine grained	$3x10^{-10}$	$3x10^{-8}$	NA
2	Organic soils - Clay	$1x10^{-10}$	$1x10^{-8}$	>3.6
3	Clay	$1x10^{-10}$	$1x10^{-9}$	2.95 to 3.6
4	Silt mixtures	$1x10^{-9}$	$1x10^{-7}$	2.6 to 2.95
5	Sand mixtures	$1x10^{-7}$	$1x10^{-5}$	2.05 to 2.60
6	Sand	$1x10^{-5}$	$1x10^{-3}$	1.31 to 2.05
7	San to Gravelly sand	$1x10^{-3}$	1	<1.31
8	Very dense / Stiff soil	$1x10^{-8}$	$1x10^{-3}$	NA
9	Very stiff fine-grained	$1x10^{-9}$	$1x10^{-7}$	NA

3.3.20.4 Hydraulic conductivity 4

The hydraulic conductivity (permeability) method 4 ($K\ \ 4$) in *Hydraulic_Conductivity_4* are defined in the following table. I_c is from *Soil_Behaviour_Type_Index_1*.

$$\text{When } 1.0 < I_c \leq 3.27, \qquad k = 10^{(0.952-3.04-I_c)}\ (m/s)$$

$$\text{When } 3.27 < I_c \leq 4.0, \qquad k = 10^{(-4.52-1.37-I_c)}\ (m/s)$$

3.3.21 State parameters

3.3.21.1 State parameter 1

Based on the method by Been et al. (1987), Ψ 1, in *State_Parameter_1* is calculated from:

$$\Psi = \frac{(\ln\ (\frac{Q_p}{k})}{m}$$

Soil liquefaction, a critical state approach, pp. 191-193

In which:

$Q_p = (\frac{3Q_t}{1_{2K_0}})$

Q_t is the normalised cone resistance, and is stored in *Normalised_Cone_Resistance* on CPT_DATA.

K_0 is the coefficient of lateral earth pressure, and is stored in Coefficient_Lateral_Earth_Pressure_1 on CPT_DATA_LIQUEFACTION.

k is stored in *Soil_and_Rigidity_Coefficient_k*.

m is stored in *Soil_and_Rigidity_Coefficient_m*.

3.3.21.2 State parameter 2

Based on the method by Shuttle and Jefferies (1998), the state parameter 2, Ψ 2, in State_Parameter_2 with constant rigidity index is calculated from:

$$\Psi = \frac{(\ln\left(\frac{Q_p}{k}\right)}{m}$$

In which:

$$Q_p = \left(\frac{3Q_t}{1+2K_0}\right)$$

$$k = \left[(3.79 - 1.12\ln(I_r))\left(1 + 1.06(M - 1.25)\right)\left(1 - 0.30(N - 0.2)\right)\left(\frac{H}{1000}\right)^{0.326}\left(1 - 1.55(\lambda - 0.01)\right)\right]^{1.45}$$

$$m = 1.45(1.04 + 0.46\ln(I_r))\left(1 - 0.4(M - 1.25)\right)\left(1 - 0.30(N - 0.2)\right)\left(\frac{H}{100}\right)^{0.15}(1 - 2.21(\lambda - 0.01))$$

Where:

Q_t is the normalised cone resistance, and is stored in *Normalised_Cone_Resistance* on CPT_DATA.

I_r is rigidity index and is stored in *Rigidity_Index* field.

K_0 is the coefficient of lateral earth pressure, and is stored in *Coefficient_Lateral_Earth_Pressure_1* on *CPT_DATA_LIQUEFACTION*.

M is the critical state ratio and is stored in *Critical_State_Ratio* field.

N is dilation parameter and is stored in *Dilation_Parameter* field.

H is plastic hardening modulus and is stored in *Plastic_Hardening_Modulus* field.

λ is slope of CSL line and is stored in *Lambda* field.

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5 APPENDIX A – CPT RESULTS TABLE

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

Daily Progress Report

Project Number:	**2390182**
Project Name:	Humber Gateway
Client:	Enviro Mayer
Date:	08-09/07/2024
Rig:	CA17
Operator:	RH

Test #	PointID	Predrill (m)	Final Depth (m)	Refusal Criteria	Operator Comments	Cone ID	Cone Area	Filter & Position	Friction Reducer	Groundwater depth	GW Depth Supplied by
1	CPT221	1.20	20.03	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
2	CPT215	1.20	16.78	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
3	CPT215A	1.20	5.00	Target Depth		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
4	CPT216	1.20	16.10	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
5	CPT217	1.20	16.20	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
6	CPT220	1.20	15.63	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
7	CPT220A	0.00	5.00	Target Depth		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
8	CPT219	1.20	16.24	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
9	CPT218	1.20	16.19	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes
10	CPT222D	0.00	17.27	Total Pressure		71447	15000	U2 HDPE	None	2.00	Assumed for calculation purposes

6 APPENDIX B – CPT PLOTS

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

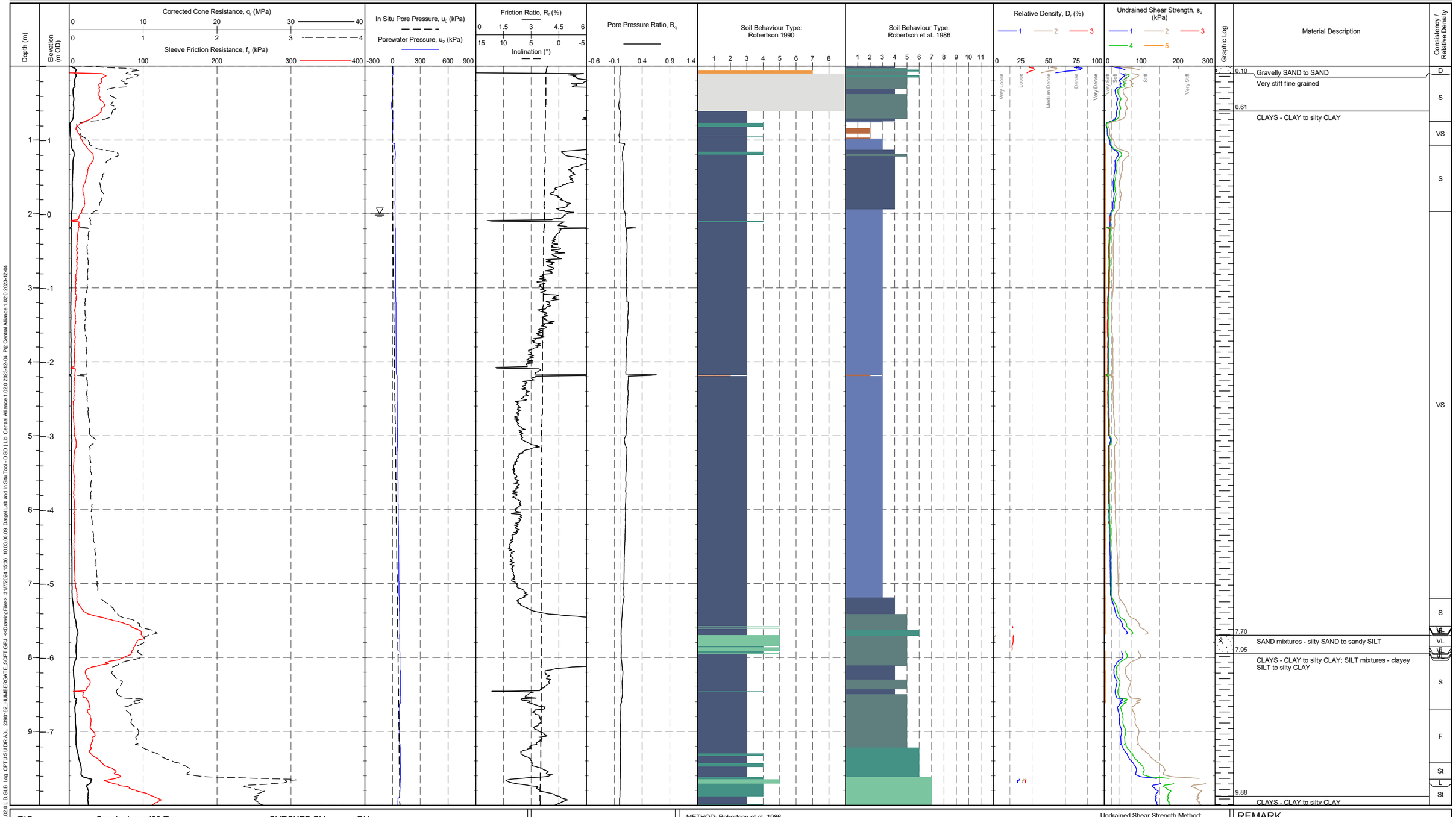
CPT LOG

PointID
CPT215

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523669.3 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412752.2 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.01 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

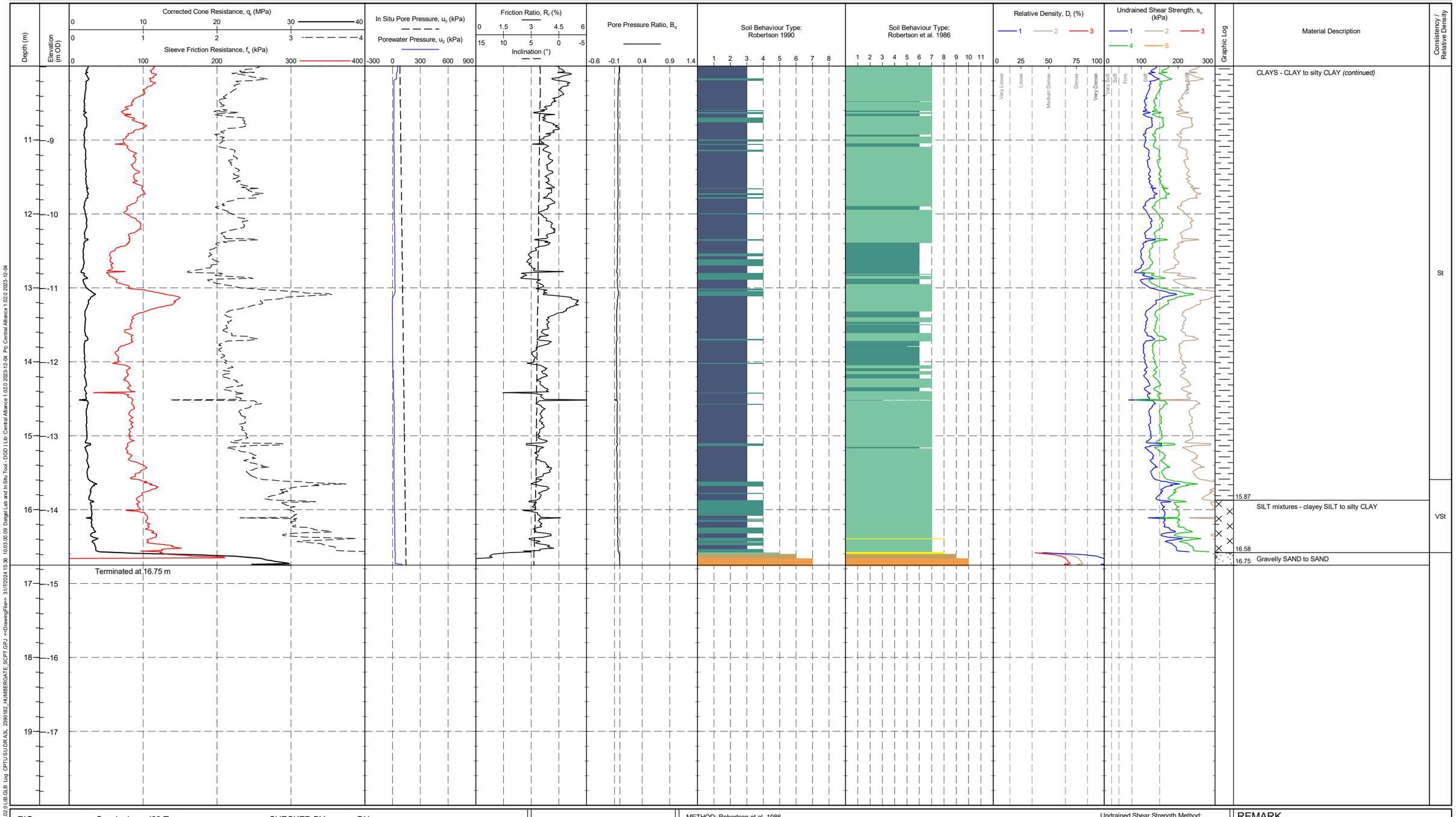
CPT LOG

PointID
CPT215

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523669.3 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412752.2 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.01 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

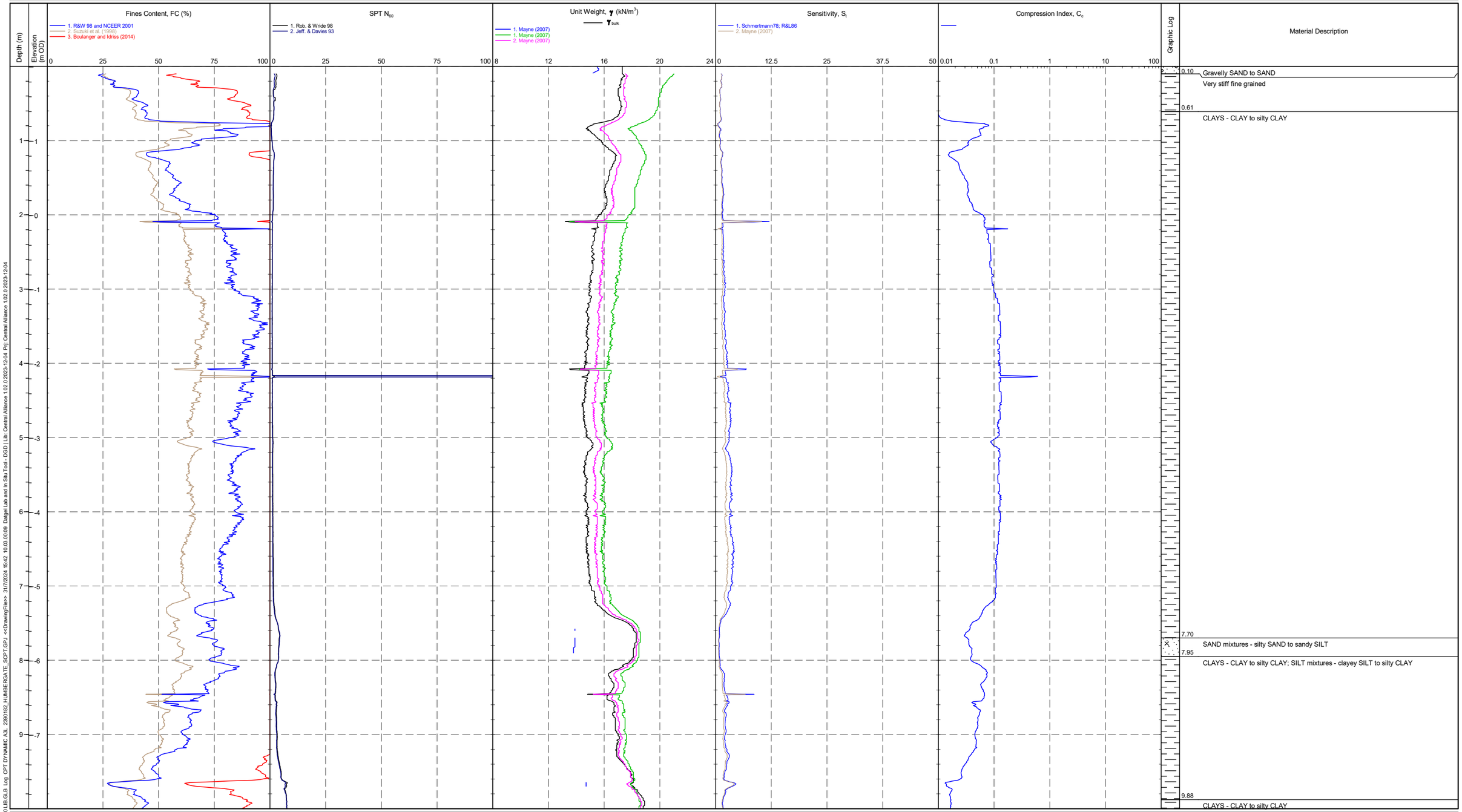
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT215

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

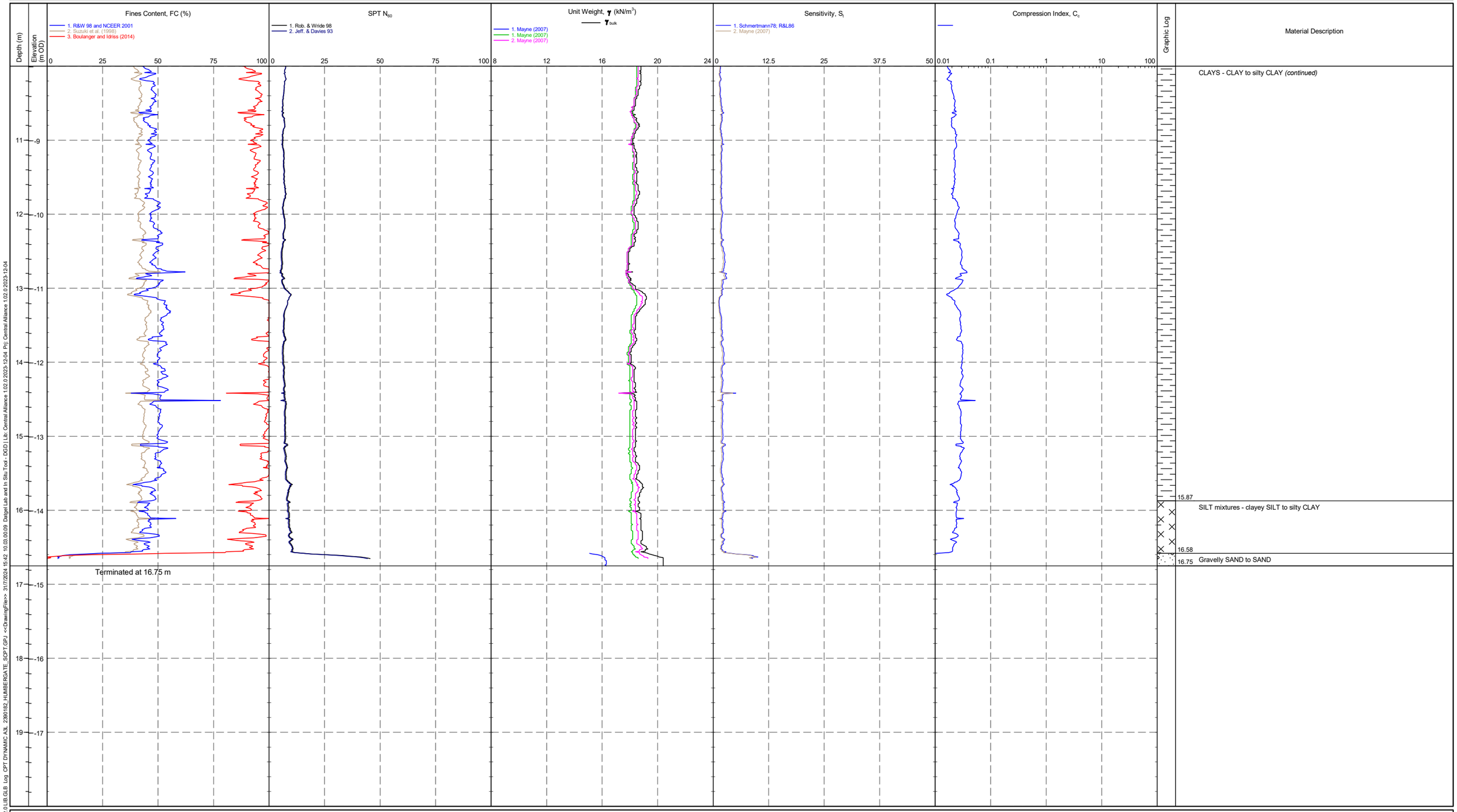
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

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CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

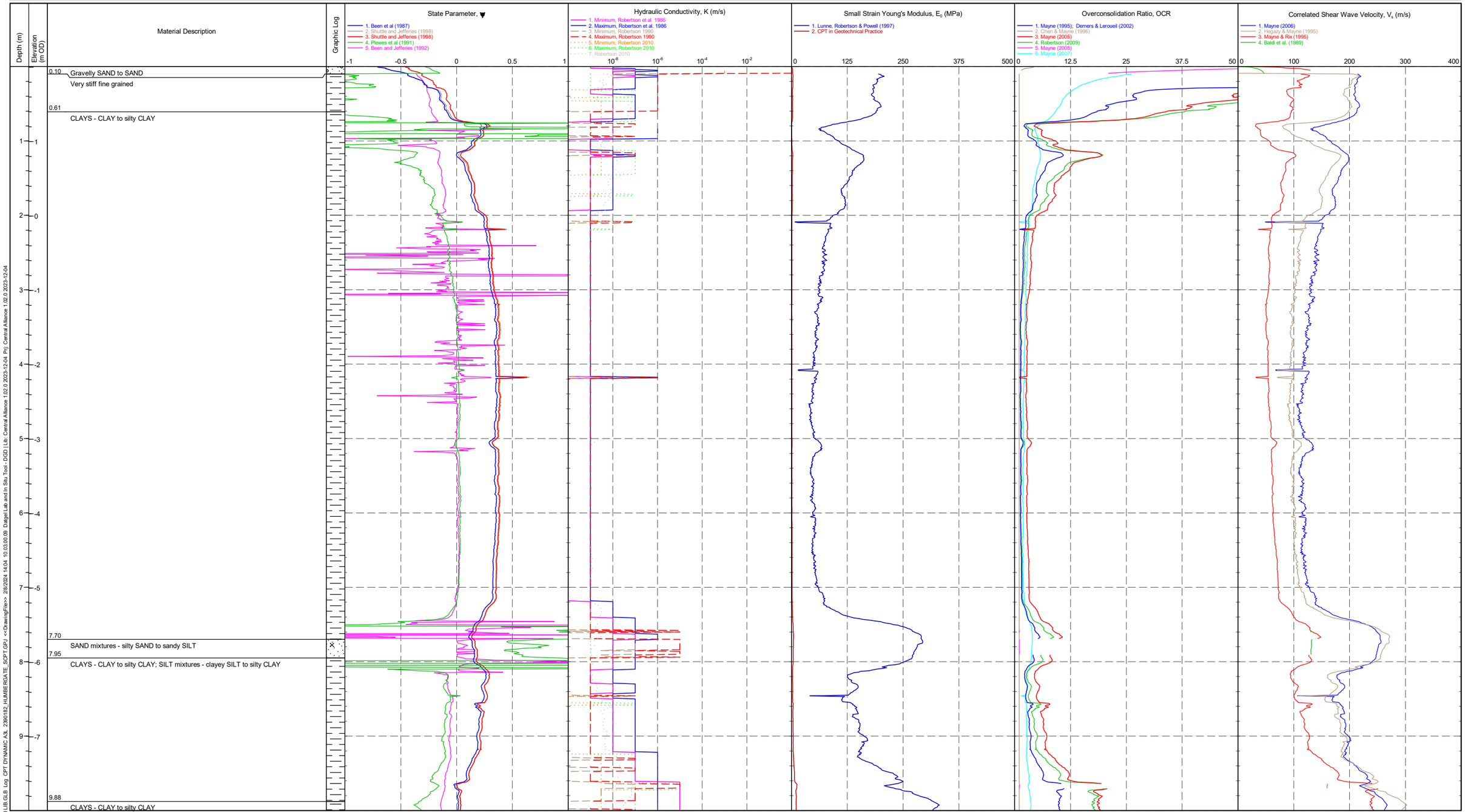
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

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CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:04 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

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CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

CLAYS - CLAY to silty CLAY *(continued)*

15.87 — SILT mixtures - clayey SILT to silty CLAY

16.58

16.75 — Gravelly SAND to SAND

Terminated at 16.75 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 | -0.5 | 0 | 0.5 | 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} | 10^{-6} | 10^{-4} | 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 | 125 | 250 | 375 | 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 | 12.5 | 25 | 37.5 | 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 | 100 | 200 | 300 | 400

Liq State Parameter Method:	Hydraulic Conductivity Method:	Youngs Modulus Method:	Overconsolidation Ratio Method:	Shear Wave Velocity Correlated Method:
1. Been et al (1987)	1. Minimum, Robertson et al. 1986	1. Lunne, Robertson & Powell (1997)	1. Mayne (1995); Demers & Leroueil (2002)	
2. Shuttle and Jefferies (1998)	2. Maximum, Robertson et al. 1986	2. CPT in Geotechnical Practice	2. Chen & Mayne (1996)	
3. Shuttle and Jefferies (1998)	3. Minimum, Robertson 1990		3. Mayne (2005)	
4. Plewes et al (1991)	4. Maximum, Robertson 1990		4. Robertson (2009)	
5. Been and Jefferies (1992)	5. Minimum, Robertson 2010		5. Mayne (2005)	
	6. Maximum, Robertson 2010		6. Mayne (2007)	

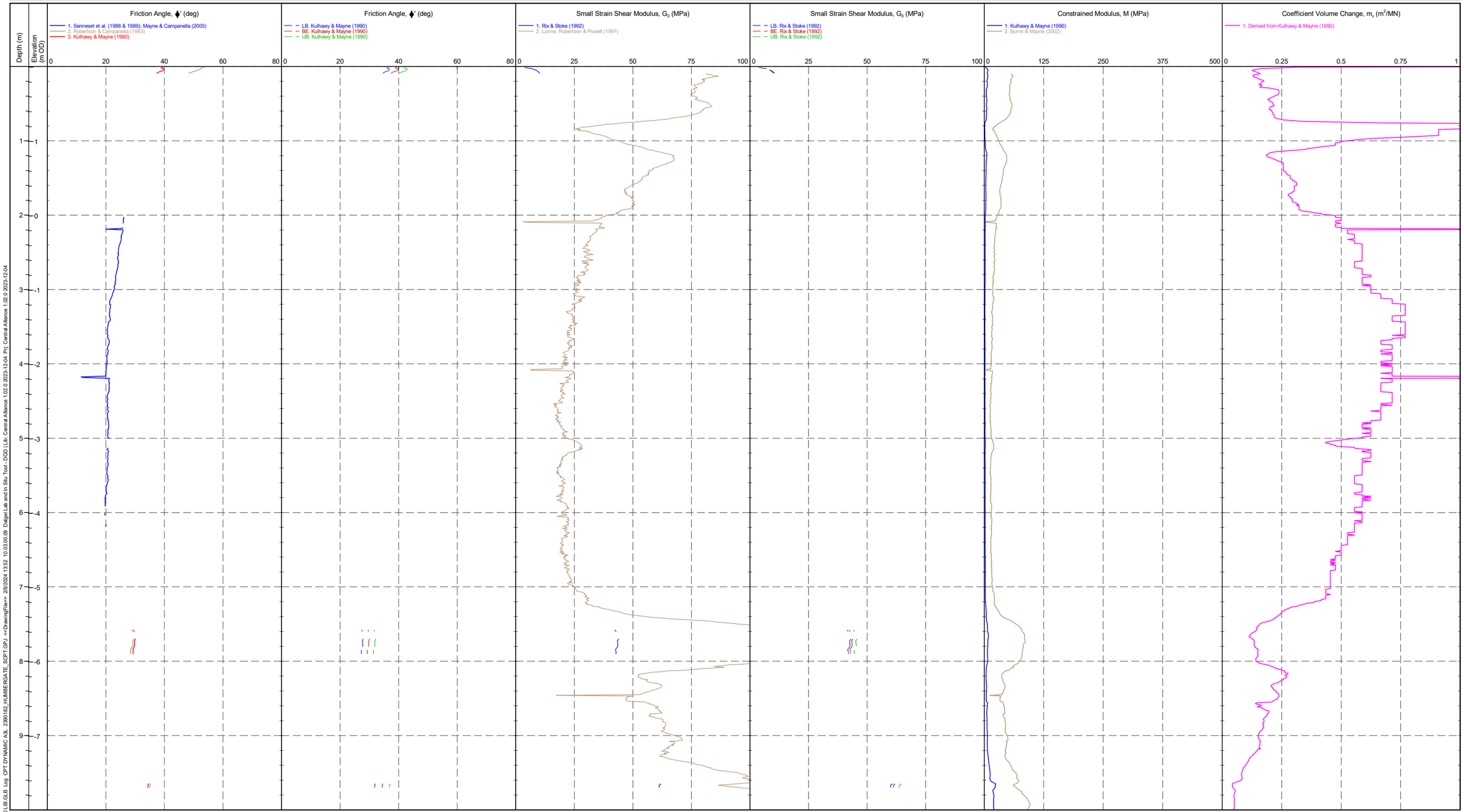
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT215

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

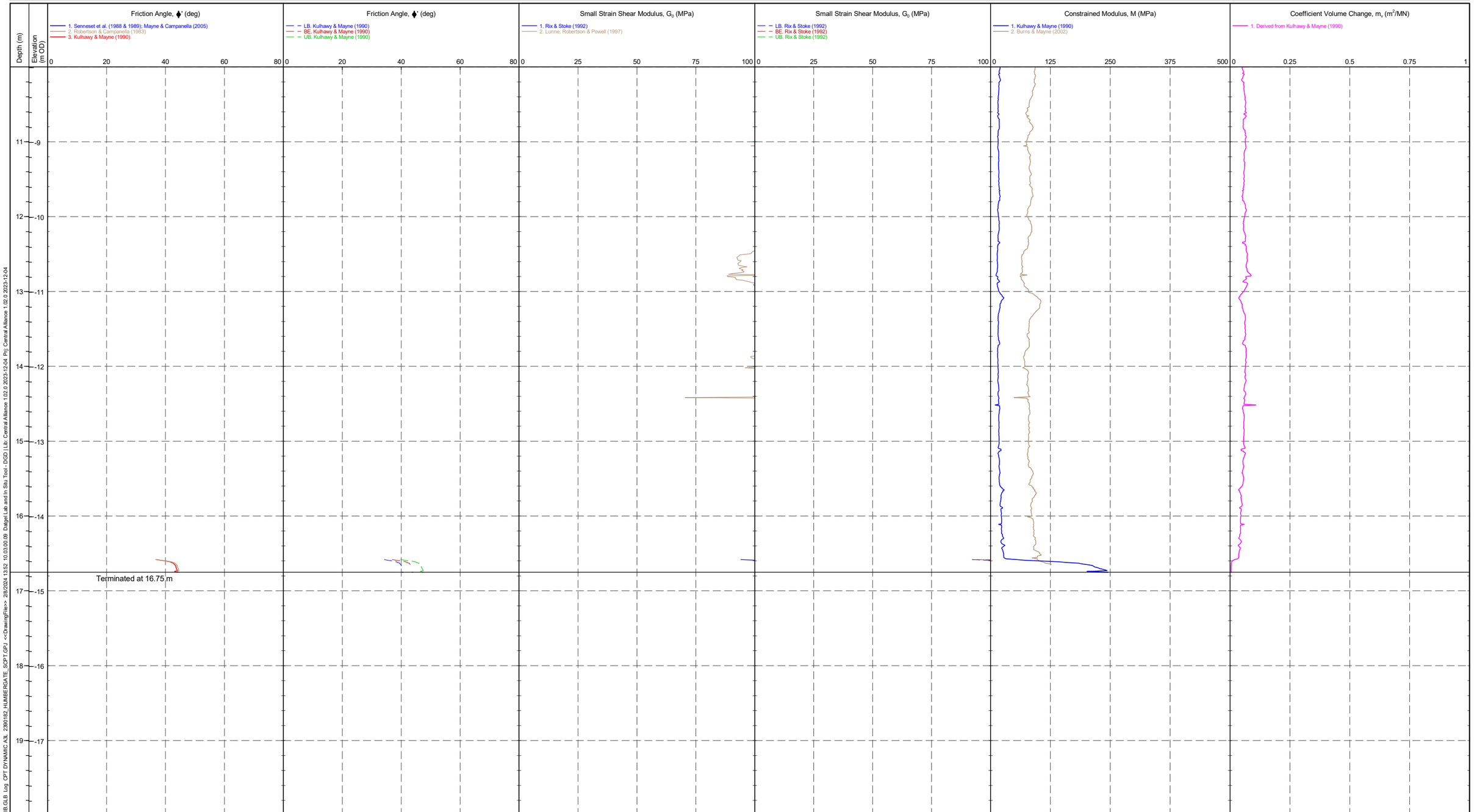
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT215

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

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1. Rix & Stoke (1992)
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LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

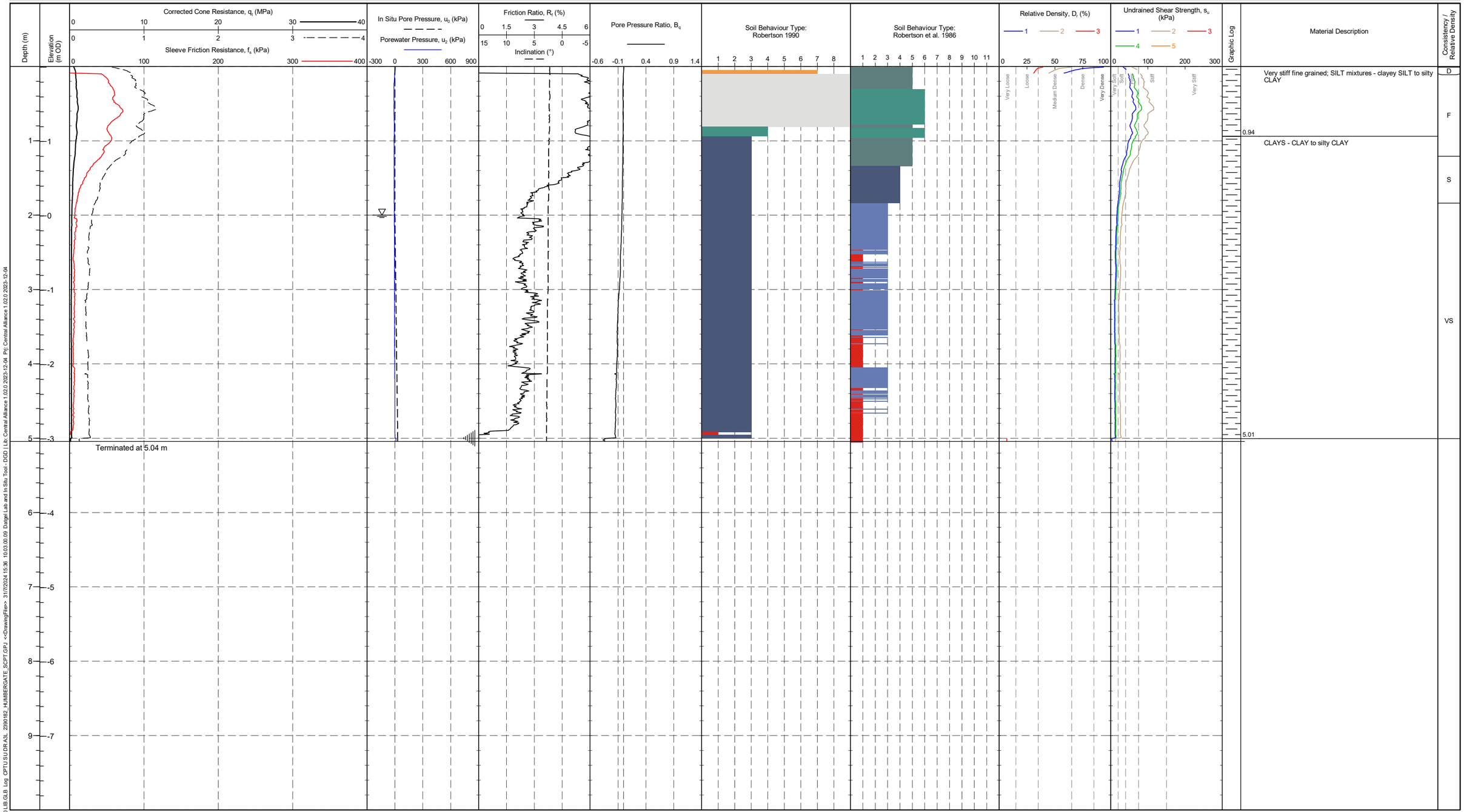
CPT LOG

PointID
CPT215A

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523669.3 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412752.2 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.01 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

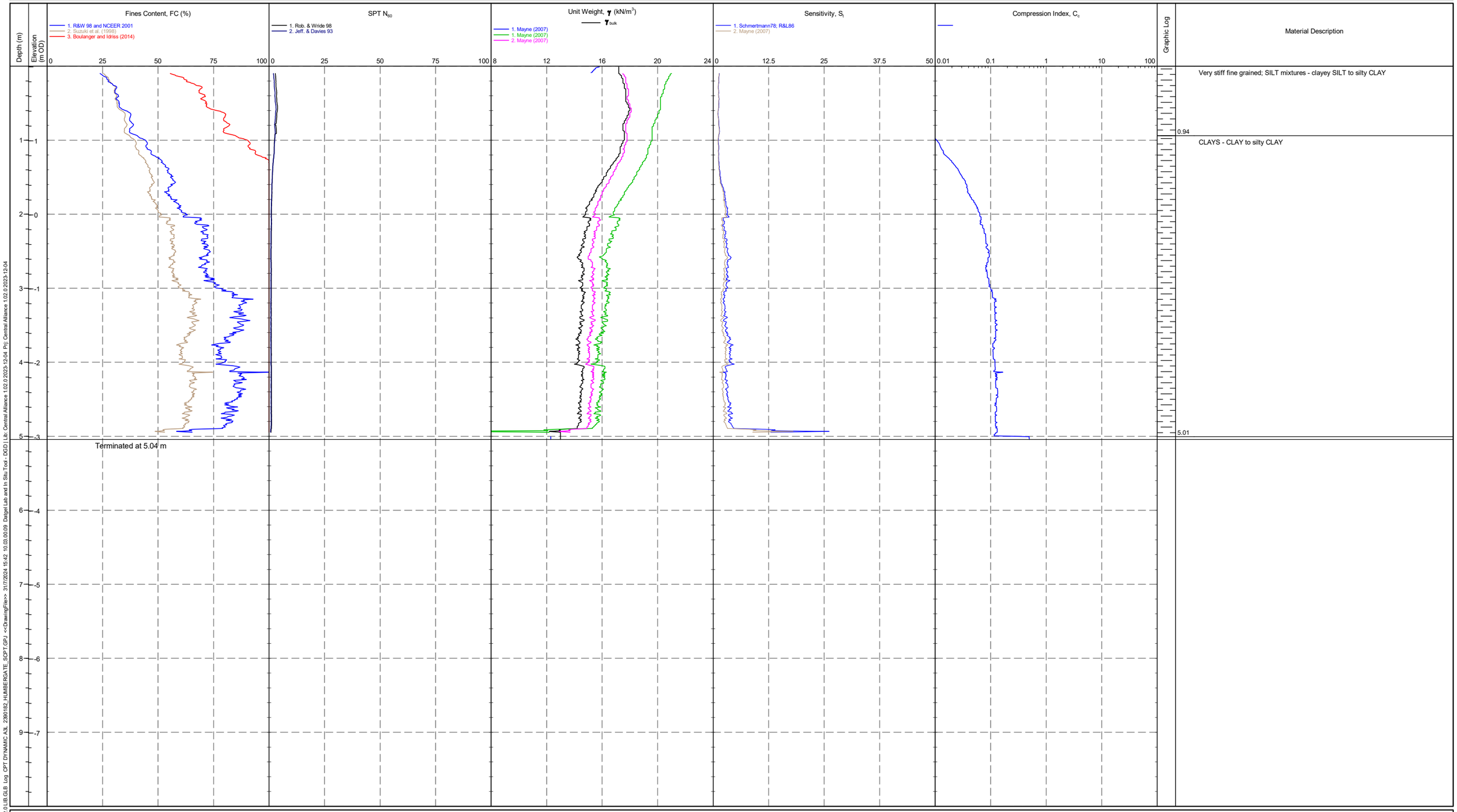
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT215A

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

GENTRAL ALLIANCE 1.02.0.LIB.GLB Log_CPT_DYNAMIC A3L_2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0.2023-12-04 Prj: Central Alliance 1.02.0.2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT215A

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

Very stiff fine grained; SILT mixtures - clayey SILT to silty CLAY

0.94

CLAYS - CLAY to silty CLAY

5.01

Terminated at 5.04 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)

Liq State Parameter Method:	Hydraulic Conductivity Method:	Youngs Modulus Method:	Overconsolidation Ratio Method:	Shear Wave Velocity Correlated Method:
1. Been et al (1987)	1. Minimum, Robertson et al. 1986	1. Lunne, Robertson & Powell (1997)	1. Mayne (1995); Demers & Leroueil (2002)	
2. Shuttle and Jefferies (1998)	2. Maximum, Robertson et al. 1986	2. CPT in Geotechnical Practice	2. Chen & Mayne (1996)	
3. Shuttle and Jefferies (1998)	3. Minimum, Robertson 1990		3. Mayne (2005)	
4. Plewes et al (1991)	4. Maximum, Robertson 1990		4. Robertson (2009)	
5. Been and Jefferies (1992)	5. Minimum, Robertson 2010		5. Mayne (2005)	
	6. Maximum, Robertson 2010		6. Mayne (2007)	

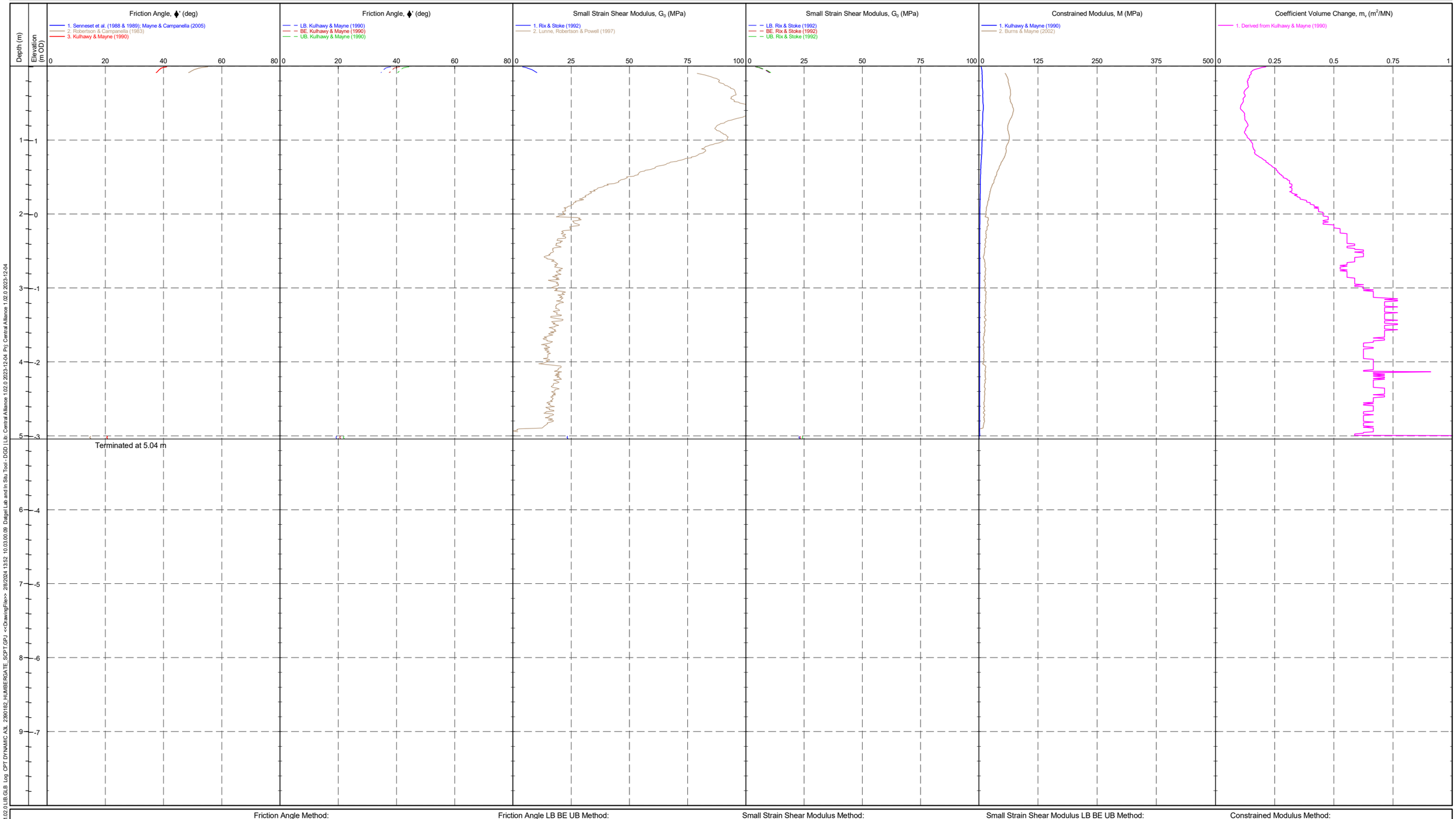
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT215A**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523669.3 m NORTHING : 412752.2 m COORD. SYS. : OSGB ELEVATION : 2.01 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

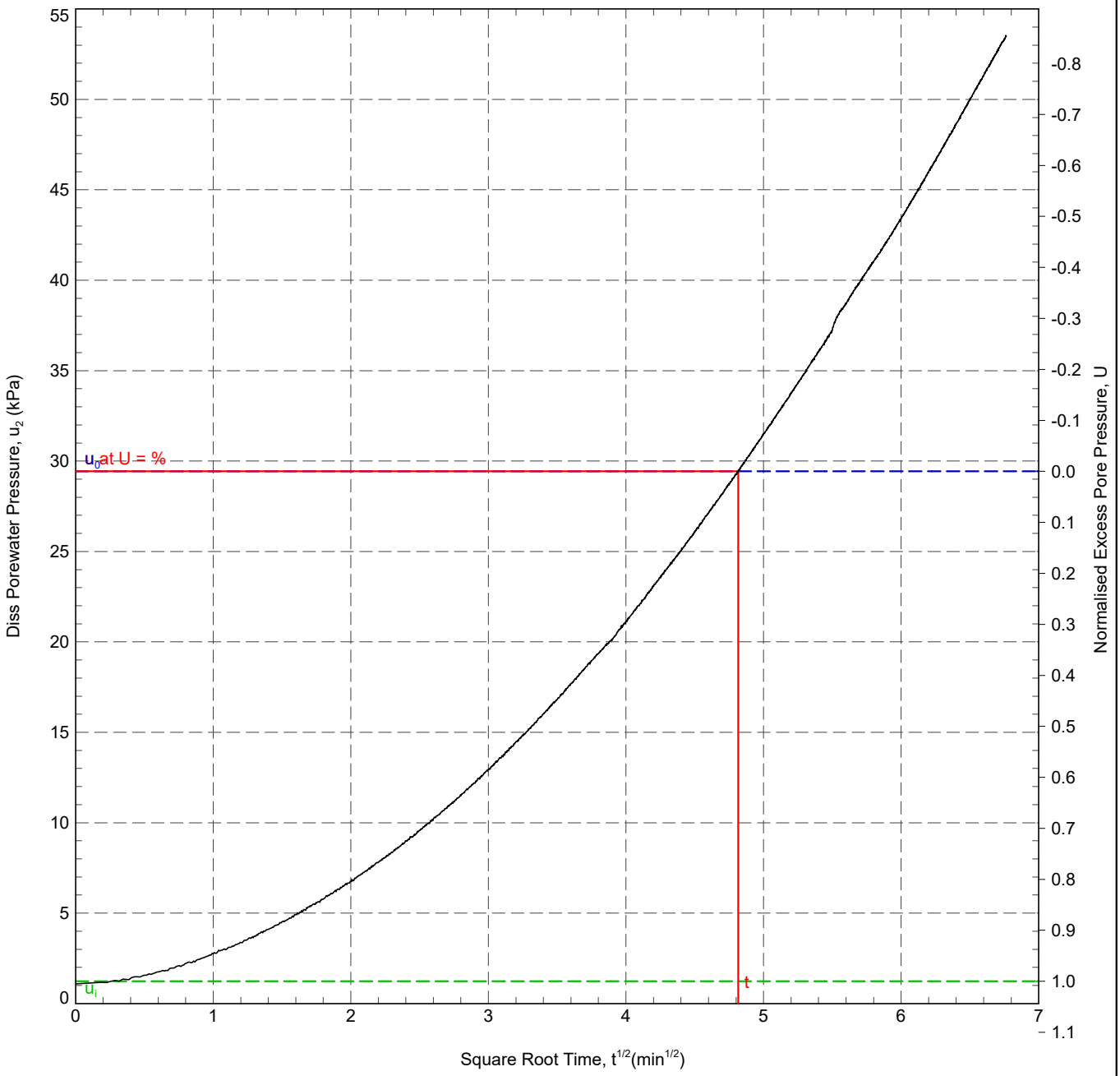
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

DISSIPATION TEST

Test ID
CPT215A - 5.00 m

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523669.3 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412752.2 m	DATE	: 08/07/24
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.01 m OD		



In Situ Pore Pressure, u_0:	29 kPa
Initial Pore Pressure, u_i:	1 kPa
Final Pore Pressure:	54 kPa
Dissipation Pressure:	29.4 kPa
Time for % Dissipation, t:	23.19 min

RIG	: ; Crawler based20 Ton;	ANALYSED BY	:	DATE:	REMARK
CONE TYPE	:	CHECKED BY	:	DATE:	
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	:	DATE:	
OPERATOR	:				

CENTRAL ALLIANCE 1.02.0 LIB.GLB Graph: PPDT PORE PRESSURE VS. SQR T A4P 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/8/2024 14:00 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

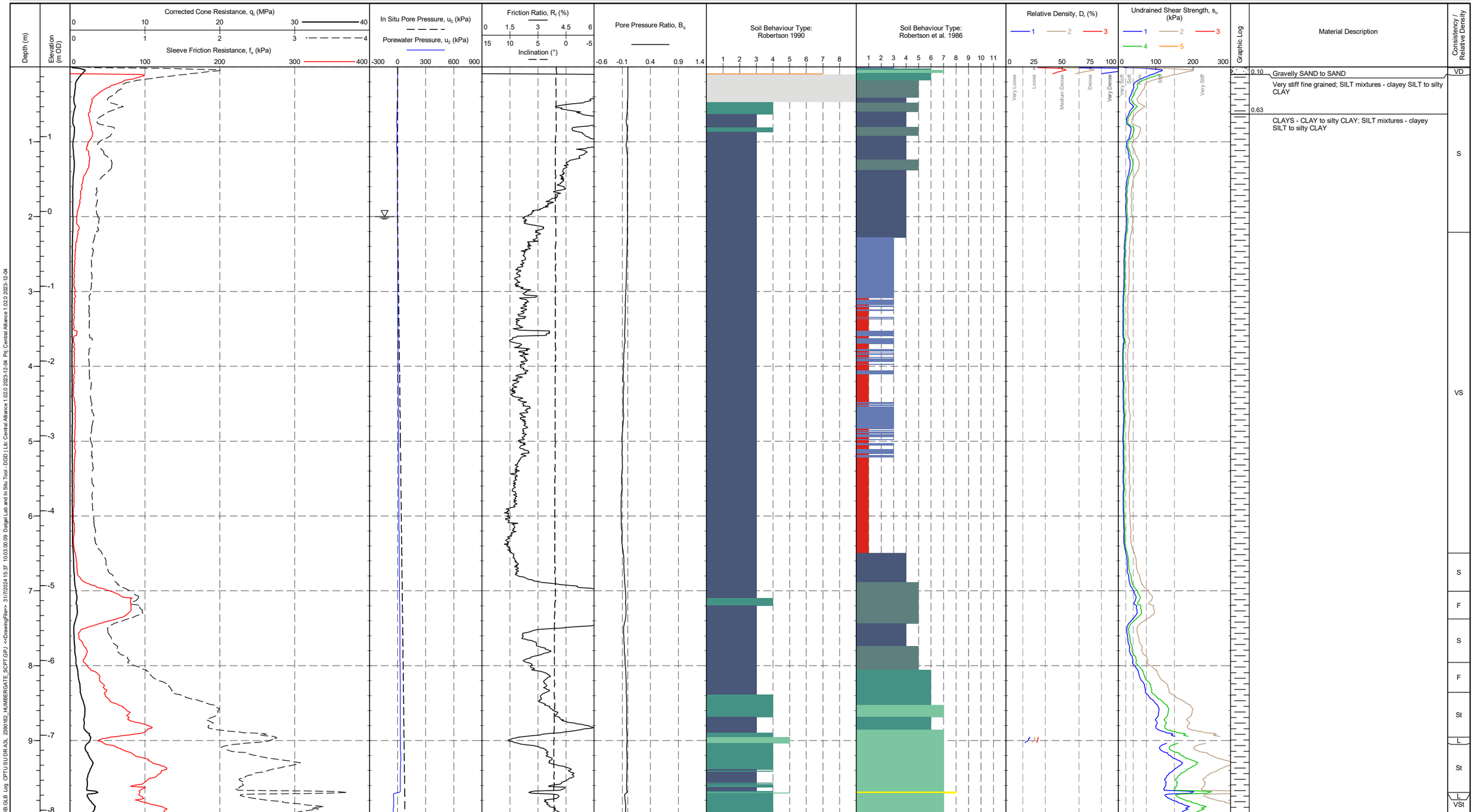
CPT LOG

PointID
CPT216

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523697.5 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412768.7 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.93 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_E/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:37 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523697.5 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412768.7 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.93 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
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6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m OD) | Corrected Cone Resistance, q_t (MPa) | Sleeve Friction Resistance, f_s (kPa) | In Situ Pore Pressure, u_0 (kPa) | Porewater Pressure, u_2 (kPa) | Friction Ratio, R_f (%) | Inclination (°) | Pore Pressure Ratio, B_q | Soil Behaviour Type: Robertson 1990 | Soil Behaviour Type: Robertson et al. 1986 | Relative Density, D_r (%) | Undrained Shear Strength, s_u (kPa) | Graphic Log | Material Description | Consistency / Relative Density

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

St

15.26

SANDS - clean SAND to silty SAND

VD

16.09

Terminated at 16.09 m

RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH		
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024		
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB		
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024		

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_c - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

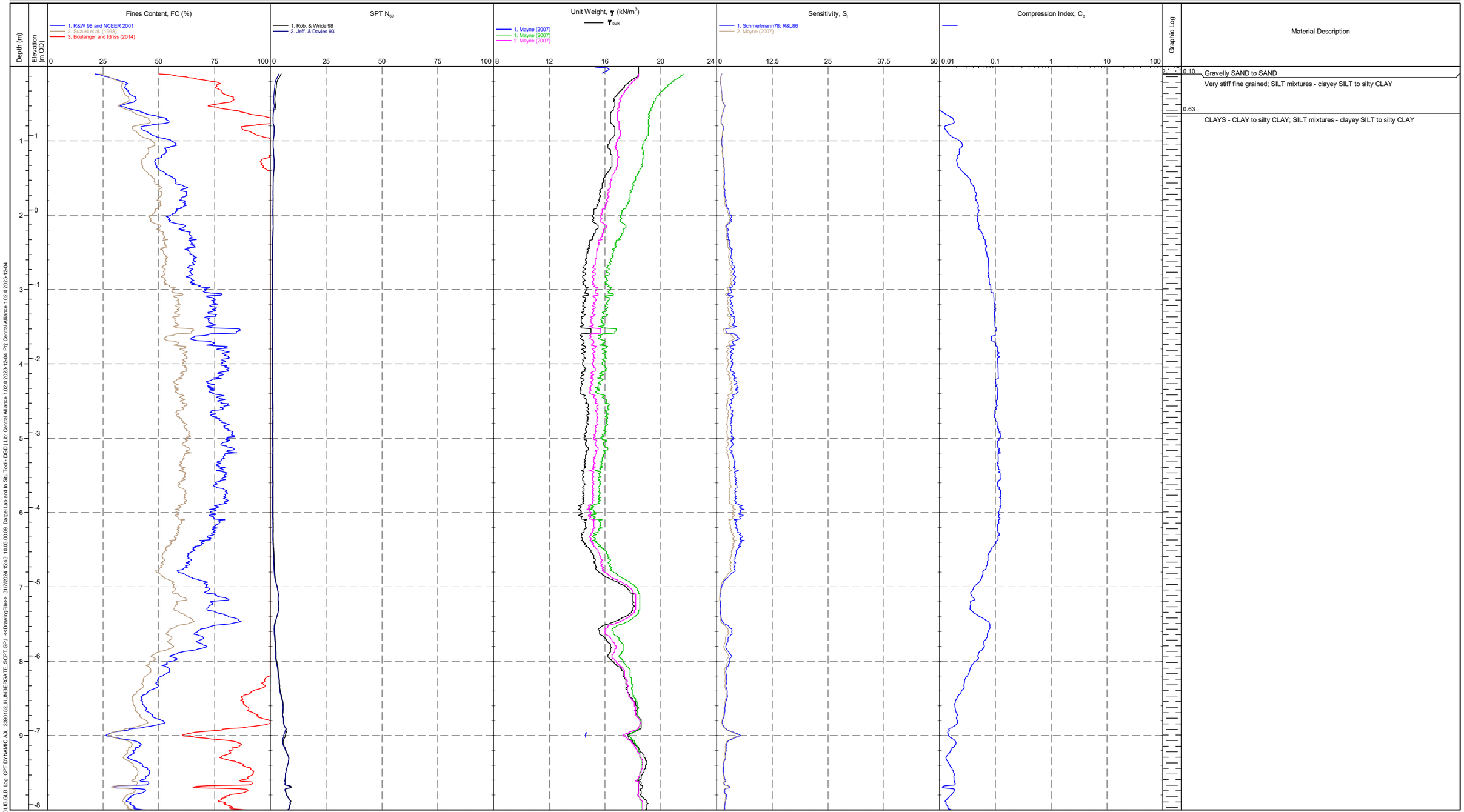
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

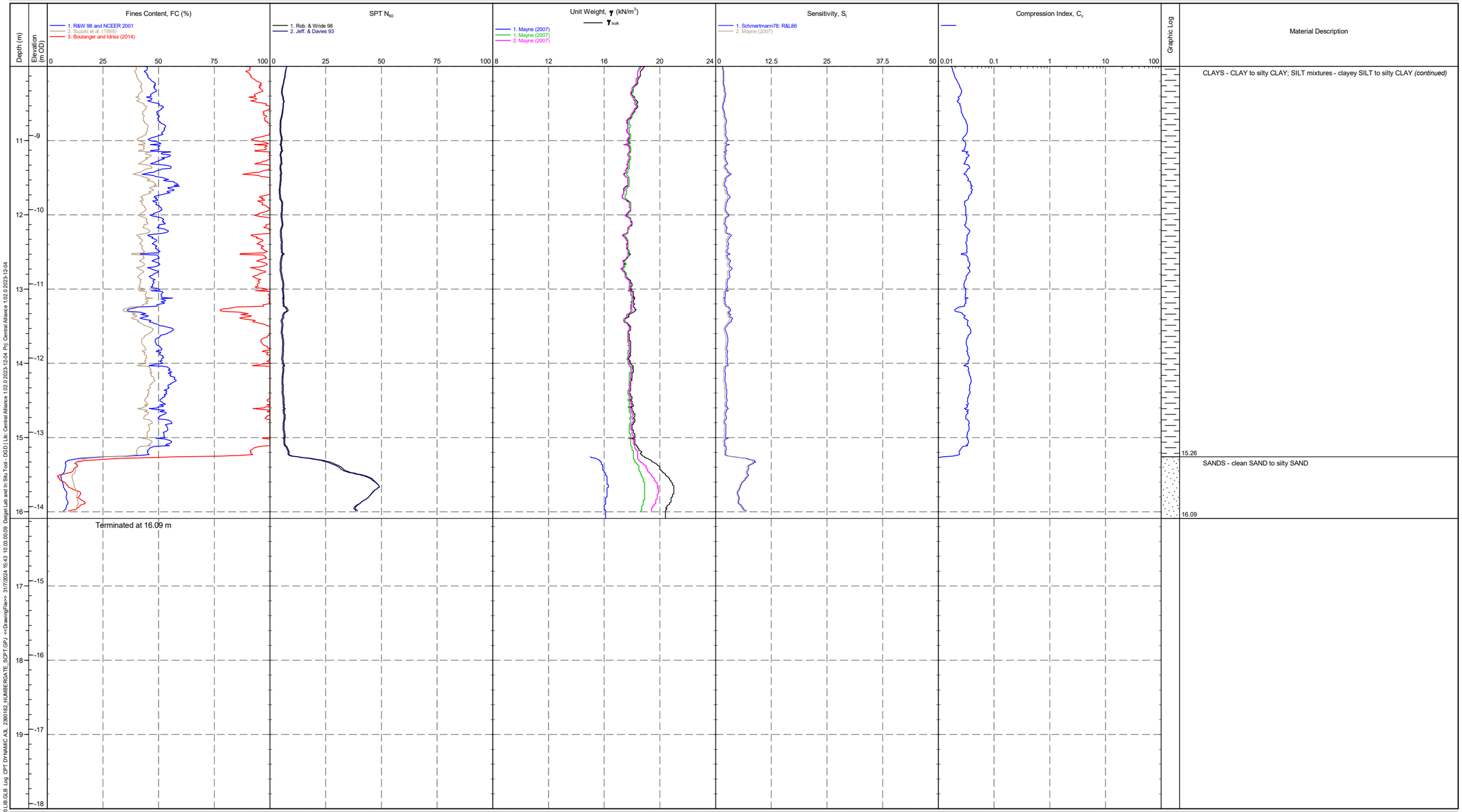
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
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3. Boulanger and Idriss (2014)

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Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ADL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

0.10 Gravelly SAND to SAND
Very stiff fine grained; SILT mixtures - clayey SILT to silty CLAY

0.63 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE 102.0 LIB:GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:05 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 102.0 2023-12-04 Prj: Central Alliance 102.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT216**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

15.26

SANDS - clean SAND to silty SAND

16.09

Terminated at 16.09 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

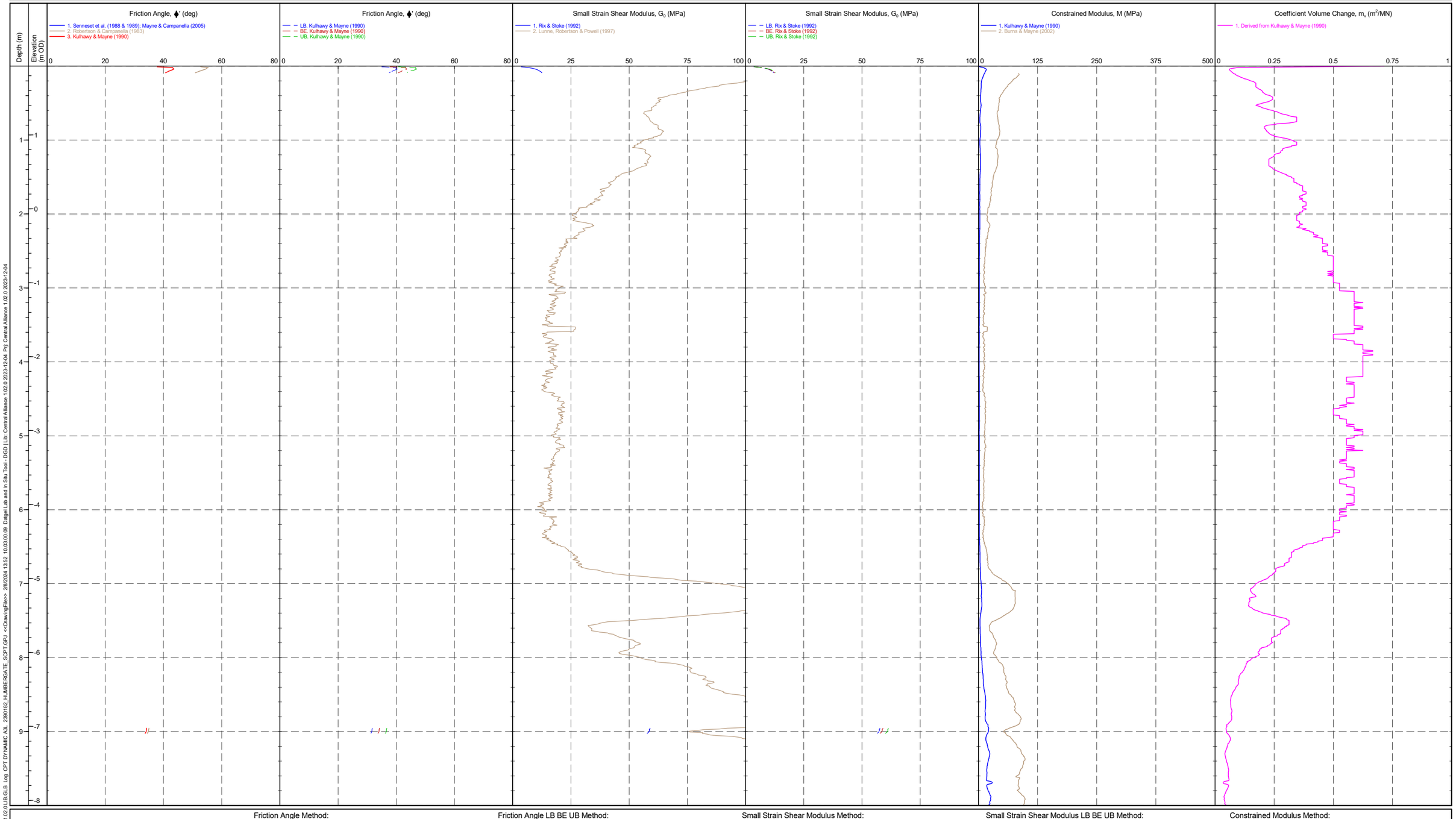
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

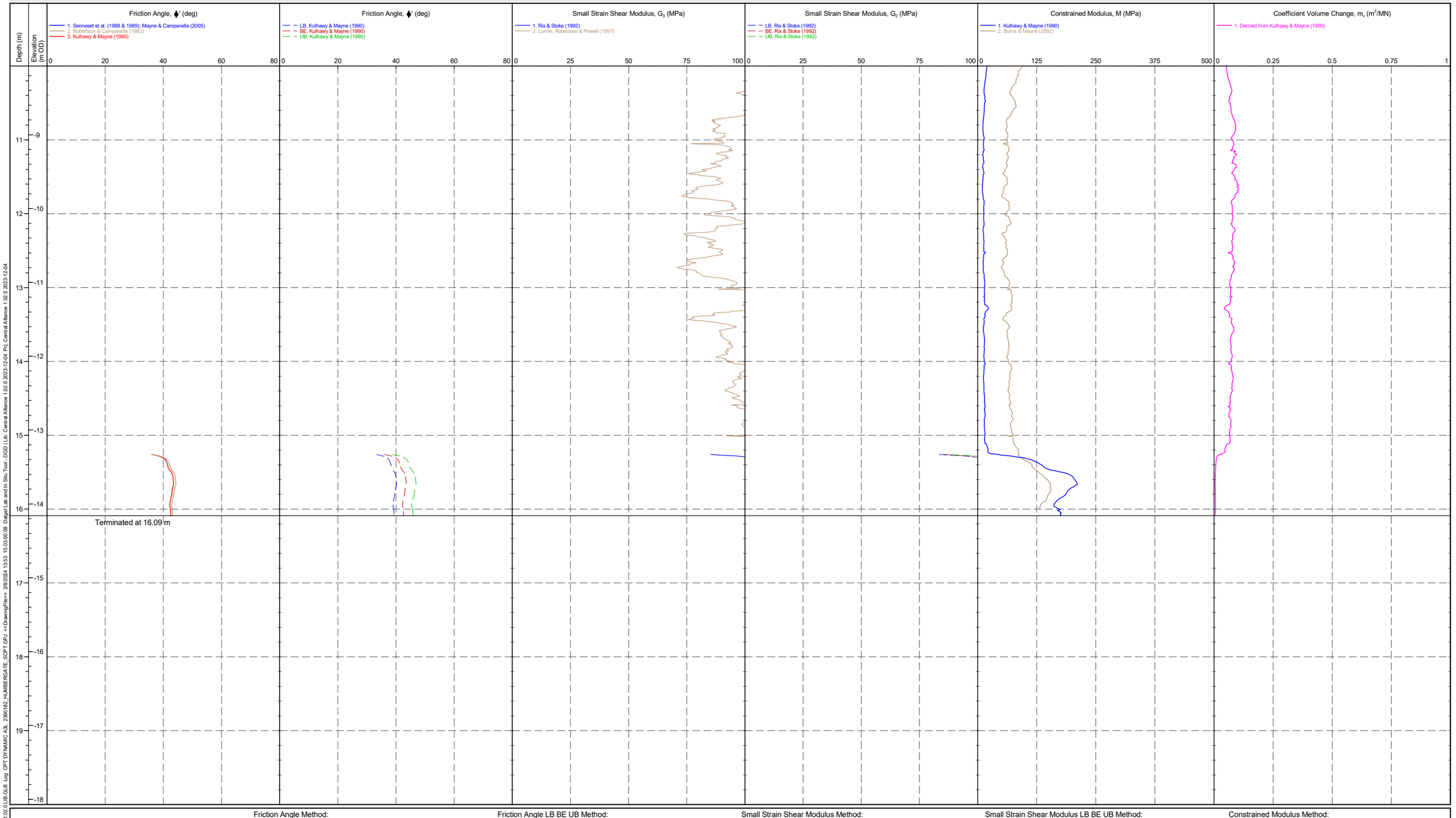
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log_CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 13:52 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT216

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523697.5 m NORTHING : 412768.7 m COORD. SYS. : OSGB ELEVATION : 1.93 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

CENTRAL ALLIANCE 102.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/6/2024 13:53 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 102.0 2023-12-04 Prj: Central Alliance 102.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

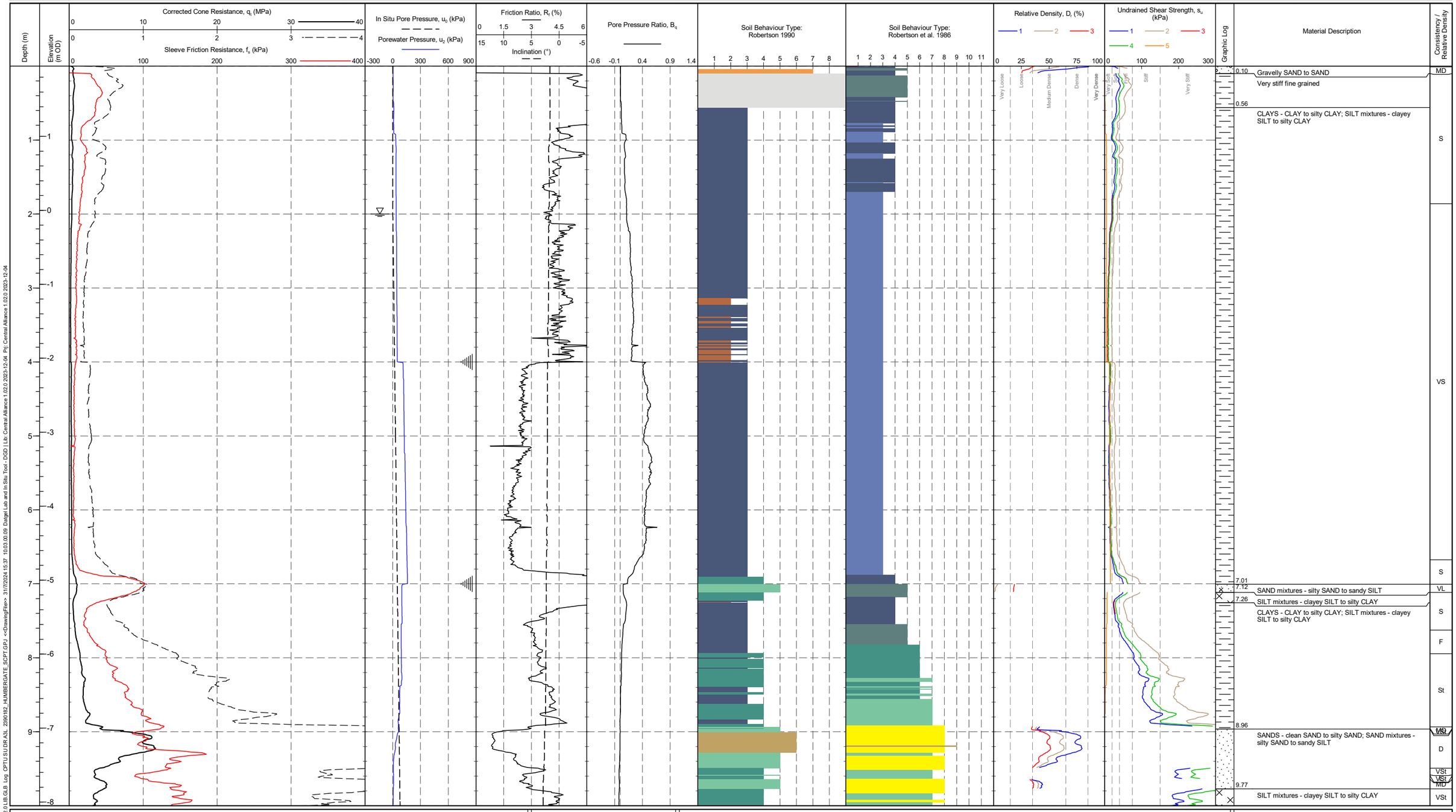
CPT LOG

PointID
CPT217

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523719.0 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412791.8 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.95 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log_CPTU.SUDR.ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:37 10.03.00.09 Datgel Lab and In Situ Tool - DGD Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

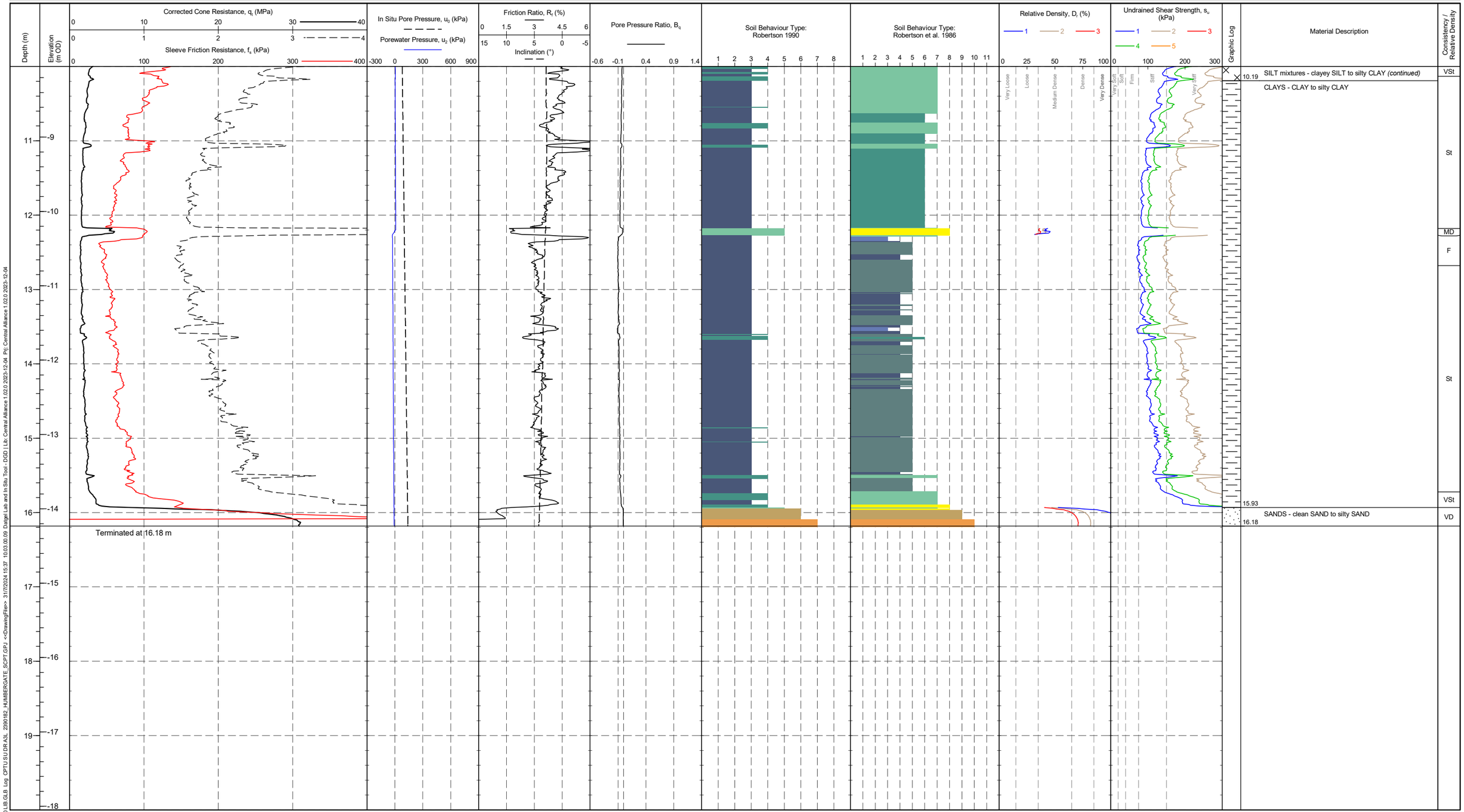
CPT LOG

PointID
CPT217

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523719.0 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412791.8 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.95 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_c - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

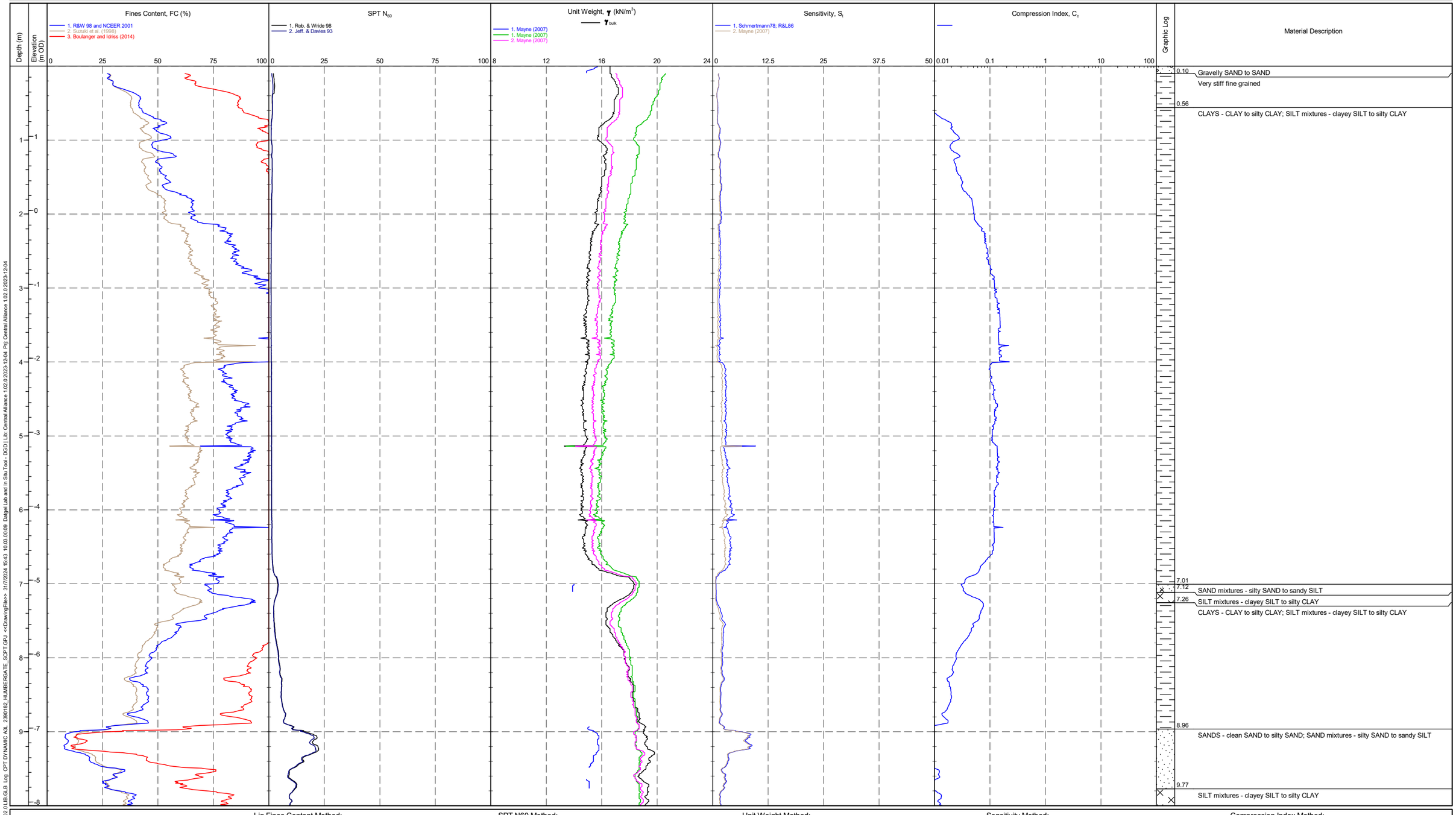
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT217

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

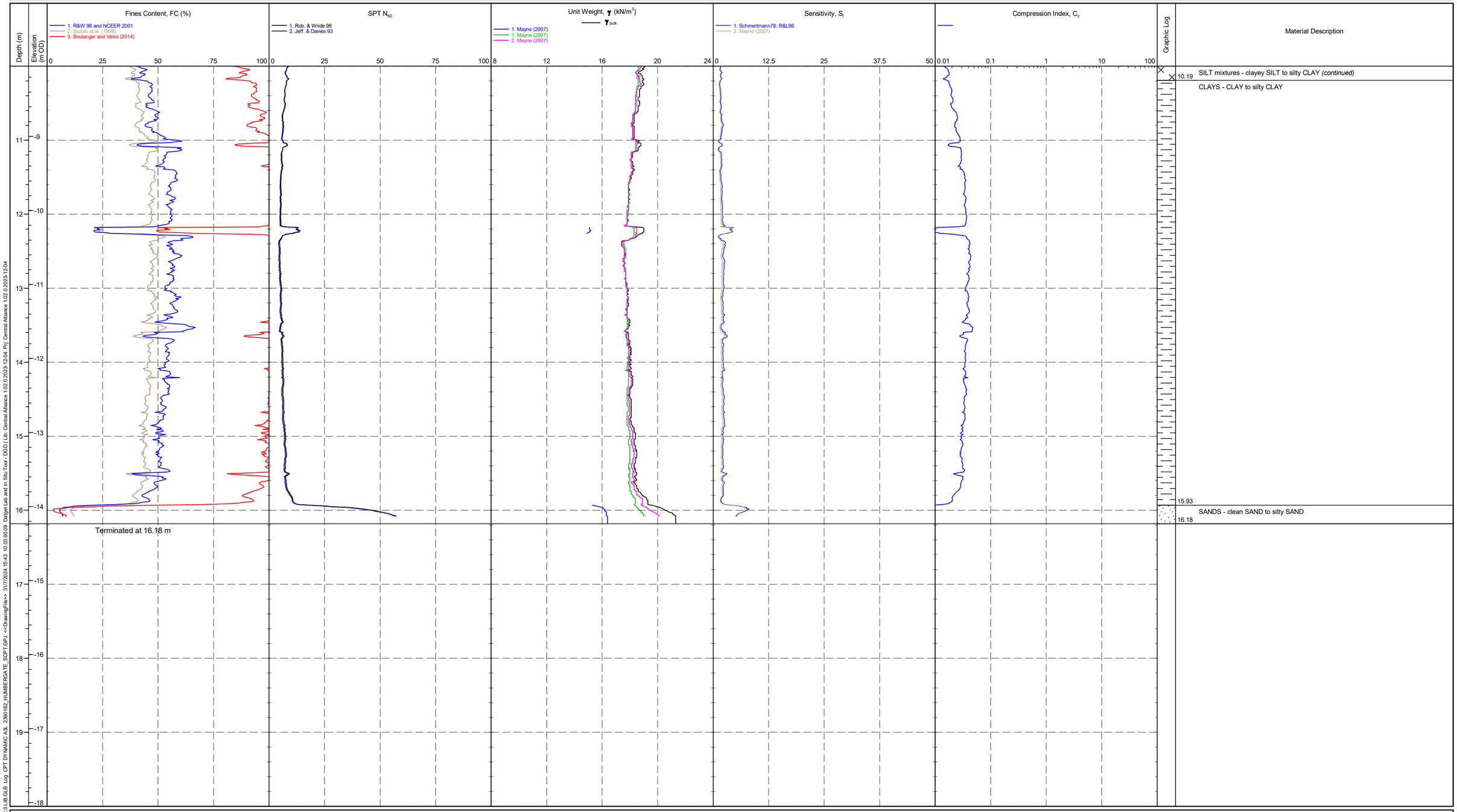
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

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CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

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1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
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Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

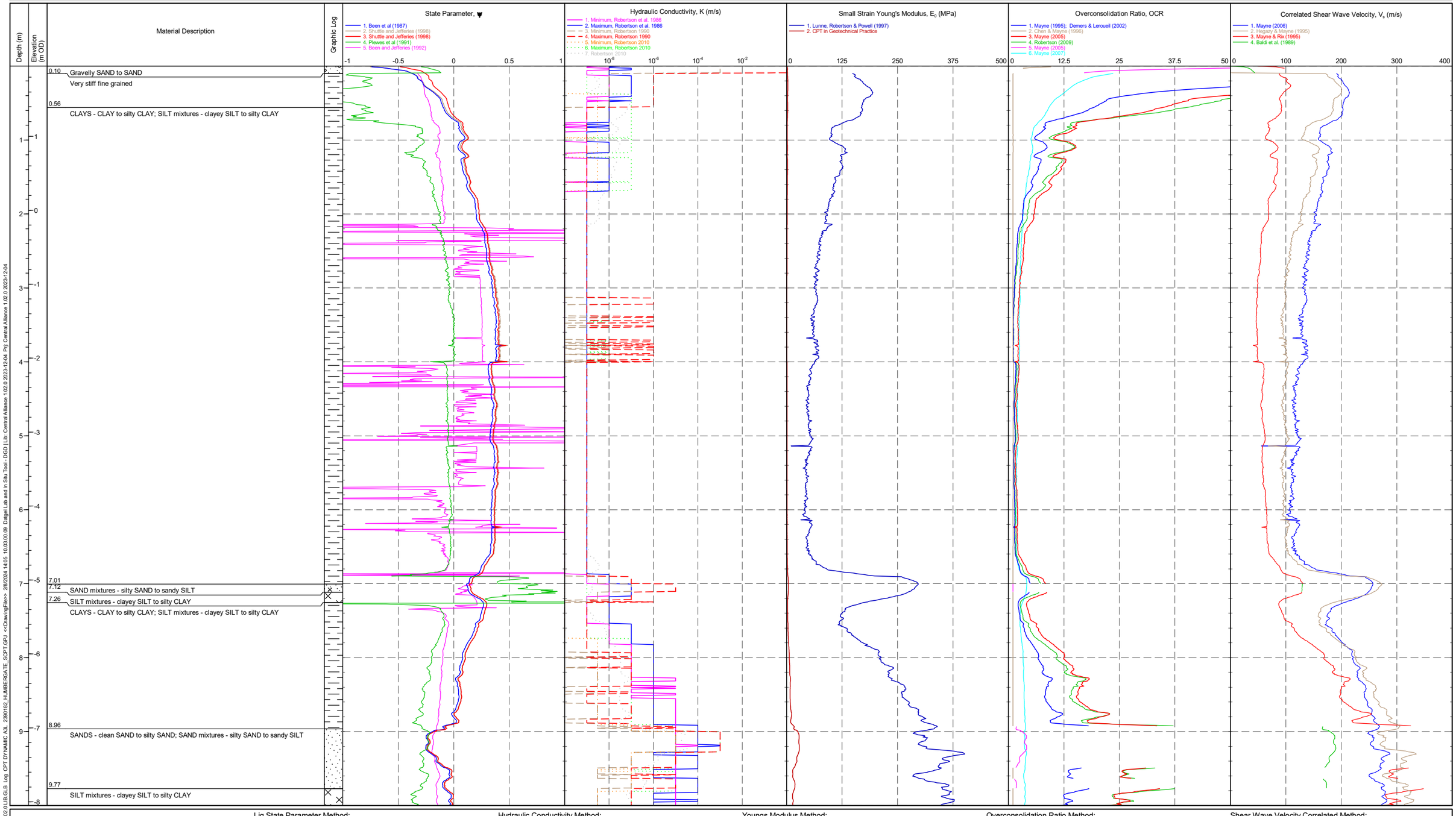
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT217

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:05 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

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CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

10.19 SILT mixtures - clayey SILT to silty CLAY *(continued)*

CLAYS - CLAY to silty CLAY

15.93 SANDS - clean SAND to silty SAND

16.18 Terminated at 16.18 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
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3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
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Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

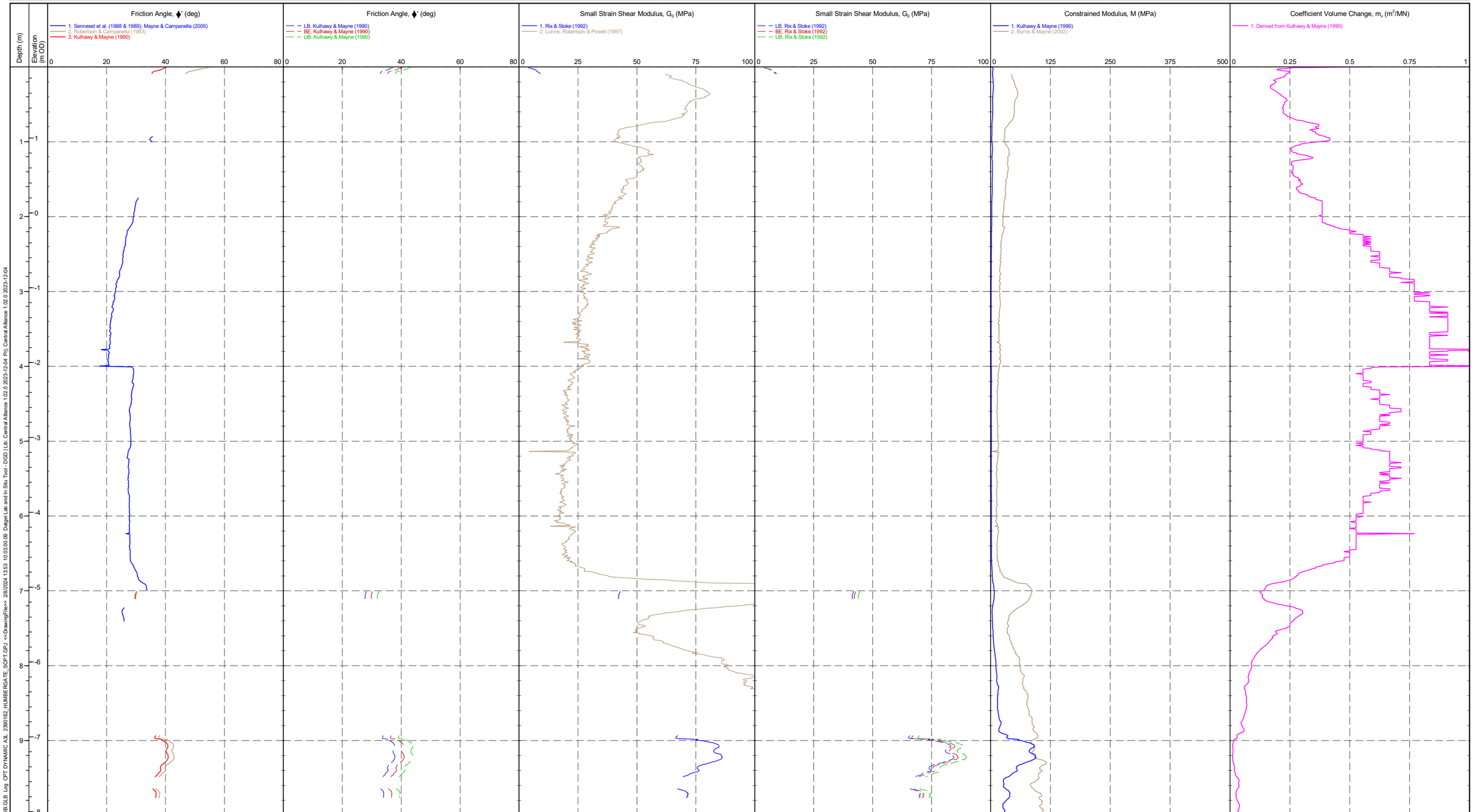
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT217

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

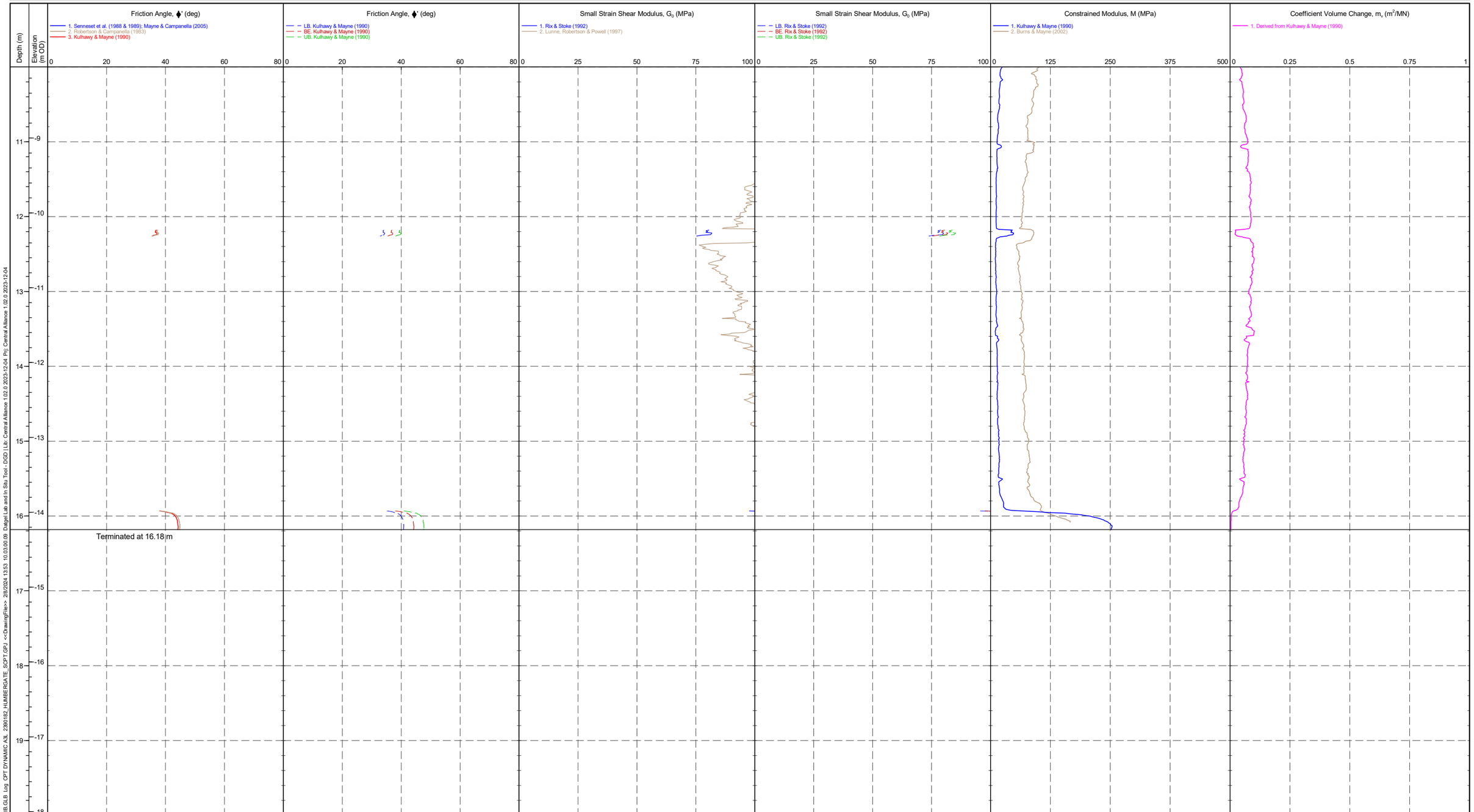
CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2/2024 13:53 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT217

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523719.0 m NORTHING : 412791.8 m COORD. SYS. : OSGB ELEVATION : 1.95 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

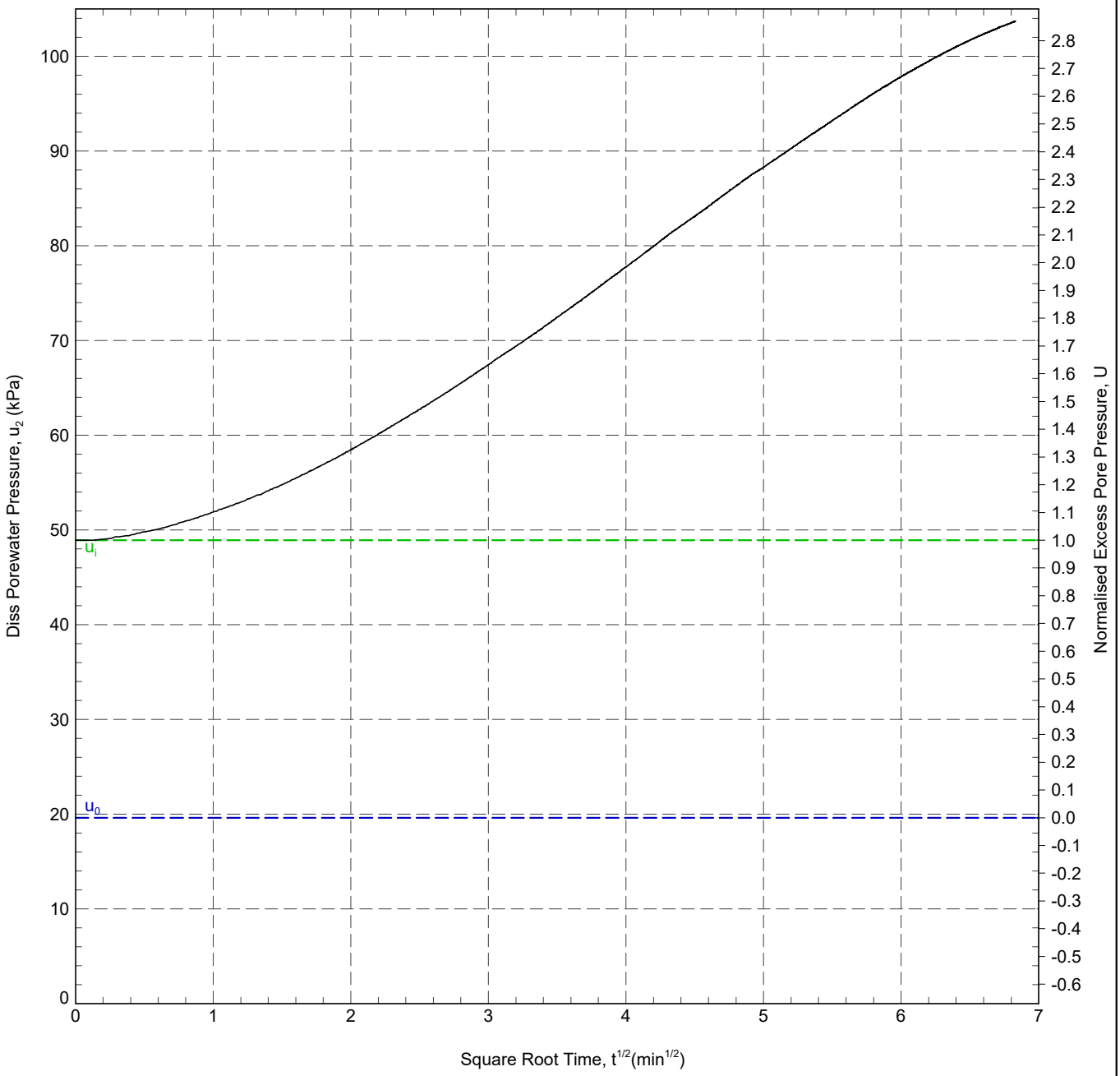
CENTRAL ALLIANCE 1.02.0.LIB.GLB Log_CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 13:53 10.03.00.09 Datgel Lab and In Situ Tools - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

DISSIPATION TEST

Test ID
CPT217 - 4.00 m

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523719.0 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412791.8 m	DATE	: 08/07/24
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.95 m OD		



In Situ Pore Pressure, u_0:	20 kPa	Rigidity Index, I_r:	4.6
Initial Pore Pressure, u_i:	49 kPa		
Final Pore Pressure:	104 kPa		
Degree of Dissipation:	50%		

RIG	: ; Crawler based20 Ton;	ANALYSED BY :	DATE:	REMARK
CONE TYPE	:	CHECKED BY :	DATE:	
CONE ID	: DP15-CFPTxy.71447	APPROVED BY :	DATE:	
OPERATOR	:			

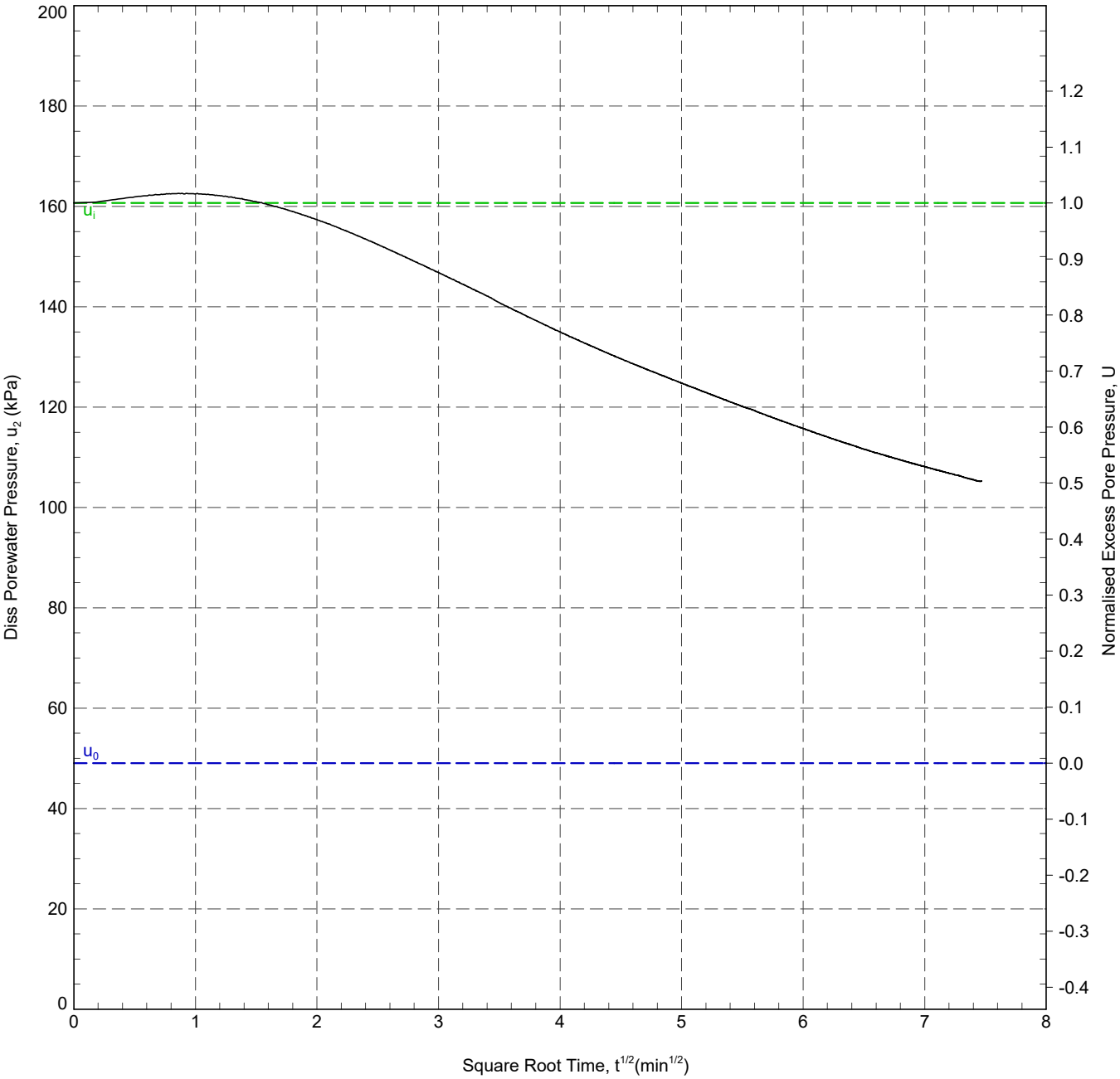
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

DISSIPATION TEST

Test ID
CPT217 - 7.00 m

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523719.0 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412791.8 m	DATE	: 08/07/24
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 1.95 m OD		



In Situ Pore Pressure, u_0:	49 kPa	Rigidity Index, I_r:	3.9
Initial Pore Pressure, u_i:	161 kPa		
Final Pore Pressure:	105 kPa		

RIG	: ; Crawler based20 Ton;	ANALYSED BY	:	DATE:	REMARK
CONE TYPE	:	CHECKED BY	:	DATE:	
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	:	DATE:	
OPERATOR	:				

CENTRAL ALLIANCE 1.02.0 LIB.GLB Graph PPDT PORE PRESSURE VS. SQR T A4P 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/8/2024 14:00 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

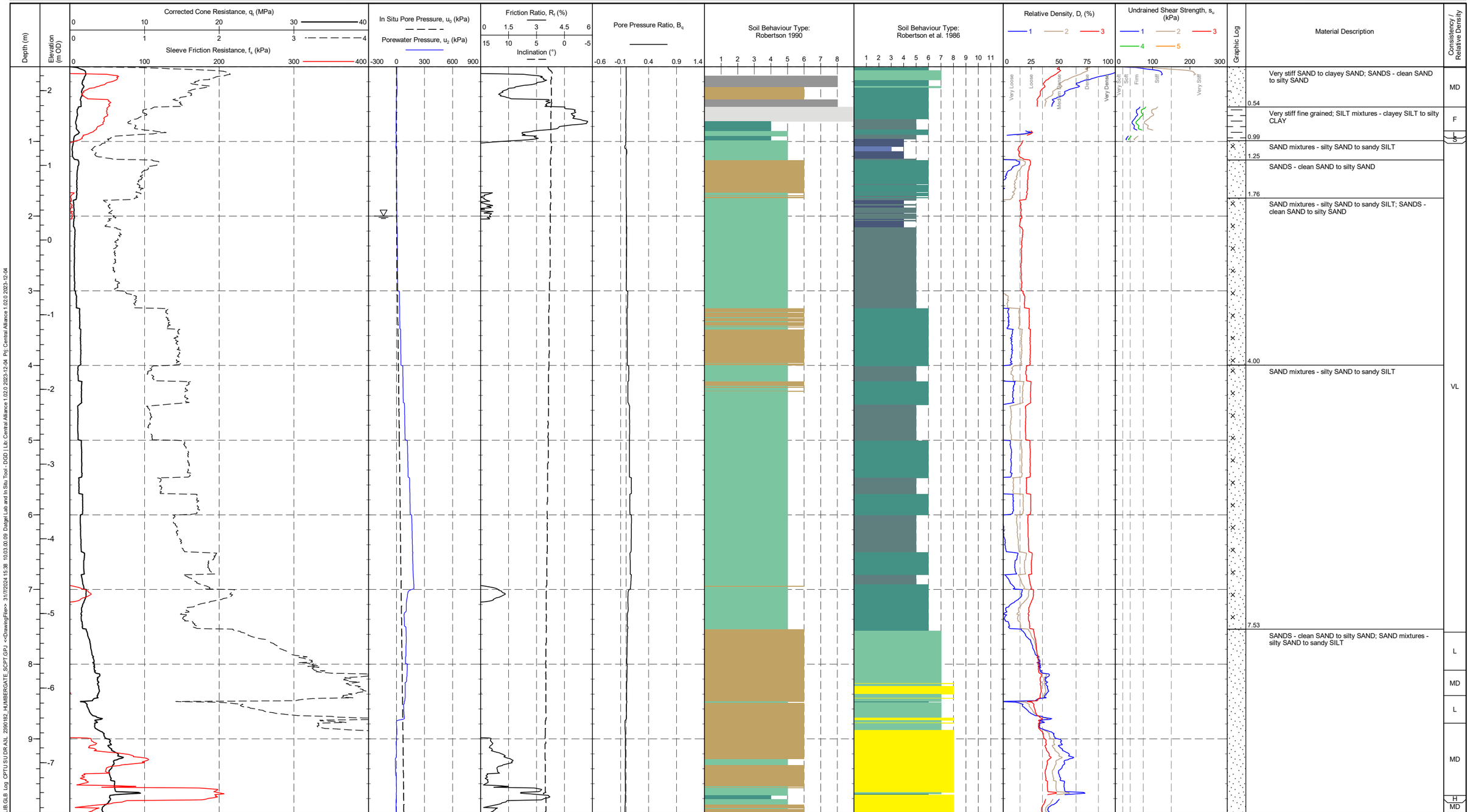
CPT LOG

PointID
CPT218

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523696.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412899.8 m	DATE	: 9/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.32 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



Graphic Log	Material Description	Consistency / Relative Density
	Very stiff SAND to clayey SAND; SANDS - clean SAND to silty SAND	MD
0.54		
	Very stiff fine grained; SILT mixtures - clayey SILT to silty CLAY	F
0.99		
	SAND mixtures - silty SAND to sandy SILT	SL
1.25		
	SANDS - clean SAND to silty SAND	
1.76		
	SAND mixtures - silty SAND to sandy SILT; SANDS - clean SAND to silty SAND	
4.00		
	SAND mixtures - silty SAND to sandy SILT	VL
7.53		
	SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT	L
		MD
		L
		MD
		H
		MD

RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_E/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:38 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

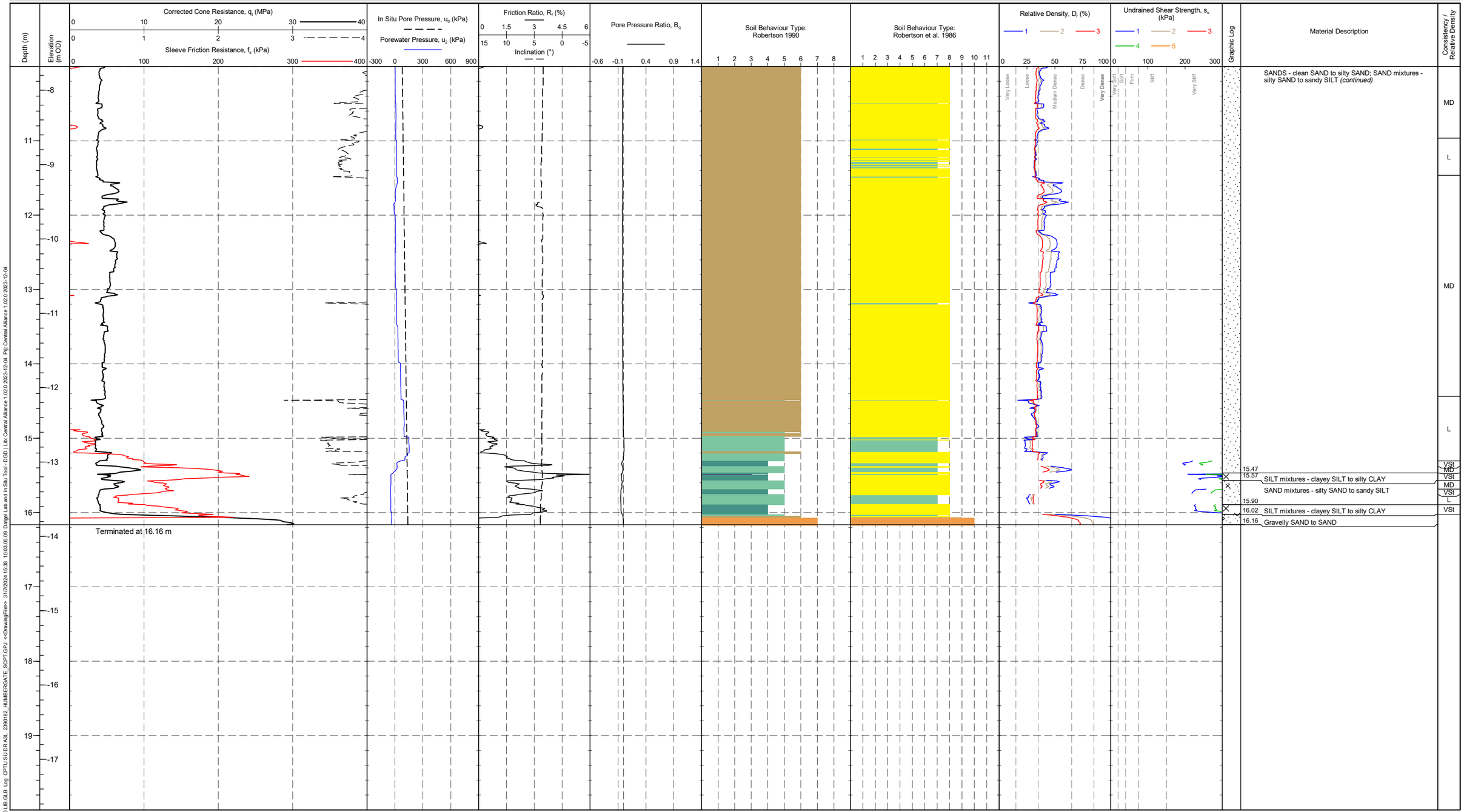
CPT LOG

PointID
CPT218

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523696.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412899.8 m	DATE	: 9/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.32 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

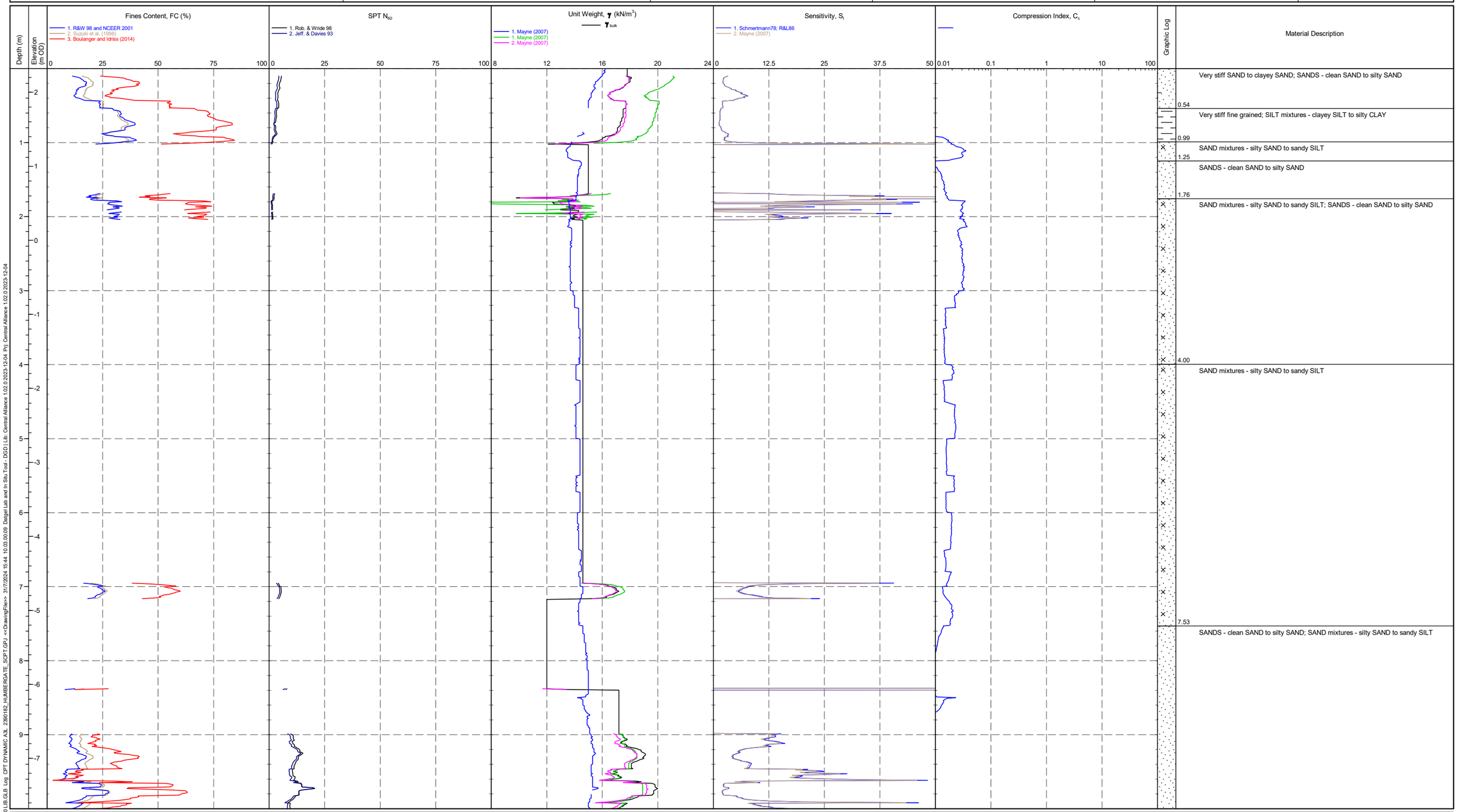
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR.ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:38 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT218**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523696.9 m NORTHING : 412899.8 m COORD. SYS. : OSGB ELEVATION : 2.32 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 9/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

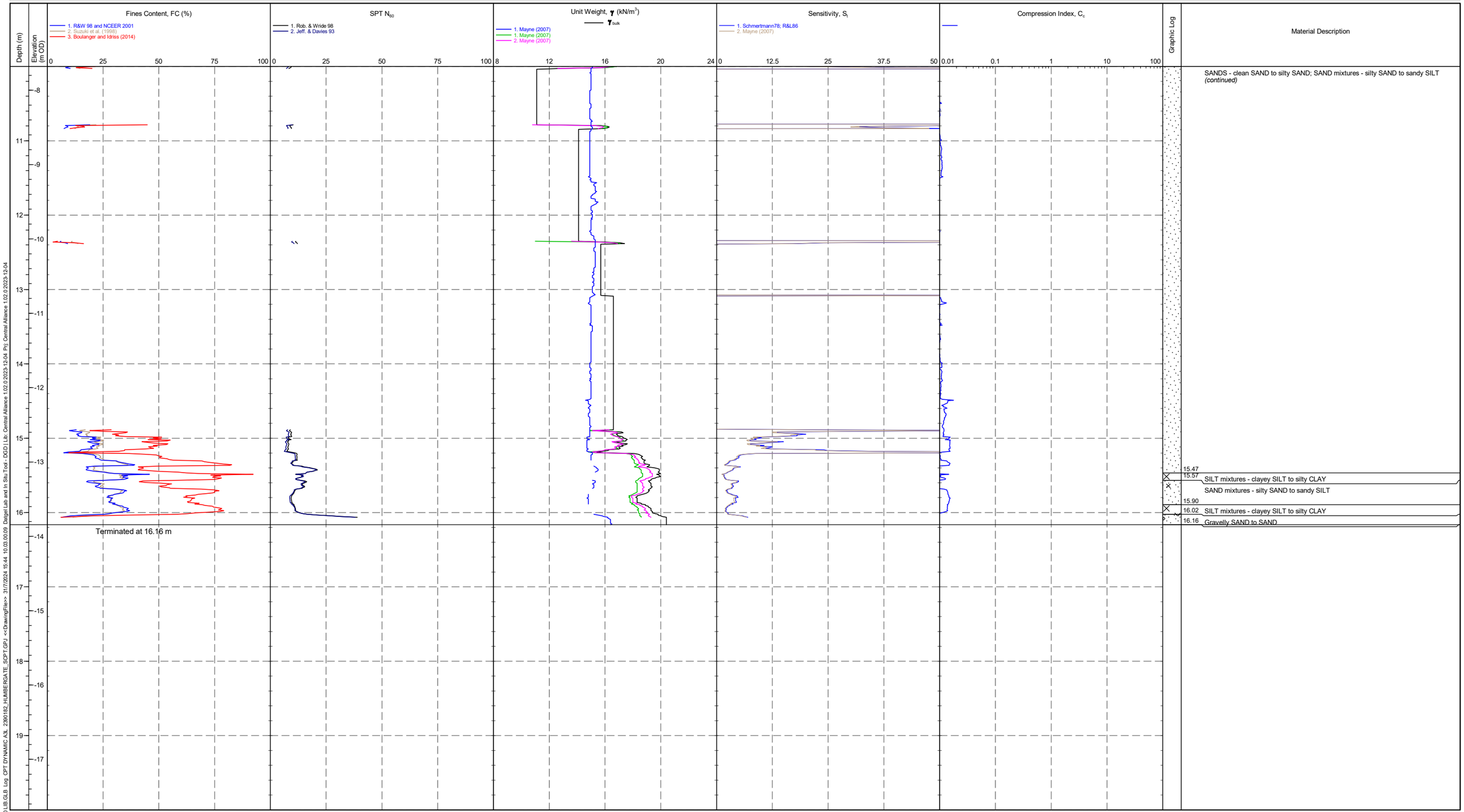
CENTRAL ALLIANCE 102.0.LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:44 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0.2023-12-04 Prj: Central Alliance 1.02.0.2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT218

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523696.9 m NORTHING : 412899.8 m COORD. SYS. : OSGB ELEVATION : 2.32 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.02.0 LIB GLB Log CPT DYNAMIC ADL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:44 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT218

CLIENT : Mayer Enviro	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : DH	REMARK	SHEET : 1 OF 2
ENGINEER :	EASTING : 523696.9 m	CONE TYPE : C+F+W2	CHECKED DATE : 23/7/2024		STATUS :
PROJECT : Humber Gateway	NORTHING : 412899.8 m	CONE ID : DP15-CFPTxy.71447	APPROVED BY : SB		DATE : 9/7/2024
LOCATION : Grimsby	COORD. SYS. : OSGB	OPERATOR : Central Alliance	APPROVED DATE : 26/7/2024		
PROJECT No. : 2390182	ELEVATION : 2.32 m OD				

Depth (m)	Elevation (m OD)	Material Description
0.00	2	Very stiff SAND to clayey SAND; SANDS - clean SAND to silty SAND
0.54		Very stiff fine grained; SILT mixtures - clayey SILT to silty CLAY
0.99	1	SAND mixtures - silty SAND to sandy SILT
1.25		SANDS - clean SAND to silty SAND
1.76	0	SAND mixtures - silty SAND to sandy SILT; SANDS - clean SAND to silty SAND
4.00	-2	SAND mixtures - silty SAND to sandy SILT
7.53	-5	SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

Graphic Log

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)

0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/8/2024 14:06 10.03.00.69 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT218**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523696.9 m NORTHING : 412899.8 m COORD. SYS. : OSGB ELEVATION : 2.32 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT *(continued)*

15.47 — 15.57 SILT mixtures - clayey SILT to silty CLAY

SAND mixtures - silty SAND to sandy SILT

15.90 — 16.02 SILT mixtures - clayey SILT to silty CLAY

16.16 Gravelly SAND to SAND

Terminated at 16.16 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

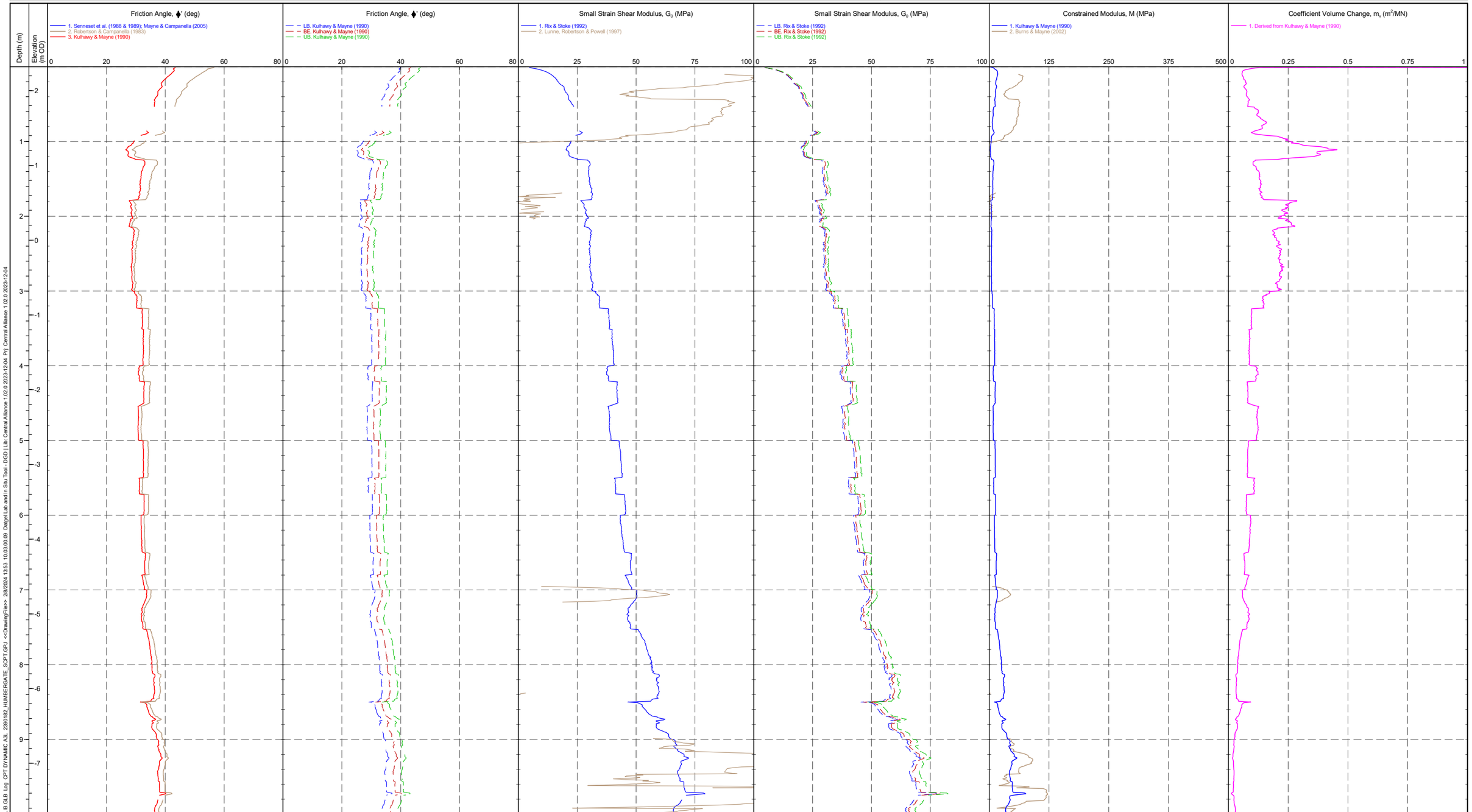
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT218

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523696.9 m NORTHING : 412899.8 m COORD. SYS. : OSGB ELEVATION : 2.32 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 9/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

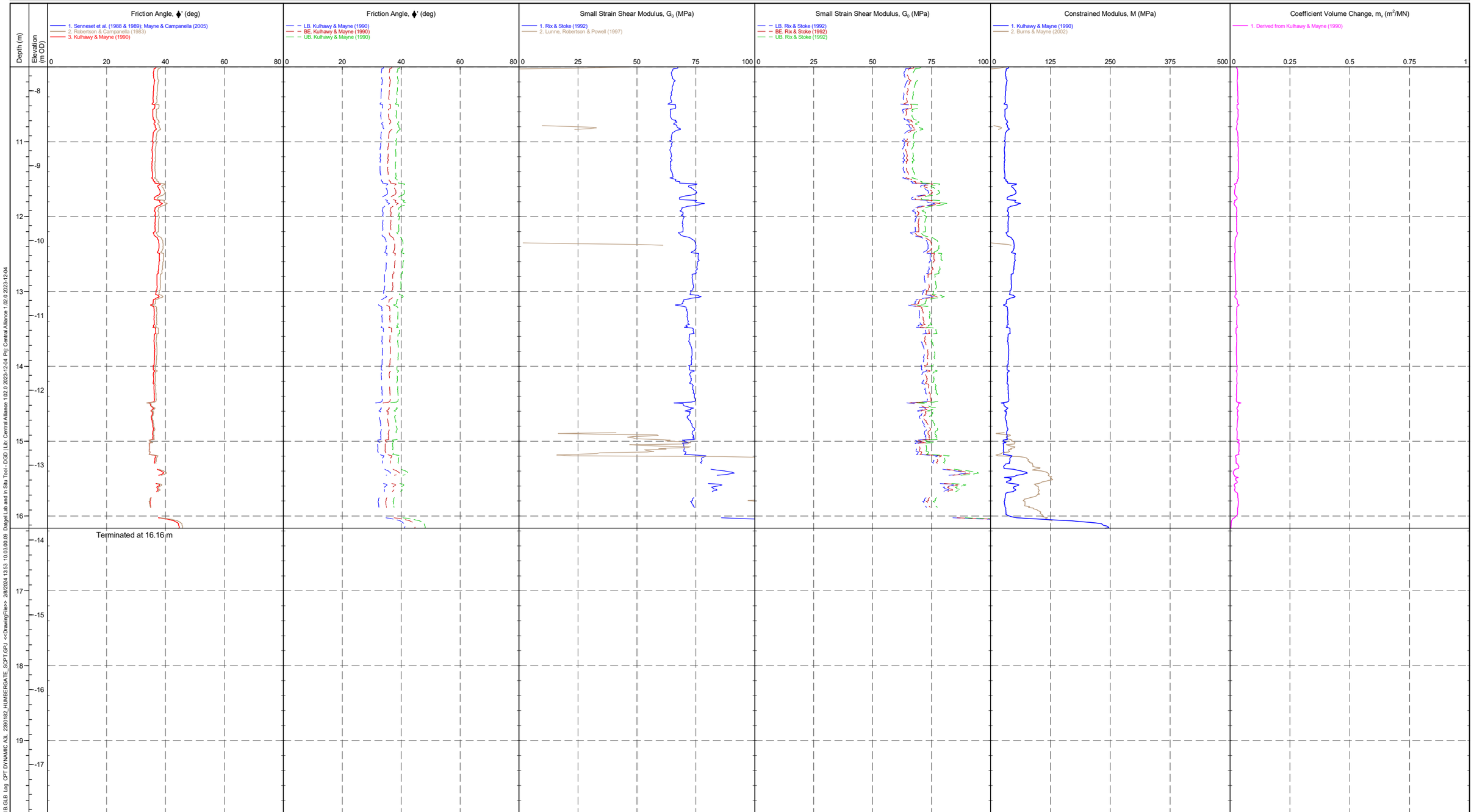
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT218

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523696.9 m NORTHING : 412899.8 m COORD. SYS. : OSGB ELEVATION : 2.32 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024



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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

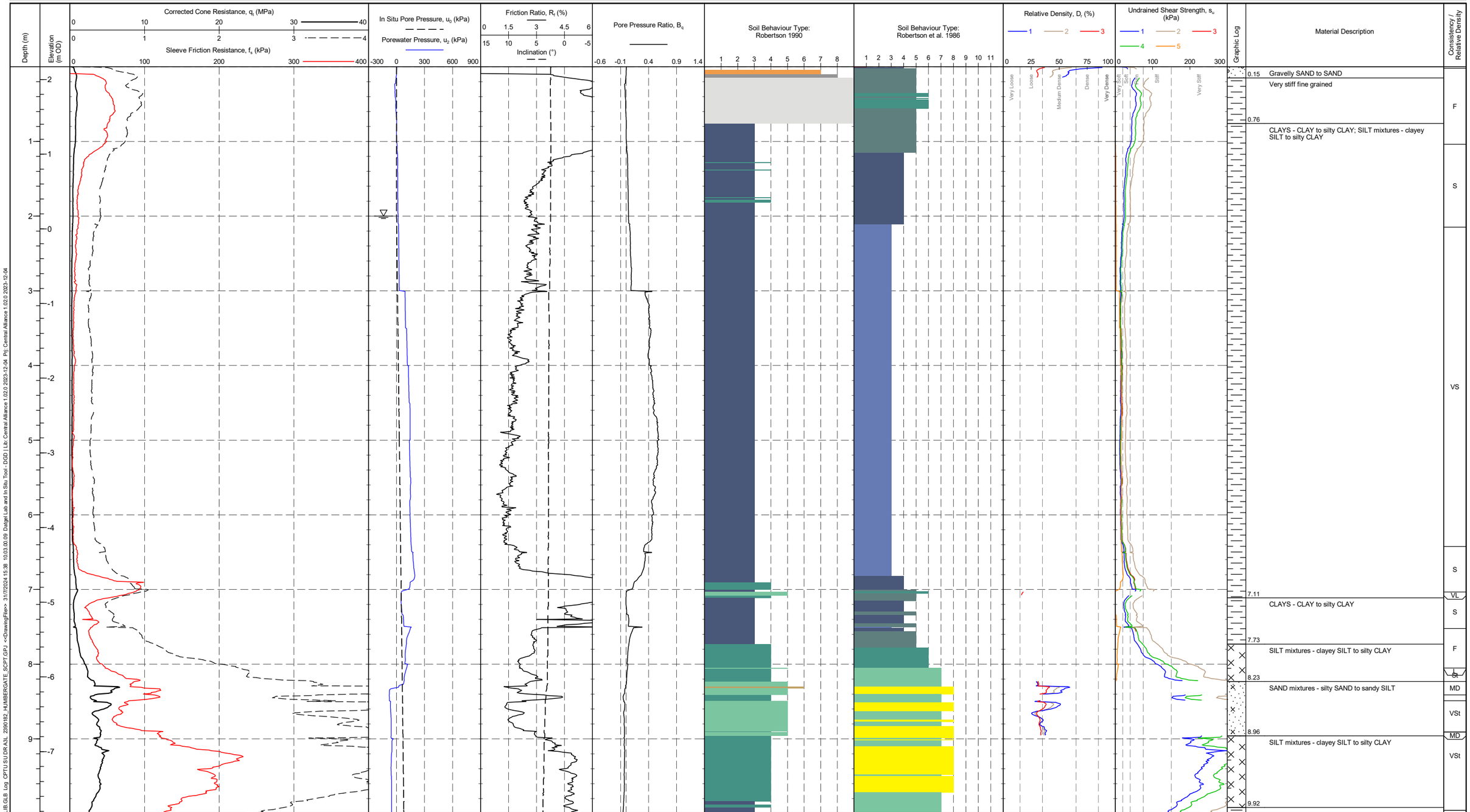
CPT LOG

PointID
CPT219

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523680.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412845.3 m	DATE	: 9/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.17 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (Q_t - \sigma_{vo})/N_{kt}$; or $(Q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR.ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:38 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

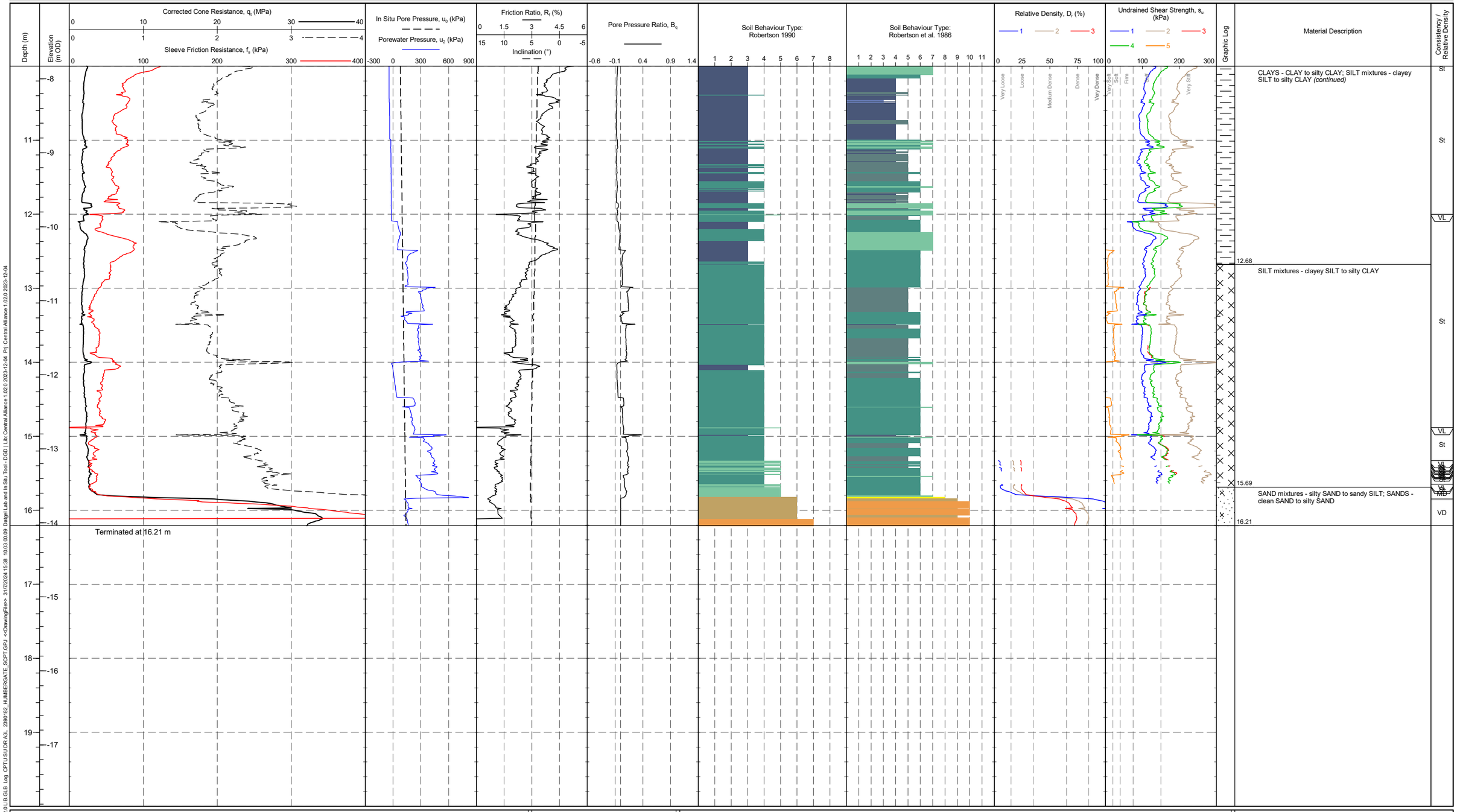
CPT LOG

PointID
CPT219

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523680.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412845.3 m	DATE	: 9/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.17 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
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3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

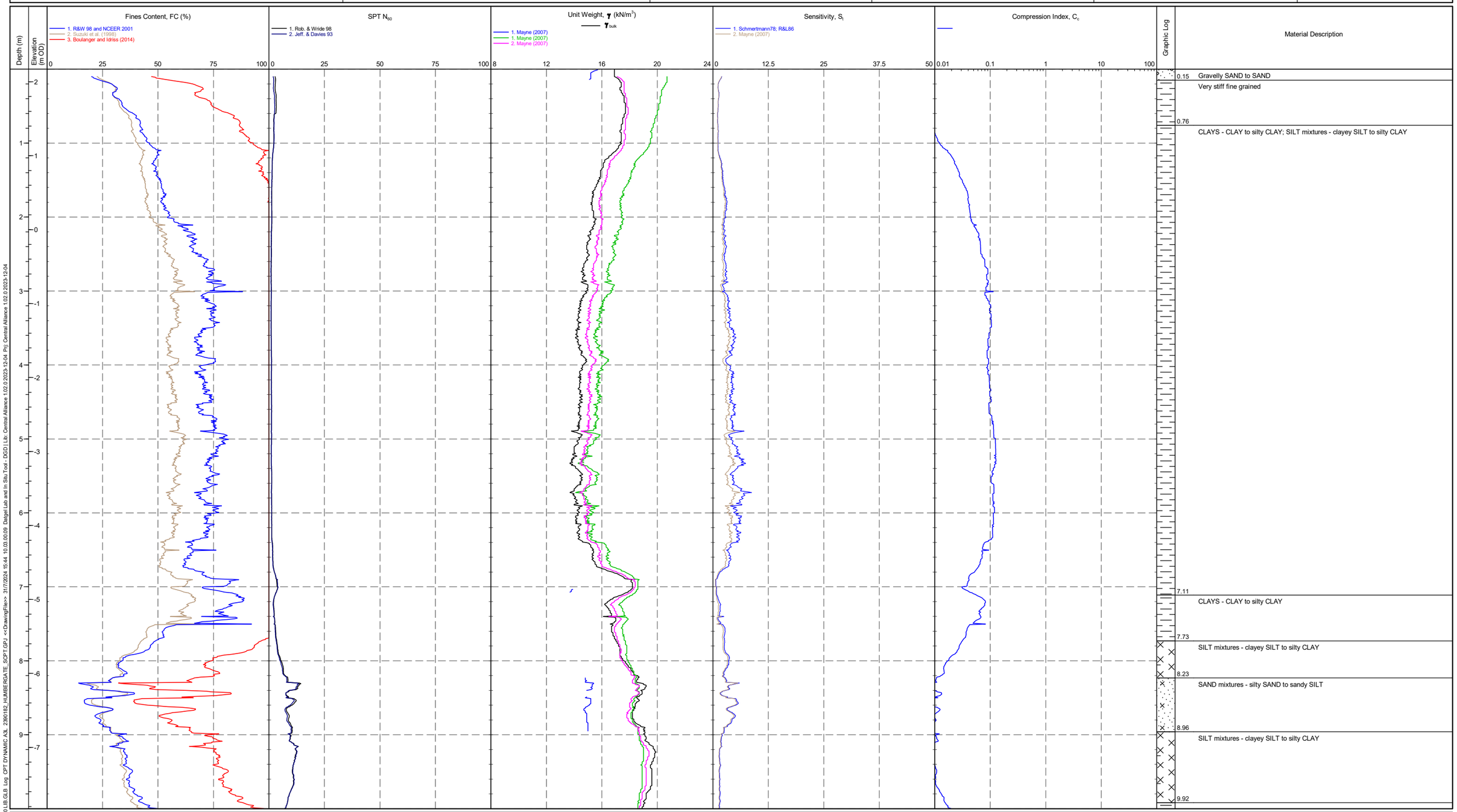
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT219

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 9/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

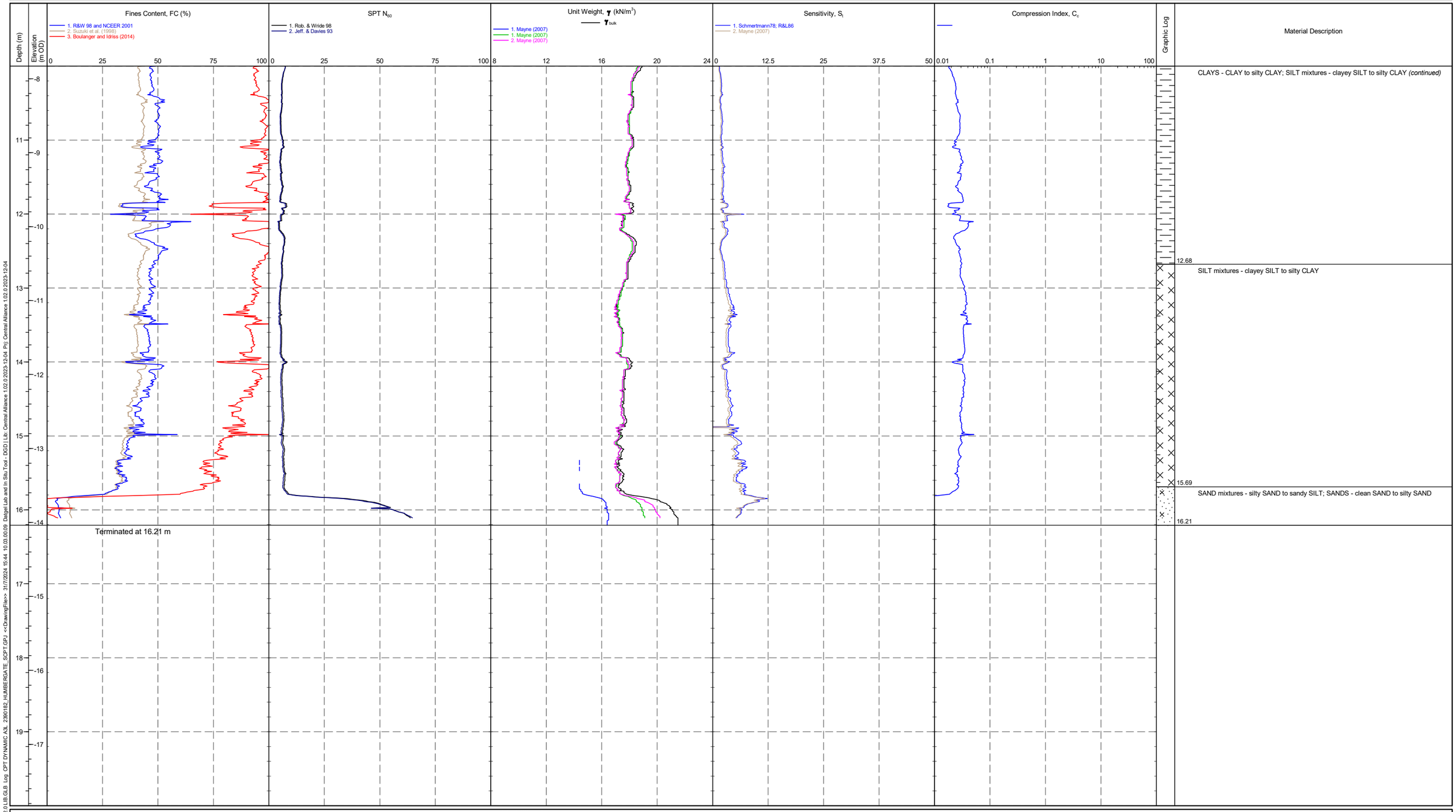
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT219**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024



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CENTRAL_ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:44 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT219**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 9/7/2024

Depth (m)	Elevation (m OD)	Material Description
0.15		Gravelly SAND to SAND
		Very stiff fine grained
0.76		CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY
7.11		CLAYS - CLAY to silty CLAY
7.73		SILT mixtures - clayey SILT to silty CLAY
8.23		SAND mixtures - silty SAND to sandy SILT
8.96		SILT mixtures - clayey SILT to silty CLAY
9.92		

Graphic Log

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
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Shear Wave Velocity Correlated Method:

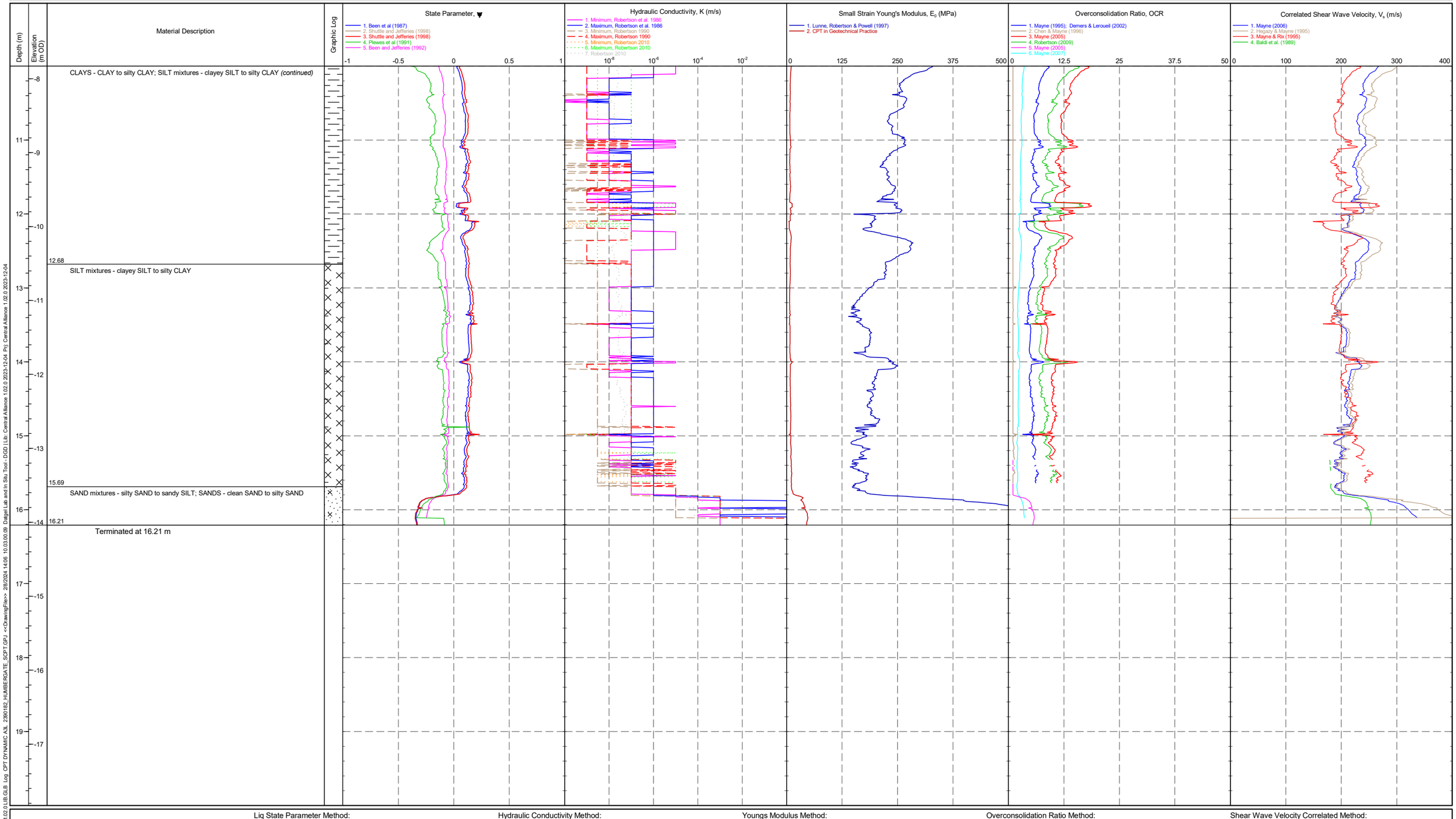
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT219**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024



Liq State Parameter Method:
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3. Shuttle and Jefferies (1998)
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5. Mayne (2005)
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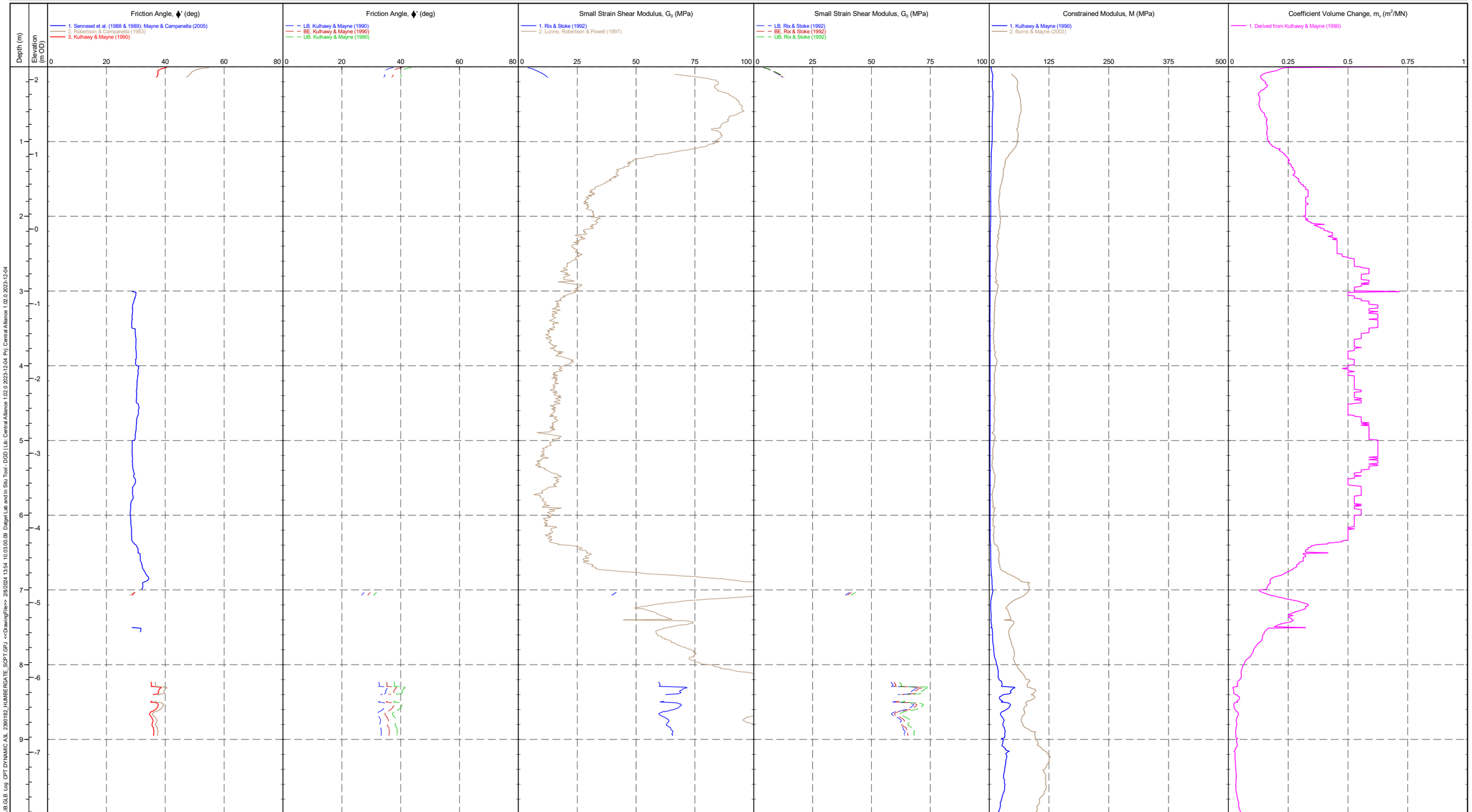
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT219

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 9/7/2024



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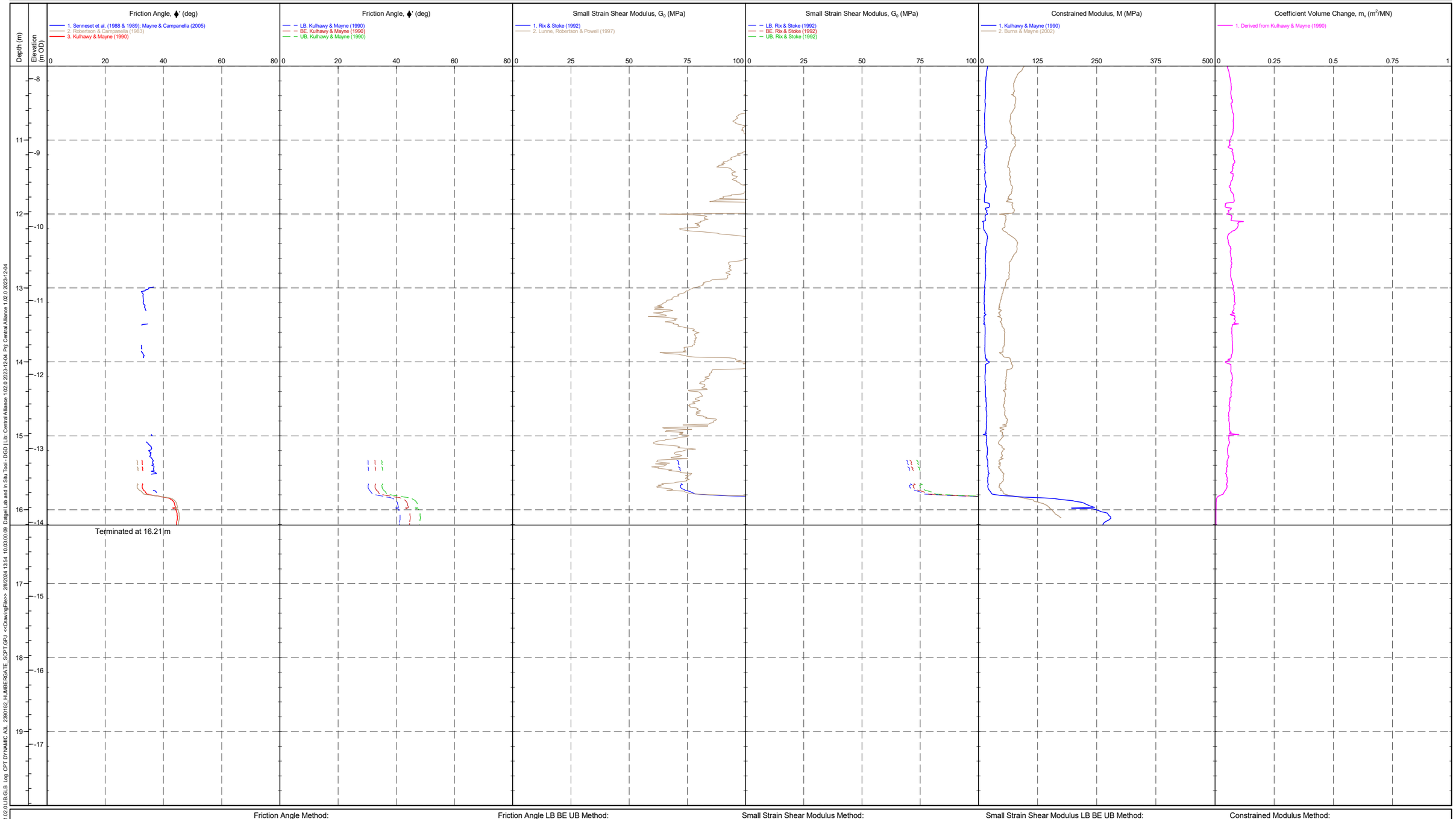
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT219

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523680.9 m NORTHING : 412845.3 m COORD. SYS. : OSGB ELEVATION : 2.17 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 9/7/2024



Friction Angle Method:
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CENTRAL_ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 13:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

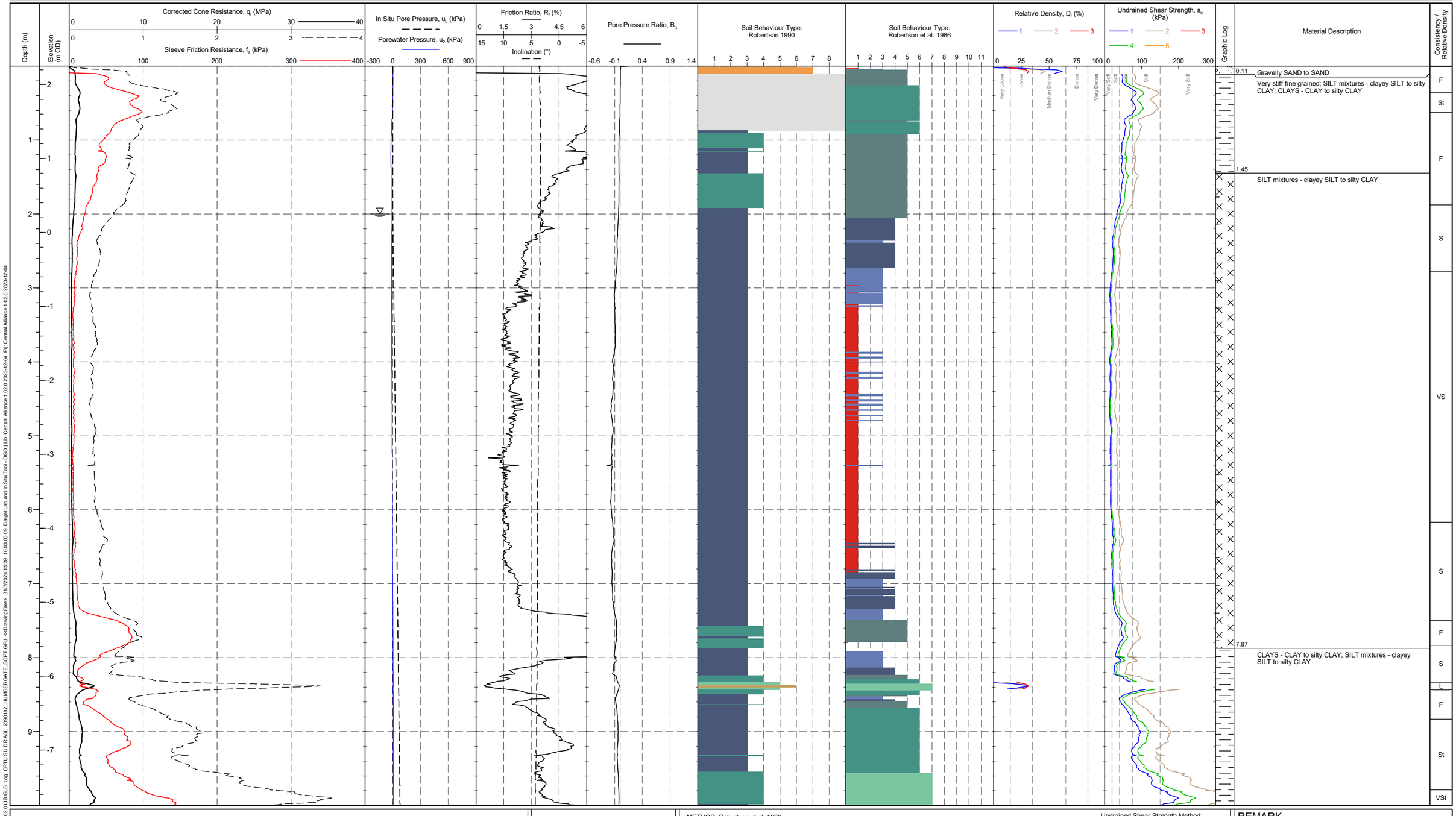
CPT LOG

PointID
CPT220

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523639.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412822.7 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.25 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kc}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DRASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:38 10.03.00.09 Datgel Lab and In-Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

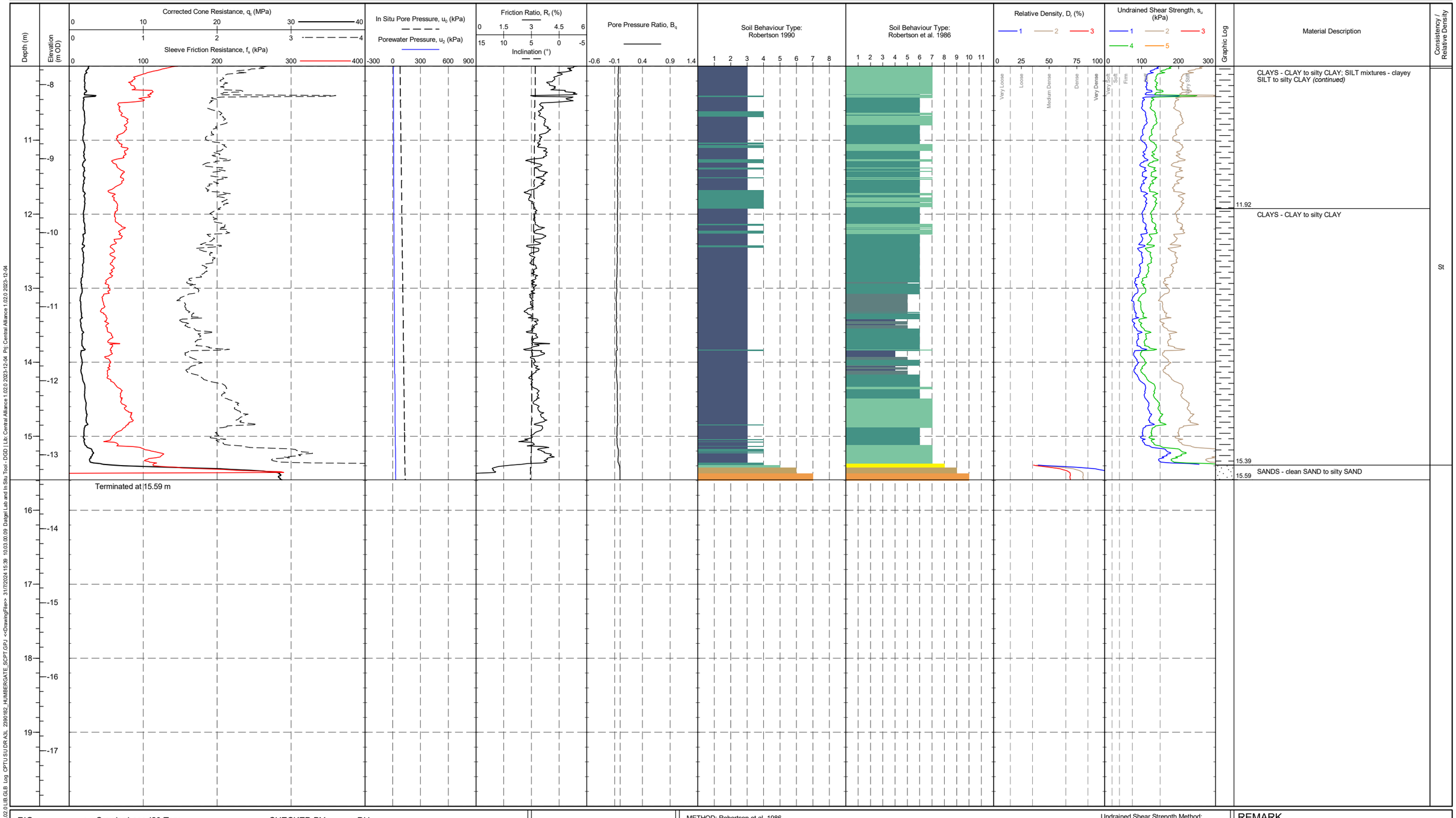
CPT LOG

PointID
CPT220

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523639.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412822.7 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.25 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

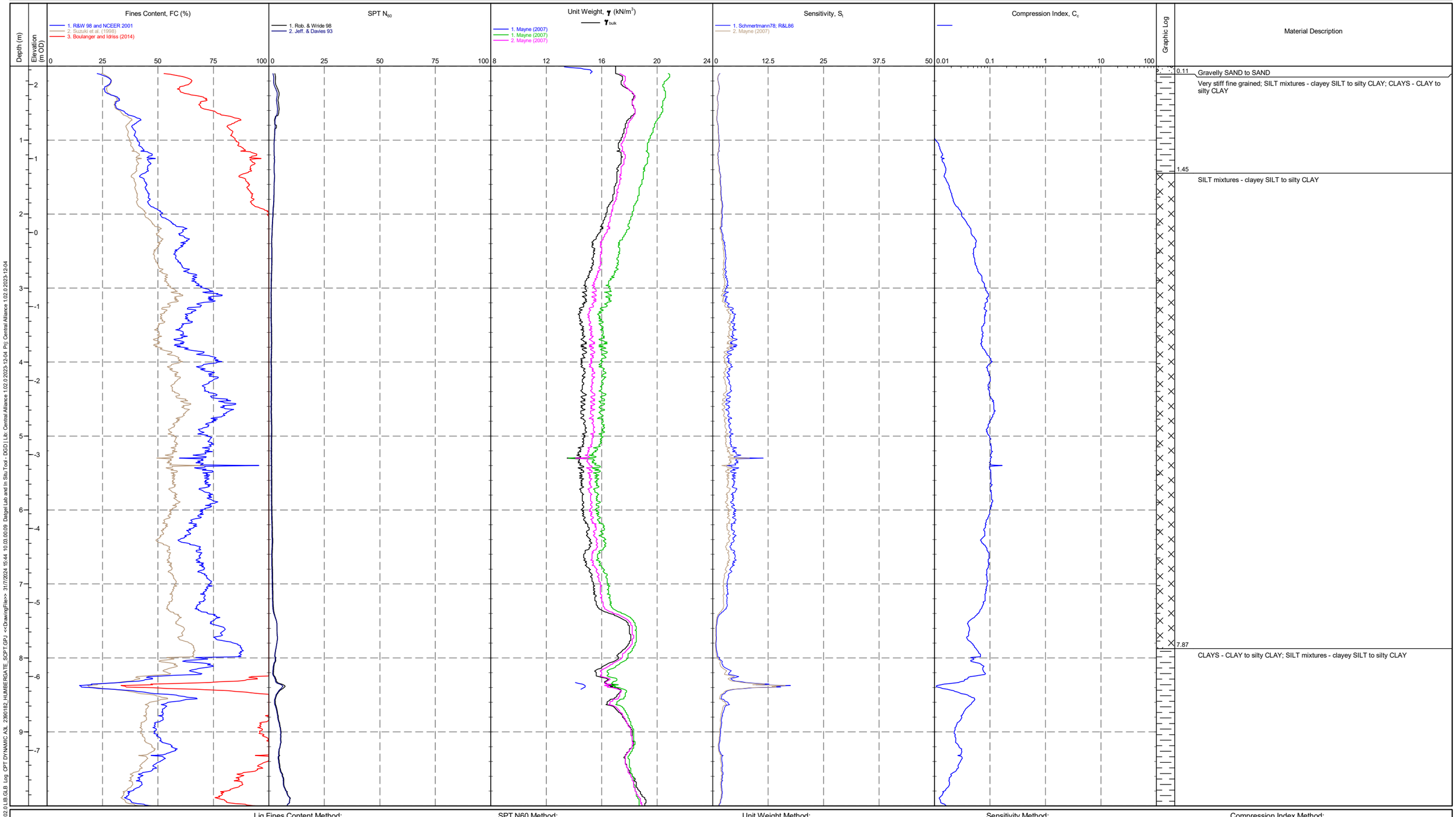
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{wet} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

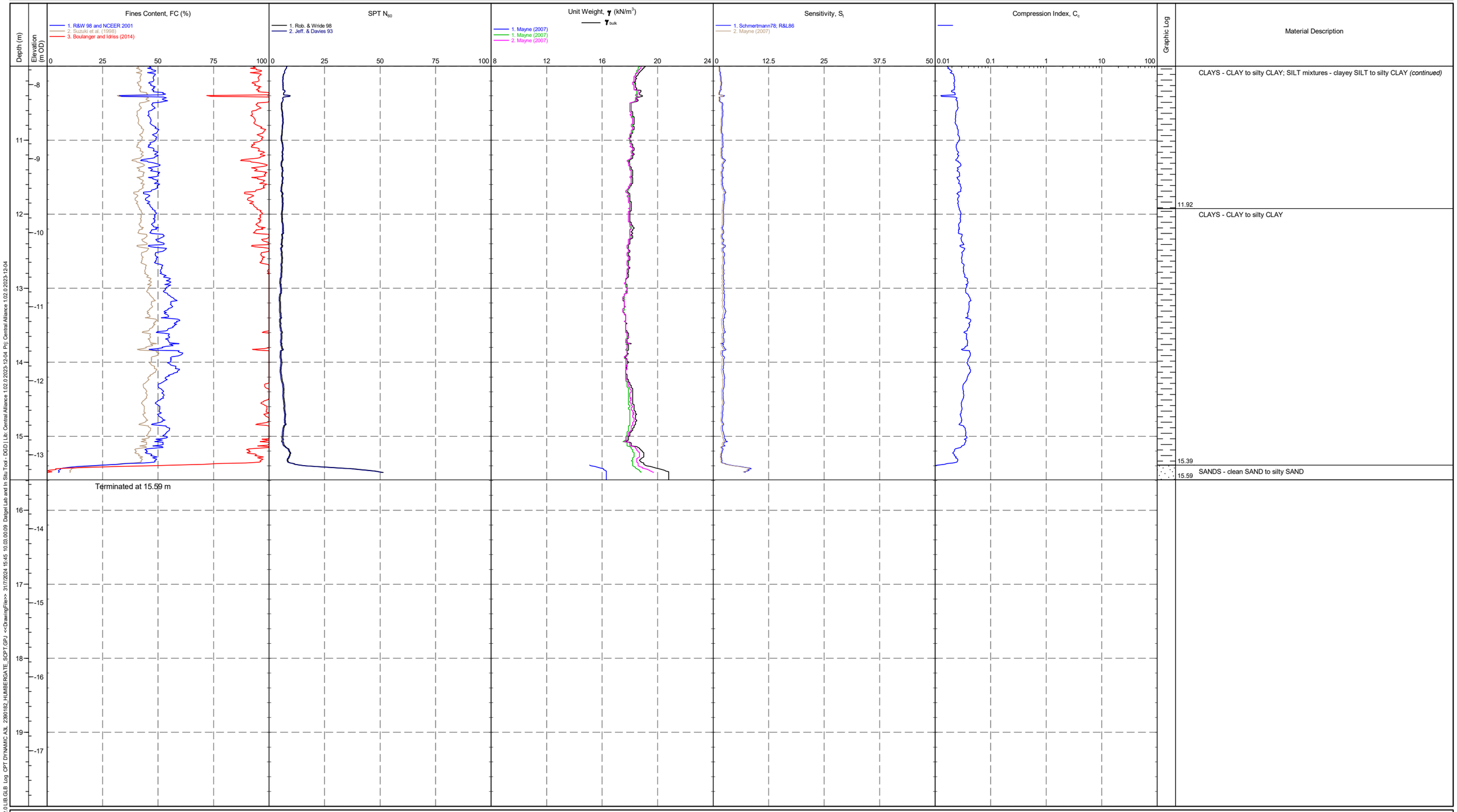
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

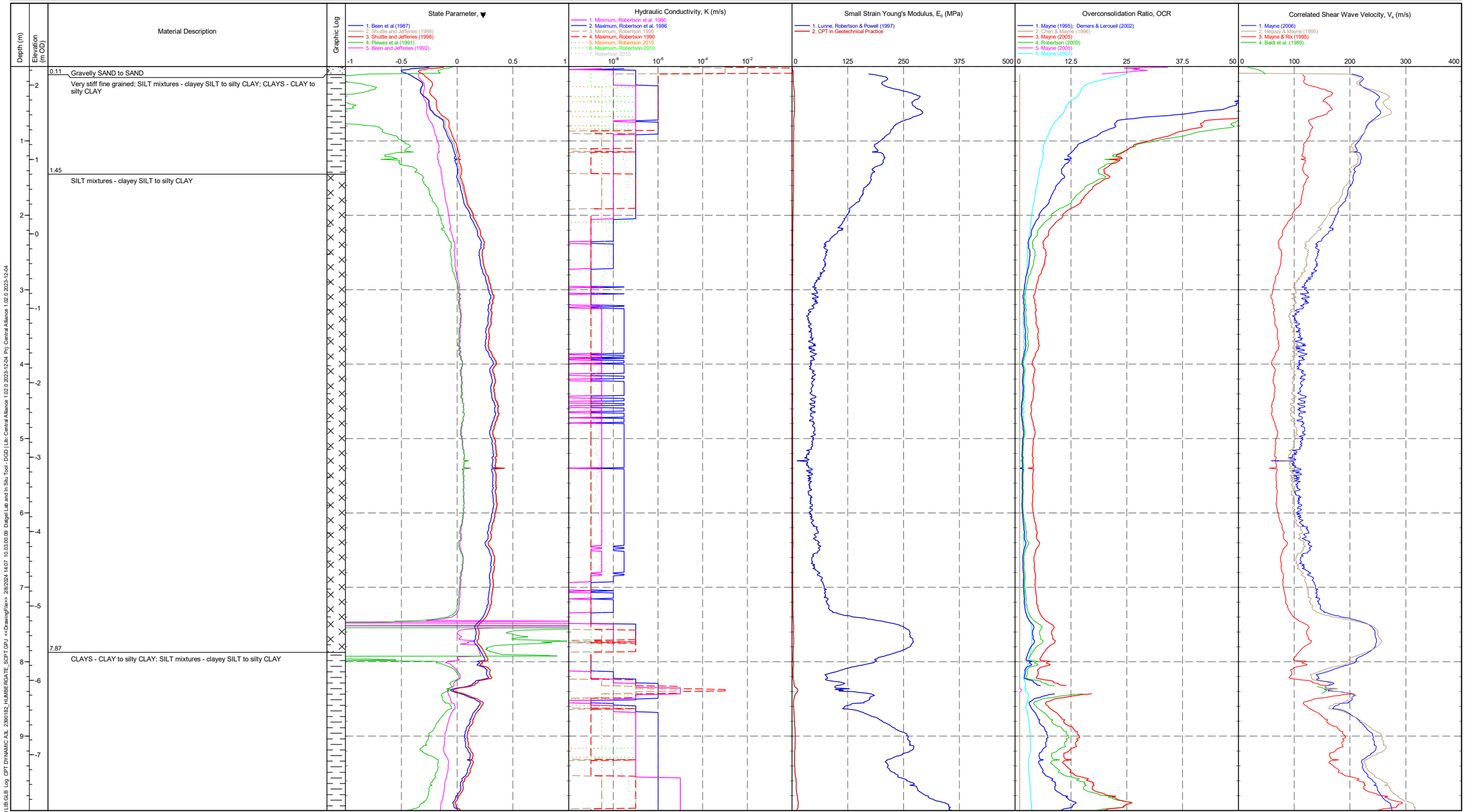
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:45 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC AGL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:07 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

11.92

CLAYS - CLAY to silty CLAY

15.39

15.59 SANDS - clean SAND to silty SAND

Terminated at 15.59 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

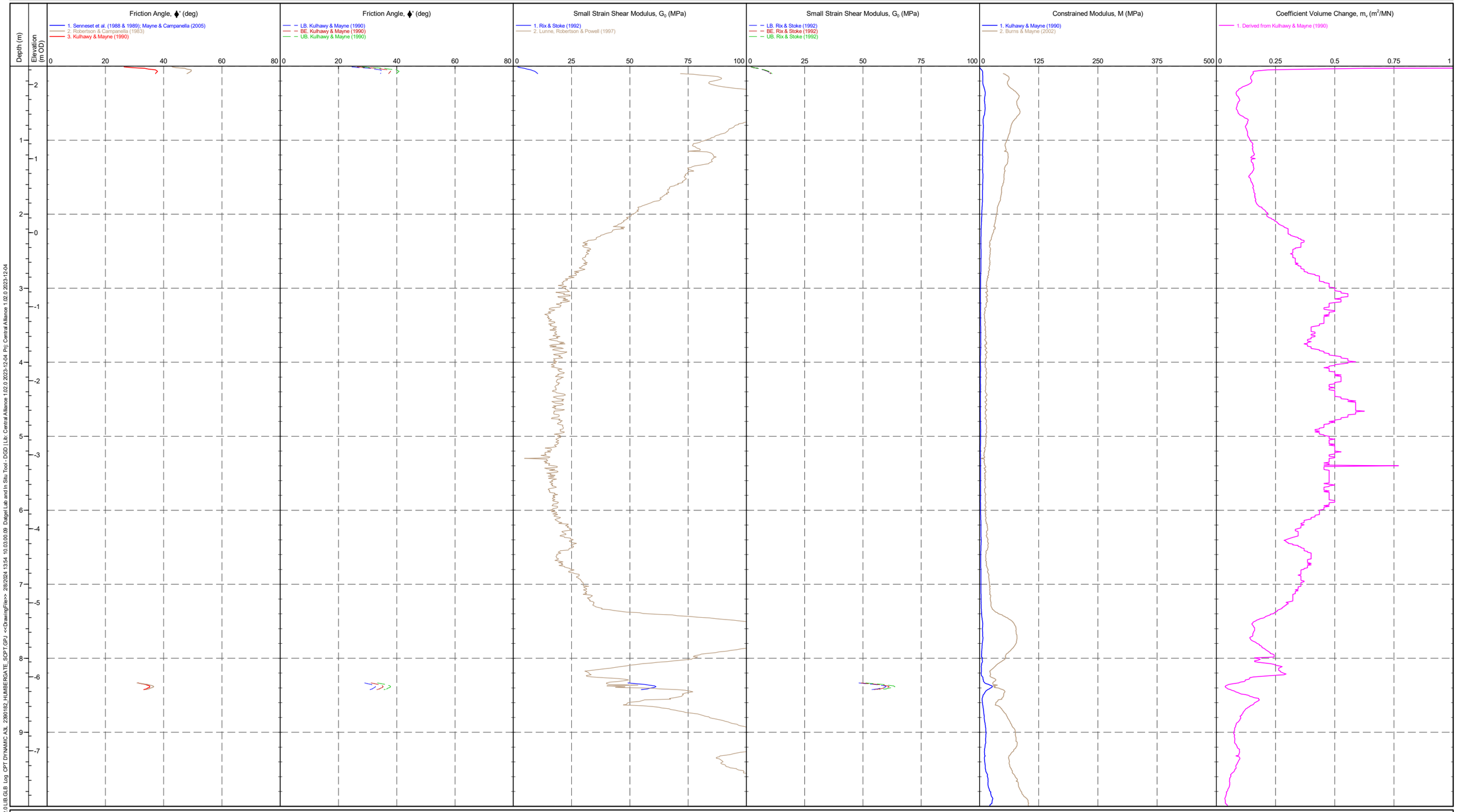
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

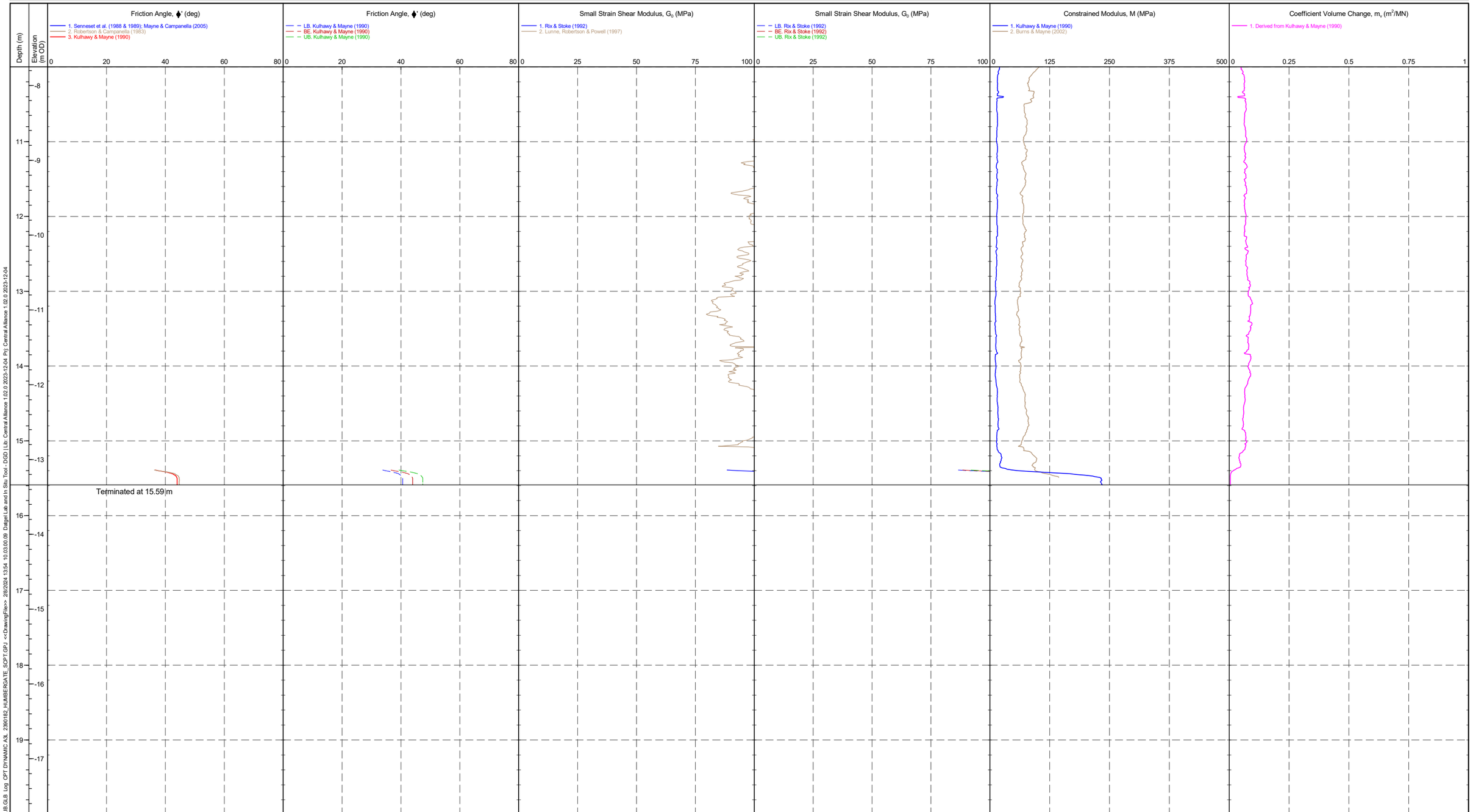
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
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1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

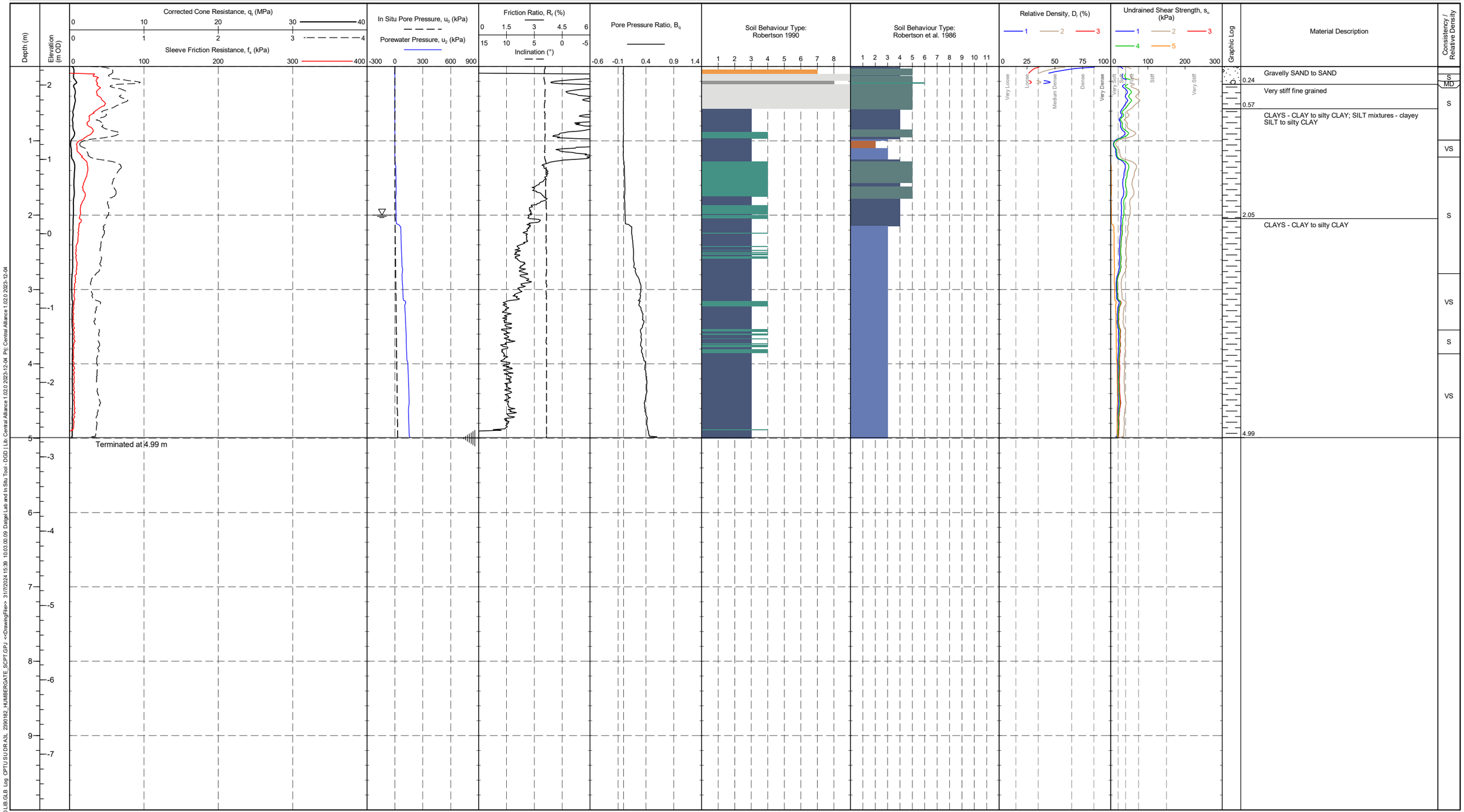
CPT LOG

PointID
CPT220a

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523639.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412822.7 m	DATE	: 9/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.25 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG : ; Crawler based20 Ton;
CONE TYPE : C+F+W2
CONE ID : DP15-CFPTxy.71447
OPERATOR : Central Alliance

CHECKED BY : DH
CHECKED DATE : 23/7/2024
APPROVED BY : SB
APPROVED DATE : 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

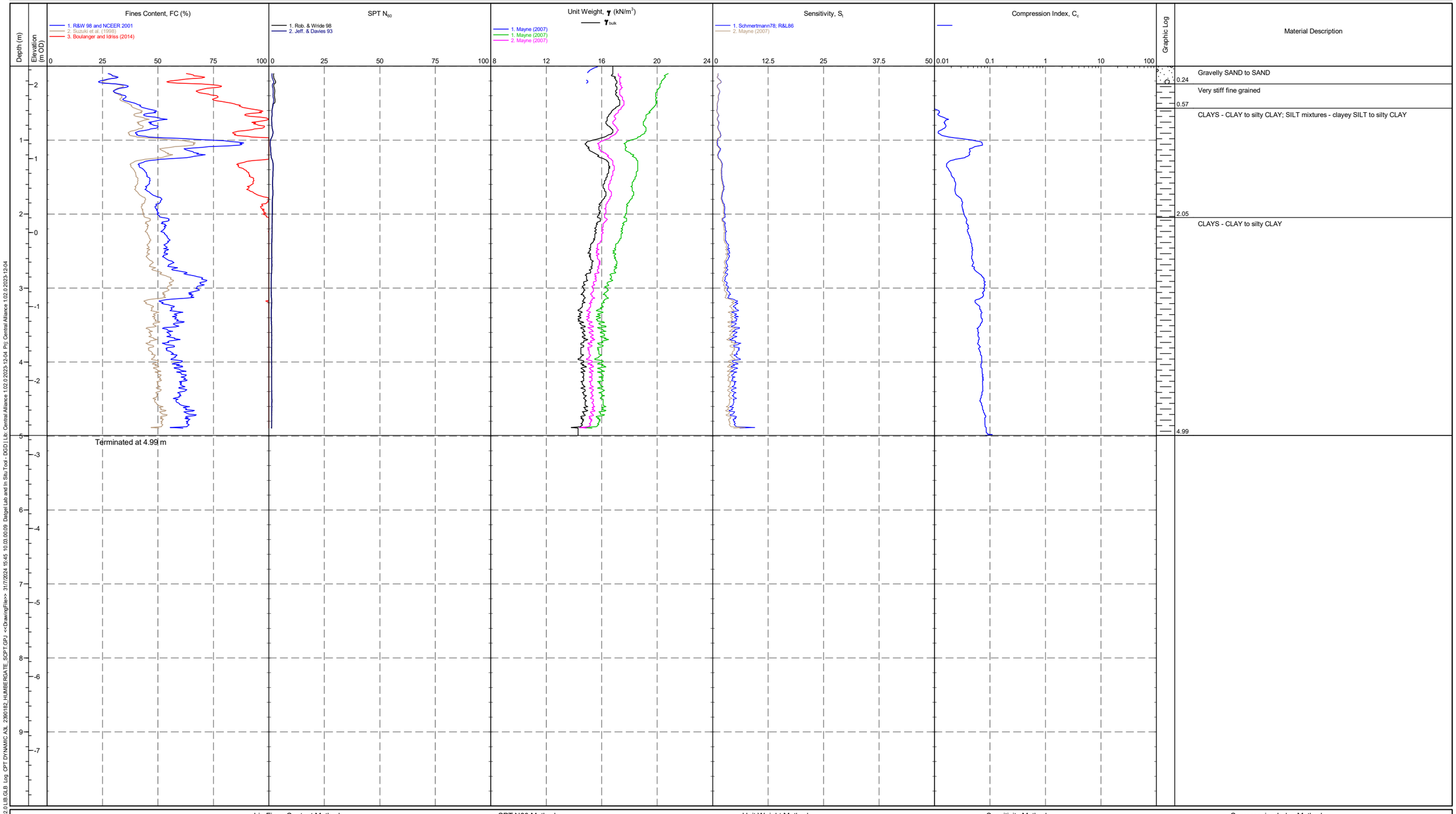
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR.ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220a

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 9/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL_ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 3/7/2024 15:45 10.03.00.09 Datgel Lab and In Situ Tool - DGD [Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT220a**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 9/7/2024

Depth (m)	Elevation (m OD)	Material Description	Graphic Log
0.24	2.01	Gravelly SAND to SAND	
		Very stiff fine grained	
0.57	1.68	CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY	
2.05	0.20	CLAYS - CLAY to silty CLAY	
4.99	-2.74	Terminated at 4.99 m	

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_GCPT.GPJ <<DrawingFile>> 2/8/2024 14:07 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

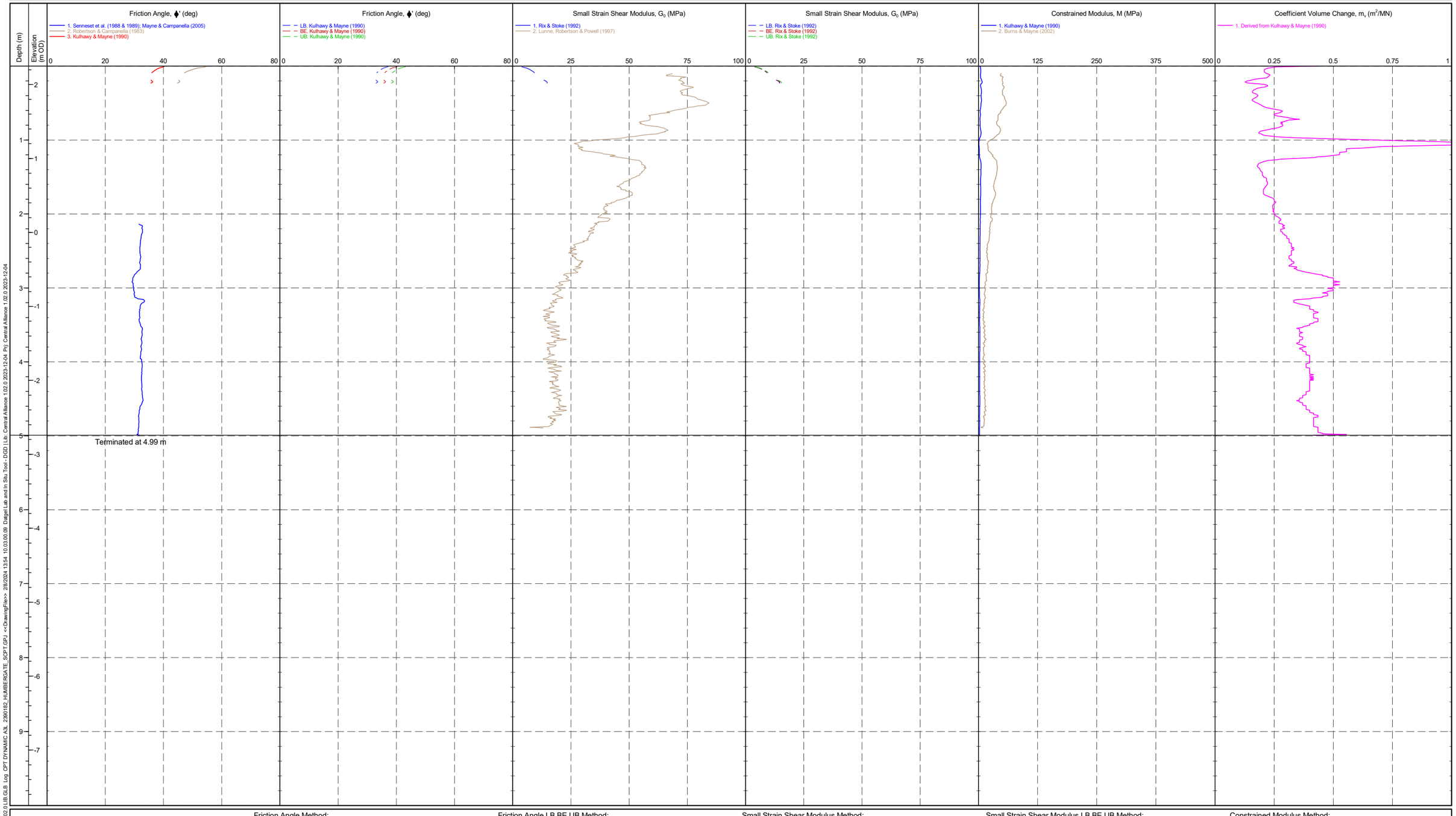
Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT220a

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523639.9 m NORTHING : 412822.7 m COORD. SYS. : OSGB ELEVATION : 2.25 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 1 STATUS : DATE : 9/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

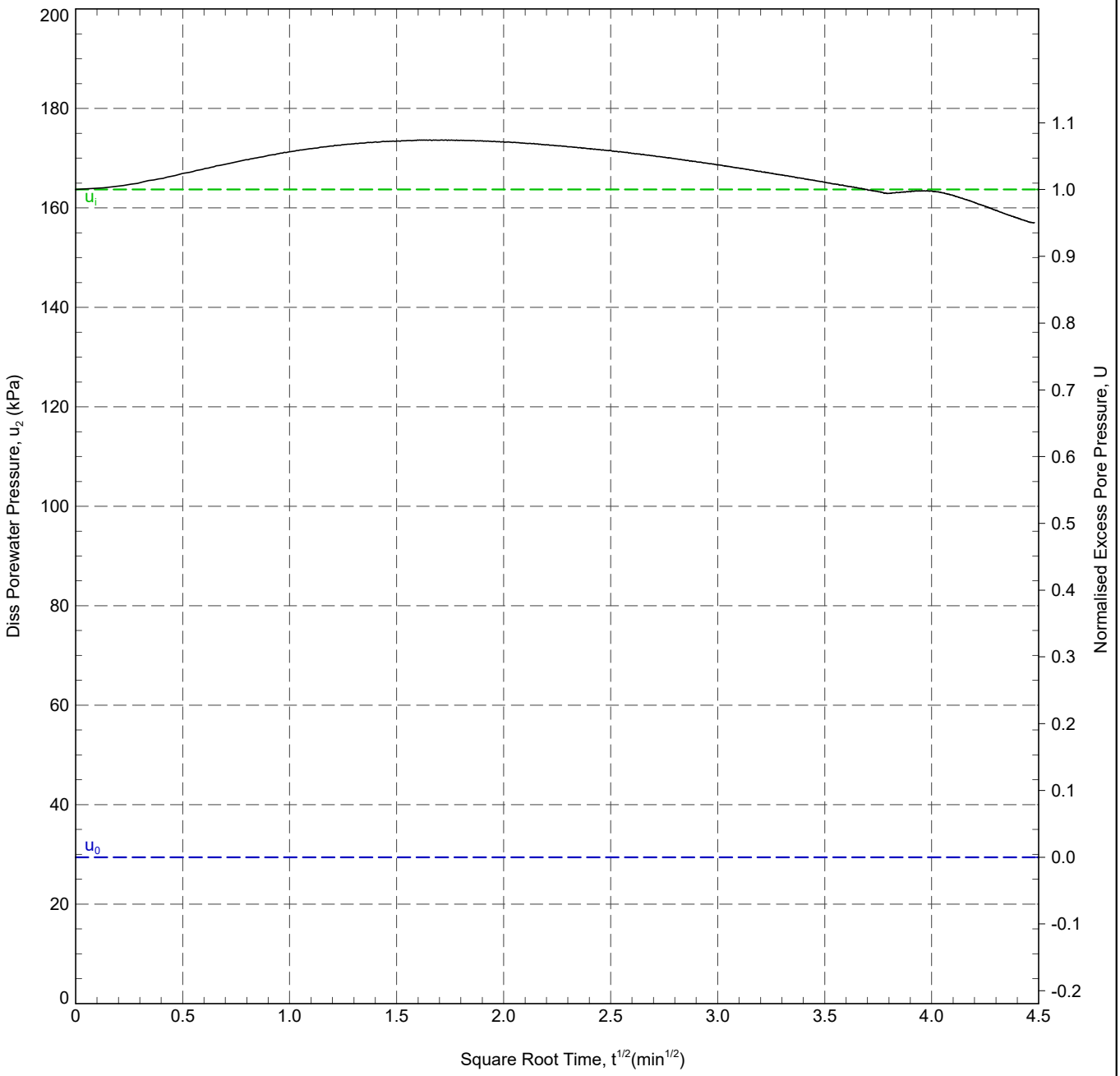
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/9/2024 13:54 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

DISSIPATION TEST

Test ID
CPT220a - 5.00 m

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 1
ENGINEER	:	EASTING	: 523639.9 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412822.7 m	DATE	: 09/07/24
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.25 m OD		



In Situ Pore Pressure, u_0:	29 kPa	Rigidity Index, I_r:	17
Initial Pore Pressure, u_i:	164 kPa		
Final Pore Pressure:	157 kPa		

RIG	: ; Crawler based20 Ton;	ANALYSED BY	:	DATE:	REMARK
CONE TYPE	:	CHECKED BY	:	DATE:	
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	:	DATE:	
OPERATOR	:				

CENTRAL ALLIANCE 1.02.0 LIB.GLB Graph PPDT PORE PRESSURE VS. SQR T A4P 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 2/8/2024 14:00 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

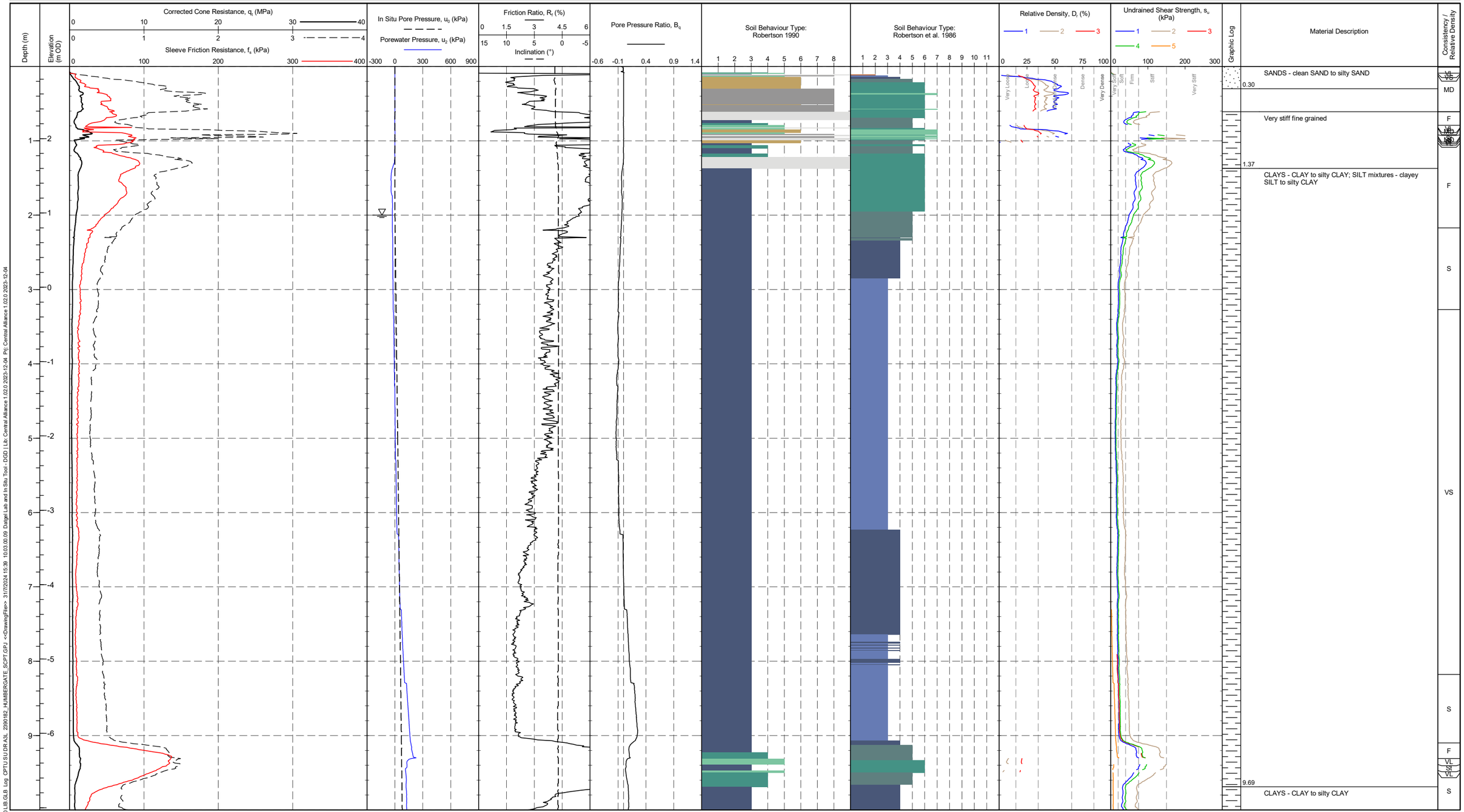
CPT LOG

PointID
CPT221

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 3
ENGINEER	:	EASTING	: 523724.5 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412711.9 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.97 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (Q_t - \sigma_{vo})/N_{kt}$; or $(Q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

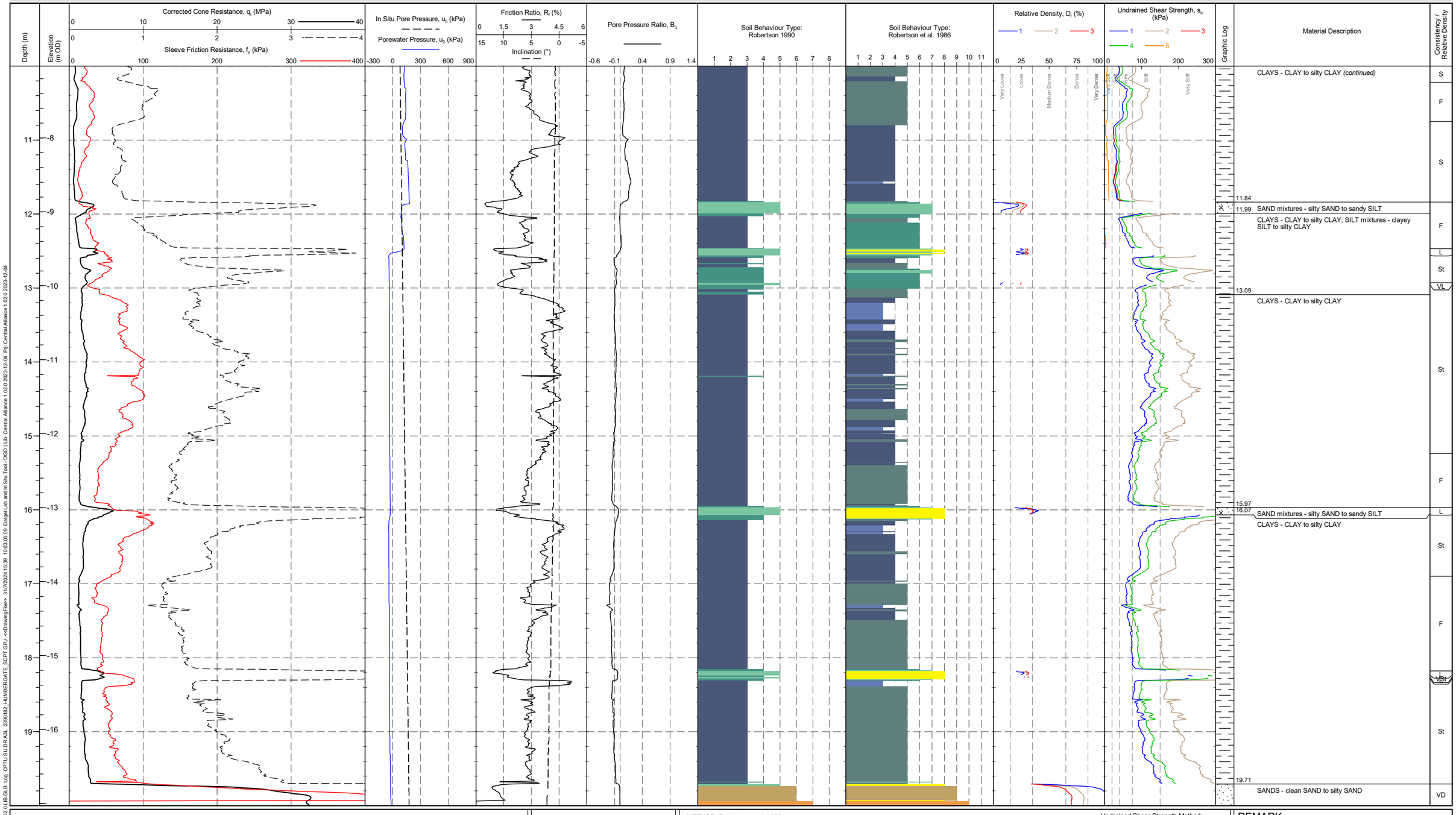
CPT LOG

PointID
CPT221

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 3
ENGINEER	:	EASTING	: 523724.5 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412711.9 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.97 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71447	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{cone}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB:GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT221**

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 3 OF 3
ENGINEER	:	EASTING	: 523724.5 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412711.9 m	DATE	: 8/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.97 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m OD) | Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 | Sleeve Friction Resistance, f_s (kPa) 0 1 2 3 4 | In Situ Pore Pressure, u_0 (kPa) | Porewater Pressure, u_2 (kPa) -300 0 300 600 900 | Friction Ratio, R_f (%) 0 1.5 3 4.5 6 | Inclination (°) 15 10 5 0 -5 | Pore Pressure Ratio, B_q -0.6 -0.1 0.4 0.9 1.4 | Soil Behaviour Type: Robertson 1990 1 2 3 4 5 6 7 8 | Soil Behaviour Type: Robertson et al. 1986 1 2 3 4 5 6 7 8 9 10 11 | Relative Density, D_r (%) 1 2 3 0 25 50 75 100 Very Loose Loose Medium Dense Dense Very Dense | Undrained Shear Strength, s_u (kPa) 1 2 3 4 5 0 100 200 300 Very Soft Soft Firm Stiff Very Stiff | Graphic Log | Material Description | Consistency / Relative Density

Terminated at 20.03 m

Depth (m)	Elevation (m OD)
21	-18
22	-19
23	-20
24	-21
25	-22
26	-23
27	-24
28	-25
29	-26

RIG : ; Crawler based20 Ton;
CONE TYPE : C+F+W2
CONE ID : DP15-CFPTxy.71447
OPERATOR : Central Alliance

CHECKED BY : DH
CHECKED DATE : 23/7/2024
APPROVED BY : SB
APPROVED DATE : 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
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9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

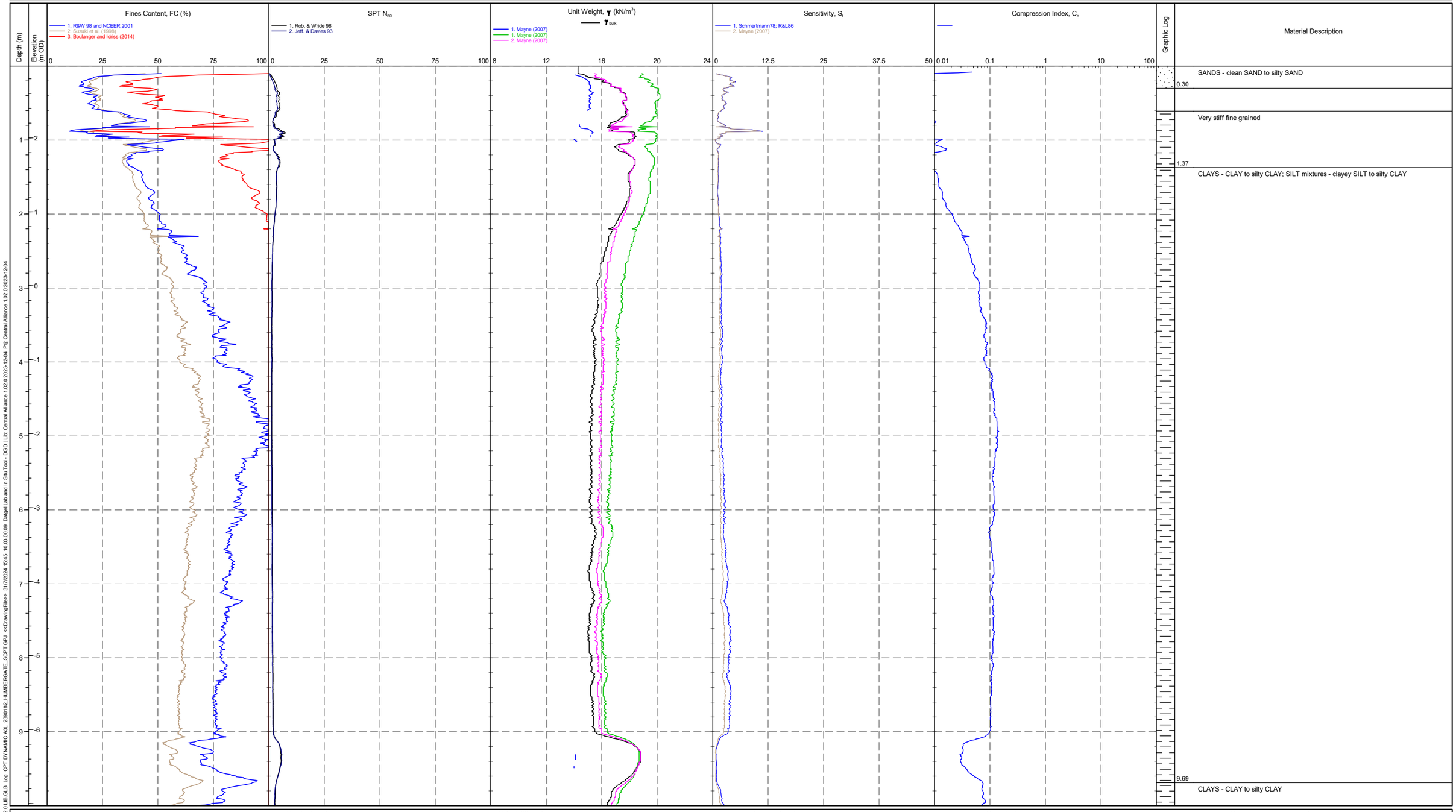
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:39 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 3 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{bat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

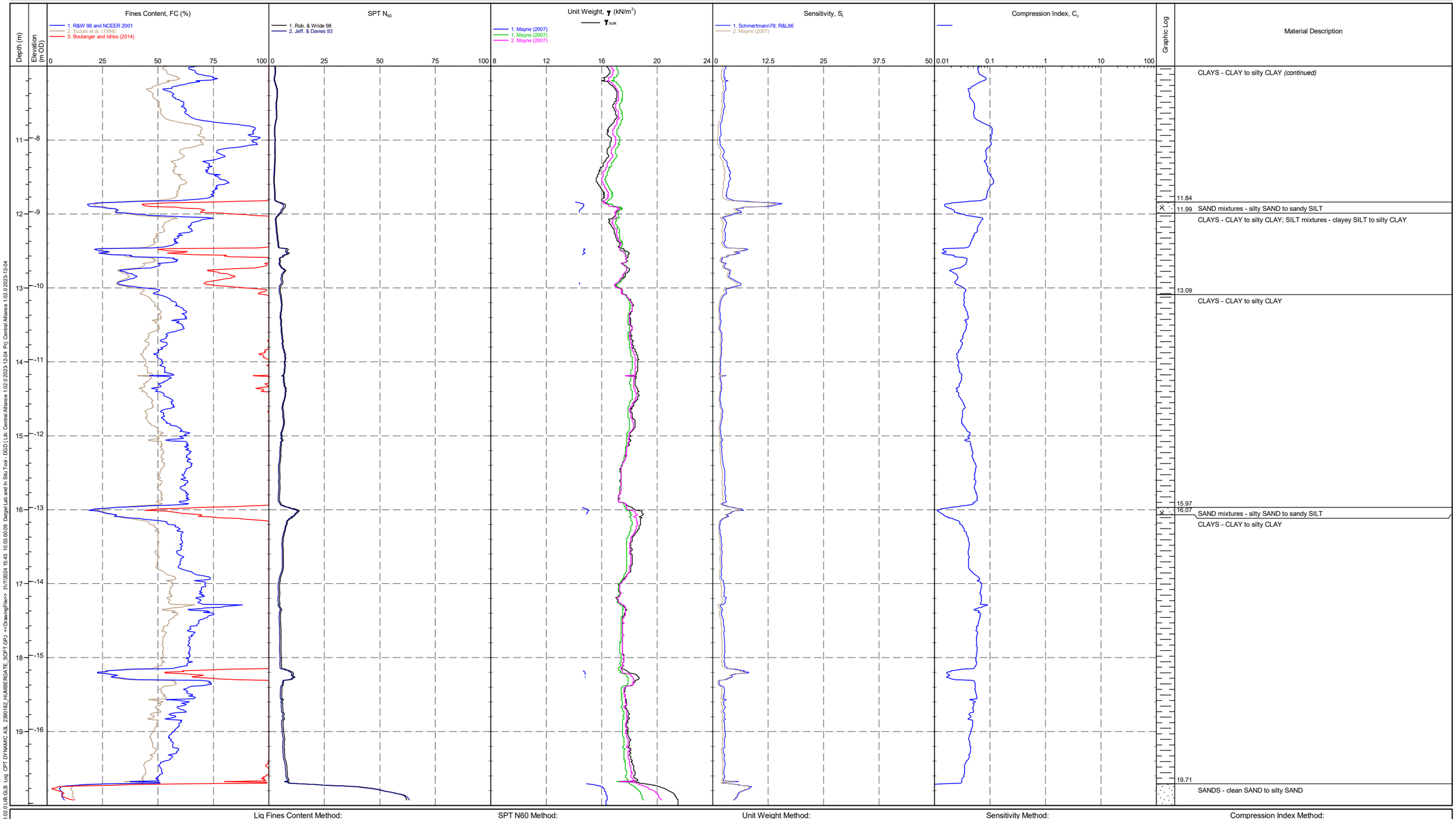
CENTRAL_ALLIANCE 1.02.0 LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:45 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 3 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
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2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

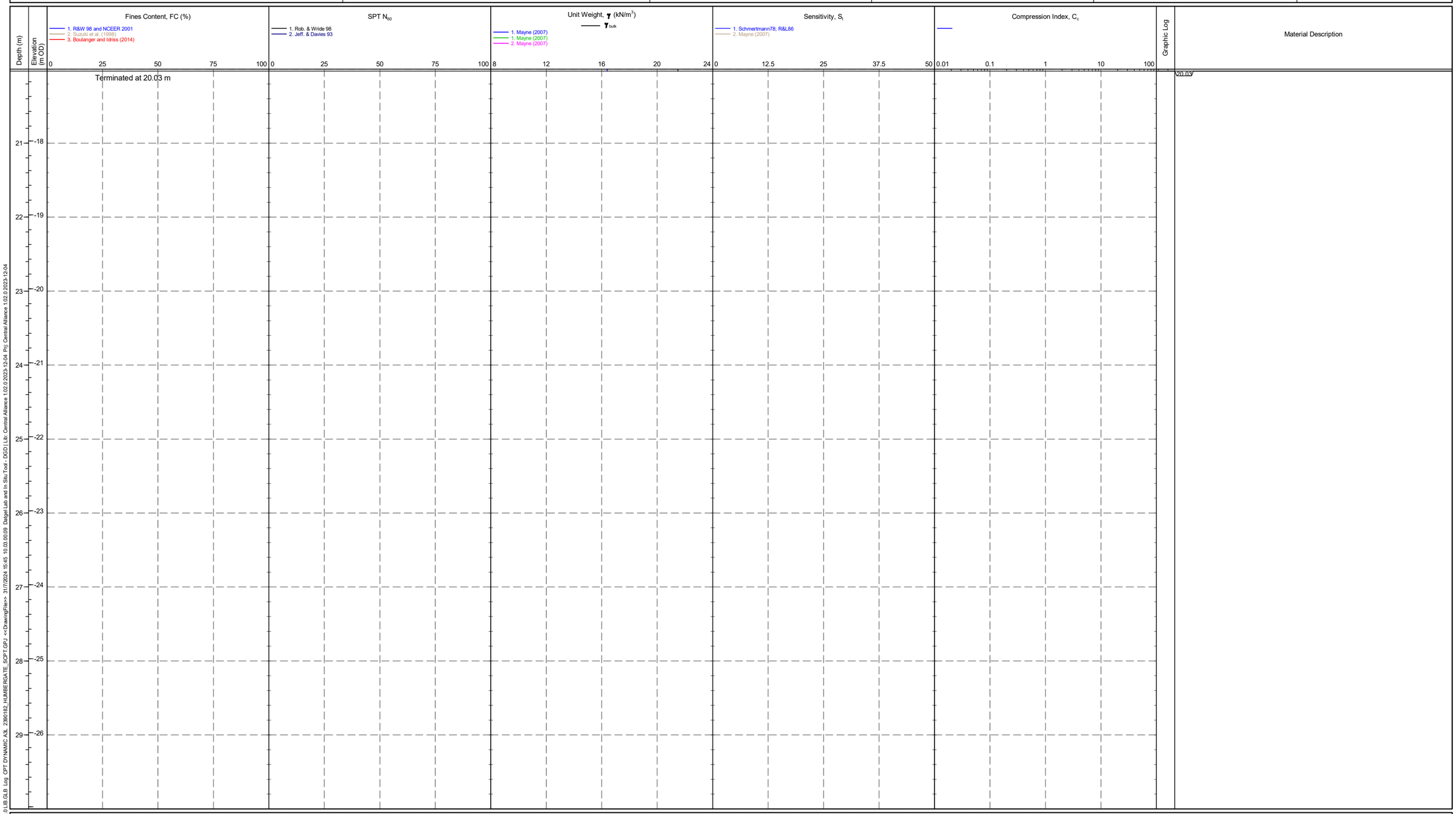
CENTRAL_ALLIANCE 1.02.0.LIB.GLB Log_CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:45 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0.2023-12-04 Prj: Central Alliance 1.02.0.2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 3 OF 3 STATUS : DATE : 8/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
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Unit Weight Method:
1. γ_b Applied in Calculation
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1. γ_{dry} Mayne (2007)

Sensitivity Method:
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2. Mayne (2007)

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1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.02.0 LIB.GLB Log_CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:45 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 3 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

0.30 SANDS - clean SAND to silty SAND

Very stiff fine grained

1.37 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

9.69 CLAYS - CLAY to silty CLAY

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
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2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

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2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

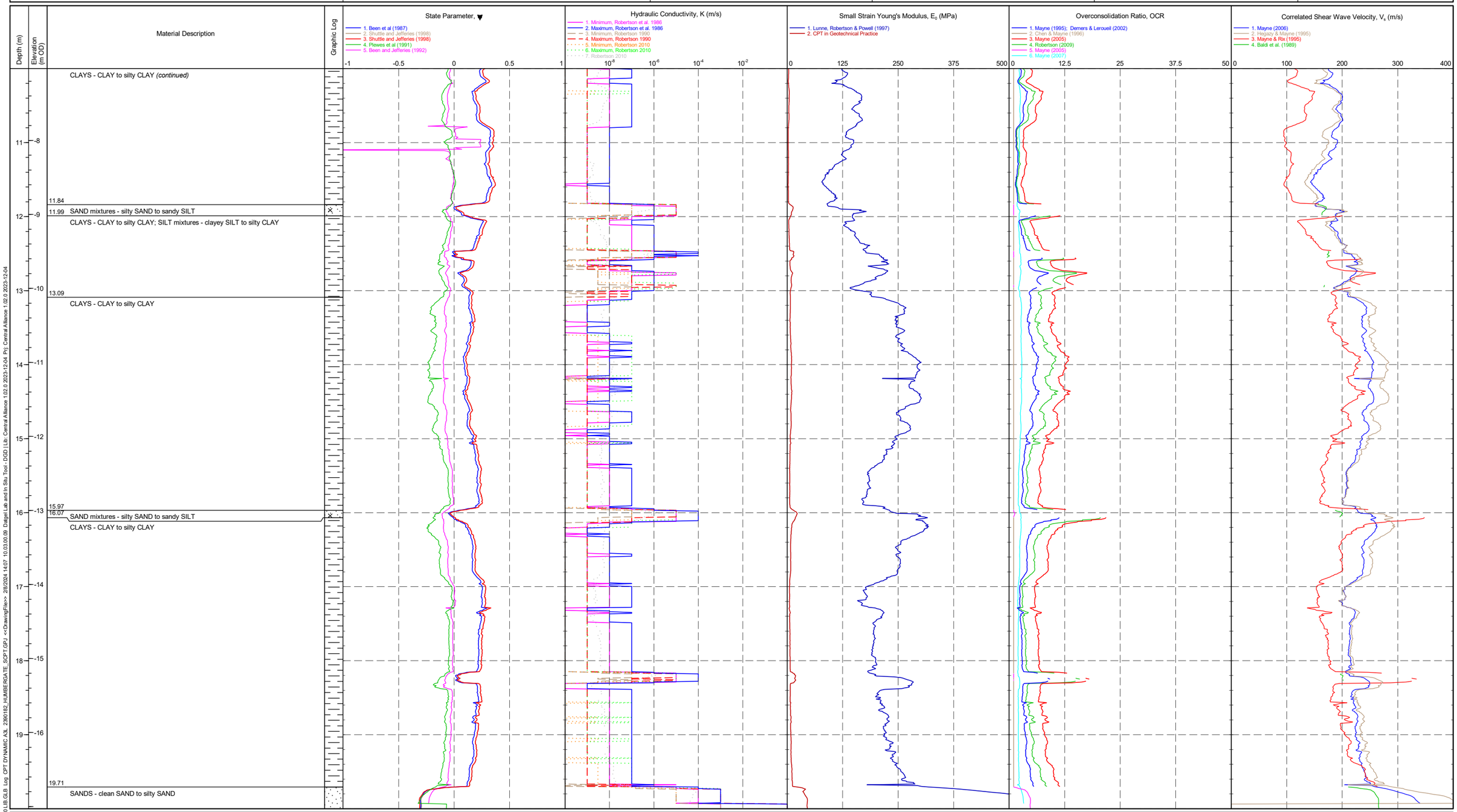
CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 26/2/2024 14:07 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 3 STATUS : DATE : 8/7/2024



Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
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Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL ALLIANCE 1.02.0.LIB GLB Log CPT DYNAMIC ADL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2/2024 14:07 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT221**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 3 OF 3 STATUS : DATE : 8/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

State Parameter, Ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)
0 100 200 300 400

Depth (m)	Elevation (m OD)	Material Description
20.03		Terminated at 20.03 m
21	-18	
22	-19	
23	-20	
24	-21	
25	-22	
26	-23	
27	-24	
28	-25	
29	-26	

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

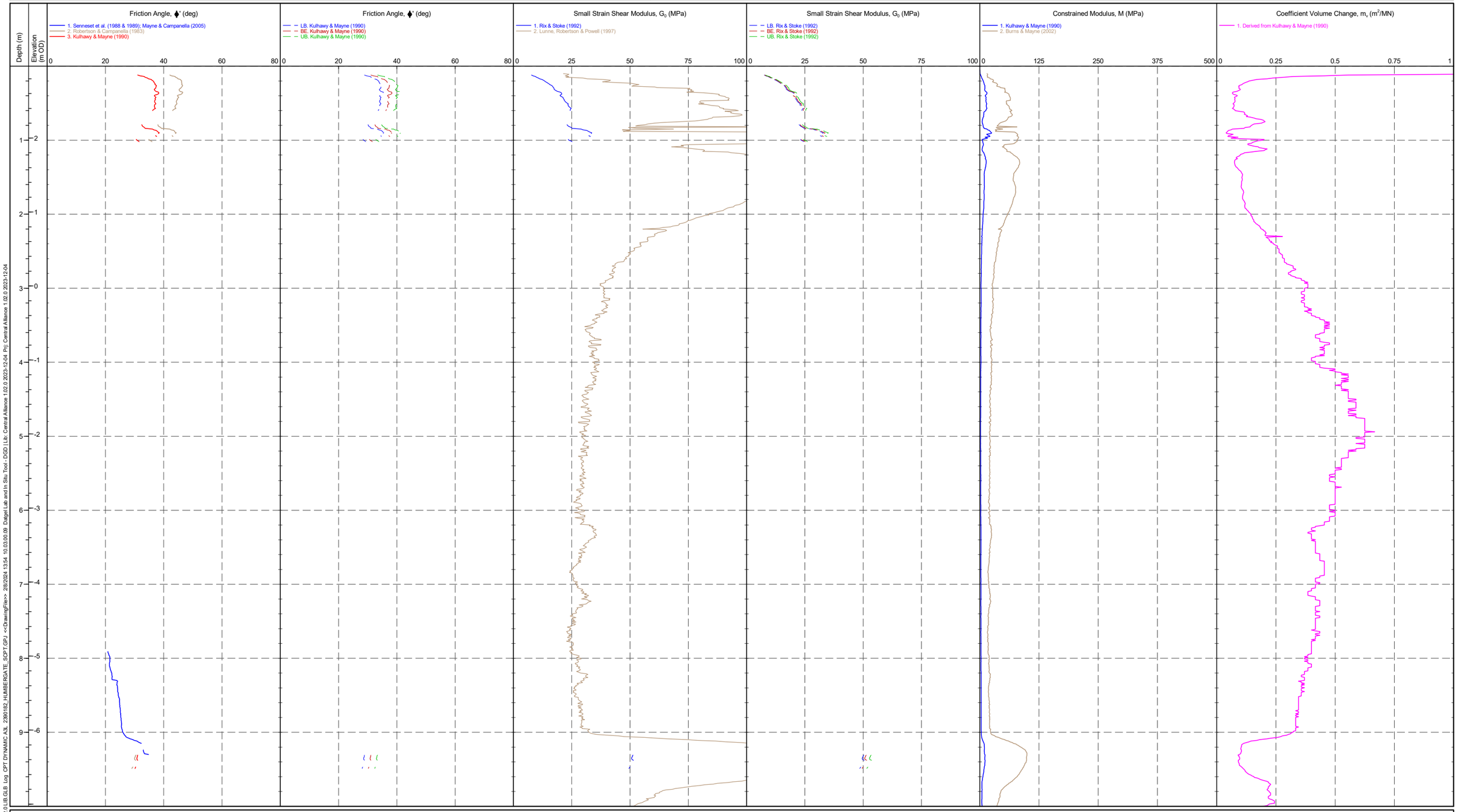
CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:08 10.03.00.69 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 3 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

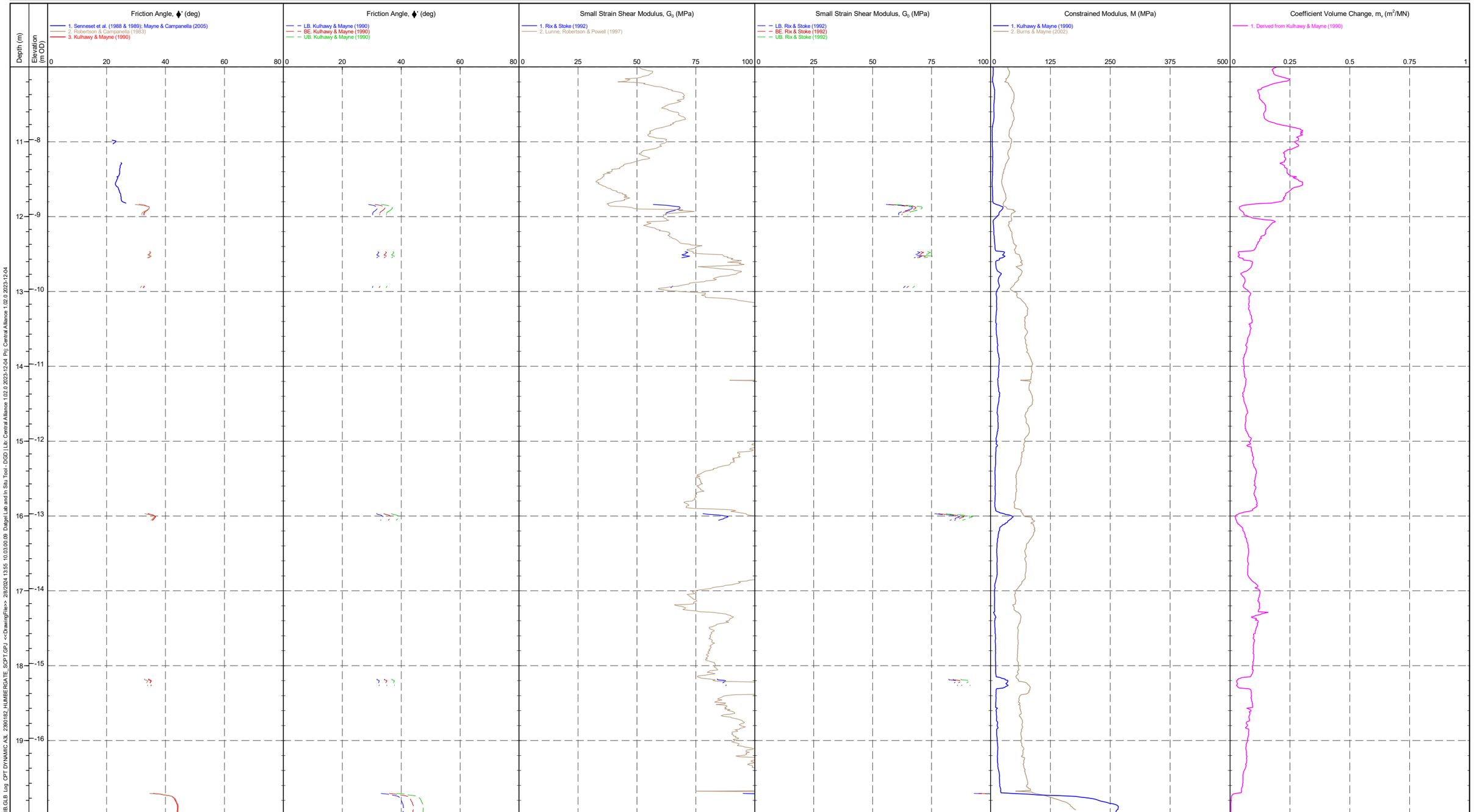
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 3 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

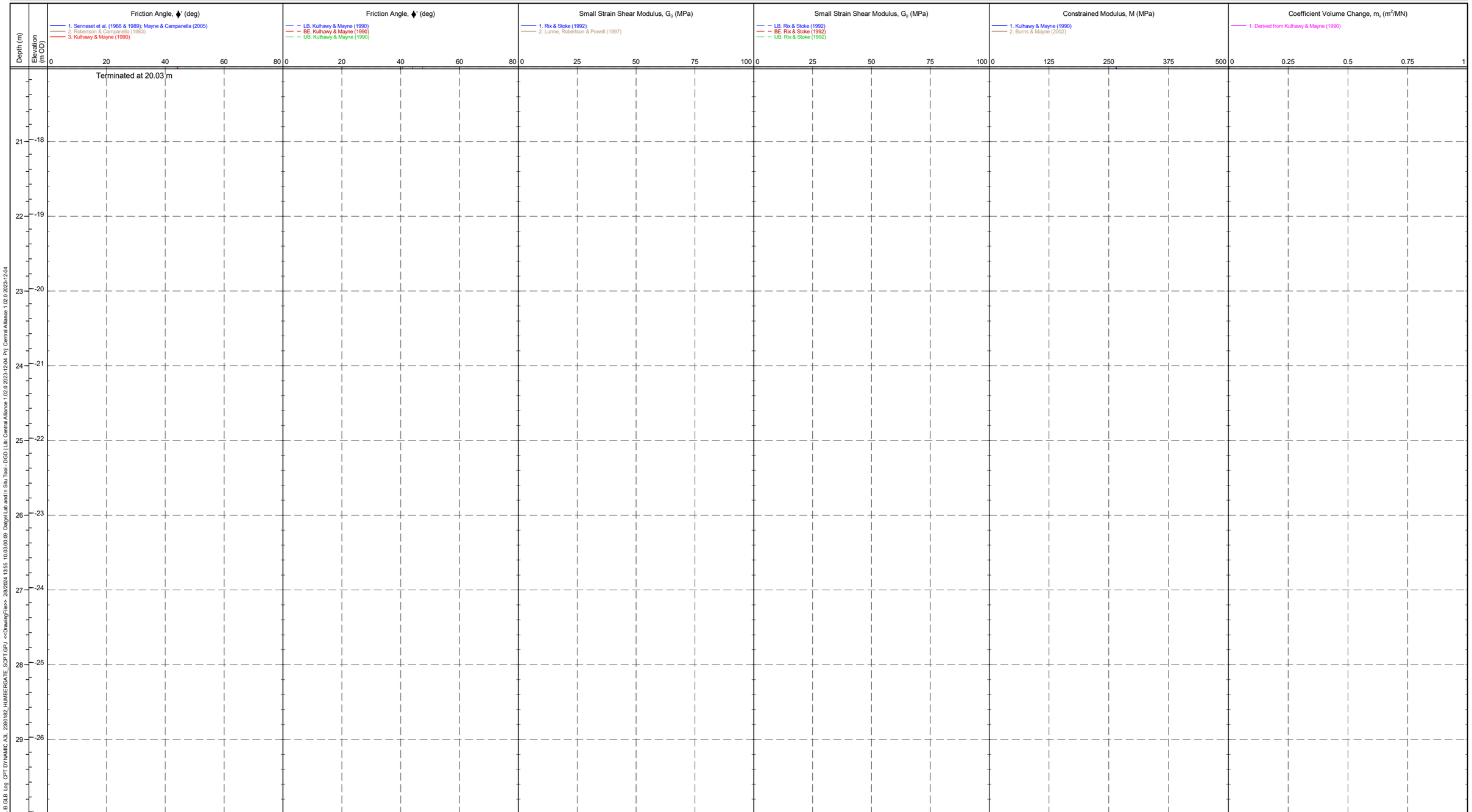
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT221

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523724.5 m NORTHING : 412711.9 m COORD. SYS. : OSGB ELEVATION : 2.97 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71447 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 3 OF 3 STATUS : DATE : 8/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

CENTRAL ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC A3L 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 13:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT222d

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 1 OF 2
ENGINEER	:	EASTING	: 523735.1 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412572.6 m	DATE	: 10/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.82 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m OD)

Corrected Cone Resistance, q_t (MPa): 0 10 20 30 40
Sleeve Friction Resistance, f_s (kPa): 0 1 2 3 4 | 0 100 200 300 400

In Situ Pore Pressure, u_0 (kPa)
Porewater Pressure, u_2 (kPa)
-300 0 300 600 900

Friction Ratio, R_f (%): 0 1.5 3 4.5 6
Inclination (°): 15 10 5 0 -5

Pore Pressure Ratio, B_q: -0.6 -0.1 0.4 0.9 1.4

Soil Behaviour Type: Robertson 1990: 1 2 3 4 5 6 7 8

Soil Behaviour Type: Robertson et al. 1986: 1 2 3 4 5 6 7 8 9 10 11

Relative Density, D_r (%): 1 2 3 | 0 25 50 75 100 | Very Loose | Loose | Medium Dense | Dense | Very Dense

Undrained Shear Strength, s_u (kPa): 1 2 3 4 5 | 0 100 200 300 | Very Soft | Soft | Firm | Stiff | Very Stiff

Graphic Log

Material Description

Consistency / Relative Density

Material Description	Consistency / Relative Density
Very stiff fine grained	VD
	D
	L
	MD
	F
1.33 CLAYS - CLAY to silty CLAY	S
	VS
7.95 SILT mixtures - clayey SILT to silty CLAY	S
8.51 CLAYS - CLAY to silty CLAY	S
	F
	St

RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_c - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.02.0 LIB GLB Log CPTU SU DR ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:40 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

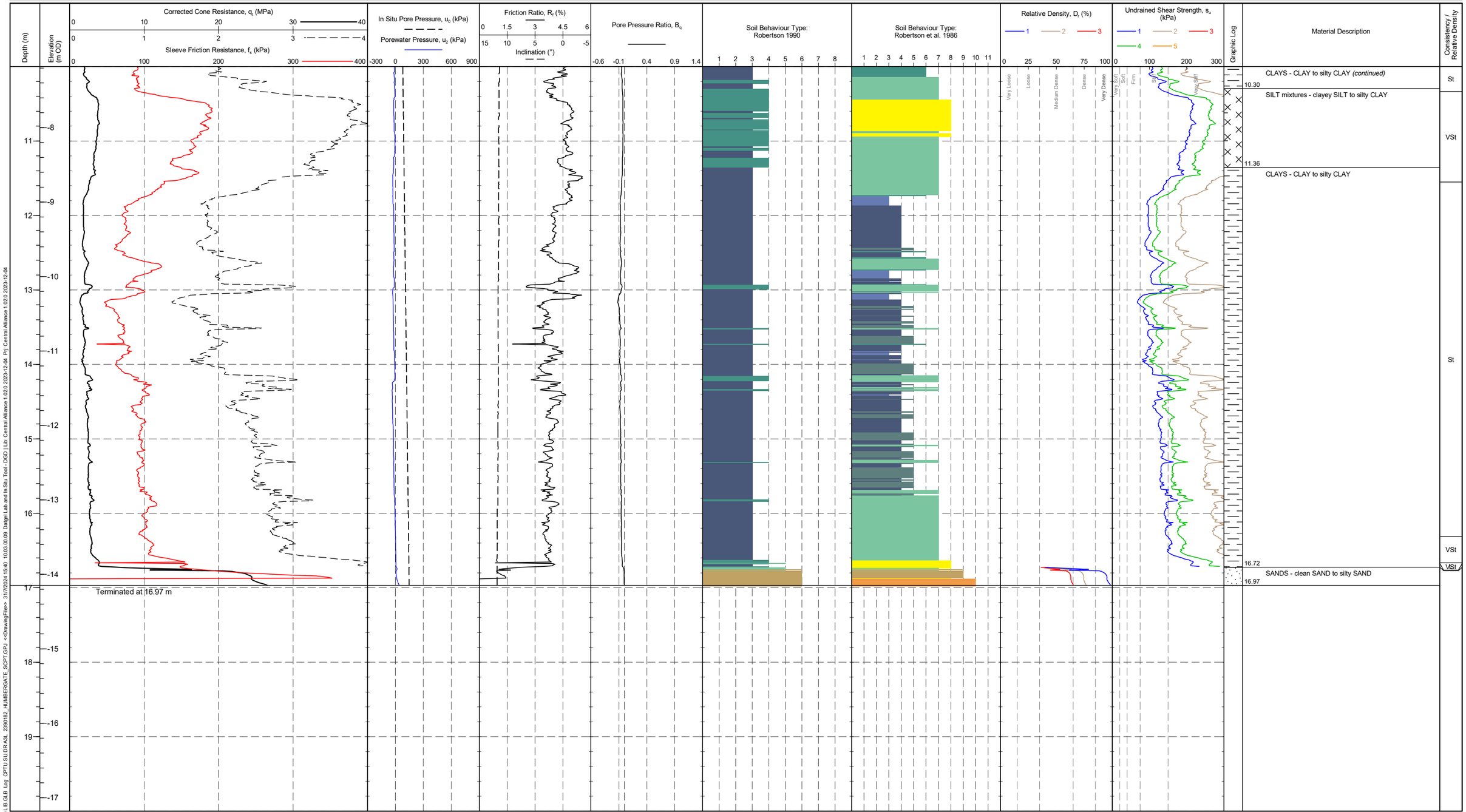
CPT LOG

PointID
CPT222d

CLIENT	: Mayer Enviro	AREA	:	SHEET	: 2 OF 2
ENGINEER	:	EASTING	: 523735.1 m	STATUS	:
PROJECT	: Humber Gateway	NORTHING	: 412572.6 m	DATE	: 10/7/2024
LOCATION	: Grimsby	COORD. SYS.	: OSGB		
PROJECT No.	: 2390182	ELEVATION	: 2.82 m OD		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



Material Description

CLAYS - CLAY to silty CLAY *(continued)*
10.30
SILT mixtures - clayey SILT to silty CLAY
11.36
CLAYS - CLAY to silty CLAY
16.72
SANDS - clean SAND to silty SAND
16.97

Consistency / Relative Density
St
VSt
St
VSt
VSL

RIG	: ; Crawler based20 Ton;	CHECKED BY	: DH
CONE TYPE	: C+F+W2	CHECKED DATE	: 23/7/2024
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: SB
OPERATOR	: Central Alliance	APPROVED DATE	: 26/7/2024

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_E/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

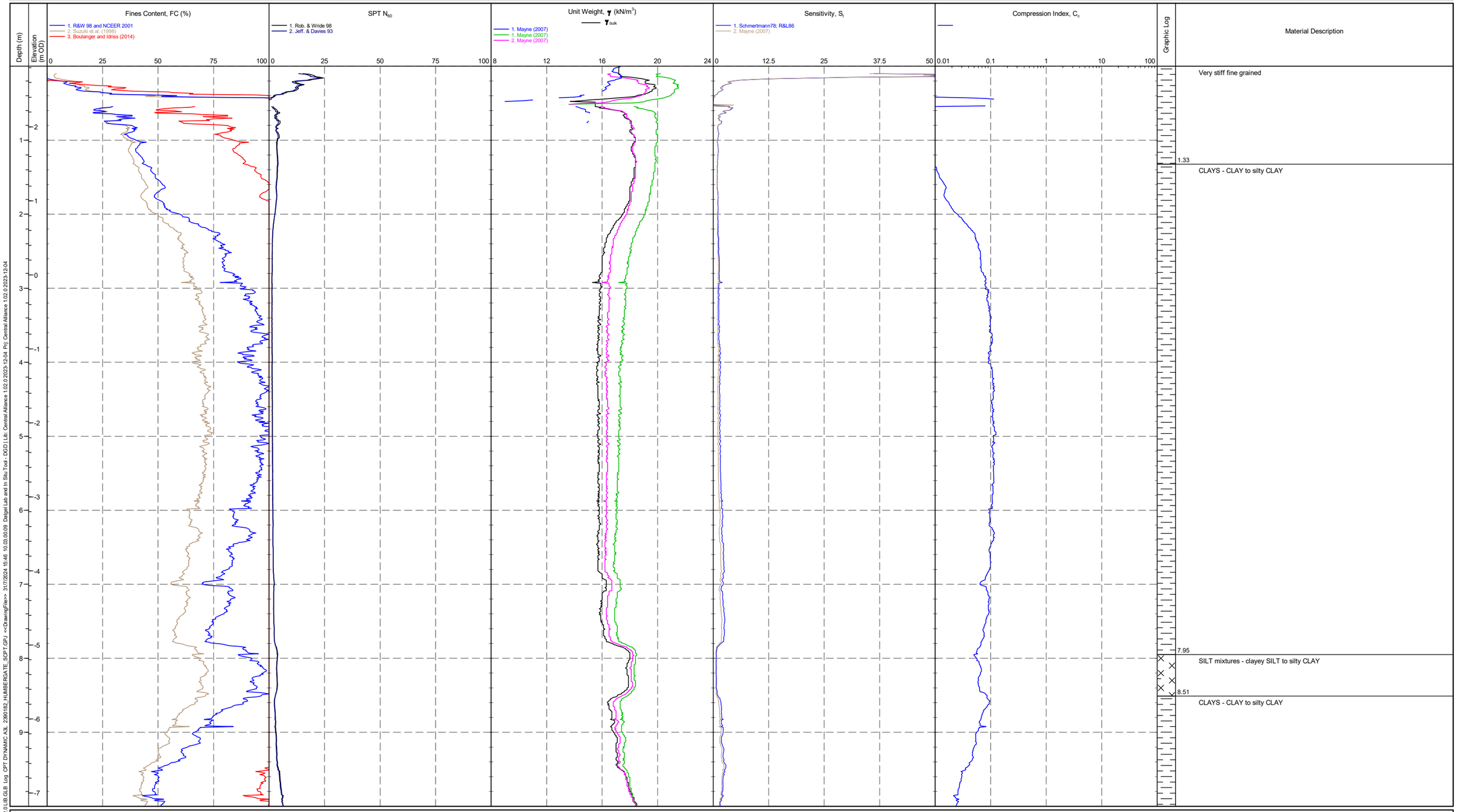
CENTRAL ALLIANCE 1.02.0 LIB.GLB Log CPTU SU DR.ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:40 10.03.00.09 DatgelLab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT222d**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 10/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

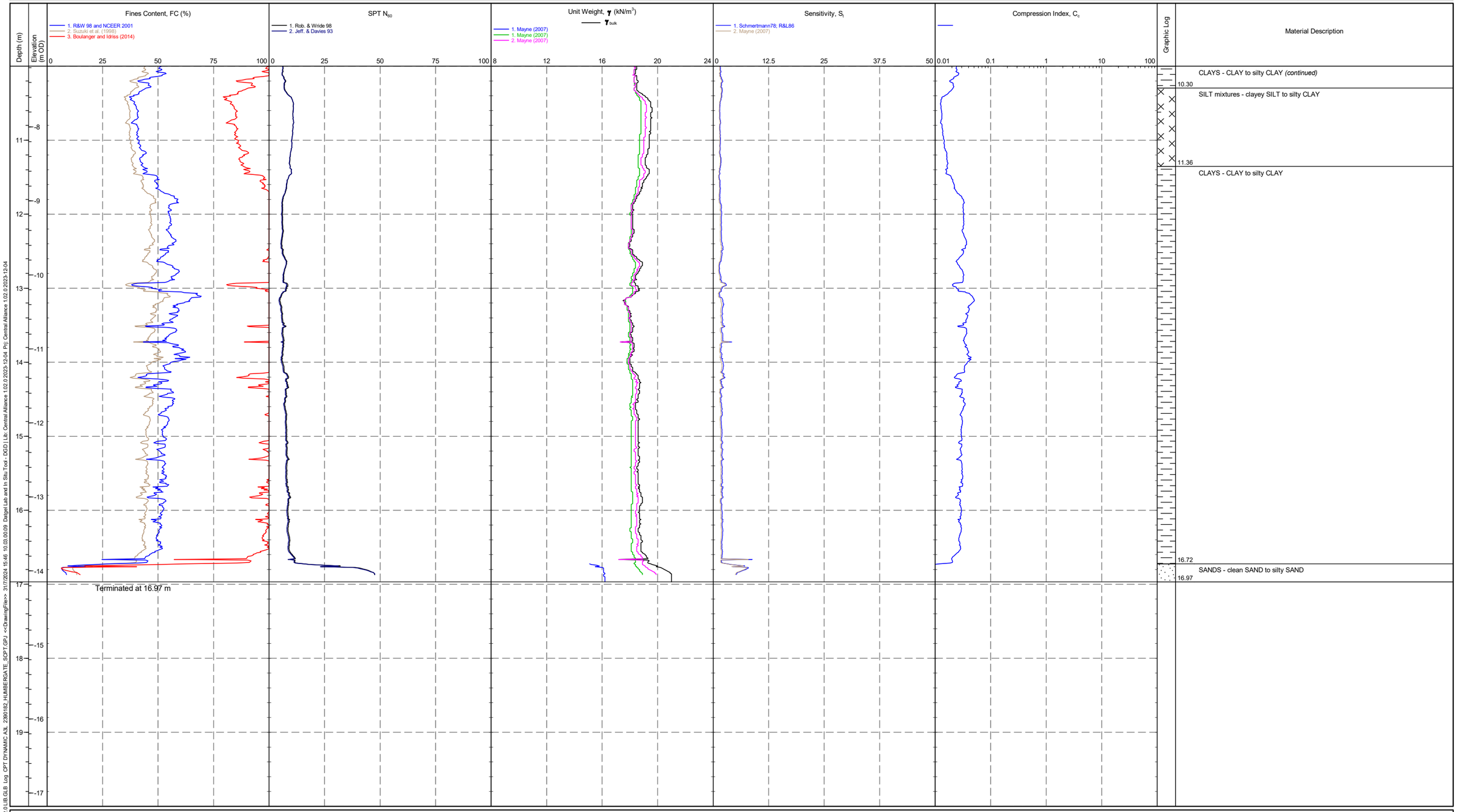
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT222d**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 10/7/2024



Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

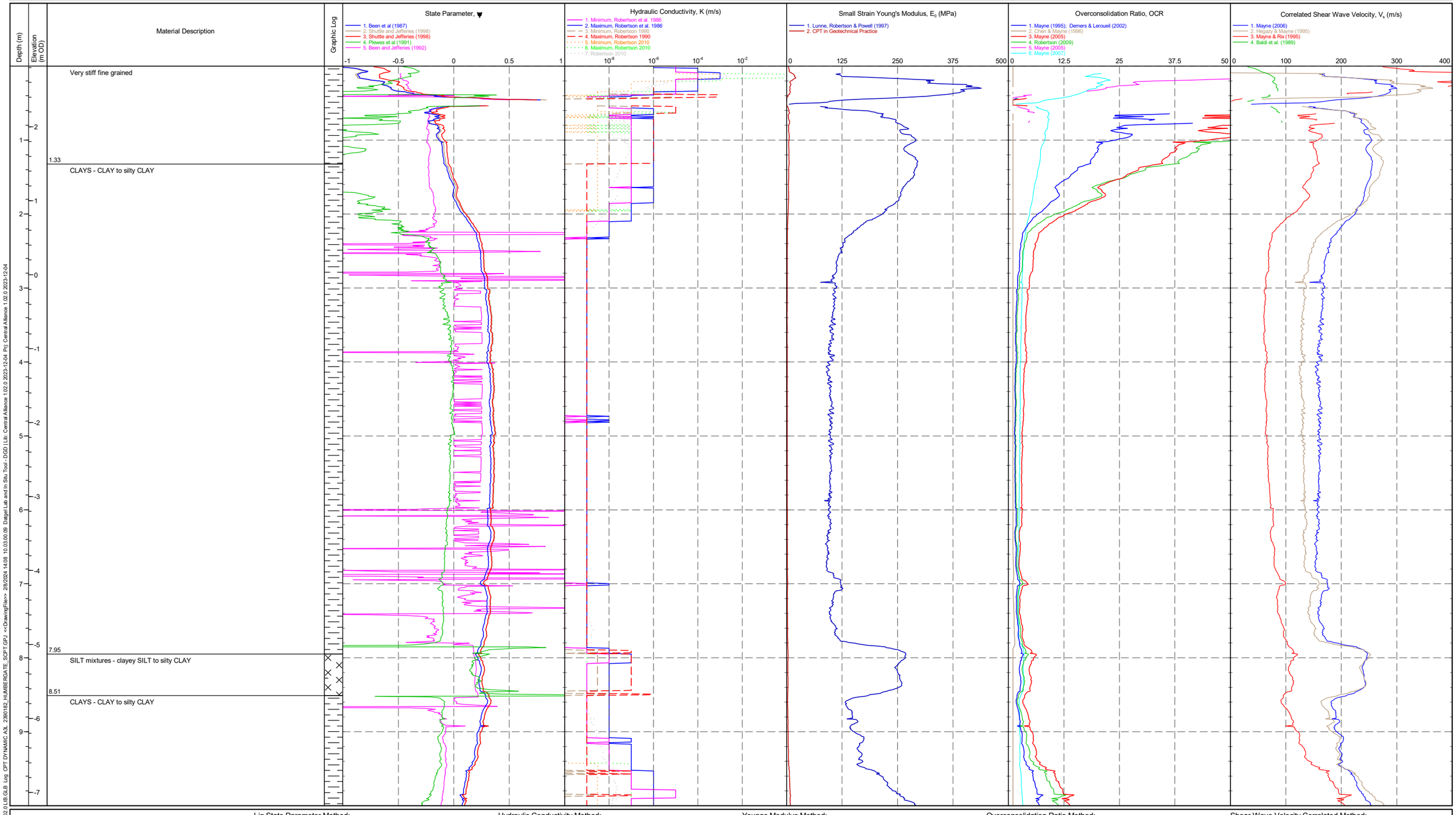
GENTRAL ALLIANCE 1.02.0.LIB.GLB Log_CPT_DYNAMIC ASL_2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 31/7/2024 15:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0.2023-12-04 Prj: Central Alliance 1.02.0.2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT222d

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 10/7/2024



Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Shear Wave Velocity Correlated Method:

CENTRAL_ALLIANCE 1.02.0.LIB.GLB Log CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:08 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT222d

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 10/7/2024

Depth (m) | Elevation (m OD) | Material Description | Graphic Log

- CLAYS - CLAY to silty CLAY *(continued)*
- 10.30
- SILT mixtures - clayey SILT to silty CLAY
- 11.36
- CLAYS - CLAY to silty CLAY
- 16.72
- SANDS - clean SAND to silty SAND
- 16.97
- Terminated at 16.97 m

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Correlated Shear Wave Velocity, V_s (m/s)
1. Mayne (2006)
2. Hegazy & Mayne (1995)
3. Mayne & Rix (1995)
4. Baldi et al. (1989)

Liq State Parameter Method:	Hydraulic Conductivity Method:	Youngs Modulus Method:	Overconsolidation Ratio Method:	Shear Wave Velocity Correlated Method:
1. Been et al (1987)	1. Minimum, Robertson et al. 1986	1. Lunne, Robertson & Powell (1997)	1. Mayne (1995); Demers & Leroueil (2002)	
2. Shuttle and Jefferies (1998)	2. Maximum, Robertson et al. 1986	2. CPT in Geotechnical Practice	2. Chen & Mayne (1996)	
3. Shuttle and Jefferies (1998)	3. Minimum, Robertson 1990		3. Mayne (2005)	
4. Plewes et al (1991)	4. Maximum, Robertson 1990		4. Robertson (2009)	
5. Been and Jefferies (1992)	5. Minimum, Robertson 2010		5. Mayne (2005)	
	6. Maximum, Robertson 2010		6. Mayne (2007)	

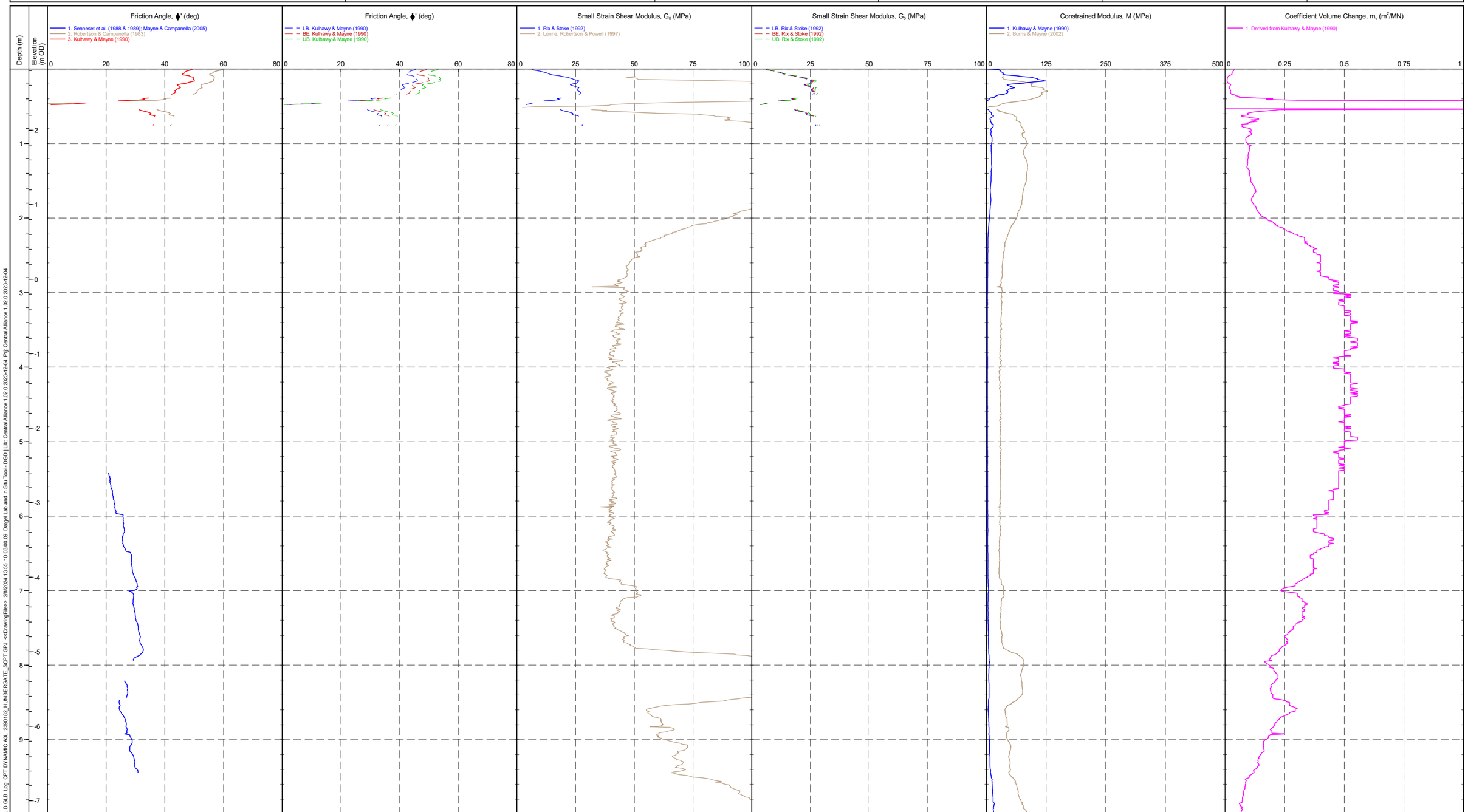
CENTRAL ALLIANCE 1.02.0 LIB.GLB Liq_CPT DYNAMIC ASL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 14:08 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1 (02.0) 2023-12-04

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT222d

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 1 OF 2 STATUS : DATE : 10/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

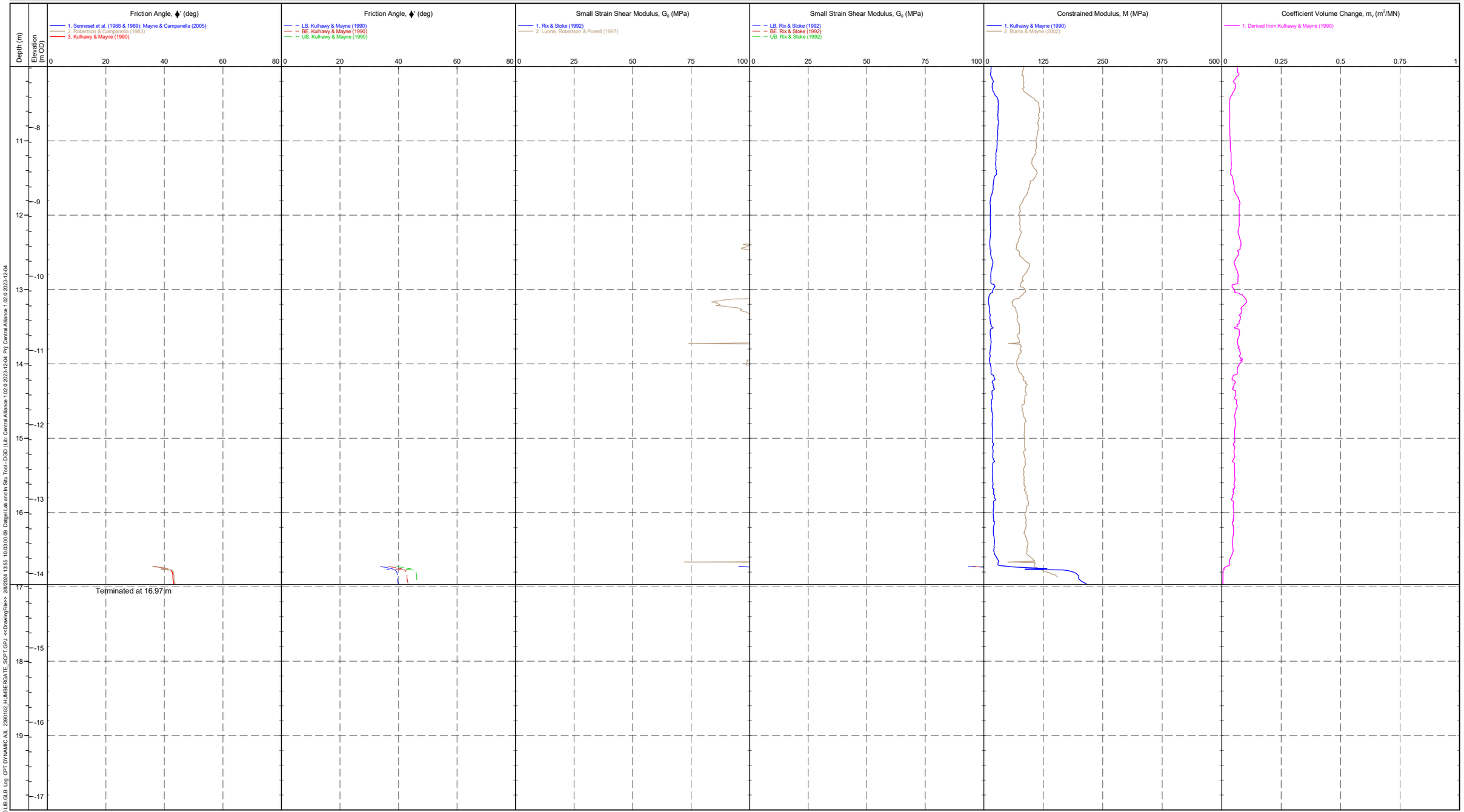
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT222d**

CLIENT : Mayer Enviro ENGINEER : PROJECT : Humber Gateway LOCATION : Grimsby PROJECT No. : 2390182	AREA : EASTING : 523735.1 m NORTHING : 412572.6 m COORD. SYS. : OSGB ELEVATION : 2.82 m OD	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : DH CHECKED DATE : 23/7/2024 APPROVED BY : SB APPROVED DATE : 26/7/2024	REMARK	SHEET : 2 OF 2 STATUS : DATE : 10/7/2024



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

CENTRAL ALLIANCE 102.0.LIB.GLB Log_CPT DYNAMIC ADL 2390182_HUMBERGATE_SCPT.GPJ <<DrawingFile>> 28/2024 13:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.02.0 2023-12-04 Prj: Central Alliance 1.02.0 2023-12-04

7 APPENDIX C – SEISMIC CPT RESULTS

Marchetti Dilatometer Equipment

Standard SDMT Report

Project:	**2390182_HumberGateway**
Firm	Central Alliance
Customer	Enviro Mayor
Job	Humber Gate
Location	CPT219



CENTRAL ALLIANCE

GROUND ENGINEERING TECHNICAL SERVICES



***Disclaimer**: This report is generated by SDMT Pro software, developed and distributed by Studio Prof. Marchetti. The output parameters are calculated according to reduction formulae published in scientific literature and international standards, referenced in detail in a specific section available for inclusion in this report. Studio Prof. Marchetti declines responsibility to third party design for projects based on the results obtained with this software.*

Description of S-wave measurements using the SDMT

The SDMT is a seismic module for recording seismic waves in the soil to evaluate shear wave velocity Vs. The device is equipped with two geophone receivers with a vertical offset of 0.50 m, which record the shear wave generated at surface. The instrument may be combined with a DMT blade, a dummy cone or a CPT probe.

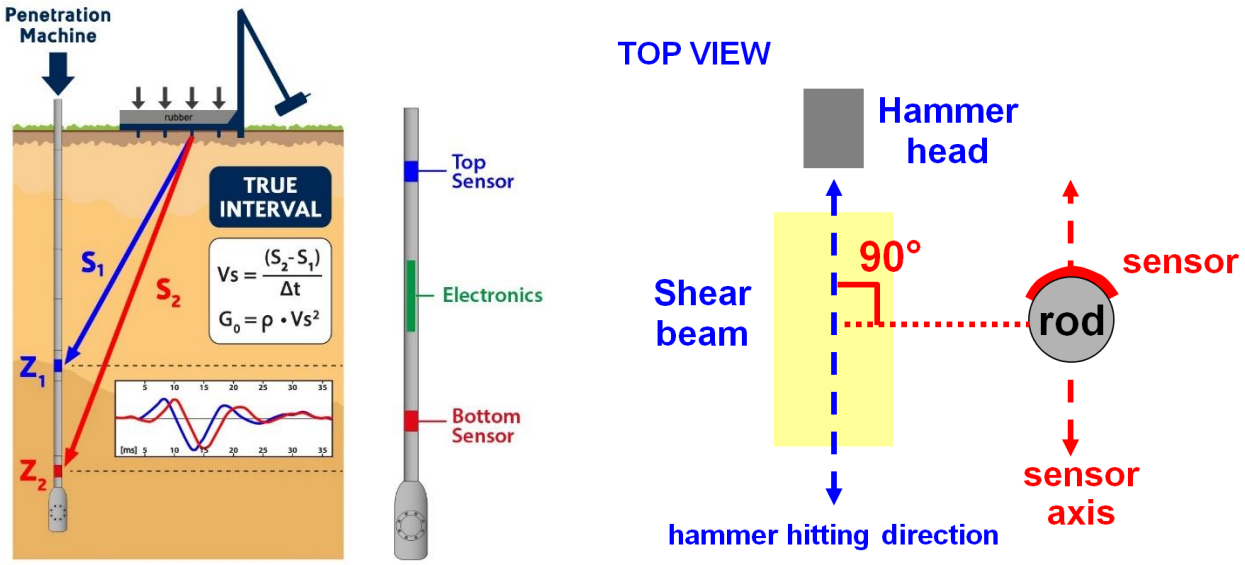
The S-wave is usually generated with a hammer striking in the horizontal direction a shear beam, which must be vertically pressed downwards to ensure good coupling with the soil. The longitudinal axis of the shear beam must be parallel to the axis of the sensors, to maximize sensitivity to the generated shear wave.

The shear wave velocity Vs is the ratio between the difference of the distances between the center of the shear beam to each receiver (S2 – S1) and the delay time (Δt) of the wave arrival to the upper and to the lower receiver.

Vs measurements are recommended with 0.50 m depth interval, to obtain wave registrations in all soil layers of the test location.

The dual sensor configuration enables True Interval interpretation of the shear wave velocity, comparing the traces of the same generated wave recorded by each receiver. In addition, two independent Pseudo Interval interpretations of Vs are possible, considering the traces of each of the two receivers with depth.

The maximum shear modulus G_0 is calculated using the well known formula: $G_0 = \rho\ Vs_2$, Where ρ is the soil density and Vs is the shear wave velocity. Soil density is evaluated from the unit weight, estimated using the Marchetti & Crapps 1981 chart or with values provided manually by the user.



References

ASTM International. 2014. 'Standard Test Methods for Downhole Seismic Testing'. ASTM D7400–14. West Conshohocken, PA. ASTM International, approved November 1, 2014.

Marchetti, S., Monaco, P., Totani, G. & Marchetti, D. 2008. 'In situ tests by seismic dilatometer (SDMT)'. Proceedings. From Re-search to Practice in Geotechnical Engineering, ASCE Ge-otech. Spec. Publ. No. 180 (honoring J.H. Schmertmann): 292-311.

Amoroso S., Monaco P., Lehane B. M., Marchetti D. 2014. Examination of the Potential of the Seismic Dilatometer (SDMT) to Estimate In Situ Stiffness Decay Curves in Various Soil Types.Soils and Rocks 37(3):177-194.

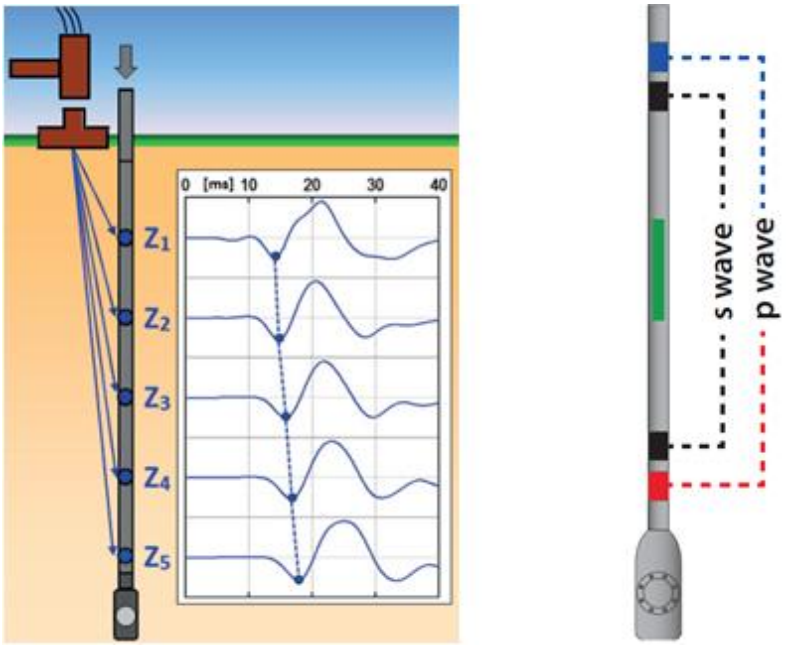
Description of P-wave measurements using the SPDMT

The SPDMT is a seismic module for recording both the shear wave and the compression wave to determine the corresponding velocities Vs and Vp. The instrument may be combined with a DMT blade, a dummy cone or a CPT tip. The SPDMT is equipped with two sensors at a distance of 0.50 m for recording the S-wave and additional two sensors spaced 0.604 m for recording the Pwaves.

The P-wave source generally consists of a hammer striking a beam in the vertical direction, as shown in the figure below. Multiple hammer strikes are generally provided to verify the repeatability of the recorded wave and also to stack the traces for a higher signal to noise ratio.

The dual sensor configuration for each wave type enables True Interval interpretation, comparing the traces of the same wave recorded by each receiver and, in addition, also two independent Pseudo Interval interpretations considering the traces of each of the receivers with depth.

The Pseudo interval interpretation requires to identify a marker time T* for each trace of the same sensor, which identifies a specific phase of the wave to follow with depth. The marker time is generally set to the first arrival, or to the first top or lower peak of the recorded wave. The difference between the wave travelpaths divided by the difference of T* between two traces provides the value of Vp for the layer between two consecutive depths, generally of at least 1 meter.



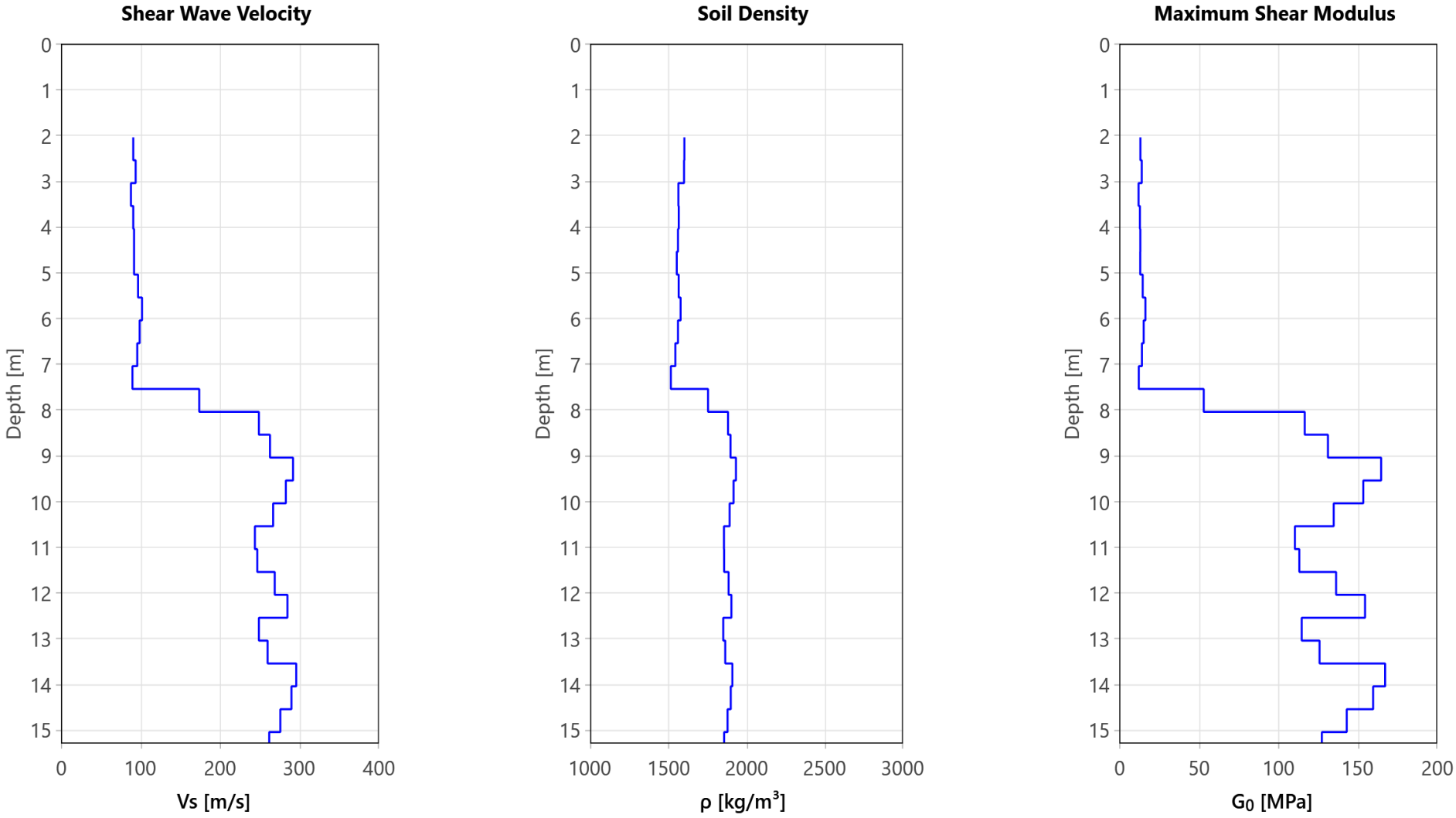
References

ASTM International. 2014. ‘Standard Test Methods for Downhole Seismic Testing’. ASTM D7400–14. West Conshohocken, PA. ASTM International, approved November 1, 2014.

Amoroso S., Comina C., Marchetti D. (2018) ‘Combined P- and S-Wave Measurements by Seismic Dilatometer Test (SPDMT): A Case History in Bondeno (Emilia Romagna, Italy)’. Geotechnical Testing Journal. 2020, Vol.43, No.2, p.20180233.

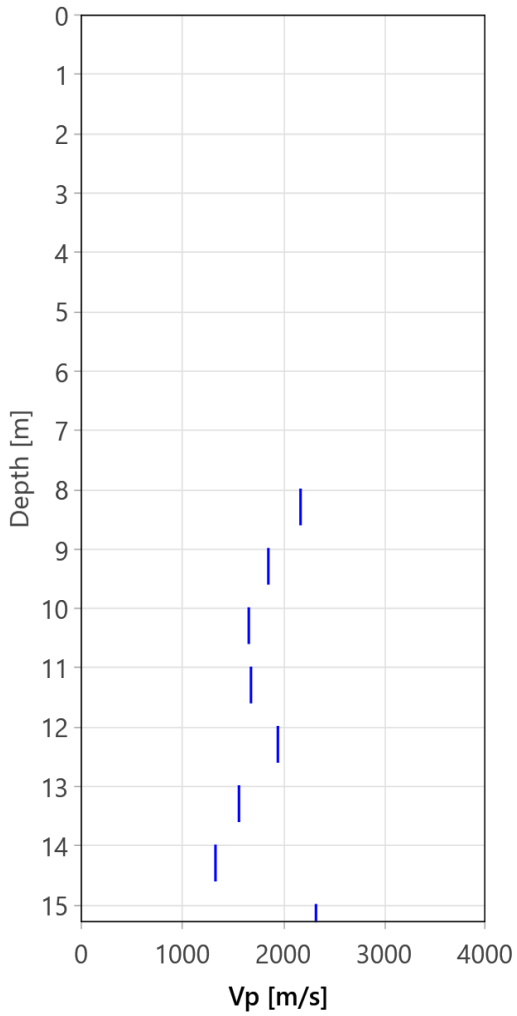
Amoroso S., Comina C., Foti S., Marchetti D. (2016), 'Preliminary results of P-wave and S-wave measurements by seismic dilatometer test (SPDMT) in Mirandola (Italy)', Geotechnical and Geophysical Site Characterisation 5, 2016 Australian Geomechanics Society, Sydney, Australia

S-wave

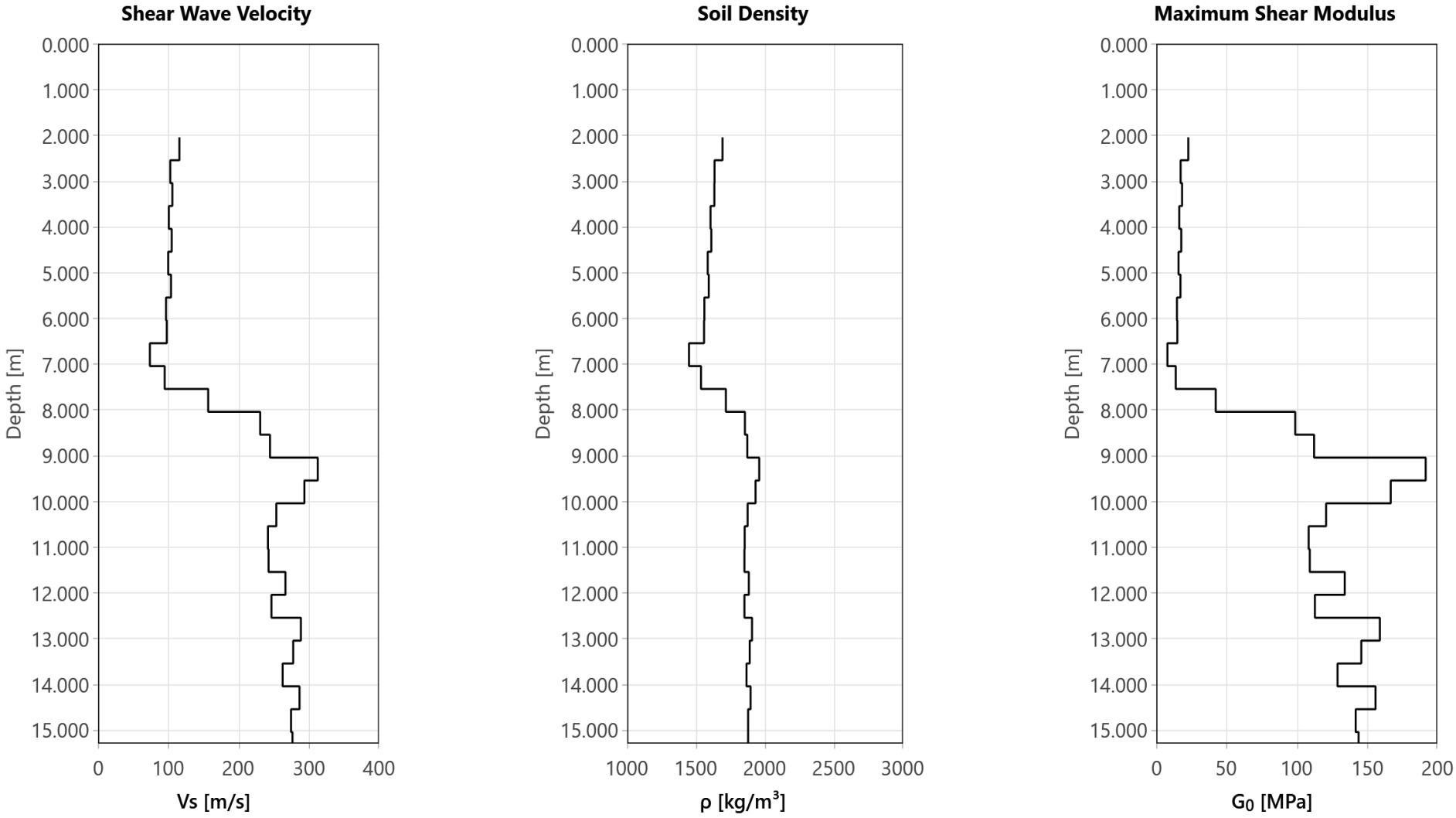

Shear Wave Velocity
Depth [m]
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0
100
200
300
400
Vs [m/s]
Soil Density
Depth [m]
1000
1500
2000
2500
3000
ρ [kg/m³]
Maximum Shear Modulus
Depth [m]
0
50
100
150
200
G0 [MPa]

P-wave

Compression Wave Velocity

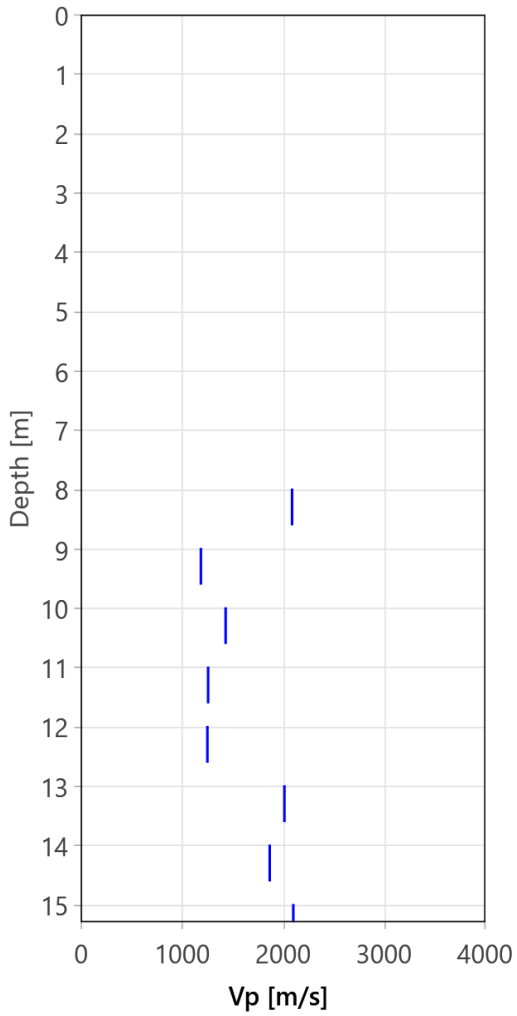


S-wave


Shear Wave Velocity
Depth [m]
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
8.000
9.000
10.000
11.000
12.000
13.000
14.000
15.000
0
100
200
300
400
Vs [m/s]
Soil Density
Depth [m]
1000
1500
2000
2500
3000
ρ [kg/m³]
Maximum Shear Modulus
Depth [m]
0
50
100
150
200
G0 [MPa]

P-wave

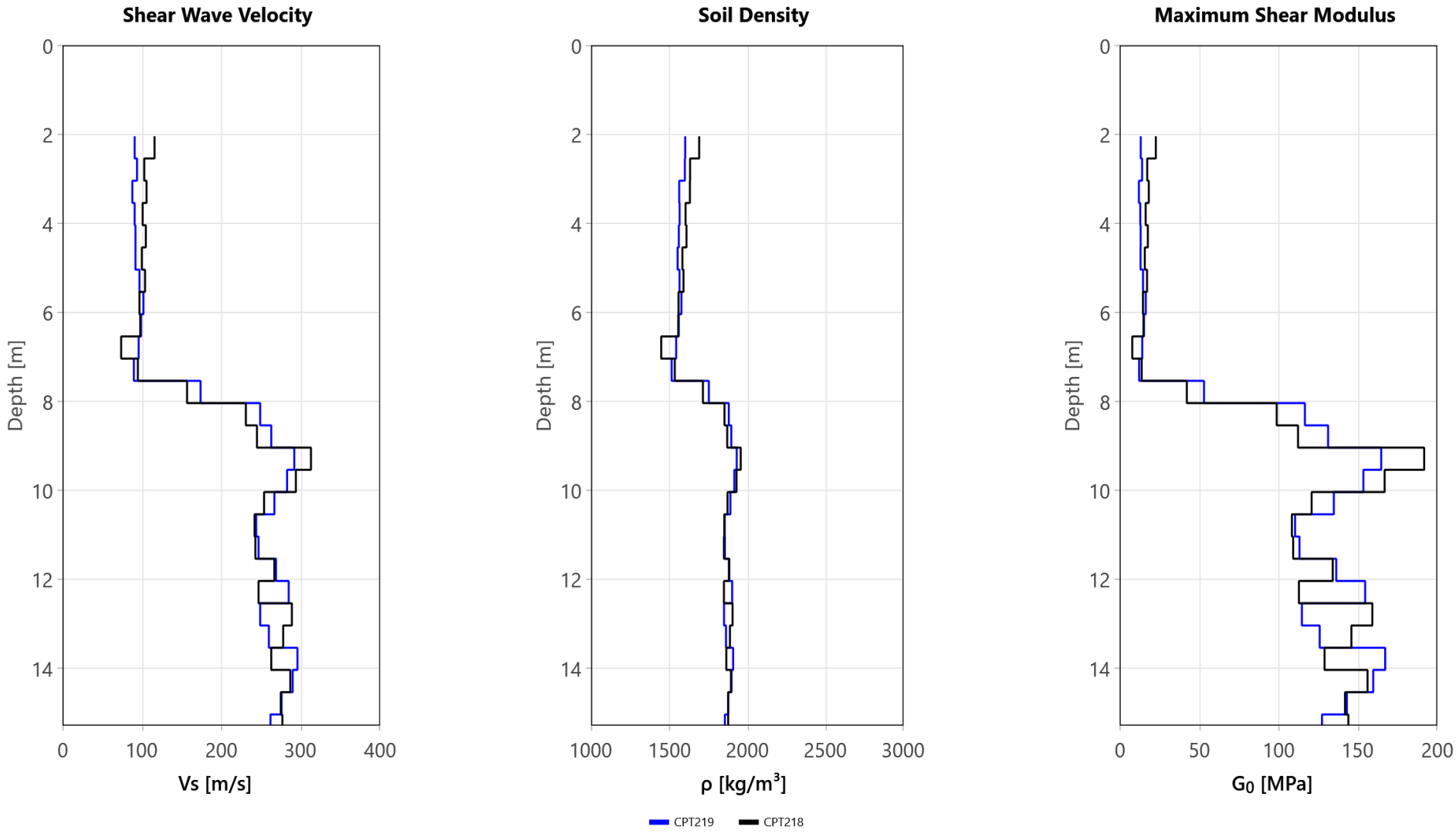
Compression Wave Velocity



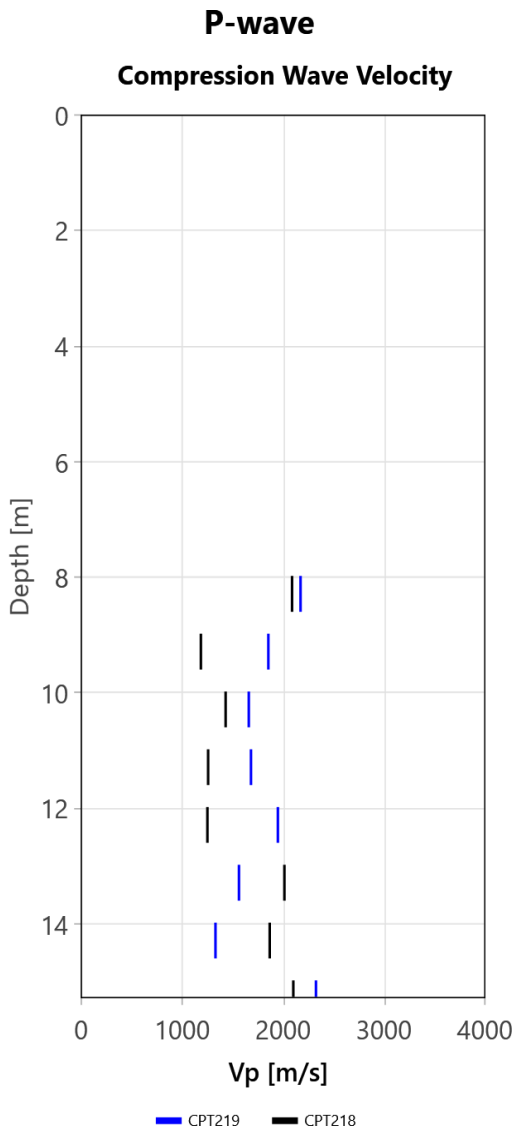
Overlay plots

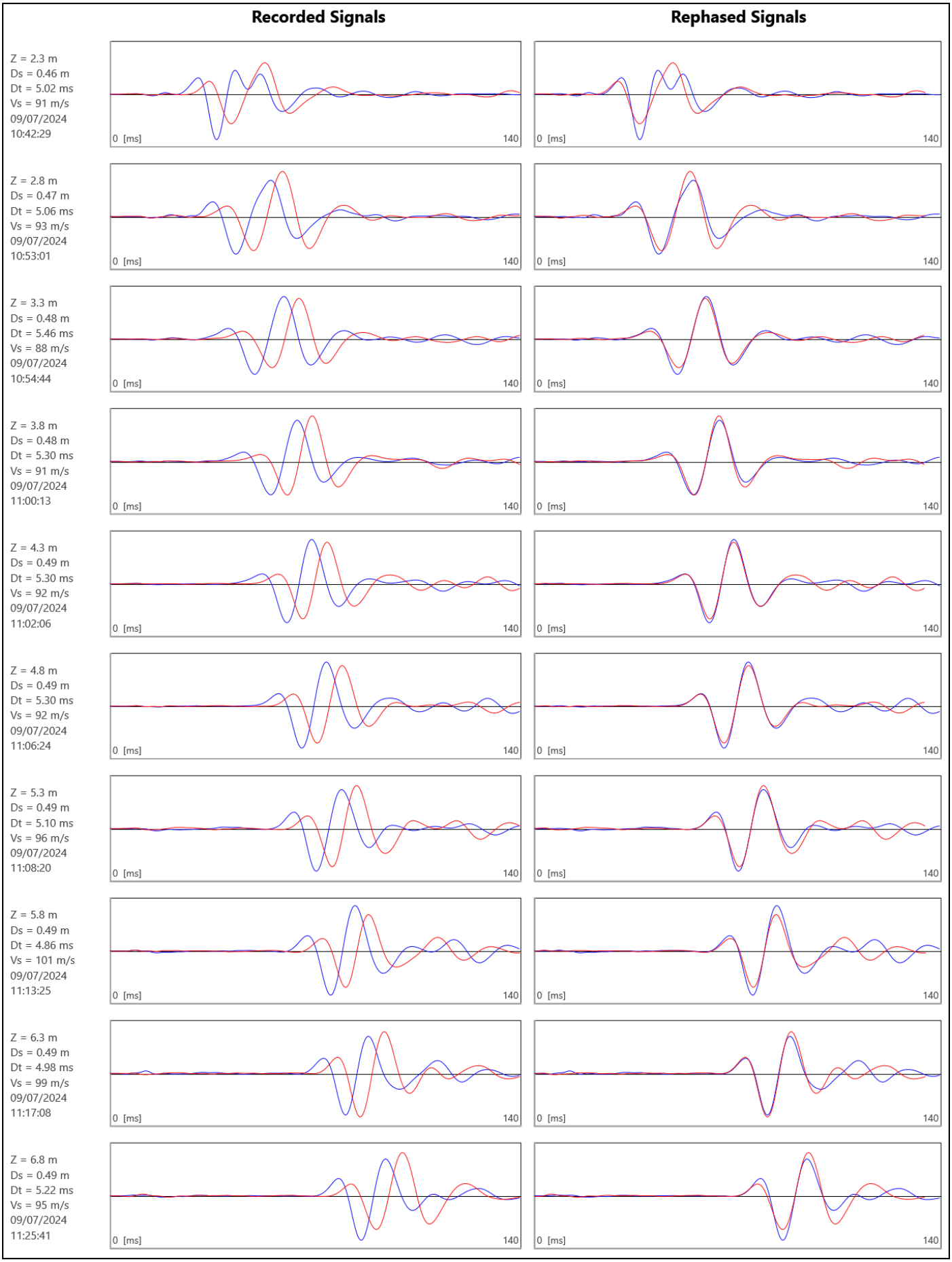
Project: 2390182_HumberGateway

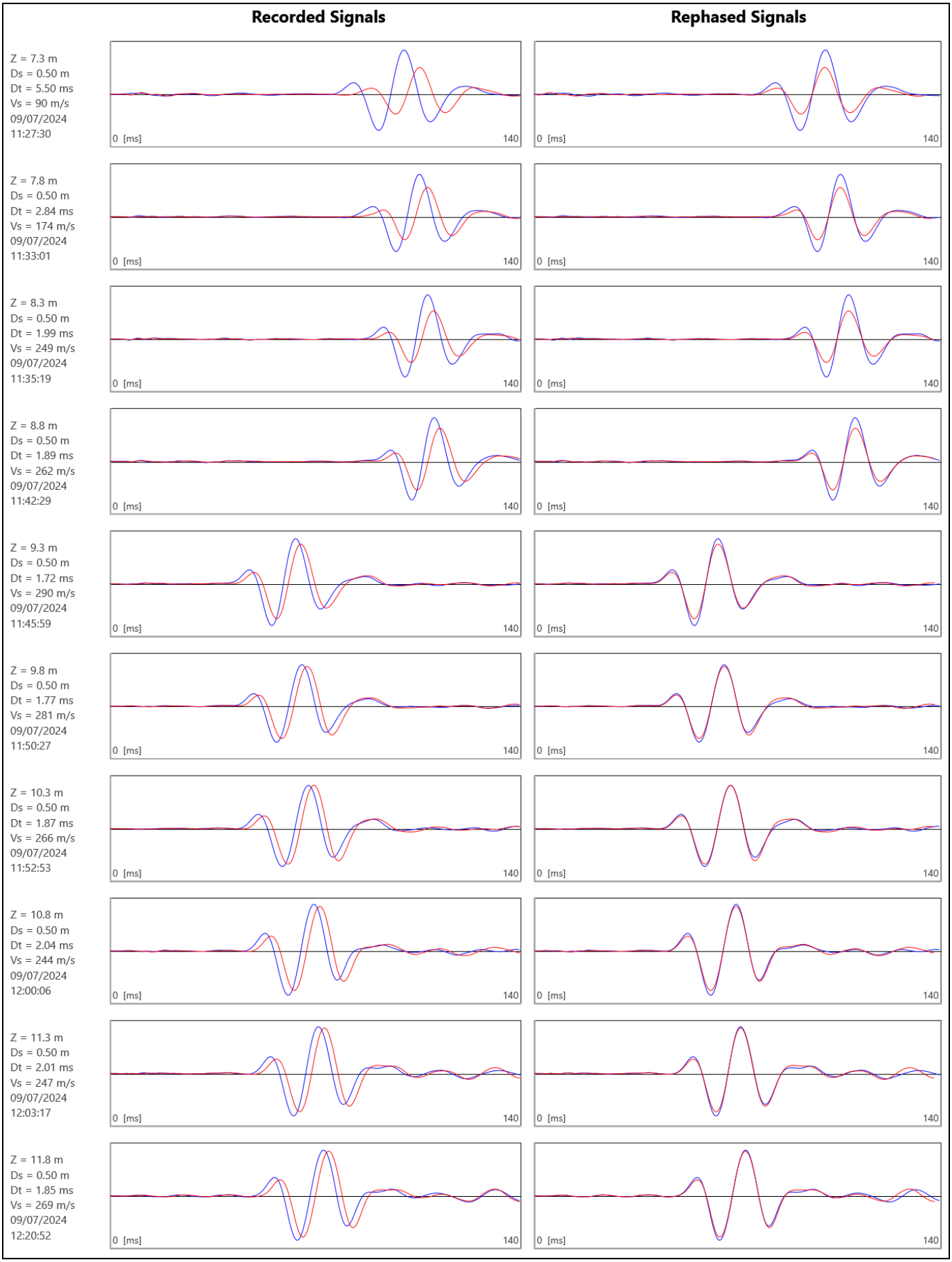
S-wave

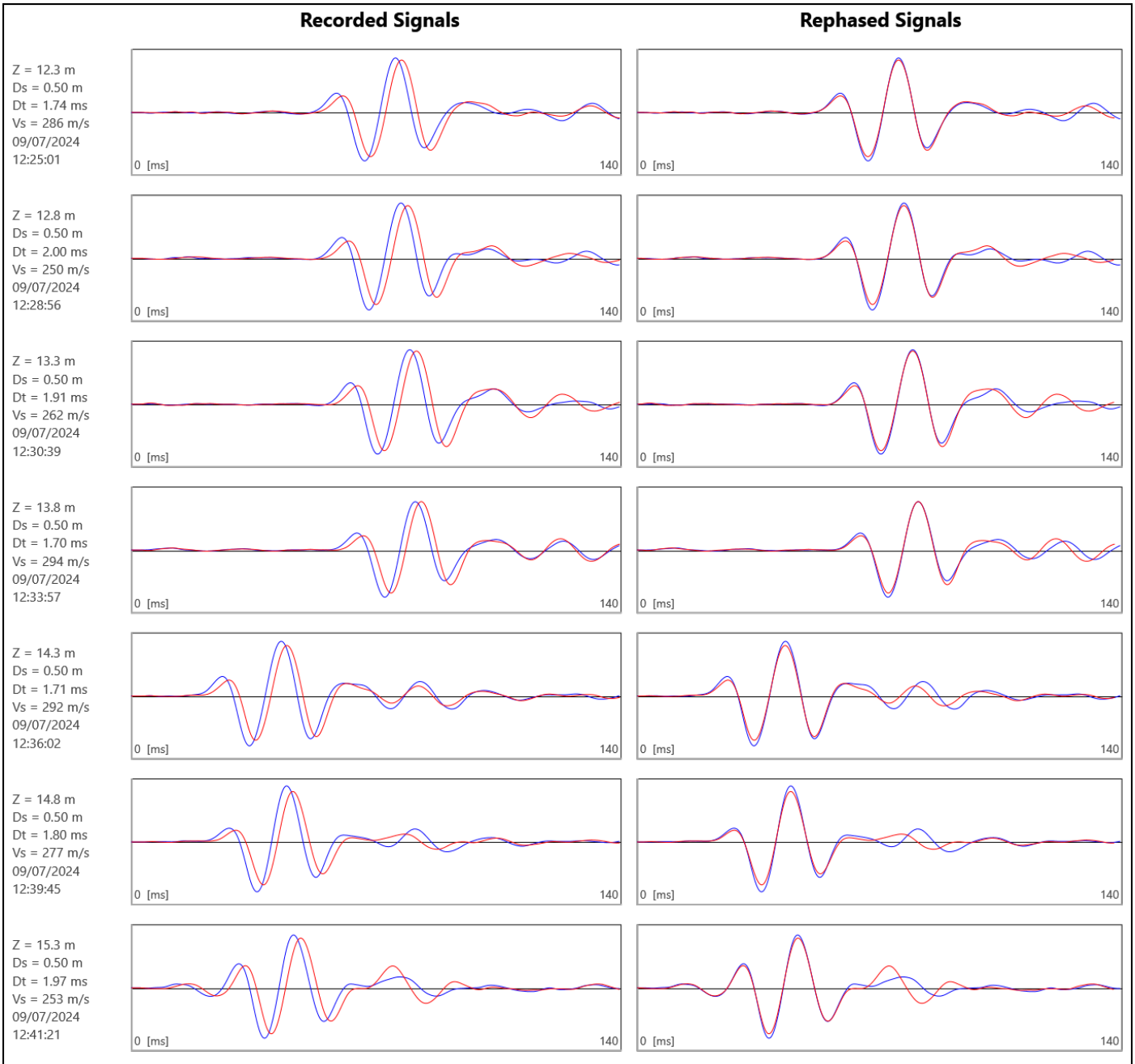


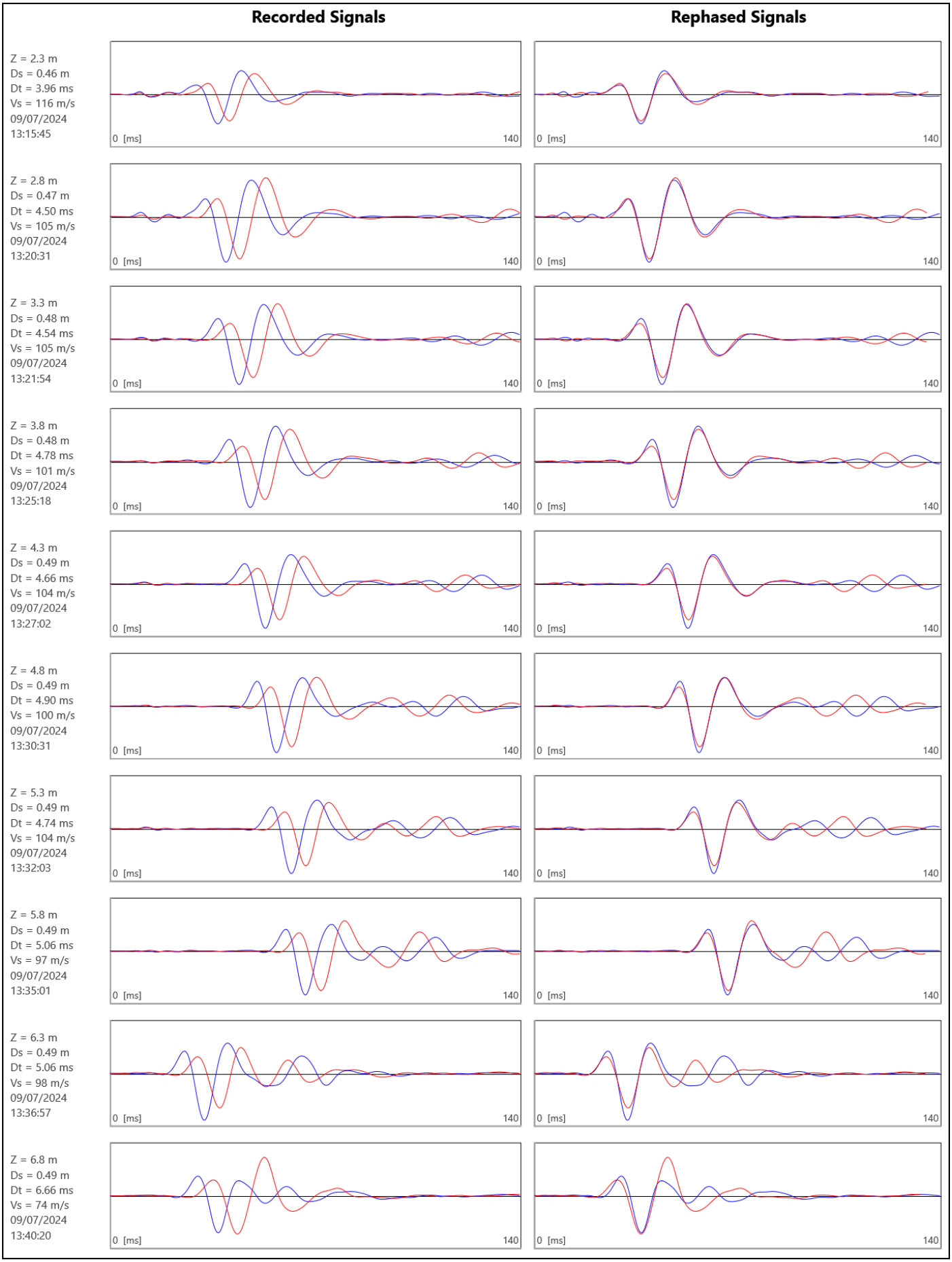
Overlay plots

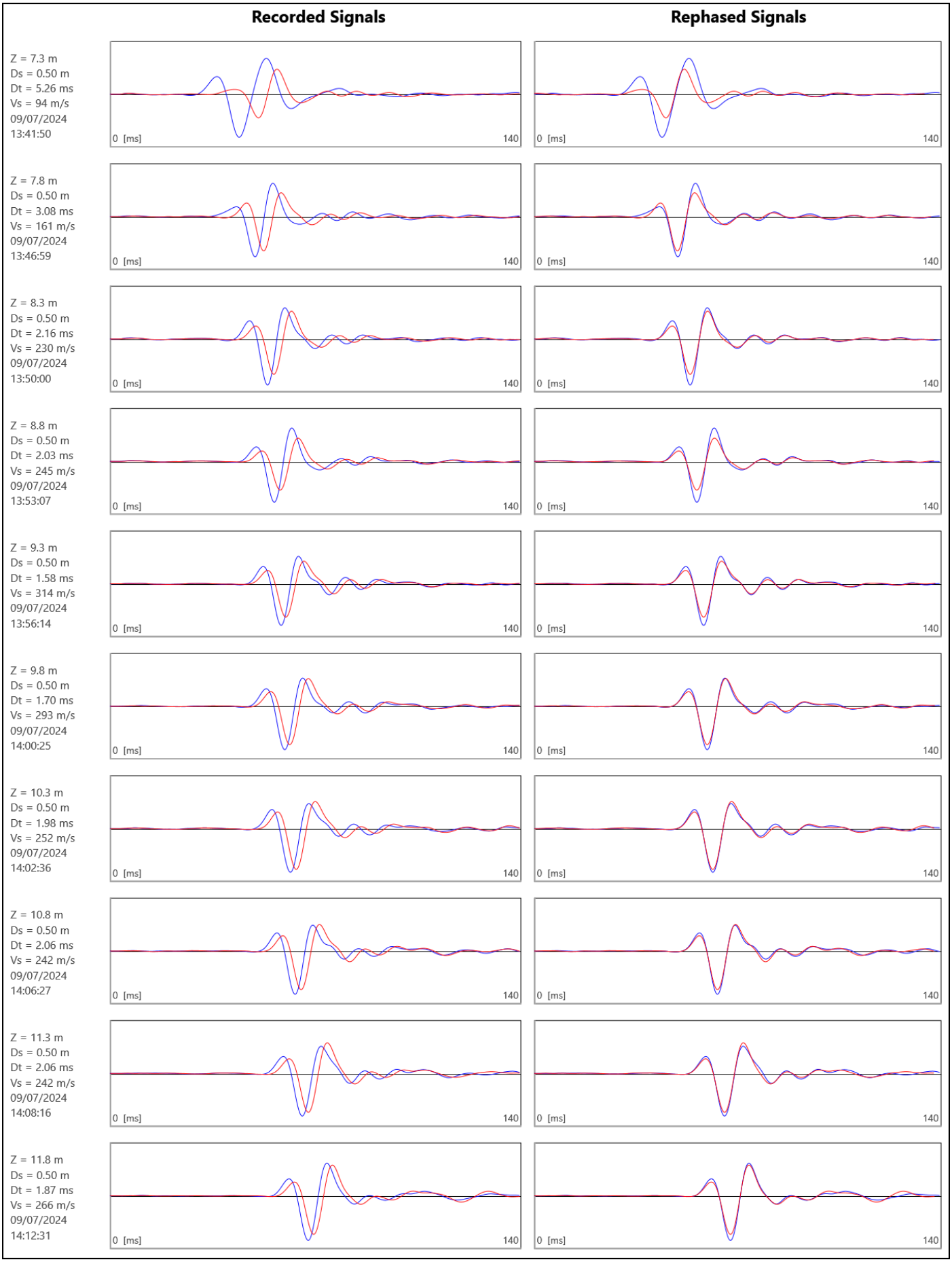



Recorded Signals
Rephased Signals
Z = 2.3 m
Ds = 0.46 m
Dt = 5.02 ms
Vs = 91 m/s
09/07/2024
10:42:29
Z = 2.8 m
Ds = 0.47 m
Dt = 5.06 ms
Vs = 93 m/s
09/07/2024
10:53:01
Z = 3.3 m
Ds = 0.48 m
Dt = 5.46 ms
Vs = 88 m/s
09/07/2024
10:54:44
Z = 3.8 m
Ds = 0.48 m
Dt = 5.30 ms
Vs = 91 m/s
09/07/2024
11:00:13
Z = 4.3 m
Ds = 0.49 m
Dt = 5.30 ms
Vs = 92 m/s
09/07/2024
11:02:06
Z = 4.8 m
Ds = 0.49 m
Dt = 5.30 ms
Vs = 92 m/s
09/07/2024
11:06:24
Z = 5.3 m
Ds = 0.49 m
Dt = 5.10 ms
Vs = 96 m/s
09/07/2024
11:08:20
Z = 5.8 m
Ds = 0.49 m
Dt = 4.86 ms
Vs = 101 m/s
09/07/2024
11:13:25
Z = 6.3 m
Ds = 0.49 m
Dt = 4.98 ms
Vs = 99 m/s
09/07/2024
11:17:08
Z = 6.8 m
Ds = 0.49 m
Dt = 5.22 ms
Vs = 95 m/s
09/07/2024
11:25:41
0 [ms]
140


Recorded Signals
Rephased Signals
Z = 7.3 m
Ds = 0.50 m
Dt = 5.50 ms
Vs = 90 m/s
09/07/2024
11:27:30
Z = 7.8 m
Ds = 0.50 m
Dt = 2.84 ms
Vs = 174 m/s
09/07/2024
11:33:01
Z = 8.3 m
Ds = 0.50 m
Dt = 1.99 ms
Vs = 249 m/s
09/07/2024
11:35:19
Z = 8.8 m
Ds = 0.50 m
Dt = 1.89 ms
Vs = 262 m/s
09/07/2024
11:42:29
Z = 9.3 m
Ds = 0.50 m
Dt = 1.72 ms
Vs = 290 m/s
09/07/2024
11:45:59
Z = 9.8 m
Ds = 0.50 m
Dt = 1.77 ms
Vs = 281 m/s
09/07/2024
11:50:27
Z = 10.3 m
Ds = 0.50 m
Dt = 1.87 ms
Vs = 266 m/s
09/07/2024
11:52:53
Z = 10.8 m
Ds = 0.50 m
Dt = 2.04 ms
Vs = 244 m/s
09/07/2024
12:00:06
Z = 11.3 m
Ds = 0.50 m
Dt = 2.01 ms
Vs = 247 m/s
09/07/2024
12:03:17
Z = 11.8 m
Ds = 0.50 m
Dt = 1.85 ms
Vs = 269 m/s
09/07/2024
12:20:52
0 [ms]
140


Recorded Signals
Rephased Signals
Z = 12.3 m
Ds = 0.50 m
Dt = 1.74 ms
Vs = 286 m/s
09/07/2024
12:25:01
Z = 12.8 m
Ds = 0.50 m
Dt = 2.00 ms
Vs = 250 m/s
09/07/2024
12:28:56
Z = 13.3 m
Ds = 0.50 m
Dt = 1.91 ms
Vs = 262 m/s
09/07/2024
12:30:39
Z = 13.8 m
Ds = 0.50 m
Dt = 1.70 ms
Vs = 294 m/s
09/07/2024
12:33:57
Z = 14.3 m
Ds = 0.50 m
Dt = 1.71 ms
Vs = 292 m/s
09/07/2024
12:36:02
Z = 14.8 m
Ds = 0.50 m
Dt = 1.80 ms
Vs = 277 m/s
09/07/2024
12:39:45
Z = 15.3 m
Ds = 0.50 m
Dt = 1.97 ms
Vs = 253 m/s
09/07/2024
12:41:21
0 [ms]
140


Recorded Signals
Rephased Signals
Z = 2.3 m
Ds = 0.46 m
Dt = 3.96 ms
Vs = 116 m/s
09/07/2024
13:15:45
Z = 2.8 m
Ds = 0.47 m
Dt = 4.50 ms
Vs = 105 m/s
09/07/2024
13:20:31
Z = 3.3 m
Ds = 0.48 m
Dt = 4.54 ms
Vs = 105 m/s
09/07/2024
13:21:54
Z = 3.8 m
Ds = 0.48 m
Dt = 4.78 ms
Vs = 101 m/s
09/07/2024
13:25:18
Z = 4.3 m
Ds = 0.49 m
Dt = 4.66 ms
Vs = 104 m/s
09/07/2024
13:27:02
Z = 4.8 m
Ds = 0.49 m
Dt = 4.90 ms
Vs = 100 m/s
09/07/2024
13:30:31
Z = 5.3 m
Ds = 0.49 m
Dt = 4.74 ms
Vs = 104 m/s
09/07/2024
13:32:03
Z = 5.8 m
Ds = 0.49 m
Dt = 5.06 ms
Vs = 97 m/s
09/07/2024
13:35:01
Z = 6.3 m
Ds = 0.49 m
Dt = 5.06 ms
Vs = 98 m/s
09/07/2024
13:36:57
Z = 6.8 m
Ds = 0.49 m
Dt = 6.66 ms
Vs = 74 m/s
09/07/2024
13:40:20
0 [ms]
140


Recorded Signals
Rephased Signals
Z = 7.3 m
Ds = 0.50 m
Dt = 5.26 ms
Vs = 94 m/s
09/07/2024
13:41:50
Z = 7.8 m
Ds = 0.50 m
Dt = 3.08 ms
Vs = 161 m/s
09/07/2024
13:46:59
Z = 8.3 m
Ds = 0.50 m
Dt = 2.16 ms
Vs = 230 m/s
09/07/2024
13:50:00
Z = 8.8 m
Ds = 0.50 m
Dt = 2.03 ms
Vs = 245 m/s
09/07/2024
13:53:07
Z = 9.3 m
Ds = 0.50 m
Dt = 1.58 ms
Vs = 314 m/s
09/07/2024
13:56:14
Z = 9.8 m
Ds = 0.50 m
Dt = 1.70 ms
Vs = 293 m/s
09/07/2024
14:00:25
Z = 10.3 m
Ds = 0.50 m
Dt = 1.98 ms
Vs = 252 m/s
09/07/2024
14:02:36
Z = 10.8 m
Ds = 0.50 m
Dt = 2.06 ms
Vs = 242 m/s
09/07/2024
14:06:27
Z = 11.3 m
Ds = 0.50 m
Dt = 2.06 ms
Vs = 242 m/s
09/07/2024
14:08:16
Z = 11.8 m
Ds = 0.50 m
Dt = 1.87 ms
Vs = 266 m/s
09/07/2024
14:12:31
0 [ms]
140


Recorded Signals
Rephased Signals
Z = 12.3 m
Ds = 0.50 m
Dt = 2.01 ms
Vs = 248 m/s
09/07/2024
14:14:21
Z = 12.8 m
Ds = 0.50 m
Dt = 1.73 ms
Vs = 289 m/s
09/07/2024
14:18:09
Z = 13.3 m
Ds = 0.50 m
Dt = 1.80 ms
Vs = 277 m/s
09/07/2024
14:20:15
Z = 13.8 m
Ds = 0.50 m
Dt = 1.88 ms
Vs = 265 m/s
09/07/2024
14:23:56
Z = 14.3 m
Ds = 0.50 m
Dt = 1.73 ms
Vs = 289 m/s
09/07/2024
14:26:50
Z = 14.8 m
Ds = 0.50 m
Dt = 1.78 ms
Vs = 280 m/s
09/07/2024
14:31:12
Z = 15.3 m
Ds = 0.50 m
Dt = 1.79 ms
Vs = 279 m/s
09/07/2024
14:33:35
0 [ms]
140

8 APPENDIX D – CONE CALIBRATION

Gouda Geo-Equipment B.V.
Satellietbaan 8
2181 MH Hillegom
The Netherlands

Tel. + 31 (0)715.318.475
E-mail: info@gouda-geo.com

Certificate of Calibration

Certificate No. CMI 23.11.6124

Instrument

Instrument Type:	Electrical Subtraction Cone	Calibration Result: Certified	
Manufacturer:	Gouda Geo-Equipment B.V		
Model No.:	DP15-CFPTxy	Date Calibrated:	21-11-2023
Serial No.:	71447	Next Due Date:	21-11-2024
Cone area factor:	0,75		

Used Calibration Procedure: GGECP008, ISO 22476-1:2012

Location: Hillegom (The Netherlands)

Customer

Central Alliance

Calibration Instruments

Instrument Type: CPT Logger	Instrument Type: CPT Logger	Instrument Type: Load-cell + amplifier
Manufacturer: Gouda Geo Equipment	Manufacturer: Gouda Geo Equipment	Manufacturer: Futek
Model No.: A	Model No.: A	Model No.: LCF500 + IAA100
Serial No.: 3010	Serial No.: 3129	Serial No.: 1016780 + 1013883
Accuracy: 0.01% + 2 Counts	Accuracy: 0.01% + 2 Counts	Accuracy: 0.1%
Date Calibrated: 27 June, 2023	Date Calibrated: 27 June, 2023	Date Calibrated: 19 September, 2023
Next Due Date: 27 June, 2024	Next Due Date: 27 June, 2024	Next Due Date: 19 September, 2024
Calibrated By: Manufacturer	Calibrated By: Manufacturer	Calibrated By: Futek
Traceability: CMI 23.06.5662	Traceability: CMI 23.06.5661	Traceability: 2309200019

Calibration Conditions

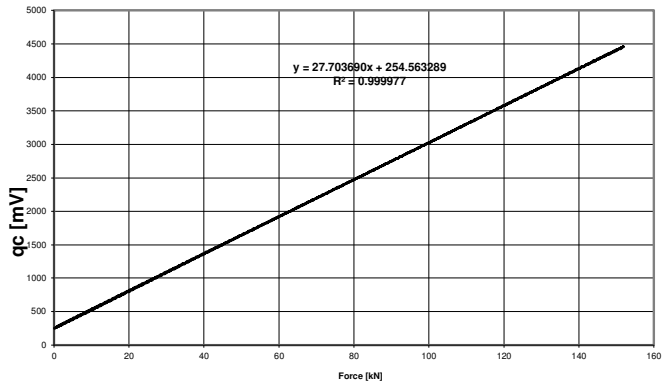
Environmental conditions whilst performing the calibration:

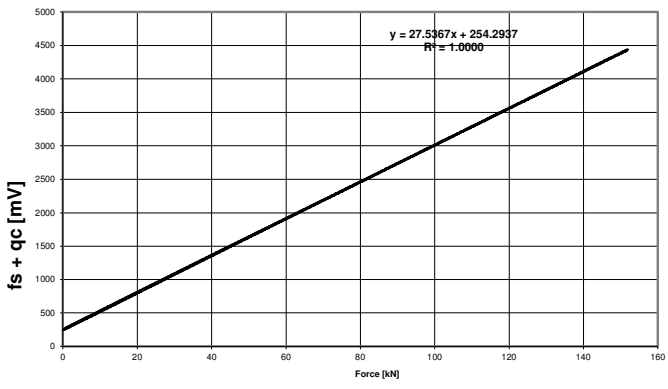
Ambient Temperat 21.4 ºC
Relative Humidity: 44.2 %

Condition of Calibrated Apparatus when Received: Fair

Measurement Parameters

zero value	258 mV	zero value	254 mV
Full scale	4156 @ 150 kN	Full scale	4131 @ 150 kN





Remarks

Data "As Received" = "As Left" unless otherwise noted. Calibration data for this item was derived from one or more of the following sources: the Nederlands Meetinstituut (NMI) or other national laboratory, a natural physical constant, or a ratio technique. The data is on file at the NMI. This calibration is compliant with Gouda Geo-Equipment's internal quality system, internal calibration procedure and meets the requirements of standard ISO 22476-1:2012.
The Calibration Interval will vary from customer use and different conditions. All calibrations are verified at a moment in time; and confirmed within controlled temperature and humidity specified standards. Gouda Geo-Equipment is not responsible for future calibrations. Improper use on the site (e.g. dropping) may cause loss of calibration.

Calibration performed by:

Vincent Vermeer
(Engineer)

Approved by:

Rogier Tijm
(Senior Engineer)

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Gouda Geo-Equipment B.V.
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The Netherlands

Tel. + 31 (0)715.318.475
E-mail: info@gouda-geo.com

Certificate of Calibration

Certificate No. CMI 23.11.6124

Instrument

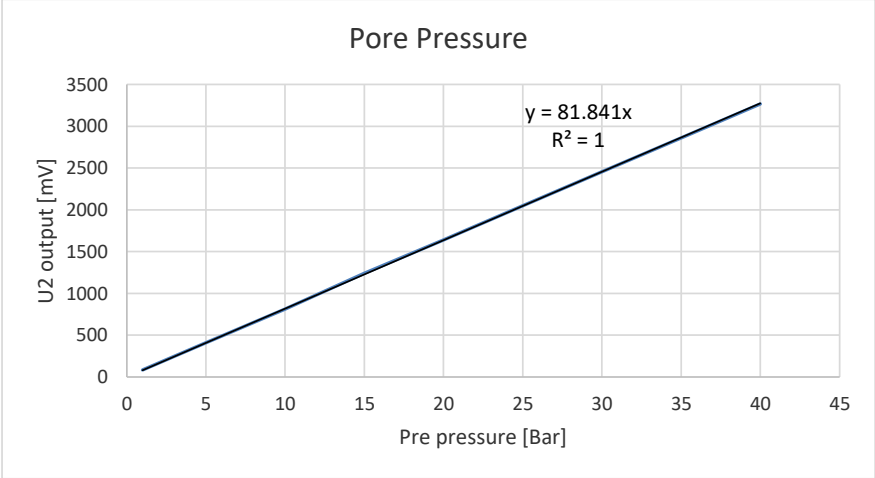
Instrument Type:	Electrical Subtraction Cone	Calibration Result: Certified	
Manufacturer:	Gouda Geo-Equipment B.V		
Model No.:	DP15-CFPTxy	Date Calibrated:	21-11-2023
Serial No.:	71447	Next Due Date:	21-11-2024
Cone area factor:	0,75		
Used Calibration Procedure: GGECP008, ISO 22476-1:2012		Location: Hillegom (The Netherlands)	

Calibration Instruments

Instrument Type: HP Kalibrator
Manufacturer: Keller Druckmesstechnik
Model No.: HPX - 200bar - 80139.31
Serial No.: 5208
Date Calibrated: 15 June, 2023
Next Due Date: 15 June, 2024
Calibrated By: Manufacturer

Pore pressure

AMB =+/-1Bar = 313 mV	
U2 [bar]	U2 [mV]
1	84
5	410
10	812
15	1241
20	1640
25	2049
30	2455
35	2862
40	3269



Calibration performed by:

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(Engineer)

Approved by:

Rogier Tijm
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Certificate of Calibration

Certificate No. CMI 23.11.6124

Instrument

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Manufacturer:	Gouda Geo-Equipment B.V		
Model No.:	DP15-CFPTxy	Date Calibrated:	21-11-2023
Serial No.:	71447	Next Due Date:	21-11-2024
Cone area factor:	0,75		

Used Calibration Procedure: GGECP008, ISO 22476-1:2012 — Location: Hillegom (The Netherlands)

Inclinometer

Degrees	Ix [mV]
20	3055
19	3011
18	2967
17	2923
16	2885
15	2836
14	2802
13	2758
12	2714
11	2665
10	2621
9	2577
8	2529
7	2489
6	2446
5	2407
4	2353
3	2314
2	2265
1	2221
0	2182
-1	2138
-2	2099
-3	2046
-4	2006
-5	1958
-6	1914
-7	1870
-8	1831
-9	1792
-10	1743
-11	1704
-12	1650
-13	1616
-14	1567
-15	1533
-16	1490
-17	1446
-18	1404
-19	1358
-20	1319

Degrees	Iy [mV]
20	3405
19	3366
18	3317
17	3269
16	3225
15	3176
14	3132
13	3093
12	3049
11	2998
10	2957
9	2903
8	2854
7	2810
6	2771
5	2722
4	2673
3	2630
2	2571
1	2527
0	2483
-1	2440
-2	2391
-3	2342
-4	2298
-5	2239
-6	2201
-7	2157
-8	2113
-9	2059
-10	2015
-11	1966
-12	1917
-13	1874
-14	1834
-15	1791
-16	1737
-17	1698
-18	1649
-19	1601
-20	1561

Gouda Geo-Equipment B.V. WWW.GOUDA-GEO.COM Down to Earth The Netherlands

Calibration performed by:

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(Engineer)

Approved by:

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Grimsby CPT

Static Cone Penetration Testing Report

2390127

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CENTRAL ALLIANCE GENERAL NOTES

Project No.: 2390127

Title: Grimsby CPT

Client: Mayer

Date: Sep 2023

Office: Central Alliance Preconstruction Services Limited, (Part of RSK Environment Limited), Alliance House, South Park Way, Wakefield 41 Business Park, Wakefield, WF2 0XJ

Status: 2390127-FAC-001

Author	Ben Bilsbrough	**Technical reviewer**	Thomas Goldsby-West
Signature		Signature	
Project manager	Ben Bilsbrough	**Quality reviewer**	Sean Blaney
Signature		Signature	

Revision control sheet

Revision reference	Date	Reason for revision	Amended by:	Approved by:

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1 INTRODUCTION

1.1 Commissioning

Central Alliance Pre-Construction Services Limited (Central Alliance) was instructed by Mayer to undertake intrusive ground investigation at Grimsby.

The scope of the investigation was designed by the designer with final exploratory hole locations agreed between client and Central Alliance, following consideration of the existing site conditions and site access restrictions.

1.2 Objectives

The aim of this report is to present the in situ Soil conditions and derived geotechnical parameters obtained, during the ground investigation, from 6 Static Piezocone Penetration Tests (CPTu).

1.3 Limitations

This report presents a description of the site at the time of the fieldwork, results of the fieldwork and in-situ testing undertaken, strata encountered and geotechnical test results.

Any of the comments and opinions contained within this report, are based on the information obtained by Central Alliance during the investigation.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been considered by this report. Responsibility cannot be accepted for conditions at the site not revealed by the investigation and confirmation of intermediate ground conditions between exploratory holes should be considered if deemed necessary.

Unless instructed by the client, Central Alliance is not obliged to and disclaims any obligation to update the report for events taking place after the date on which this investigation was undertaken.

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2 SITE DETAILS

2.1 Site location

Site location details are presented in **Table 1**

Table 1 Site location details

Site name	Grimsby
Full site address and postcode	Humber Gate, Energy Park Way, DN31 2TT

3 FIELD WORK

3.1 Completed Works

- 6 number of CPTu tests with real-time temperature compensation.
- Factual Report with measure and interpreted parameters.

3.1.1 Equipment Used

Type	ID	Date of Service / Calibration
200KN Crawler CPT Rig	CPT01	12/01/2023
15cm² Piezocone (u2)	71175	20/07/2023

3.1.2 Cone Calibration

The CPTu load cells and pore pressure transducer are calibrated regularly by the manufacturer adhering to BS EN ISO 224576-1:2012. Appendix (C) contains cone calibration certificates for all cones used on this project.

3.1.3 CPTu Pore Pressure Transducer Saturation

The u2 position was used with a HDPE filter which had been vacuum saturated with glycerine oil of viscosity 1412mPas.

3.1.4 Summary of Field Work

Testing was carried out by a 200kn tracked CPT rig. Where shallow refusals were met, the clients onsite represent was advised, retests were carried out as agreed with client. Appendix (A) includes final depths and refusal criteria as determined by the operator.

3.2 Methodology

All testing carried out adhered strictly to BS EN ISO 224576-1:2012.

Before each test is started the operator will take a zero value of the probe before loading, this will be compared with the unloaded zero values at the end of the test to ensure the sensors have not experienced any significant drift during the push. The push will be completed, at speeds not exceeding 2.2cm/s, in 1m stokes taking continuous readings. The readings on the probe are transmitted via the data cable to the datalogger and can be viewed in real-time on the computer. The test is ended when the specified depth is reach or when the operator believes the equipment will be damaged by continuing.

4 DATA PROCESSING

4.1 Applied Corrections

4.1.1 Corrected Cone Resistance (q_t)

During the push excess pore pressure acts on the tip of the probe due to unequal area effect. Pore pressure acts behind the tip of the probe with an unequal force than on the tip affecting qc. The difference between qc and qt is largest when in low strength soils with a high excess pore pressure, such as very soft clays. This report uses the correction defined by Lunne et al., 1997:

$$qt = qc + \left(u_2(1-\alpha)\right)$$

Where a is the cone area ratio.

The cone area ratio for this project is 0.75. And can be found on the cone calibration sheet in appendix B.

4.1.2 Corrected sleeve friction, (f_t)

Sleeve friction corrected for pore water pressure effects at either end of the friction sleeve, due to the geometry of the sleeve, there is closer to equal pressures at either end therefore the effect is often negligible.

4.1.3 Depth Correction

An automatic depth correction is applied to all tests, to show the data relative to the vertical axis, accounting for inclination. This completed in accordance with ISO 22476-1:2012.

4.2 DERIVED PARAMETERS

The following table presents the derived parameters.

DGD Field Name	Symbol	Unit
Penetration Rate		
Bulk Unit Weight	γ_b	kN/m^3
In Situ Pore Pressure	u_o	kPa
Excess Pore Pressure	Δu	kPa
Normalised Excess Pore Pressure	Normalised Δu	
Slope Indicator	a	deg
Total Stress	σ_{vo}	kPa
Effective Stress	σ'_{vo}	kPa
Total Cone Resistance	q_t	MPa
Total Cone Resistance Moving Average		MPa
Total Cone Resistance Moving Average Inc		MPa

DGD Field Name	Symbol	Unit
Net Cone Resistance	q_n	MPa
Corrected Sleeve Friction	f_t	kPa
Friction Ratio	R_f	%
Normalised Friction Ratio	F_r	%
Normalised Cone Resistance	Q_t	-
Stress Normalised Cone Resistance	q_{t1}	-
Pore Pressure Ratio	B_q	-
Differential Pore Pressure Ratio	DPPR	-
Dimensionless Penetration Resistance	$Q_t(1-B_q)+1$	-

4.3 Calculated Geotechnical Parameters

4.3.1 Soil Behaviour Type

The Soil behaviour type can be provided based on the following eight interpretation methods:

- Begemann 1965
- Eslami Fellenius 1997
- Ramsey 2002
- Robertson 1990
- Robertson 1990 Extrapolated (axis extrapolated out one order of magnitude)
- Robertson et al. 1986
- Schmertmann 1978
- Schneider et al. 2008 (defined by formula in paper's table 6)

The Default for reporting, unless otherwise stated is Robertson 1990 and Robertson et al. 1986.

4.3.2 Angle of friction

Soil friction angle is a shear strength parameter of soils. Its definition is derived from the Mohr-Coulomb failure criterion, and it is used to describe the friction shear resistance of soils together with the normal effective stress. φ' is derived for uncemented coarse grained soils by correlations with empirical data.

4.3.2.1 Friction Angle 1

The angle of internal friction of mixed soils (Φ') in Friction Angle 1 is defined as:

$$\Phi' = C1º \cdot B_{C2q} \cdot [C3 + C4 \cdot B_q + logQ_t]$$

Mayne and Campanella (2005), NCHRP Synthesis 368 pp 38-39

Where:

C1 is 29.5

*C*2 is 0.121

*C*3 is 0.256

*C*4 is 0.336

This correlation of *Φ'* is only applicable for 0.1<*Bq*<1.0 and hence will only be calculated if *Bq* in the Pore Pressure Ratio field on the same row lies within this range.

4.3.2.2 Friction Angle 2

The angle of internal friction of sands (Φ') in Friction Angle 2 is defined as:

$$\Phi' = \tan - 1(\mathrm{C1} + \mathrm{C2} \cdot \log({}^{\mathrm{qt}}/_{\sigma'\mathrm{v0}}))$$

Robertson and Campanella (1983), NCHRP Synthesis 368 p 38

Where:

C1 is 0.10

C2 is 0.38

This correlation of Φ′ is only applicable for Sands and hence will only be calculated if the Soil Type is coarse or mixed.

4.3.2.3 Friction Angle 3

The angle of internal friction of sand (Φ′) in Friction Angle 3 is defined as:

$$\Phi' = \mathrm{C1} + \mathrm{C2} \cdot \log(\mathrm{qt1})$$

Kulhawy and Mayne (1990), NCHRP Synthesis 368 p 38

Where:

C1 is 17.6°

C2 is 11.0°

This correlation of Φ′ is only applicable for Sands and hence will only be calculated if the soil type is coarse or mixed.

4.3.3 Coefficient of Lateral Earth Pressure

4.3.3.1 Coefficient of Lateral Earth Pressure 1

Coefficient of Lateral Earth Pressure 1 *(K0)* for uncemented sands and well behaved clays in Coefficient Lateral Earth Pressure 1 is defined as:

$$\mathrm{K0} = (1 - \sin\Phi') \cdot \mathrm{OCR}^{\sin\Phi'}$$

$$\mathrm{MaximumK0} = \mathrm{KP} = 1 + \frac{\sin\Phi' 1}{\sin\Phi'}$$

Mayne (2007), NCHRP Synthesis 368 p 42

Where:

Φ′ is taken from the Friction Angle 3 and Friction Angle 1.

4.3.3.2 Coefficient of Lateral Earth Pressure 2

Coefficient of Lateral Earth Pressure 2 (K0) for sand in Coefficient Lateral Earth Pressure 2 is defined as:

$$K0 = C1 \cdot (\frac{qt}{\sigma_{atm}})C2 \cdot (\frac{\sigma atm}{\sigma'_{v0}})C3 \cdot OCR^{C4}$$

Mayne (2007), NCHRP Synthesis 368 p 43

Where:

C1 is 0.192

C2 is 0.22

C3 is 0.31

C4 is 0.27

4.3.3.3 Coefficient of Lateral Earth Pressure 3

Coefficient of Lateral Earth Pressure 3 (K0) for fine grained soils in Coefficient_Lateral_Earth_Pressure_3 is defined as:

$$K_0 = C_1 \cdot (\frac{q_t - \sigma_{v0}}{\sigma'_{v0}})$$

Kulhawy and Mayne (1990), CPT Guide p 32

Where:

C1 is 0.1

4.3.4 Coefficient of volume change

The coefficient of volume change 1 (mv) in Coefficent Volume Change 1 is defined as:

$$m_v = \frac{1}{M}$$

CPT in Geotechnical Practice p 71

Where:

M the constrained modulus.

4.3.5 Compression Index

The Compression Index 1 (Cc) in Compression Index 1 is defined as:

$$C_c = \frac{2.3(1+e) \cdot \sigma'_{v0}}{M}$$

CPT in Geotechnical Practice p 71

Where:

e is the Void Ratio and is stored in the Void Ratio field.

M is the constrained modulus and is taken from the Constrained Modulus 1 field.

4.3.6 Constrained Modulus

4.3.6.1 Constrained Modulus 1

The constrained modulus 1 (M) in Constrained Modulus 1 is defined as:

$$M = C_1 \cdot (q_t - \sigma_{vo})$$

Kulhawy and Mayne (1990), NCHRP Synthesis 368 p 33, CPT in Geotechnical Practice p 72

Where:

C1 is 8.25

4.3.6.2 Constrained Modulus 2

The constrained modulus 2 (M) in Constrained Modulus 2 is defined as:

$$M = C_1 \cdot G_0$$

Burns and Mayne (2002), NCHRP Synthesis 368 pp 33-34

Where:

C1 is 0.02 for organic plastic clays, up to 2 for over consolidated quartz sands in the published literature.

G0 is taken from Small Strain Shear Modulus 2.

4.3.7 Effective Cohesion

The cohesion *(c')* in Effective Cohesion 1 is defined as:

$$c' = C_1 \cdot \sigma'_p$$

Mayne and Stewart (1988), Mesri and Abdel-Ghaffar (1993), NCHRP Synthesis 368 p 44

Where:

C_1 is 0.02 in the published formula.

σ'_p is taken from Preconsolidation Stress.

4.3.8 Preconsolidation Stress and Overconsolidation Ratio

4.3.8.1 Preconsolidation Stress 1

The Preconsolidation Stress 1 (σ'_p) of clay defined as:

$$\sigma'_p = C_1 \cdot (q_t - \sigma_{v0})$$

Mayne (1995), Demers and Leroueil (2002), NCHRP Synthesis 368 p 34

Where:

C_1 is 0.33

4.3.8.2 Preconsolidation Stress 2

The Preconsolidation Stress 2 (σ'p) of clay is defined as:

$$\sigma'_p = C1 \cdot \Delta u$$

Chen and Mayne (1996), NCHRP Synthesis 368 p 34

Where:

C1 is 0.53

4.3.8.3 Preconsolidation Stress 3

The Preconsolidation Stress 3 (σ'p) of clay is defined as:

$$\sigma'_p = C_1 \cdot (q_t - u_2)$$

Mayne (2005), NCHRP Synthesis 368 p 35

Where:

C1 is 0.6.

4.3.8.4 Preconsolidation Stress 4

The Preconsolidation Stress 4 (σ'p) of clay is defined as:

$$\sigma' p = C1 \cdot Q_t^{C2} \cdot \sigma' v0$$

Robertson (2009), Guide to CPT p 31

Where:

C1 is 0.25.

C2 is 1.25.

4.3.8.5 Preconsolidation Stress 5

The Preconsolidation Stress 5 (σ'p) of sand is defined as:

$$\sigma' p = [\frac{C1 \cdot (qt/\sigma_{atm})C2}{(1 - sin\Phi') \cdot (\sigma' v0/\sigma_{atm})C3}]^{\frac{1}{sin\Phi' - C4}} \cdot \sigma'_{v0}$$

Mayne (2005), NCHRP Synthesis 368 p 35

Where:

C1 is 0.192.

C2 is 0.22.

C3 is 0.31.

C4 is 0.27.

Φ' is taken from Friction_Angle_3

4.3.8.6 Preconsolidation Stress 6

The Preconsolidation Stress 6 (σ'p) of all soil types is defined as:

$$\sigma'p = C1 \cdot \sigma_{atm}^{C2} \cdot (G0)^{C3} \cdot \sigma'^{C4}_{v0}$$

Mayne (2007), NCHRP Synthesis 368 pp 37

Where:

σ'p, σatm, G0 and σ'v0 are in kPa

C1 is 0.101

C2 is 0.102

C3 is 0.478

C4 is 0.420

G0 is taken from Small Strain Shear Modulus 2

4.3.8.7 Overconsolidation Ratio

Overconsolidation ratio is defined as the maximum historical effective stress and the current overburden effective stress.

The Overconsolidation ratio is defined as:

$$OCR = \frac{\sigma'p}{\sigma'v0}$$

OCR 1: σ'p is taken from Preconsolidation Stress 1.

OCR 2: σ'p is taken from Preconsolidation Stress 2.

OCR 3: σ'p is taken from Preconsolidation Stress 3.

OCR 4: σ'p is taken from Preconsolidation Stress 4.

OCR 5: σ'p is taken from Preconsolidation Stress 5.

OCR 6: σ'p is taken from Preconsolidation Stress 6.

4.3.9 Relative Density (D_r)

4.3.9.1 Relative Density 1

$$D_r = \frac{1}{C_2} \cdot \ln\left(\frac{q_c \cdot W_{ehr}}{C_0 \cdot (\sigma'_{v0})^{C_1}}\right) \cdot 100$$

Baldi et al. (1986) and Al-Homoud and Wehr (2006), CPT in Geotechnical Practice p 83

Where:

qc and σ'_{v0} are in kPa

C0 value for normally consolidated 157, over consolidated 181

C1 is 0.55.

C2 is 2.46

W_{ehr} is the Wehr Correction for Calcareous Soils, this constant was suggested in Al-Homoud and Wehr (2006). If the field is empty the default is 1.

4.3.9.2 Relative Density 2

$$D_r = 100 \cdot \left[C1 \cdot \ln\left(\frac{\frac{q_c}{\sigma_{atm}}}{\sqrt{\frac{\sigma_{v0}}{\sigma_{atm}}}}\right) + C2\right]$$

Jamiolkowski et al. (2001), NCHRP Synthesis 368 pp 41-42

Where:

C1 is 0.268 for all Sands

C2 is −0.675 , for high compressibility and sands of carbonate or calcareous composition: C2≤1.0, for low compressibility: C2≥2.0.

4.3.9.3 Relative Density 3

$$D_r = \left[\frac{q_{C1}}{305 \cdot OCR^{0.18} \cdot (12 + 0.5 \cdot Log\left(\frac{t}{100}\right))}\right]^{0.5} \cdot 100$$

Kulhawy and Mayne (1990), CPT in Geotechnical Practice p 84

Where:

$q_{c1} = q_c / \sqrt{(\sigma'_{vo} - \sigma_{atm})}$

C1 is 0.91 for low compressibility, 1.0 for medium compressible sands, to 1.09 for highly compressible

t is time in years

4.3.10 Rigidity index

4.3.10.1 Rigidity index 1

Rigidity index 1 (Ir) for fine material is defined as:

$$I_r = exp[(\frac{C_1}{M} + C_2) \cdot (\frac{q_t - \sigma_{v0}}{q_t - u_2}) - C_3]$$

Mayne (2001), NCHRP Synthesis 368 p 46

Where:

C1 is 1.5

C2 is 2.925

C3 is 2.925

M is the Cam clay constant, slope of the critical state line and is defined as:

$$M = \frac{6 \cdot sin\Phi'}{3 - sin\Phi'}$$

4.3.10.2 Rigidity index 2

Rigidity index 2 (Ir) for fine material based on plasticity is defined as:

$$I_r = \frac{exp[C_1 \cdot (C_2 - PI)]}{[1 + ln\{1 + C_3 \cdot (OCR - 1)^{C_4}\}]^{C_5}}$$

Keaveny and Mitchel (1986), NCHRP Synthesis 368 p 46

Where:

C1 is 0.0435

C2 is 137

C3 is 0.385

C4 is 3.2

C5 is 0.8

PI is the Plasticity Index

OCR is taken from OCR 4

This correlation of Ir is calculated only when the Soil Type is fine.

4.3.11 Sensitivity

4.3.11.1 Sensitivity 1

The Sensitivity (S_t) is defined as:

$$S_t = \frac{N_s}{R_f}$$

Schmertmann (1978), Rad and Lunne (1986), CPT in Geotechnical Practice p 68

Where:

Ns is a value between 5 and 10

4.3.11.2 Sensitivity 2

The Sensitivity (St) is defined as:

$$S_t = \frac{C_1 \cdot (q_t - \sigma_{v0})}{f_s}$$

Mayne (2007), NCHRP Synthesis 368 p 41

C1 is 0.073

This correlation of St is based on the assumption of OCR<2, su=0.22·σ'p and σ'p=0.33(qt−σv0).

4.3.12 Shear Wave Velocity

4.3.12.1 Shear Wave Velocity 1

Shear Wave velocity (V_s) is defined as:

$$Vs = C1 \cdot log(fs) + C2$$

Mayne (2006), NCHRP Synthesis 368 p 30

Where:

fs is in kPa.

C1 is 118.8

C2is 18.5

4.3.12.2 Shear Wave Velocity 2

Shear Wave velocity 2 (V_s) is defined as:

$$Vs = (C1 \cdot log(qt) - C2)^{C3} \cdot (\frac{fs}{qt} \cdot 100)^{C4}$$

Hegazy and Mayne (1995), NCHRP Synthesis 368 p 30

qt and fs are in kPa.

C1 is 10.1

C2 is 11.4

C3 is 1.67

C4 is 0.3

4.3.12.3 Shear Wave Velocity 3 (CLAYS)

Shear Wave velocity 3 (V_s) is defined as:

$$\mathrm{Vs} = \mathrm{C1} \cdot (\mathrm{qt})^{\mathrm{C2}}$$

Mayne and Rix (1995), NCHRP Synthesis 368 p 30

Where:

qt and fs are in kPa

C1 is 1.75

C2 is 0.627

4.3.12.4 Shear Wave Velocity 4 (SANDS)

Shear Wave velocity 4 (Vs) is defined as:

$$Vs = C1 \cdot qt^{c2} \cdot (\sigma'_{v0})^{C3}$$

Baldi et al. (1989), NCHRP Synthesis 368 p 30

Where:

qt and σ'v0 are in MPa.

C1 is 277

C2 is 0.13

C3 is 0.27

4.3.13 Small-Strain Shear Modulus

4.3.13.1 Small-Strain Shear Modulus 1

Small-Strain Shear Modulus 1 (G_0) is defined as:

$$G_0 = C_1 \cdot \left(\frac{q_c}{\sqrt{\sigma'_{v0}}}\right)^{C_2} \cdot q_c$$

Rix and Stokoe (1992), CPT in Geotechnical Practice p 94

Where:

qc, σ'v0 and G0 are in kPa.

C1 is 1634

C2 is -0.75

This correlation of G0 is calculated only when the Soil Type is Coarse or Mixed.

4.3.13.2 Small-Strain Shear Modulus 2

Small-Strain Shear Modulus 2 (G_0) is defined as:

$$G_0 = \frac{\gamma_{bulk}}{g} \cdot {V_s}^2$$

Elastic theory, CPT in Geotechnical Practice p 74 and 94, NCHRP Synthesis 368 p 31

Where:

Vs is taken from the Shear Wave Velocity 1, or extrapolated shear wave velocities.

γ_{bulk} is taken from Bulk Unit Weight

This correlation of G0 is applicable to all soil types.

4.3.14 Soil Behaviour Type Index

4.3.14.1 Soil Behaviour Type Index 1

The soil behaviour type index (Ic) is defined as:

$$Ic = ((C1 - log_{10}Qt)^2 + (log_{10}Fr + C2)^2)^{0.5}$$

$$Qt = qc - \sigma_{v0}Pa(\frac{Pa}{\sigma'_{v0}})^n$$

$$(\frac{Pa}{\sigma'_{v0}}) \leq 1.7$$

$$Fr = \frac{fs}{qt - \sigma_{v0}} \times 100\%$$

Ic is calculated using n=1, if Ic>Ic break, then it's been accepted, otherwise it's calculated using n=0.5. If Ic<Ic break break then it's accepted, otherwise it's calculated using n=0.7.

Robertson and Wride (1998)

Where:

C1 is 3.47

C2 is 1.22

4.3.14.2 Transition zones

A Transition Zone in Soil_Behaviour_Type_Index_Transition_1 for a certain depth is considered when:

2.3<Ic<2.9;

The rate of Ic change is rapid (slope of Ic vs. depth above and below of the current depth > 5) and crosses the Ic=2.6 line.

4.3.14.3 Soil Behaviour Type Index 2

The soil behaviour type index (Ic) is defined as:

$$Ic = \sqrt{[C1 - log_{10}Qt(1 - Bq)]2 + [C2 + C3 \cdot log_{10}Fr]^2}$$

Jefferies and Davies (1993), NCHRP Synthesis 368 p 27

Where:

C1 is 3

C2 is 1.5

C3 is 1.3

4.3.14.4 Soil Behaviour Type Index 3

The non-normalised Soil Behaviour Type Index (ISBT) in is defined as:

$$((C_1 - log(\frac{(q_c)}{p_a}))^2 + (log(R_f) + C_2)^2)^{0.5}$$

Robertson (2010), CPT 10, paper 2-56

Where:

C1 is 3.47

pa is the Atmospheric pressure, 101.4 kPa

C2 is 1.22

4.3.14.5 Soil Behaviour Type Index 4

The soil behaviour type index (Ic):

$$I_c = \sqrt{[C_1 - log_{10}Q_t(1 - B_q) + 1]^2 + [C_2 + C_3 \cdot log_{10}F_r]^2}$$

Been and Jefferies (1992), Soil liquefaction, a critical state approach, pp. 206-207

Where:

C1 is 3

C2 is 1.5

C3 is 1.3

4.3.15 SPT N_{60} Value

4.3.15.1 SPT N_{60} Value 1

The SPT N_{60} is defined as:

$$N_{60} = \frac{qc}{C1 \cdot pa(1 - \frac{Ic}{C2})}$$

Robertson and Wride (1998), CPT in Geotechnical Practice p 151

Where:

C_1 is 8.5

C_2 is 4.6

p_a is the Atmospheric pressure, 100 kPa

4.3.15.2 SPT N_{60} Value 2

The SPT N_{60} is defined as:

$$N_{60} = \frac{qc}{C1 \cdot (1 - \frac{Ic}{C2})}$$

Jefferies and Davies (1993)

Where:

C1 is 0.85

C2 is 4.75

4.3.15.3 SPT Average N_{60} Value

The SPT average N_{60} value is a stepped average of SPT N_{60} for each defined depth interval step.

4.3.16 Undrained shear strength

4.3.16.1 Undrained shear Strength 1

Undrained Shear Strength 1 is defined as:

When qt has data,

$$su = \frac{(qt - \sigma_{v0})}{N_{kt}}$$

Otherwise,

$$su = \frac{(qc - \sigma_{v0})}{N_k}$$

NCHRP Synthesis 368 p 39

Different values for Nk and Nkt can be defined for when qc or qt is either greater than or equal to, or less than a defined break point.

4.3.16.2 Undrained shear Strength 2

Undrained Shear Strength 2 is defined as:

When qt has data,

$$su = \frac{(qt)}{N_{kt}}$$

Otherwise,

$$su = \frac{(qc - \sigma_{v0})}{N_{kt}}$$

4.3.16.3 Undrained shear Strength 3

Undrained Shear Strength 3 is defined as:

$$su = 0.5 \cdot sin\Phi' \cdot OCR^{\Lambda} \cdot \sigma'_{v0}$$

Wroth (1984), NCHRP Synthesis 368 p 39

Φ' is taken from Friction Angle 3 and Friction Angle 1

OCR is taken from Overconsolidation Ratio 1

Λ=1−CsCc , typically low to medium sensitivity clays are 0.7≤Λ≤0.8 , and sensitive and structured clays are 0.9≤Λ≤1.0, and is stored in the Undrained_Shear_Strength_3_Lambda field.

4.3.16.4 Undrained shear Strength 4

Undrained Shear Strength 4 is defined as:

$$su = C1 \cdot \sigma'_p$$

Trak et al. (1980), Terzaghi et al. (1996), NCHRP Synthesis 368 p 40

C1 is 0.22

4.3.16.5 Undrained shear Strength 5

Undrained Shear Strength 5 is defined as:

$$su = \frac{\Delta u}{N\Delta u}$$

Robertson (2009), pp 28-29

4.3.17 Unit Weight

4.3.17.1 Dry Unit Weight (γ_{dry})

Dry Unit Weight (γ_{dry}) is defined as:

$$\gamma_{dry} = C1 \cdot \log(qt) + C2$$

Mayne (2007), NCHRP Synthesis 368 p 31

Where:

C1 is 1.89

C2 is 11.8

4.3.17.2 Saturated Unit Weight 1

Saturated Unit Weight 1 (γ_{sat}) is defined as:

$$\gamma_{sat} = C1 \cdot log(Vs) - C2 \cdot log(z)$$

Mayne (2007), NCHRP Synthesis 368 p 31

Where:

Vs is in m/s and z is in m VS is taken from shear wave velocity 1 or extrapolated shear wave velocity.

C1 is 8.32

C2 is 1.61

z is Depth

4.3.17.3 Saturated Unit Weight 2

Saturated Unit Weight 2 (γ_{sat}) is defined as:

$$\gamma sat = C1 \cdot log(fs) + C2 \cdot Gs - C3$$

Mayne (2007), NCHRP Synthesis 368 p 32

Where:

fs is in kPa.

C1 is 2.6

C2 is 15

C3 is 26.5

Gs is Specific Gravity of Solids, typically 2.4 to 2.9

4.3.18 Young's Modulus

4.3.18.1 Small Strain Young's Modulus

Small Strain Young's Modulus 1 (E_0) is defined as:

$$E_0 = 2 \cdot (1 + v) \cdot G_0$$

Elastic theory, CPT in Geotechnical Practice p 74 and 94, NCHRP Synthesis 368 p 32

Where:

v = 0.2 is applied and can be varied in the Formula Tool. Published literature states: v'=0.2 applies for drained soils and vu=0.5 applies for undrained soils.

G0 is taken from Small Strain Shear Modulus 2.

This correlation of E0 is applicable to all soil types.

4.3.18.2 Young's Modulus 2

Young's Modulus2 (E_0) is defined as:

$$E_0 = \alpha q_c$$

CPT in Geotechnical Practice p 160, Figure 6.13

Where:

a is calculated from degree of loading, qc, effective stress and reduction factor

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6 APPENDIX A – CPT RESULTS TABLE

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

Project Number:	**2390127**
Project Name:	Grimsby
Client:	Mayer
Date:	13/09/2023
Rig:	CPT01
Operator:	RH

Test #	PointID	Predrill (m)	Final Depth (m)	Refusal Criteria	Operator Comments	Cone ID	Cone Area	Filter & Position	Friction Reducer	Groundwater depth	GW Depth Supplied by	Eastings	Northings
1	CPT01	1.20	24.94	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689832.4	5942525
2	CPT02	1.20	16.85	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689838.6	5942597
3	CPT03	1.20	14.85	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689798.4	5942595
4	CPT04	1.20	21.15	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689688.9	5942719
5	CPT05	1.20	15.01	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689687.1	5942715
6	CPT06	1.20	15.12	Total Pressure		71175	15000	U2 HDPE	None	2	Assumed for calculation purposes	689770.5	5942502

7 APPENDIX B – CPT PLOTS

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

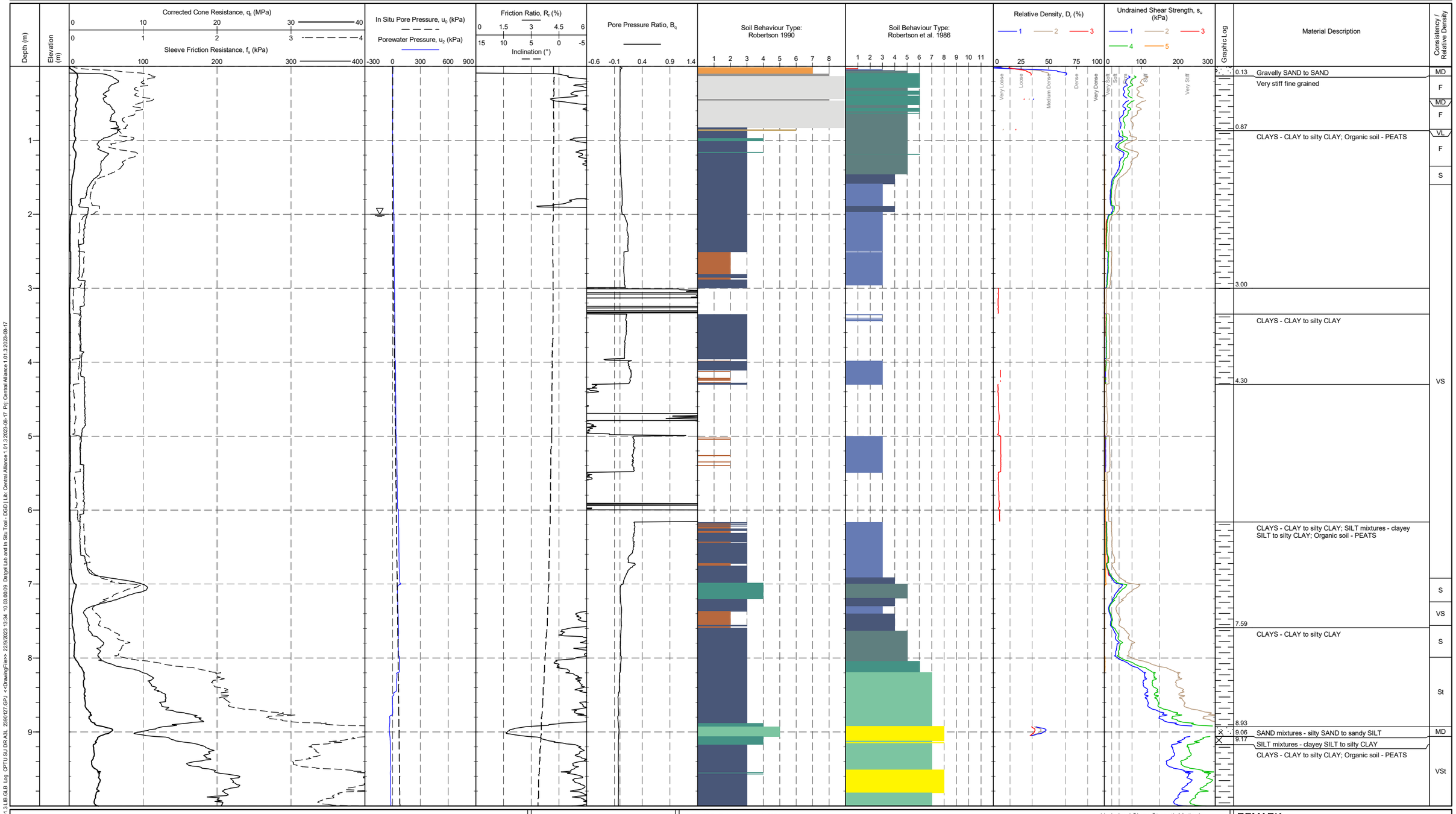
CPT LOG

PointID
CPT01

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689832.4 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942525.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{cone}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{cone}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:24 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689832.4 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942525.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 | Sleeve Friction Resistance, f_s (kPa) 0 1 2 3 4 | In Situ Pore Pressure, u_0 (kPa) | Porewater Pressure, u_2 (kPa) -300 0 300 600 900 | Friction Ratio, R_f (%) 0 1.5 3 4.5 6 | Inclination (°) 15 10 5 0 -5 | Pore Pressure Ratio, B_q -0.6 -0.1 0.4 0.9 1.4 | Soil Behaviour Type: Robertson 1990 1 2 3 4 5 6 7 8 | Soil Behaviour Type: Robertson et al. 1986 1 2 3 4 5 6 7 8 9 10 11 | Relative Density, D_r (%) 1 2 3 0 25 50 75 100 Very Loose Loose Medium Dense Dense Very Dense | Undrained Shear Strength, s_u (kPa) 1 2 3 4 5 0 100 200 300 Very Soft Soft Firm Stiff Very Stiff | Graphic Log

Material Description	Consistency / Relative Density
CLAYS - CLAY to silty CLAY; Organic soil - PEATS *(continued)*	VSt
	St
14.60 SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT	VD
	D
16.46	
16.60 SILT mixtures - clayey SILT to silty CLAY	VSt
CLAYS - CLAY to silty CLAY	St
	VSt
	St
19.82	D

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{cone}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB	Dissipation Test
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023	
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB	
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023	

REMARK

CENTRAL_ALLIANCE 1.01.3.UB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFiles>> 22/9/2023 13:34 10.00.00.09 Datgel Lab and In Situ Tool - DGD [Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT	: Mayer	AREA	:	SHEET	: 3 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689832.4 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942525.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 | Sleeve Friction Resistance, f_s (kPa) 0 1 2 3 4 | In Situ Pore Pressure, u_0 (kPa) -300 0 300 600 900 | Porewater Pressure, u_2 (kPa) | Friction Ratio, R_f (%) 0 1.5 3 4.5 6 | Inclination (°) 15 10 5 0 -5 | Pore Pressure Ratio, B_q -0.6 -0.1 0.4 0.9 1.4 | Soil Behaviour Type: Robertson 1990 1 2 3 4 5 6 7 8 | Soil Behaviour Type: Robertson et al. 1986 1 2 3 4 5 6 7 8 9 10 11 | Relative Density, D_r (%) 1 2 3 0 25 50 75 100 Very Loose Loose Medium Dense Dense Very Dense | Undrained Shear Strength, s_u (kPa) 1 2 3 4 5 0 100 200 300 Very Soft Soft Firm Stiff Very Stiff | Graphic Log | Material Description | Consistency / Relative Density

Depth (m)	Material Description	Consistency / Relative Density
	SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT *(continued)*	VD, D, MD
20.77		
20.91	SILT mixtures - clayey SILT to silty CLAY	H
21.06	SAND mixtures - silty SAND to sandy SILT	MD
21.20	SILT mixtures - clayey SILT to silty CLAY	H
	SAND mixtures - silty SAND to sandy SILT	MD
22.51		
22.62	SILT mixtures - clayey SILT to silty CLAY	H
	SAND mixtures - silty SAND to sandy SILT	MD
23.73		
	SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT	D, MD
24.94		

Terminated at 24.94 m
Refusal

RIG : ; Crawler based20 Ton;
CONE TYPE : C+F+W2
CONE ID : DP15-CFPTxy.71175
OPERATOR : Central Alliance

CHECKED BY : BB
CHECKED DATE : 20/9/2023
APPROVED BY : BB
APPROVED DATE : 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_c/N_{kc}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3 GLB Log CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:34 10.03.00.09 Datgel Lab and In Situ Tools - DGD | Lib: Central Alliance 1.01.3 2025-06-17 Prj: Central Alliance 1.01.3 2025-06-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID
CPT02

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689838.6 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942597.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) | Sleeve Friction Resistance, f_s (kPa) | In Situ Pore Pressure, u_0 (kPa) | Porewater Pressure, u_2 (kPa) | Friction Ratio, R_f (%) | Inclination (°) | Pore Pressure Ratio, B_q | Soil Behaviour Type: Robertson 1990 | Soil Behaviour Type: Robertson et al. 1986 | Relative Density, D_r (%) | Undrained Shear Strength, s_u (kPa) | Graphic Log | Material Description | Consistency / Relative Density

Graphic Log	Material Description	Consistency / Relative Density
0.11	SANDS - clean SAND to silty SAND Very stiff fine grained	VL F
0.82		VL VL L L MD MD VS
	CLAYS - CLAY to silty CLAY; Organic soil - PEATS	VS S
2.78	CLAYS - CLAY to silty CLAY; Sensitive, fine grained	VS
6.69	CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY	VS S VS S F St VSt MD
9.84	CLAYS - CLAY to silty CLAY	VSt

RIG : ; Crawler based20 Ton;
CONE TYPE : C+F+W2
CONE ID : DP15-CFPTxy.71175
OPERATOR : Central Alliance

CHECKED BY : BB
CHECKED DATE : 20/9/2023
APPROVED BY : BB
APPROVED DATE : 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_c/N_{cone}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL_ALLIANCE 1.01.3.UB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFiles>> 22/9/2023 13:35 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689838.6 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942597.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) 0–40 | Sleeve Friction Resistance, f_s (kPa) 0–400 | In Situ Pore Pressure, u_0 (kPa) | Porewater Pressure, u_2 (kPa) -300–900 | Friction Ratio, R_f (%) 0–6 | Inclination (°) 15–-5 | Pore Pressure Ratio, B_q -0.6–1.4 | Soil Behaviour Type: Robertson 1990 1–8 | Soil Behaviour Type: Robertson et al. 1986 1–11 | Relative Density, D_r (%) 0–100 (Very Loose, Loose, Medium Dense, Dense, Very Dense) | Undrained Shear Strength, s_u (kPa) 0–300 (Very Soft, Soft, Firm, Stiff, Very Stiff) | Graphic Log | Material Description | Consistency / Relative Density

CLAYS - CLAY to silty CLAY *(continued)* — VSt

VSt

St

VSt

16.58

VSt

SANDS - clean SAND to silty SAND — VD

16.85

Terminated at 16.85 m
Refusal

RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{cone}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{cone}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

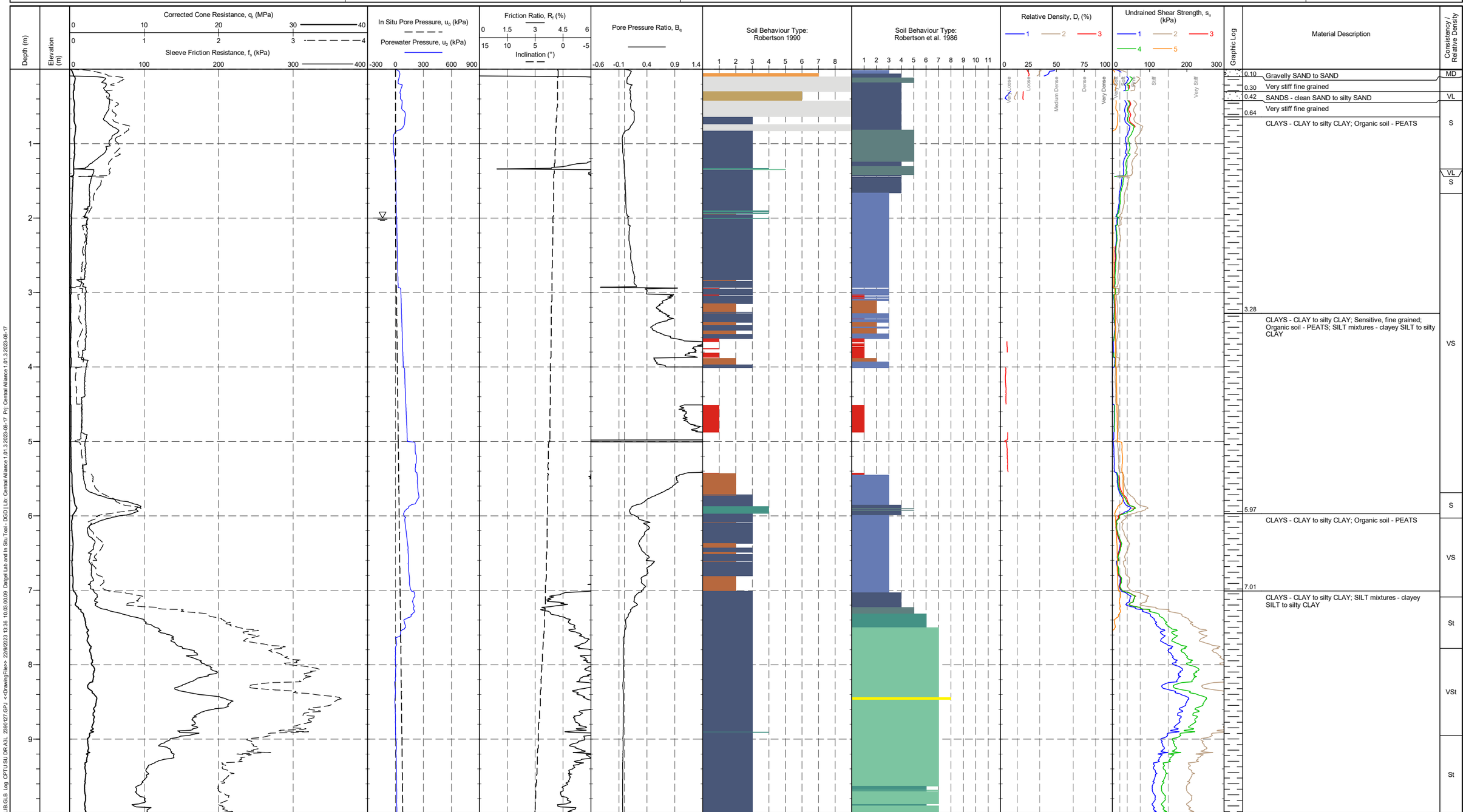
CPT LOG

PointID **CPT03**

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689798.4 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942595.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:36 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689798.4 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942595.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 | Sleeve Friction Resistance, f_s (kPa) 0 1 2 3 4 | In Situ Pore Pressure, u_0 (kPa) -300 0 300 600 900 | Porewater Pressure, u_2 (kPa) | Friction Ratio, R_f (%) 0 1.5 3 4.5 6 | Inclination (°) 15 10 5 0 -5 | Pore Pressure Ratio, B_q -0.6 -0.1 0.4 0.9 1.4 | Soil Behaviour Type: Robertson 1990 1 2 3 4 5 6 7 8 | Soil Behaviour Type: Robertson et al. 1986 1 2 3 4 5 6 7 8 9 10 11 | Relative Density, D_r (%) 1 2 3 0 25 50 75 100 Very Loose Loose Medium Dense Dense Very Dense | Undrained Shear Strength, s_u (kPa) 1 2 3 4 5 0 100 200 300 Very Soft Soft Firm Stiff Very Stiff | Graphic Log | Material Description | Consistency / Relative Density

11
12
13
14
15
16
17
18
19

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)* — St

14.34

SANDS - clean SAND to silty SAND — VD

14.85

Terminated at 14.85 m
Refusal

VSt

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_c/N_{kc}$ or q_c/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

Dissipation Test

RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

REMARK

CENTRAL_ALLIANCE 1.01.3.ULB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:36 10.00.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-06-17 Prj: Central Alliance 1.01.3

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

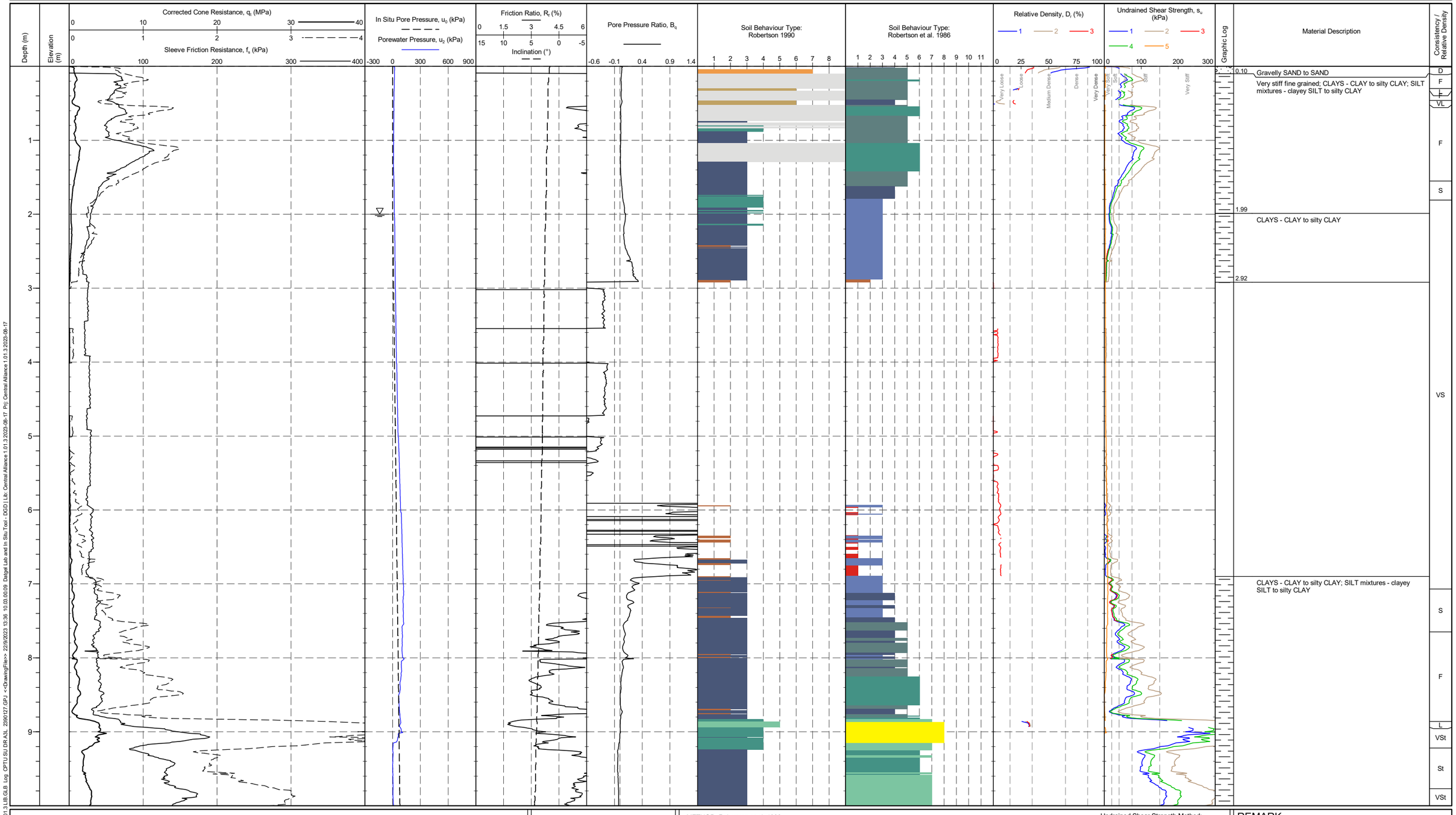
CPT LOG

PointID **CPT04**

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689688.9 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942719.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{cone}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL_ALLIANCE 1.01.3.LIB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFiles>> 22/9/2023 13:36 10.00.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

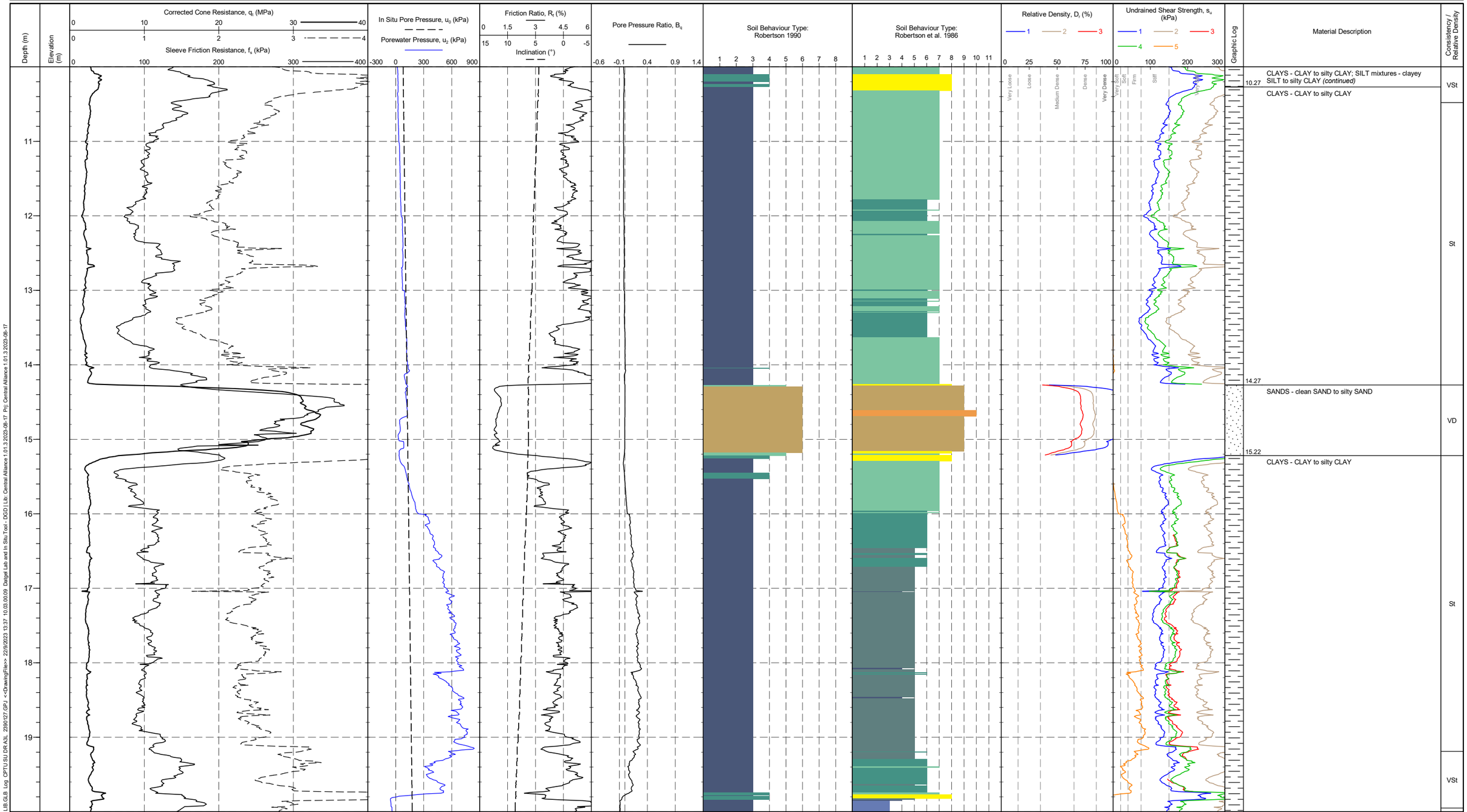
CPT LOG

PointID **CPT04**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689688.9 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942719.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:37 10.03.00.09 Datgel Lab and In Situ Tools - DGD | Lib: Central Alliance 1.01.3 2025-08-17 Prj: Central Alliance 1.01.3 2025-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

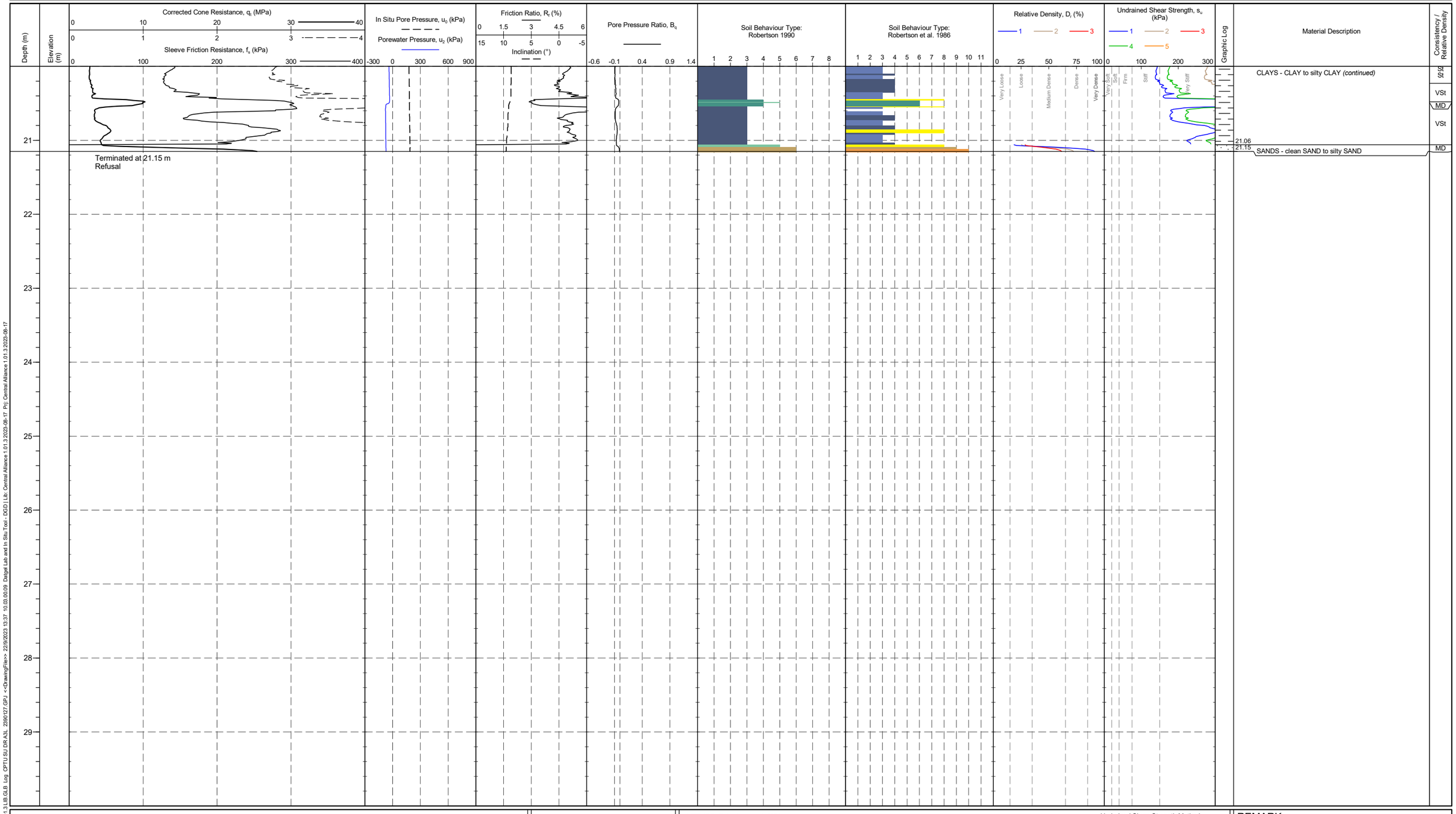
CPT LOG

PointID **CPT04**

CLIENT	: Mayer	AREA	:	SHEET	: 3 OF 3
ENGINEER	: Ben Bilsbrough	EASTING	: 689688.9 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942719.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{\Delta u}$ or q_E/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL_ALLIANCE 1.01.3.LIB.GLB Log CPTU SU DR.ASL 2390127.GPJ <<DrawingFiles>> 22/9/2023 13:37 10.00.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

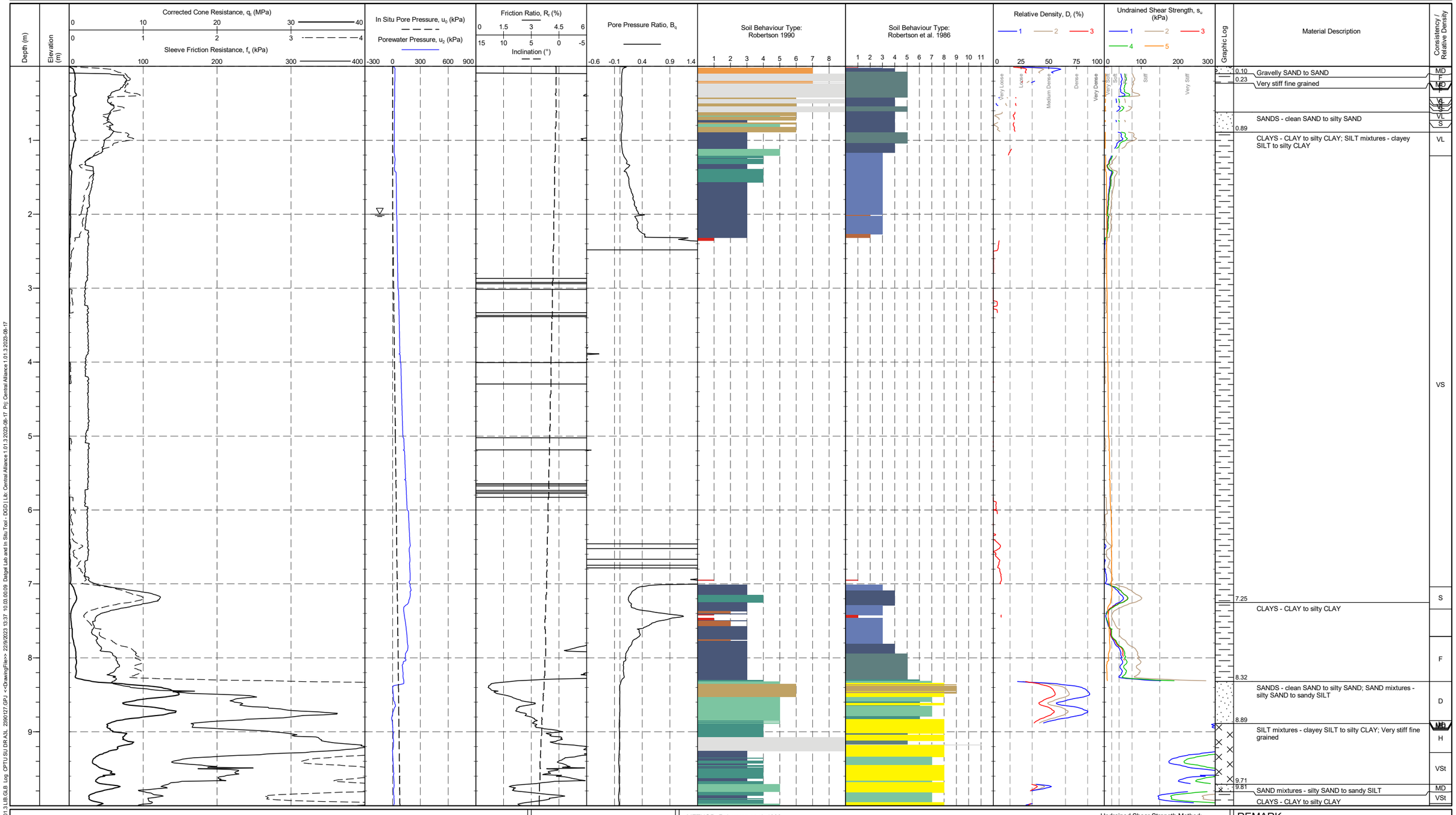
CPT LOG

PointID **CPT05**

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689687.1 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942715.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:37 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689687.1 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942715.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)

Depth (m) | Elevation (m) | Corrected Cone Resistance, q_t (MPa) 0 10 20 30 40 | Sleeve Friction Resistance, f_s (kPa) 0 1 2 3 4 | In Situ Pore Pressure, u_0 (kPa) -300 0 300 600 900 | Porewater Pressure, u_2 (kPa) | Friction Ratio, R_f (%) 0 1.5 3 4.5 6 | Inclination (°) 15 10 5 0 -5 | Pore Pressure Ratio, B_q -0.6 -0.1 0.4 0.9 1.4 | Soil Behaviour Type: Robertson 1990 1 2 3 4 5 6 7 8 | Soil Behaviour Type: Robertson et al. 1986 1 2 3 4 5 6 7 8 9 10 11 | Relative Density, D_r (%) 1 2 3 0 25 50 75 100 Very Loose Loose Medium Dense Dense Very Dense | Undrained Shear Strength, s_u (kPa) 1 2 3 4 5 0 100 200 300 Very Soft Soft Firm Very Stiff | Graphic Log | Material Description | Consistency / Relative Density

11
12
13
14
15
16
17
18
19

CLAYS - CLAY to silty CLAY *(continued)*

St

14.92
15.01 Gravelly SAND to SAND

VSt

D

Terminated at 15.01 m
Refusal

RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$ or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:37 10.03.00.09 Datgel Lab and In Situ Tools - DGD | Lib: Central Alliance 1.01.3 2025-06-17 Prj: Central Alliance 1.01.3 2025-06-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

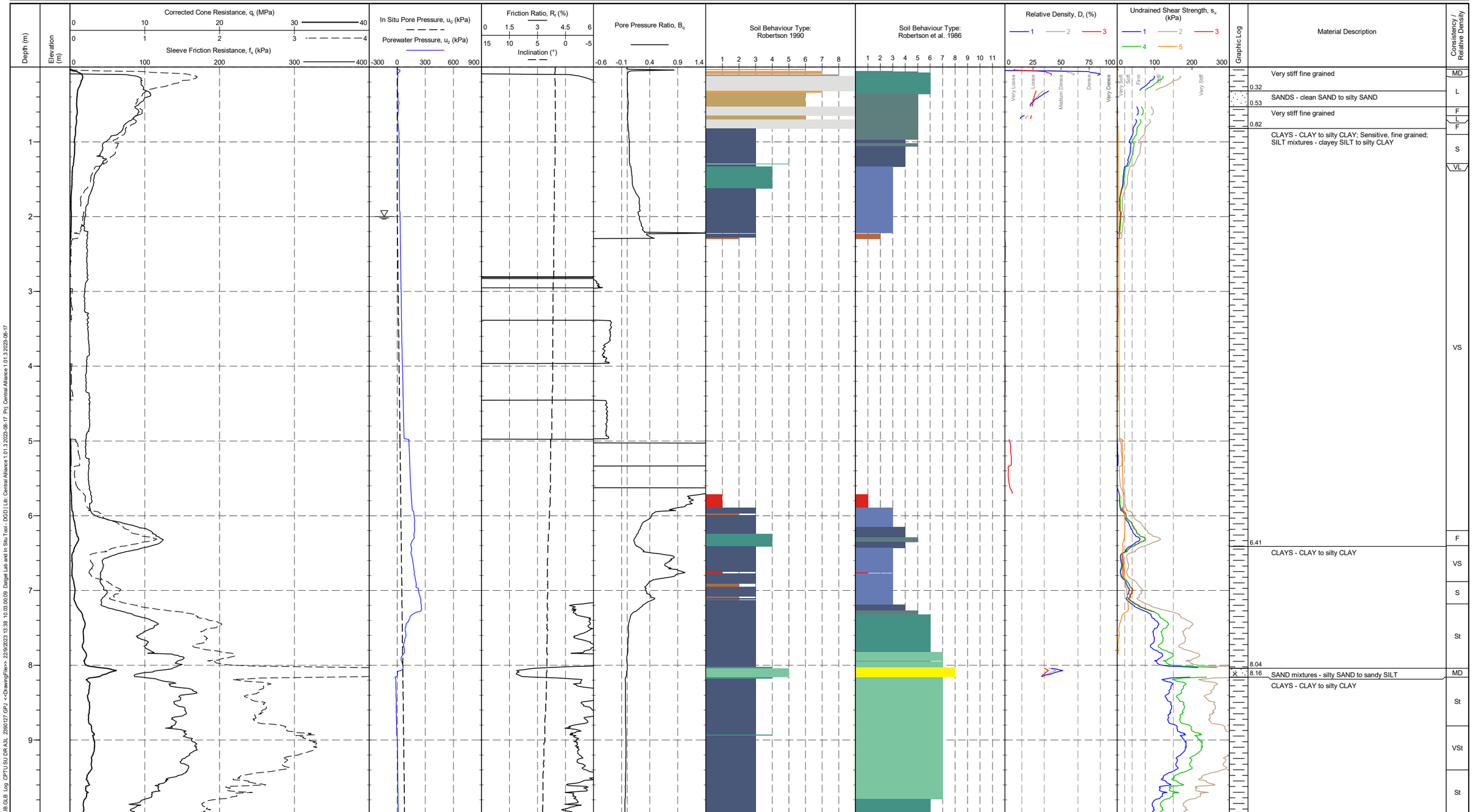
CPT LOG

PointID
CPT06

CLIENT	: Mayer	AREA	:	SHEET	: 1 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689770.5 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942502.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_E - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{kt}$; or q_E/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009), $s_u = \Delta u/N$

REMARK

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log: CPTU SU DR ASL 2390127.GPJ <<DrawingFile>> 22/8/2023 13:38 10.03.00.09 Datget Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2022-08-17 Prj: Central Alliance 1.01.3 2022-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

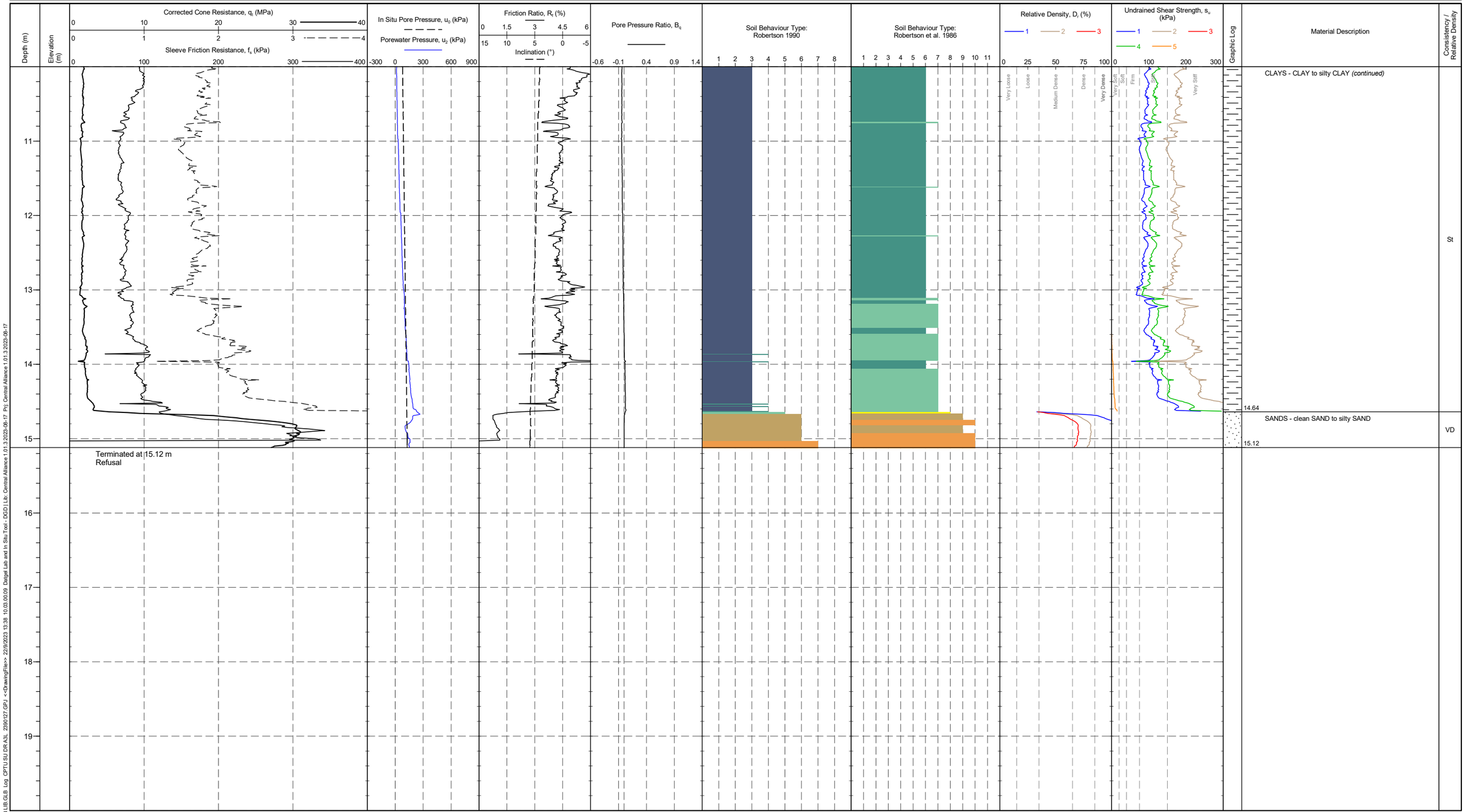
CPT LOG

PointID **CPT06**

CLIENT	: Mayer	AREA	:	SHEET	: 2 OF 2
ENGINEER	: Ben Bilsbrough	EASTING	: 689770.5 m	STATUS	:
PROJECT	: Grimsby CPT	NORTHING	: 5942502.0 m	DATE	: 13/9/2023
LOCATION	: Grimsby	COORD. SYS.	:		
PROJECT No.	: 2390127	ELEVATION	:		

METHOD: Robertson 1990
1 - Sensitive, fine grained
2 - Organic soil - PEATS
3 - CLAYS - CLAY to silty CLAY
4 - SILT mixtures - clayey SILT to silty CLAY
5 - SAND mixtures - silty SAND to sandy SILT
6 - SANDS - clean SAND to silty SAND
7 - Gravelly SAND to SAND
8 - Very stiff SAND to clayey SAND
9 - Very stiff fine grained

Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006)
2. Jamiolkowski et al. (2001)
3. Kulhawy & Mayne (1990)



RIG	: ; Crawler based20 Ton;	CHECKED BY	: BB
CONE TYPE	: C+F+W2	CHECKED DATE	: 20/9/2023
CONE ID	: DP15-CFPTxy.71175	APPROVED BY	: BB
OPERATOR	: Central Alliance	APPROVED DATE	: 20/9/2023

Dissipation Test

METHOD: Robertson et al. 1986
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Undrained Shear Strength Method:
1. $s_u = (q_t - \sigma_{vo})/N_{kt}$; or $(q_t - \sigma_{vo})/N_k$
2. $s_u = q_t/N_{\Delta u}$ or q_t/N_k
3. Wroth (1984)
4. Trak et al. (1980), Terzaghi et al. (1996)
5. Robertson (2009). $s_u = \Delta u/N$

REMARK

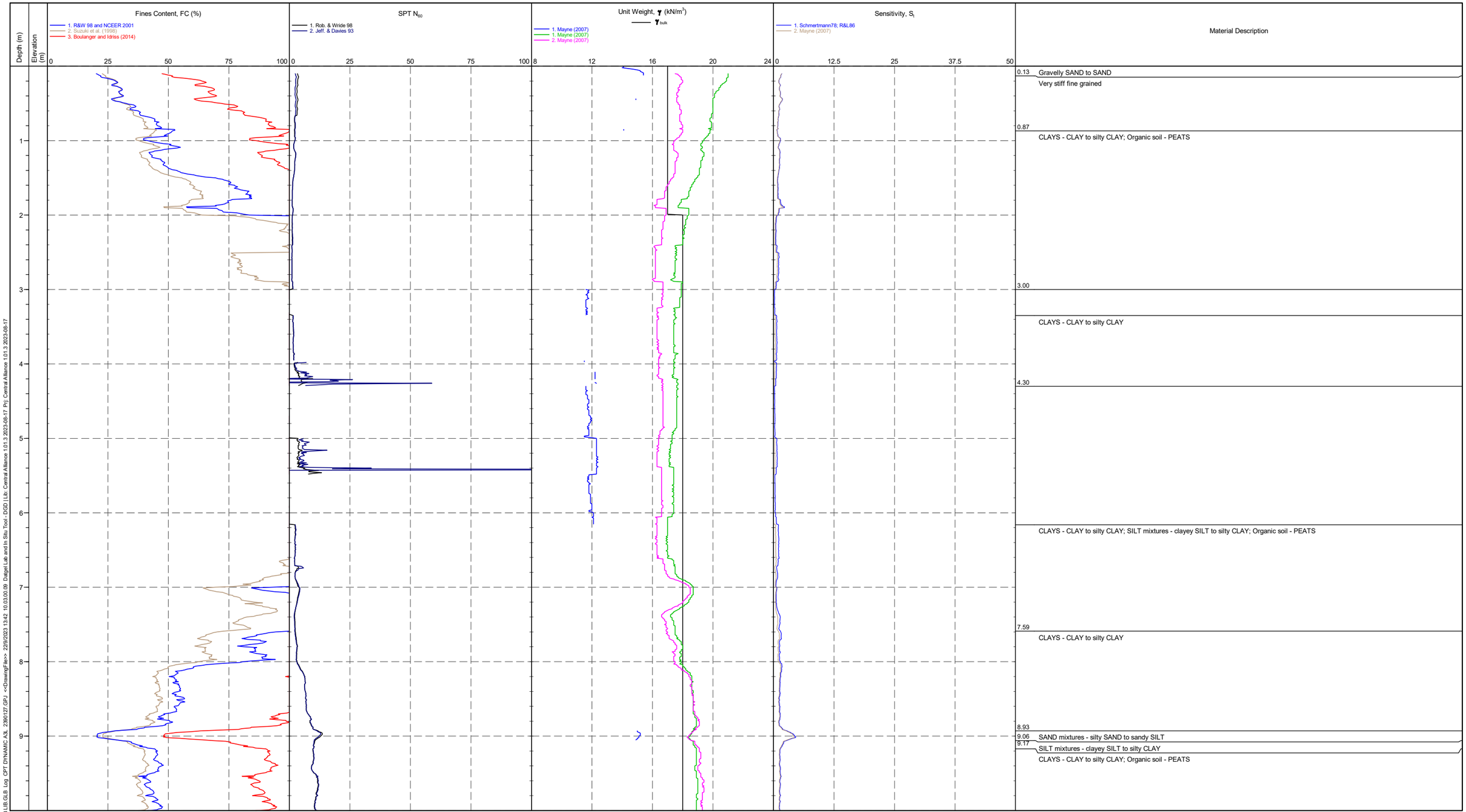
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

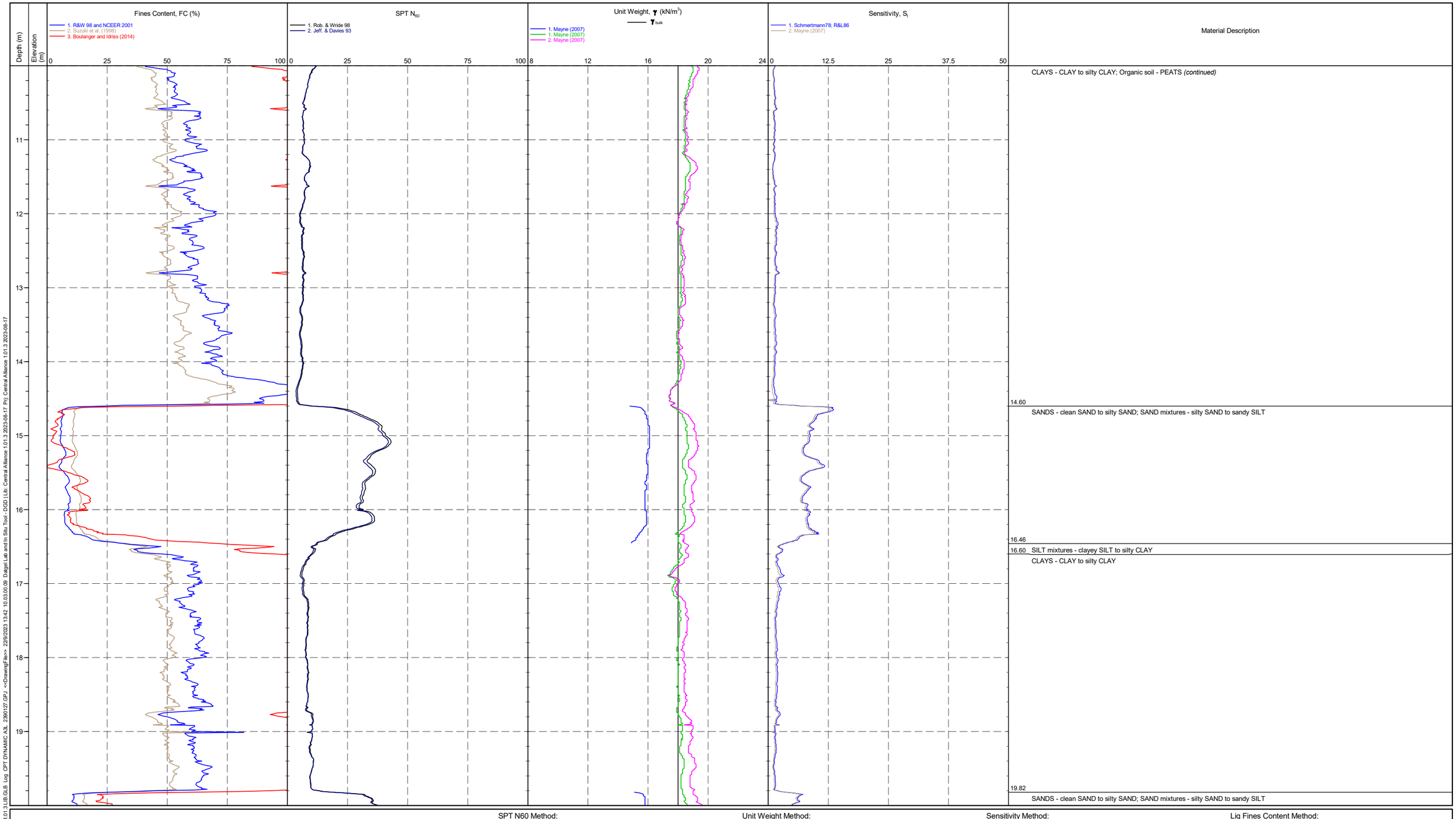
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

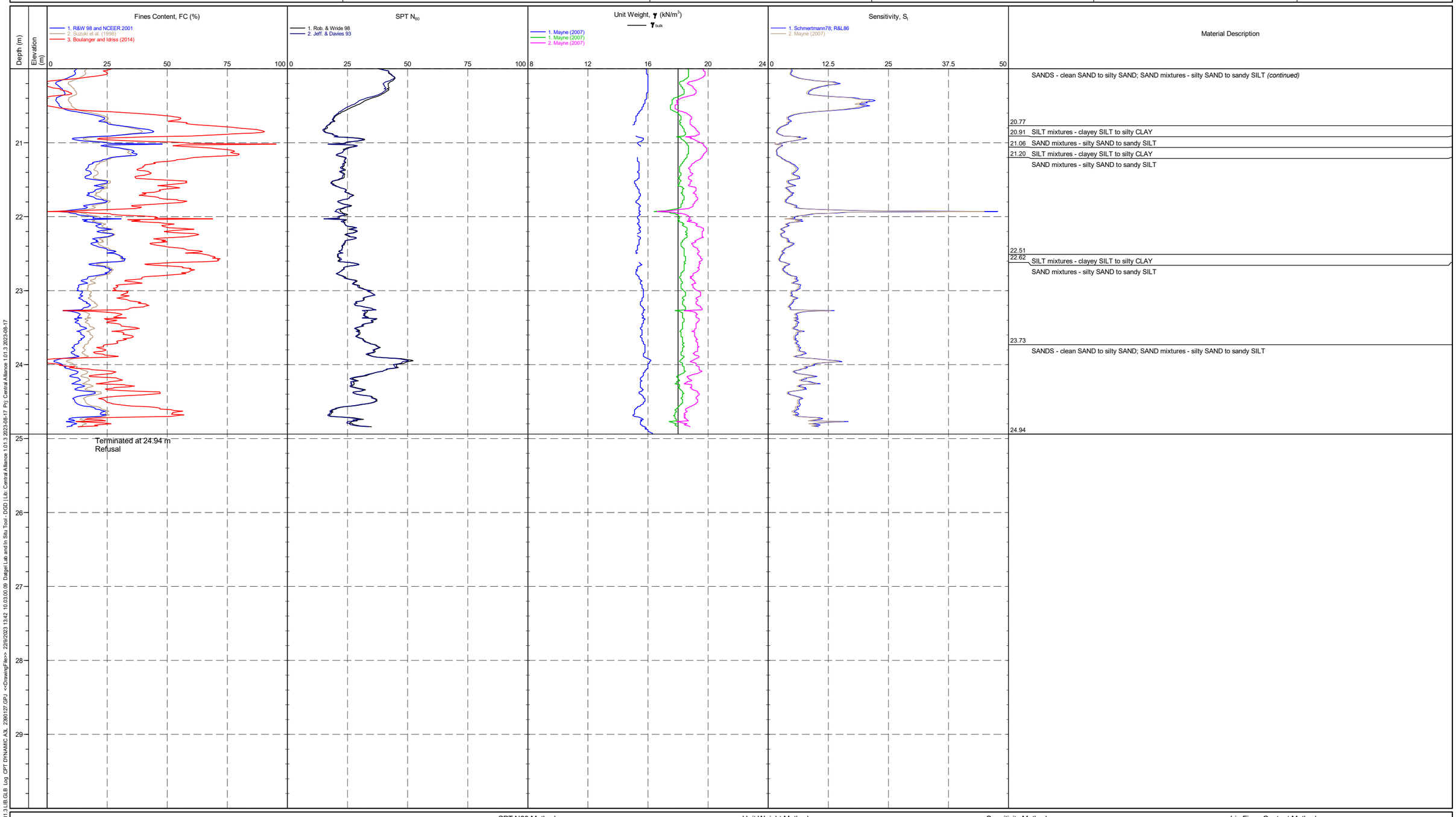
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

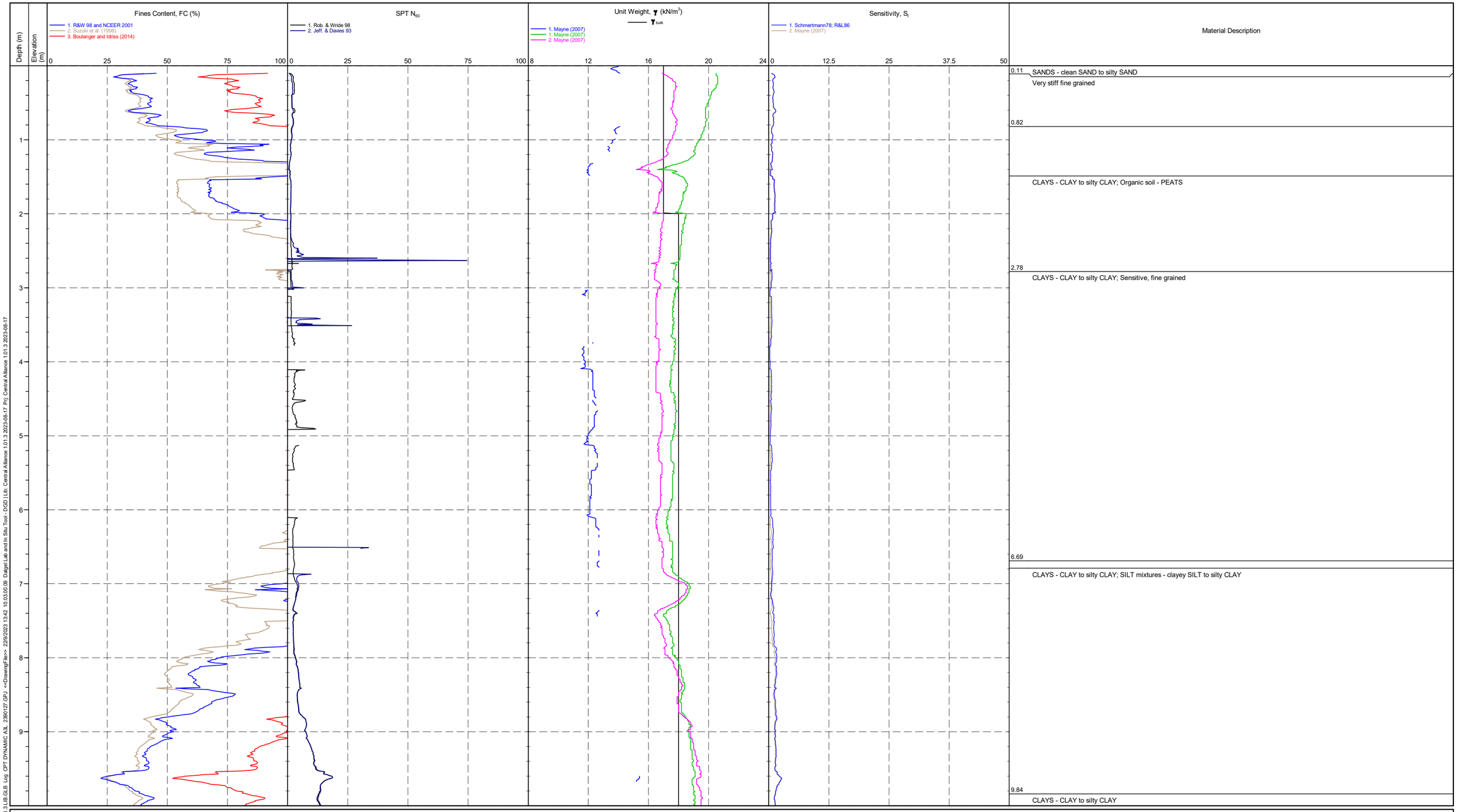
GENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

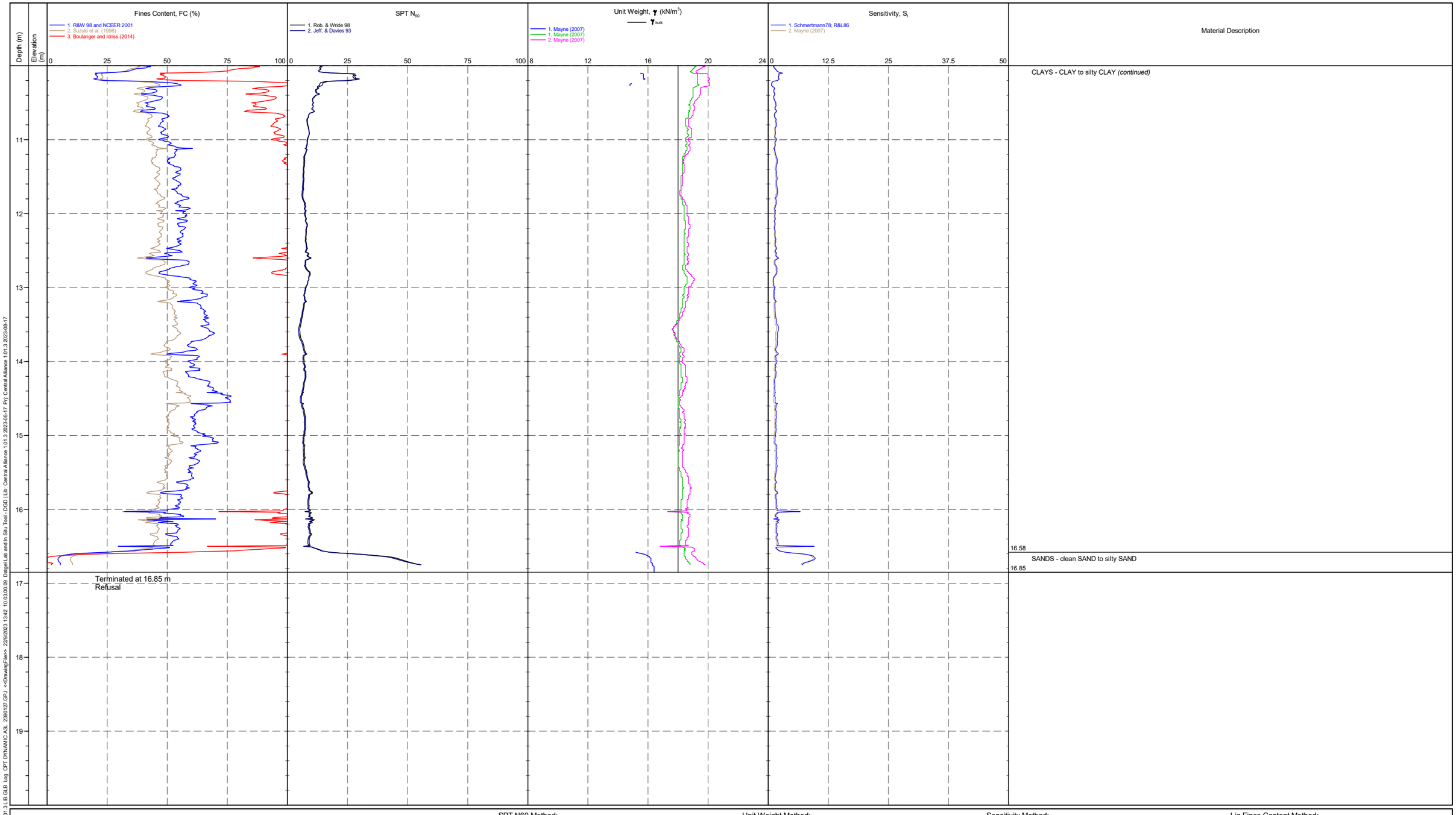
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{bat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

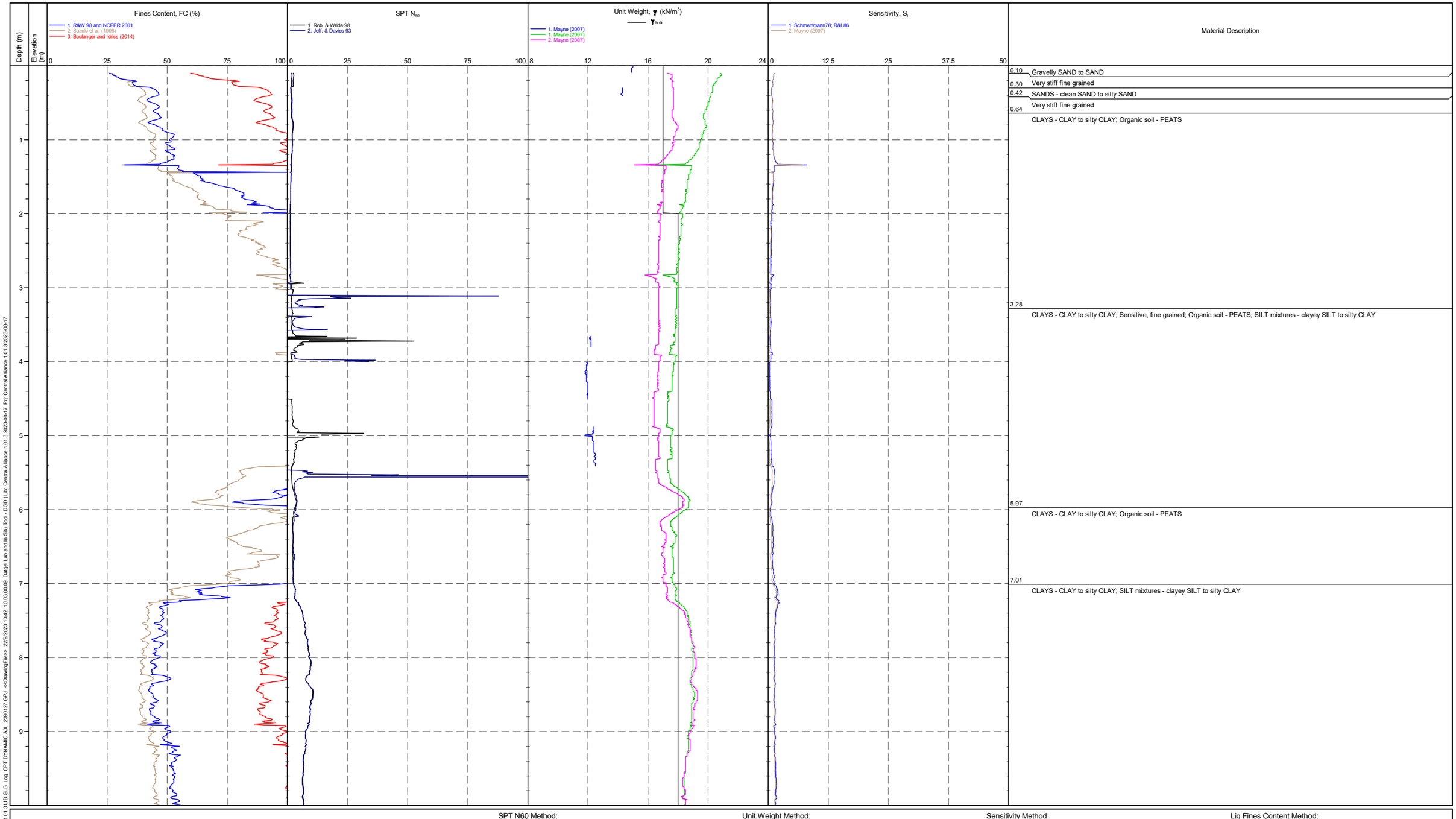
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

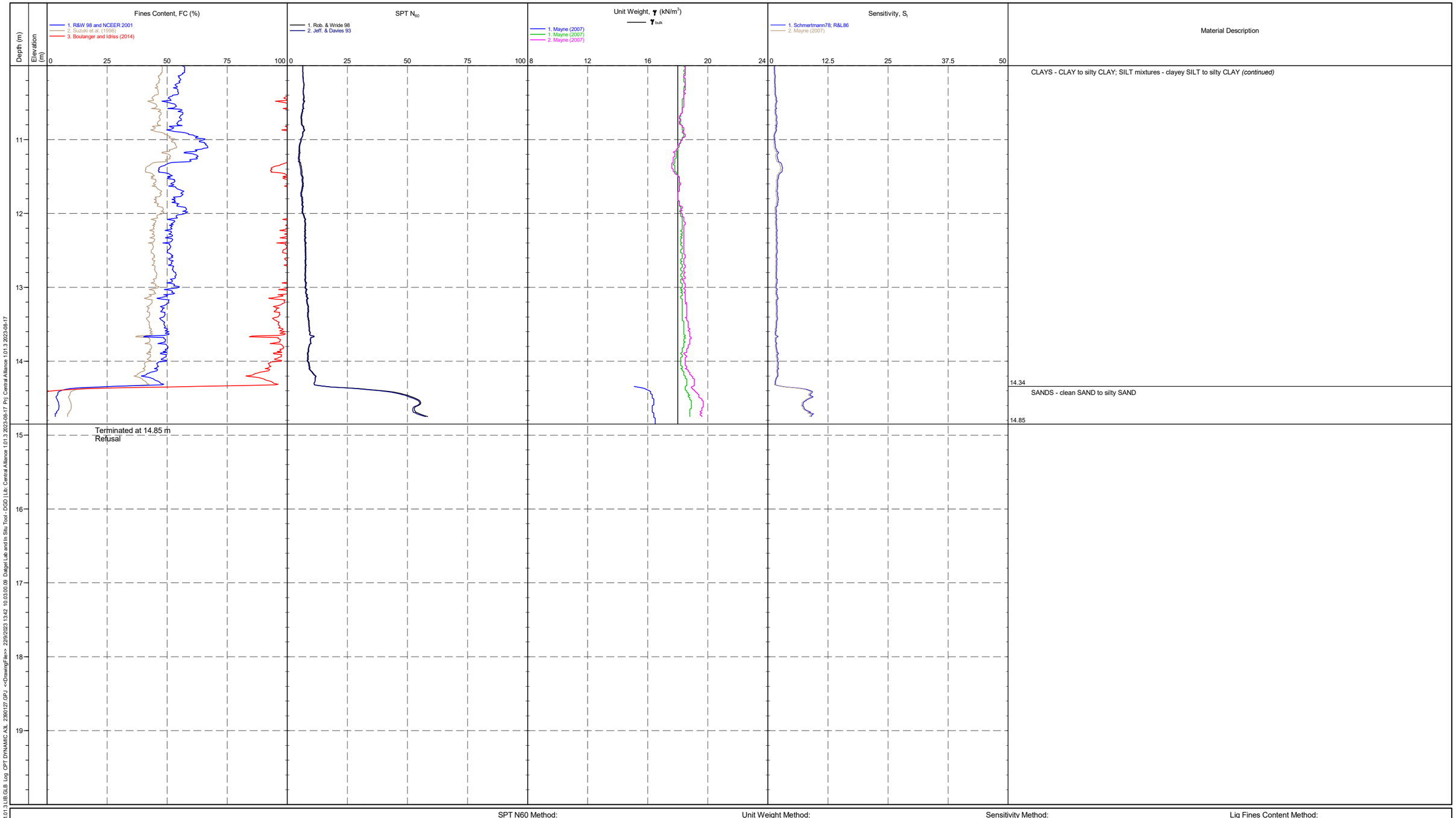
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log_CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

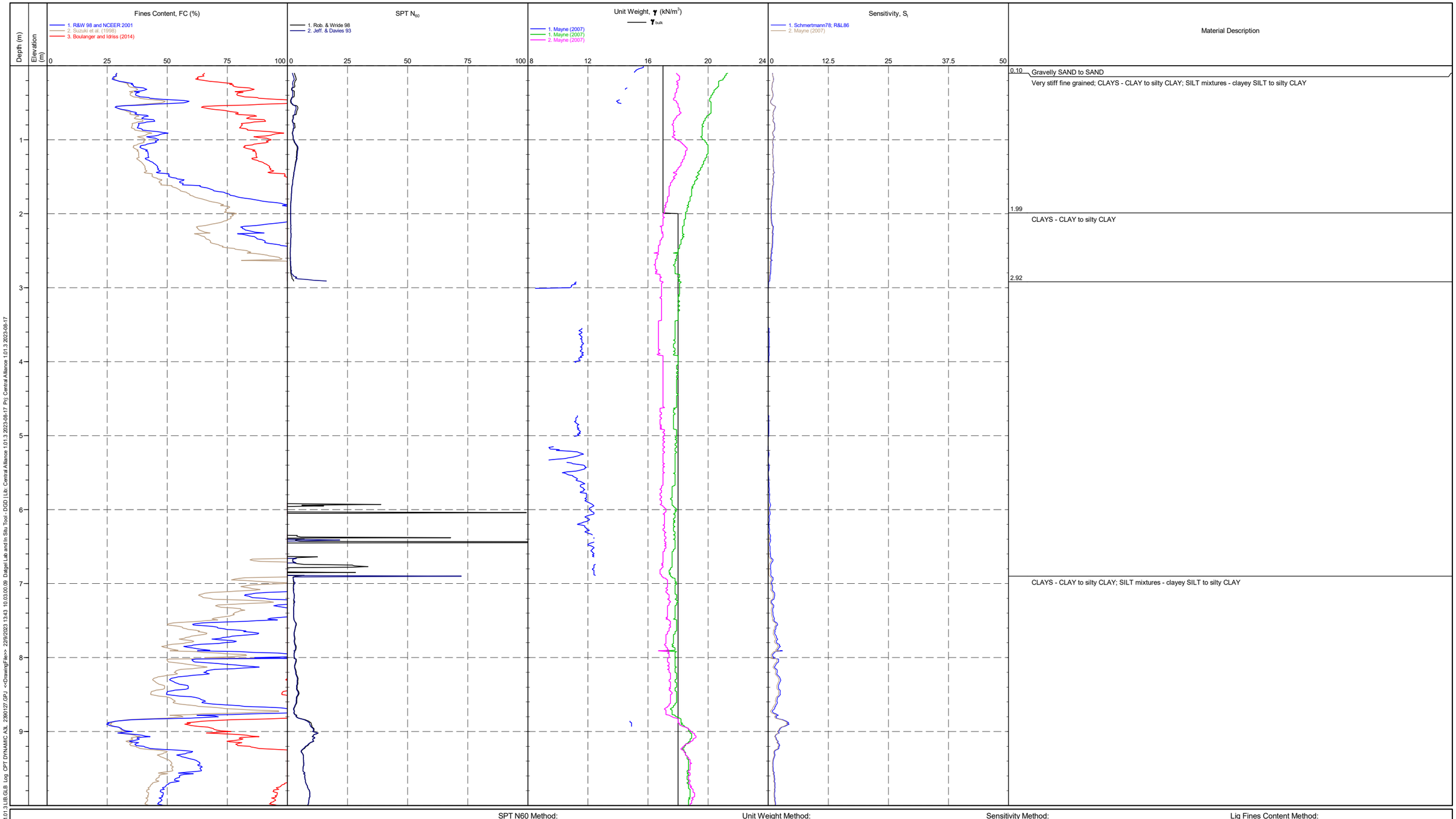
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:42 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

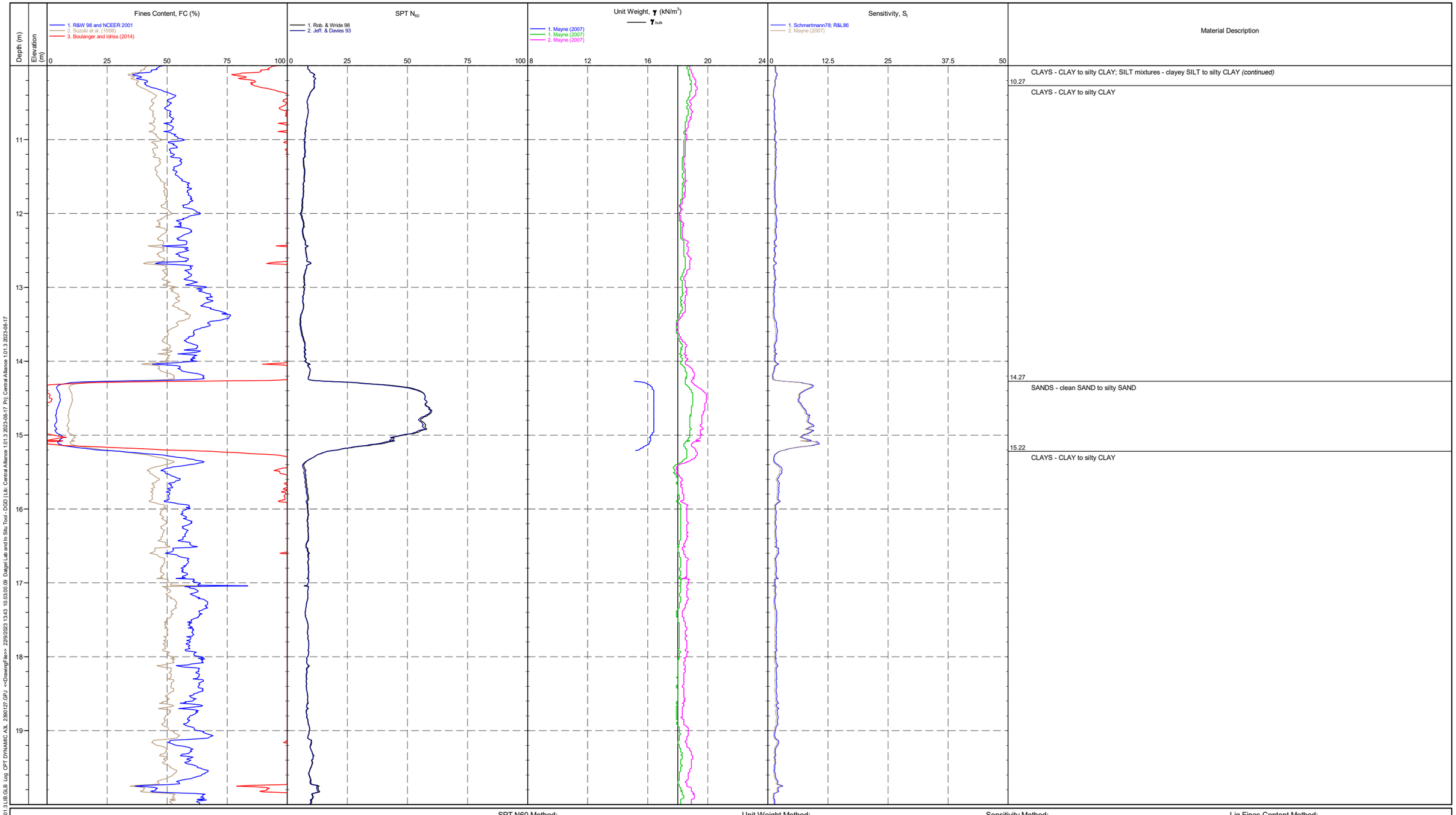
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

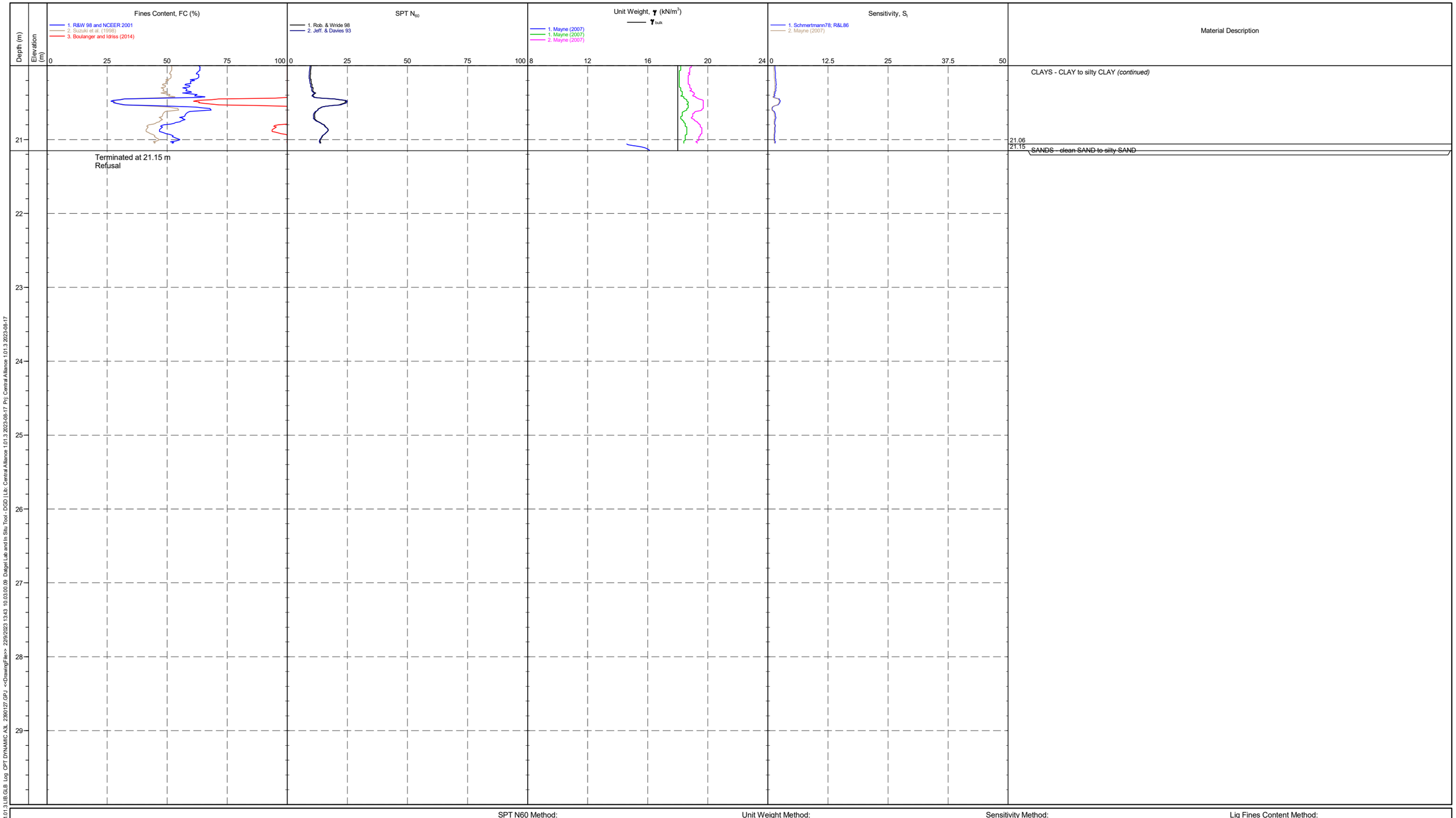
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

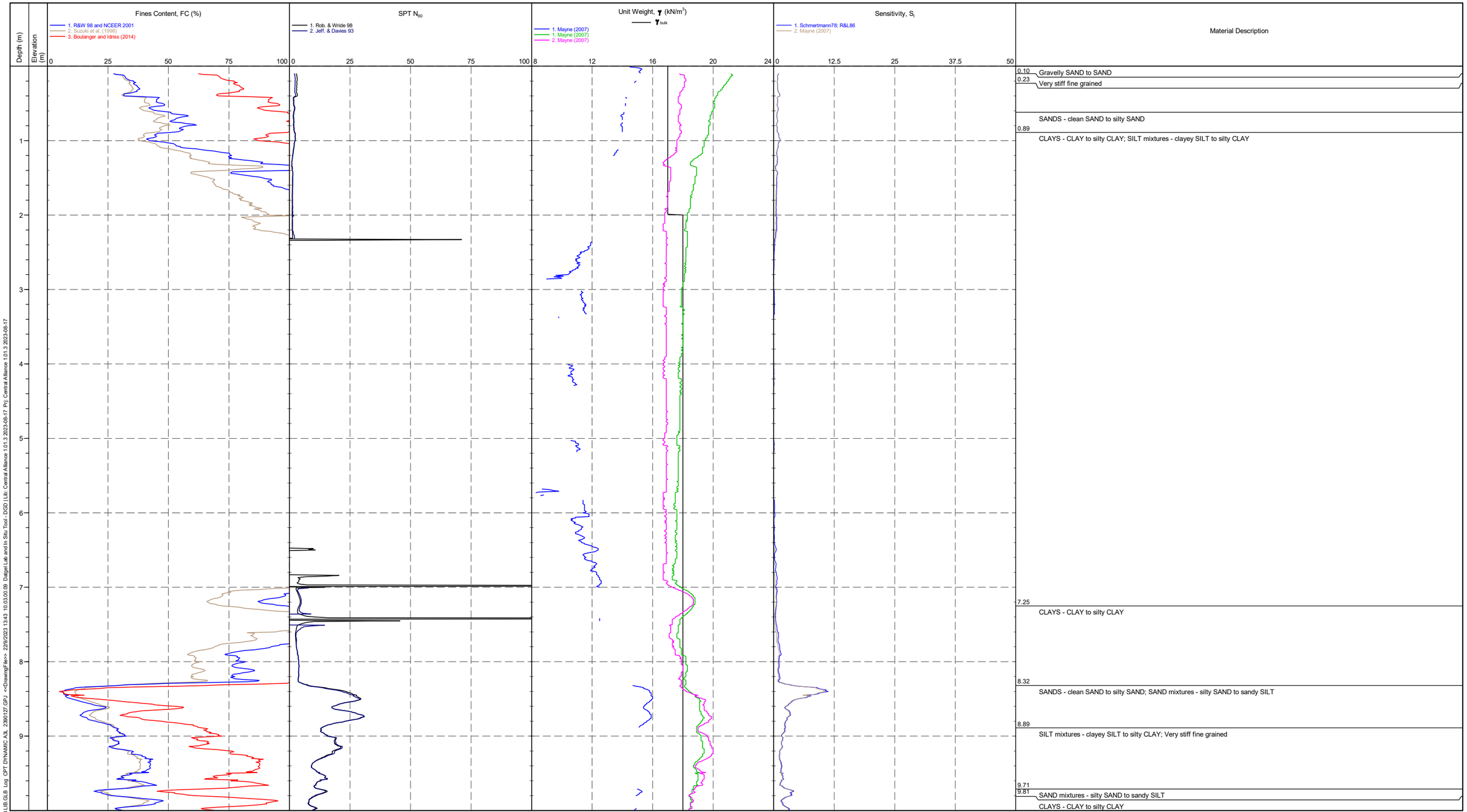
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

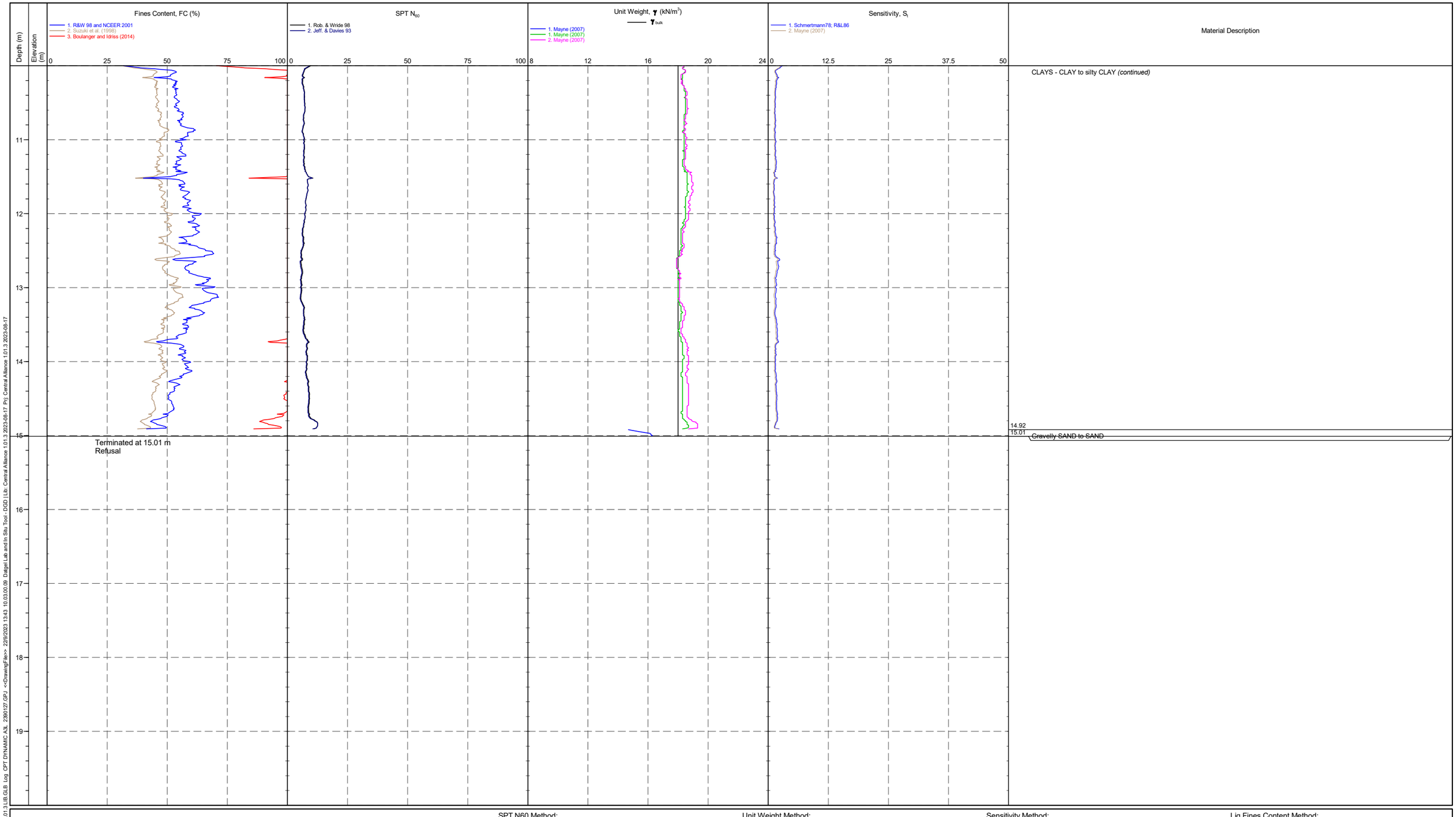
CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 29/9/2023 13:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

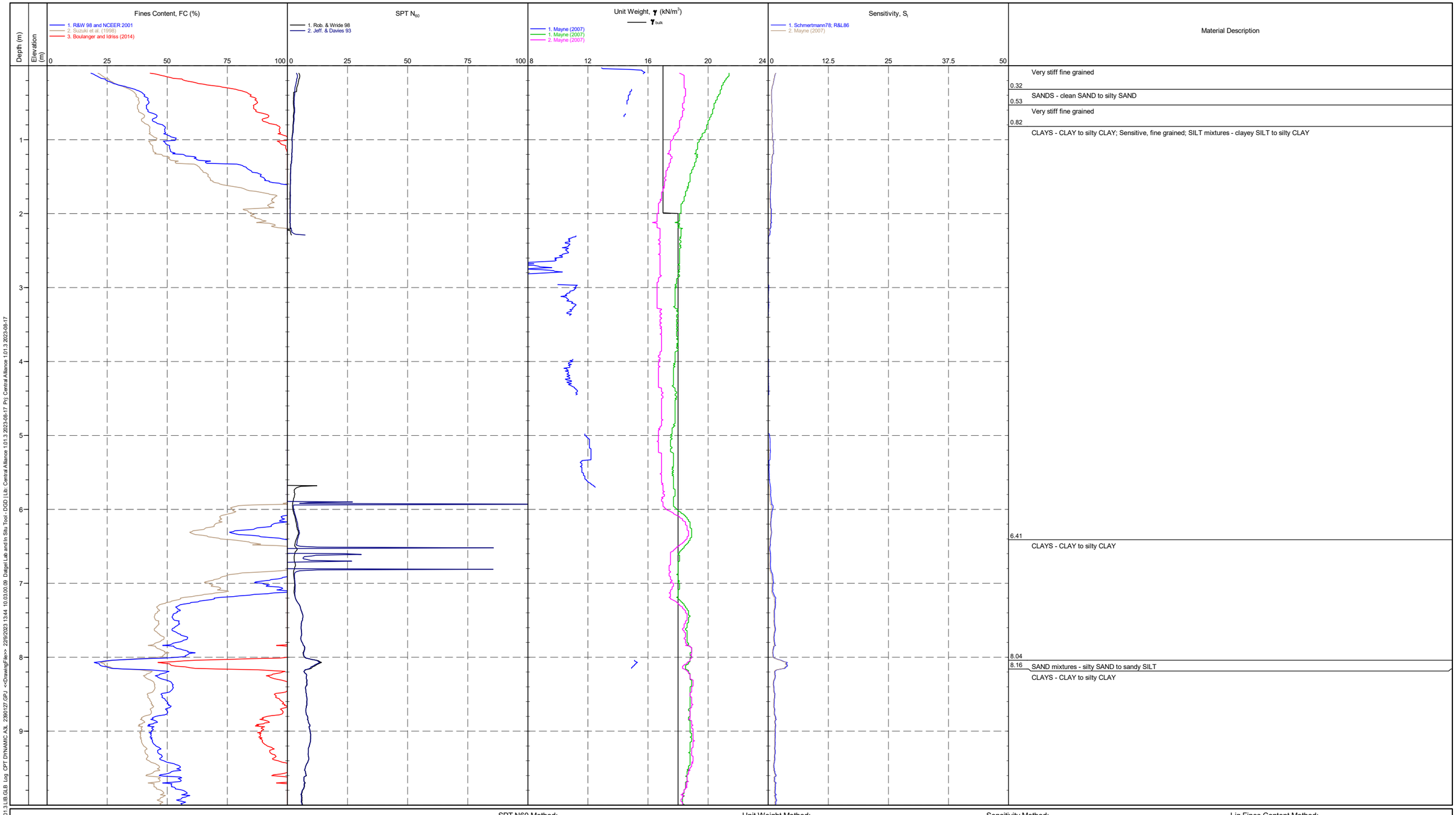
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:43 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

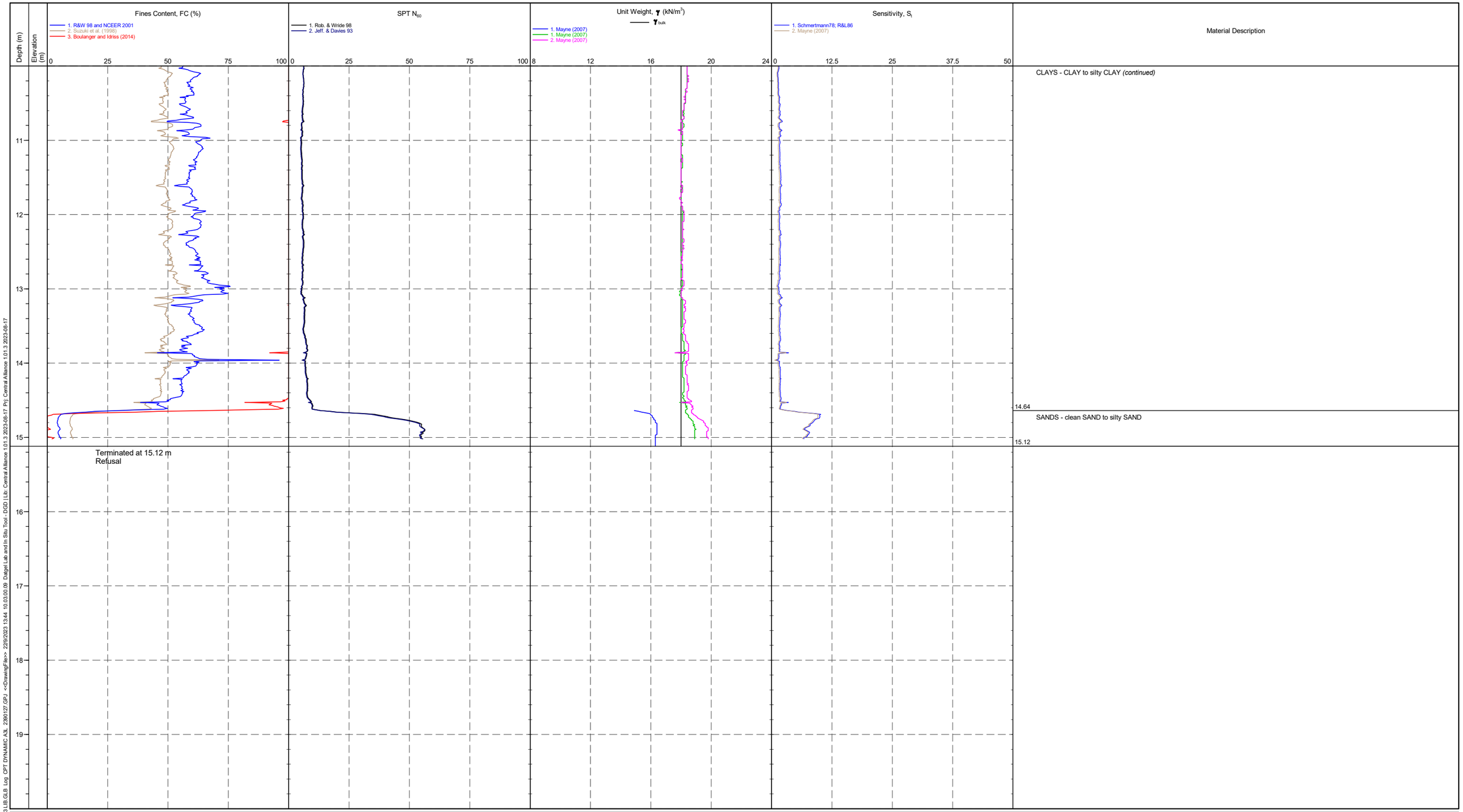
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:44 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



SPT N60 Method:
1. Rob. & Wride 98
2. Jeff. & Davies 93

Unit Weight Method:
1. γ_b Applied in Calculation
1. γ_{sat} Mayne (2007)
2. γ_{sat} Mayne (2007)
1. γ_{dry} Mayne (2007)

Sensitivity Method:
1. Schmertmann78; R&L86
2. Mayne (2007)

Liq Fines Content Method:
1. R&W 98 and NCEER 2001
2. Suzuki et al. (1998)
3. Boulanger and Idriss (2014)

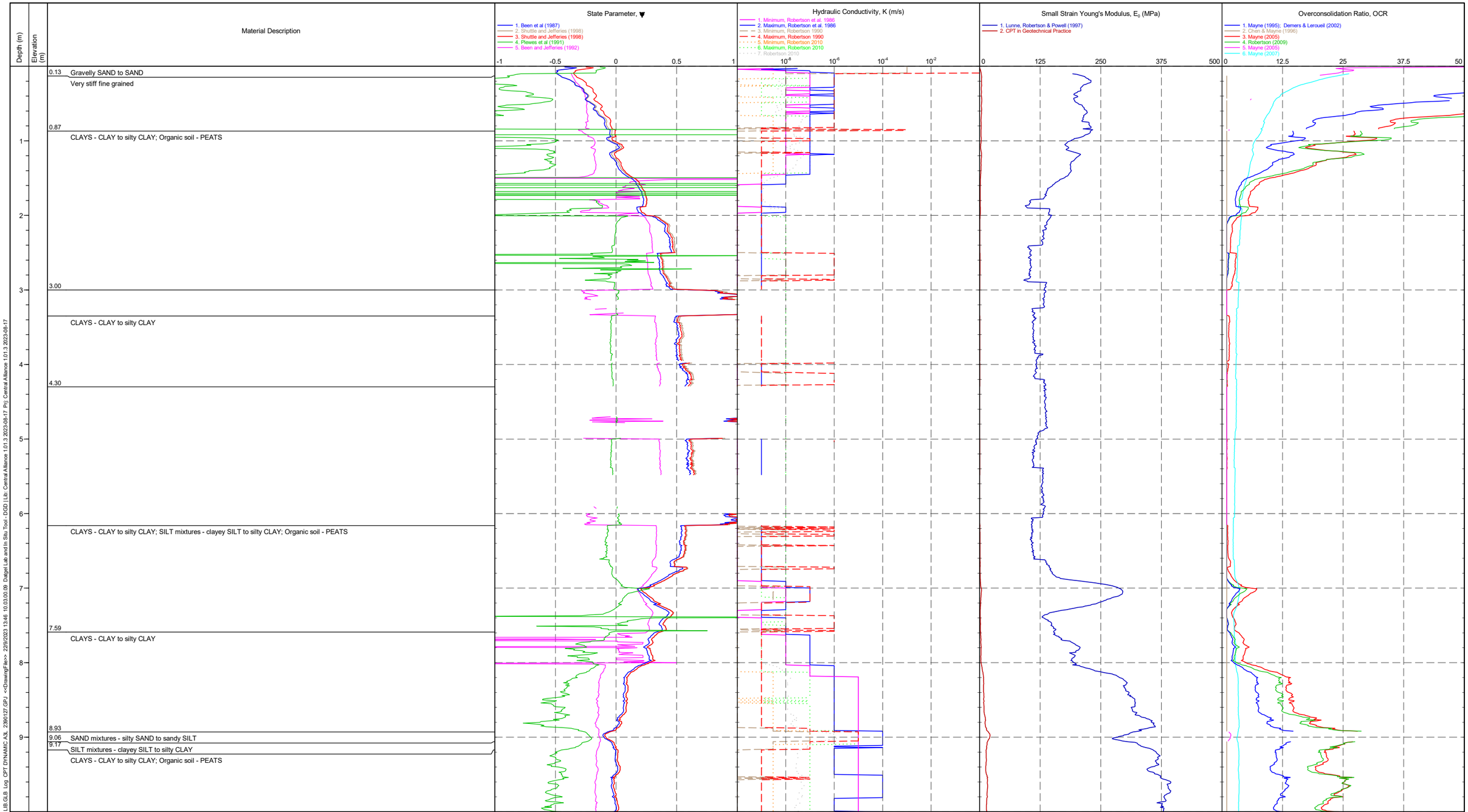
CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:44 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : BB	REMARK	SHEET : 1 OF 3
ENGINEER : Ben Bilsbrough	EASTING : 689832.4 m	CONE TYPE : C+F+W2	CHECKED DATE : 20/9/2023		STATUS :
PROJECT : Grimsby CPT	NORTHING : 5942525.0 m	CONE ID : DP15-CFPTxy.71175	APPROVED BY : BB		DATE : 13/9/2023
LOCATION : Grimsby	COORD. SYS. :	OPERATOR : Central Alliance	APPROVED DATE : 20/9/2023		
PROJECT No. : 2390127	ELEVATION :				



Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:46 10.03.00.09 Dataet Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : BB	REMARK	SHEET : 2 OF 3
ENGINEER : Ben Bilsbrough	EASTING : 689832.4 m	CONE TYPE : C+F+W2	CHECKED DATE : 20/9/2023		STATUS :
PROJECT : Grimsby CPT	NORTHING : 5942525.0 m	CONE ID : DP15-CFPTxy.71175	APPROVED BY : BB		DATE : 13/9/2023
LOCATION : Grimsby	COORD. SYS. :	OPERATOR : Central Alliance	APPROVED DATE : 20/9/2023		
PROJECT No. : 2390127	ELEVATION :				

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY; Organic soil - PEATS *(continued)*

14.60
SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

16.46
16.60 SILT mixtures - clayey SILT to silty CLAY
CLAYS - CLAY to silty CLAY

19.82
SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC AGL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:46 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT *(continued)*

20.77
20.91 SILT mixtures - clayey SILT to silty CLAY
21.06 SAND mixtures - silty SAND to sandy SILT
21.20 SILT mixtures - clayey SILT to silty CLAY

SAND mixtures - silty SAND to sandy SILT

22.51
22.62 SILT mixtures - clayey SILT to silty CLAY

SAND mixtures - silty SAND to sandy SILT

23.73

SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

24.94

Terminated at 24.94 m
Refusal

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL_ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:47 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3.2023-08-17 Prj: Central Alliance 1.01.3.2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.11 SANDS - clean SAND to silty SAND
Very stiff fine grained

0.82 CLAYS - CLAY to silty CLAY; Organic soil - PEATS

2.78 CLAYS - CLAY to silty CLAY; Sensitive, fine grained

6.69 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

9.84 CLAYS - CLAY to silty CLAY

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:47 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY *(continued)*

16.58

SANDS - clean SAND to silty SAND

16.85

Terminated at 16.85 m
Refusal

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:47 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m)	Material Description
0.10	Gravelly SAND to SAND
0.30	Very stiff fine grained
0.42	SANDS - clean SAND to silty SAND
0.64	Very stiff fine grained
	CLAYS - CLAY to silty CLAY; Organic soil - PEATS
3.28	CLAYS - CLAY to silty CLAY; Sensitive, fine grained; Organic soil - PEATS; SILT mixtures - clayey SILT to silty CLAY
5.97	CLAYS - CLAY to silty CLAY; Organic soil - PEATS
7.01	CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

State Parameter, Ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 101.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:47 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 101.3 2023-08-17 Prj: Central Alliance 101.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

14.34

SANDS - clean SAND to silty SAND

14.85

Terminated at 14.85 m
Refusal

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log_CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.10 Gravelly SAND to SAND
Very stiff fine grained; CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

1.99 CLAYS - CLAY to silty CLAY

2.92 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

10.27

CLAYS - CLAY to silty CLAY

14.27

SANDS - clean SAND to silty SAND

15.22

CLAYS - CLAY to silty CLAY

State Parameter, Ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Liq CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

21 — CLAYS - CLAY to silty CLAY *(continued)*

21.06 / 21.15 — ~~SANDS - clean SAND to silty SAND~~

Terminated at 21.15 m
Refusal

22 23 24 25 26 27 28 29

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 2/9/2023 13:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.10 Gravelly SAND to SAND
0.23 Very stiff fine grained
SANDS - clean SAND to silty SAND
0.89
CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY
7.25
CLAYS - CLAY to silty CLAY
8.32
SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT
8.89
SILT mixtures - clayey SILT to silty CLAY; Very stiff fine grained
9.71
9.81 SAND mixtures - silty SAND to sandy SILT
CLAYS - CLAY to silty CLAY

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 101.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:49 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 101.3 2023-08-17 Plt: Central Alliance 101.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY *(continued)*

14.92
15.01 Gravelly SAND to SAND
Terminated at 15.01 m
Refusal

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:49 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m)	Elevation (m)	Material Description
		Very stiff fine grained
0.32		SANDS - clean SAND to silty SAND
0.53		Very stiff fine grained
0.82		CLAYS - CLAY to silty CLAY; Sensitive, fine grained; SILT mixtures - clayey SILT to silty CLAY
6.41		CLAYS - CLAY to silty CLAY
8.04		
8.16		SAND mixtures - silty SAND to sandy SILT
		CLAYS - CLAY to silty CLAY

State Parameter, ▼
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

Liq State Parameter Method:
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)

Hydraulic Conductivity Method:
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010

Youngs Modulus Method:
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice

Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)

CENTRAL ALLIANCE 1.01.3 LIB.GLB Liq_CPT_DYNAMIC_ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:49 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY *(continued)*

14.64

SANDS - clean SAND to silty SAND

15.12

Terminated at 15.12 m
Refusal

State Parameter, ψ
1. Been et al (1987)
2. Shuttle and Jefferies (1998)
3. Shuttle and Jefferies (1998)
4. Plewes et al (1991)
5. Been and Jefferies (1992)
-1 -0.5 0 0.5 1

Hydraulic Conductivity, K (m/s)
1. Minimum, Robertson et al. 1986
2. Maximum, Robertson et al. 1986
3. Minimum, Robertson 1990
4. Maximum, Robertson 1990
5. Minimum, Robertson 2010
6. Maximum, Robertson 2010
7. Robertson 2010
10^{-8} 10^{-6} 10^{-4} 10^{-2}

Small Strain Young's Modulus, E_0 (MPa)
1. Lunne, Robertson & Powell (1997)
2. CPT in Geotechnical Practice
0 125 250 375 500

Overconsolidation Ratio, OCR
1. Mayne (1995); Demers & Lerouell (2002)
2. Chen & Mayne (1996)
3. Mayne (2005)
4. Robertson (2009)
5. Mayne (2005)
6. Mayne (2007)
0 12.5 25 37.5 50

Liq State Parameter Method:	Hydraulic Conductivity Method:	Youngs Modulus Method:	Overconsolidation Ratio Method:
1. Been et al (1987)	1. Minimum, Robertson et al. 1986	1. Lunne, Robertson & Powell (1997)	1. Mayne (1995); Demers & Lerouell (2002)
2. Shuttle and Jefferies (1998)	2. Maximum, Robertson et al. 1986	2. CPT in Geotechnical Practice	2. Chen & Mayne (1996)
3. Shuttle and Jefferies (1998)	3. Minimum, Robertson 1990		3. Mayne (2005)
4. Plewes et al (1991)	4. Maximum, Robertson 1990		4. Robertson (2009)
5. Been and Jefferies (1992)	5. Minimum, Robertson 2010		5. Mayne (2005)
	6. Maximum, Robertson 2010		6. Mayne (2007)

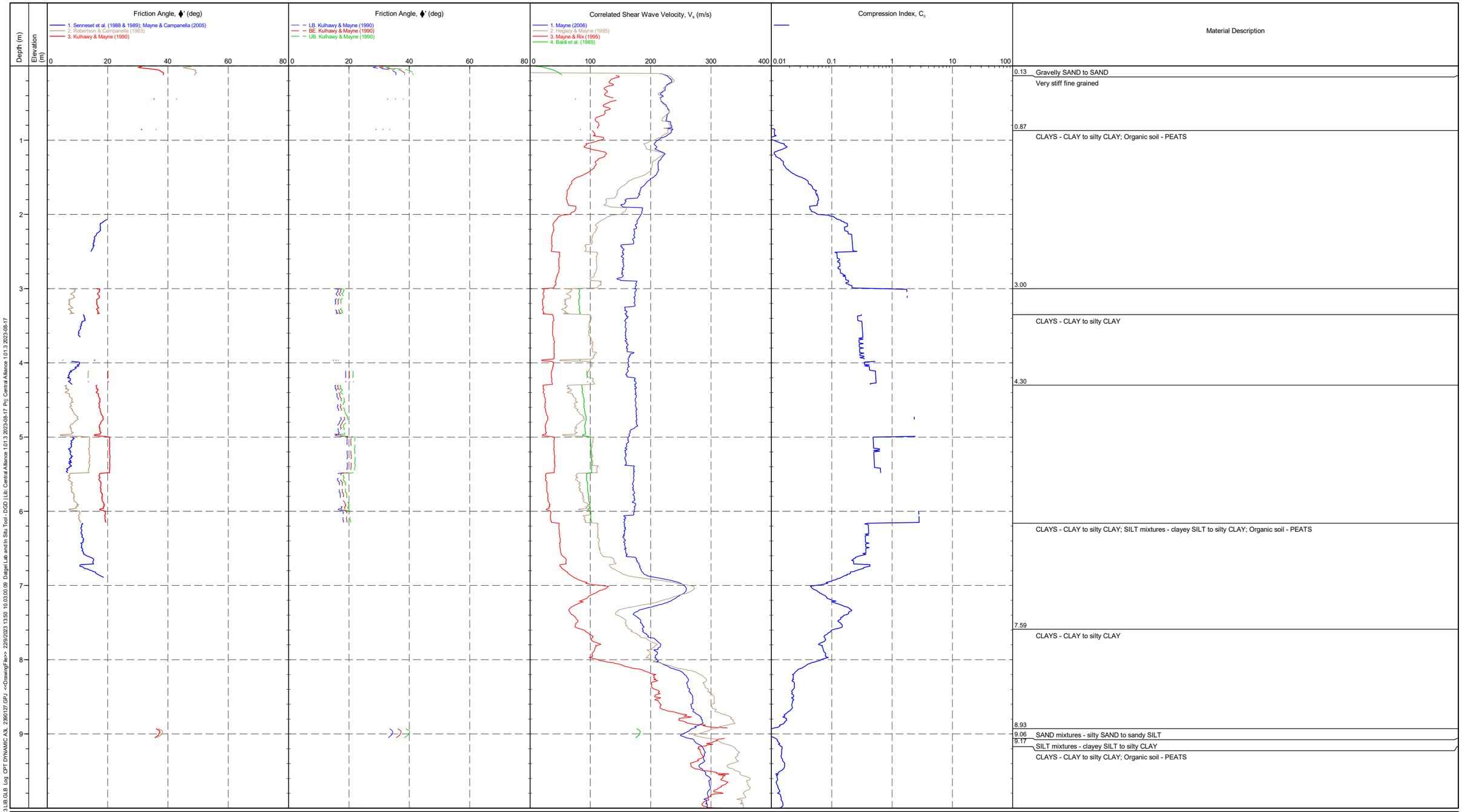
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

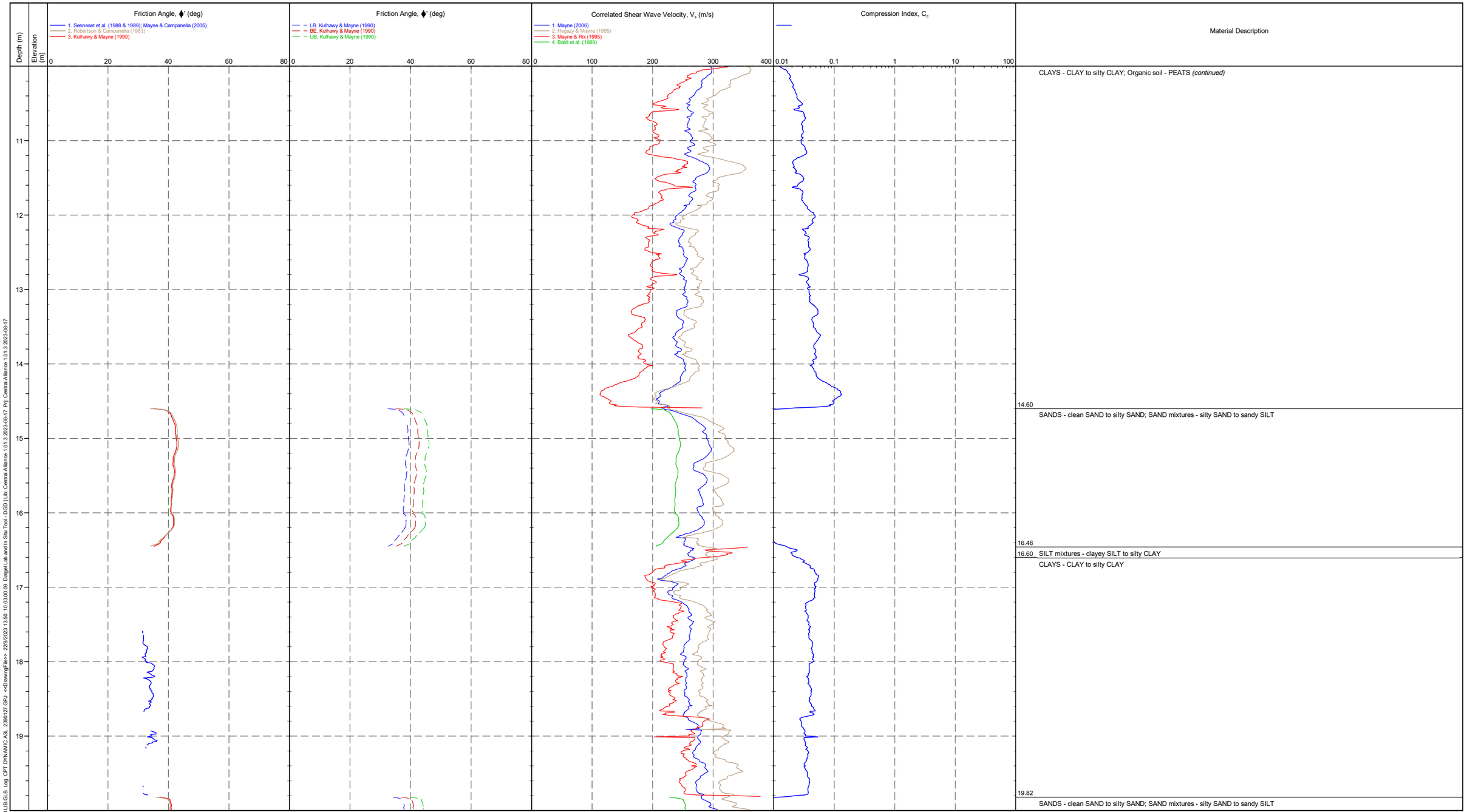
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

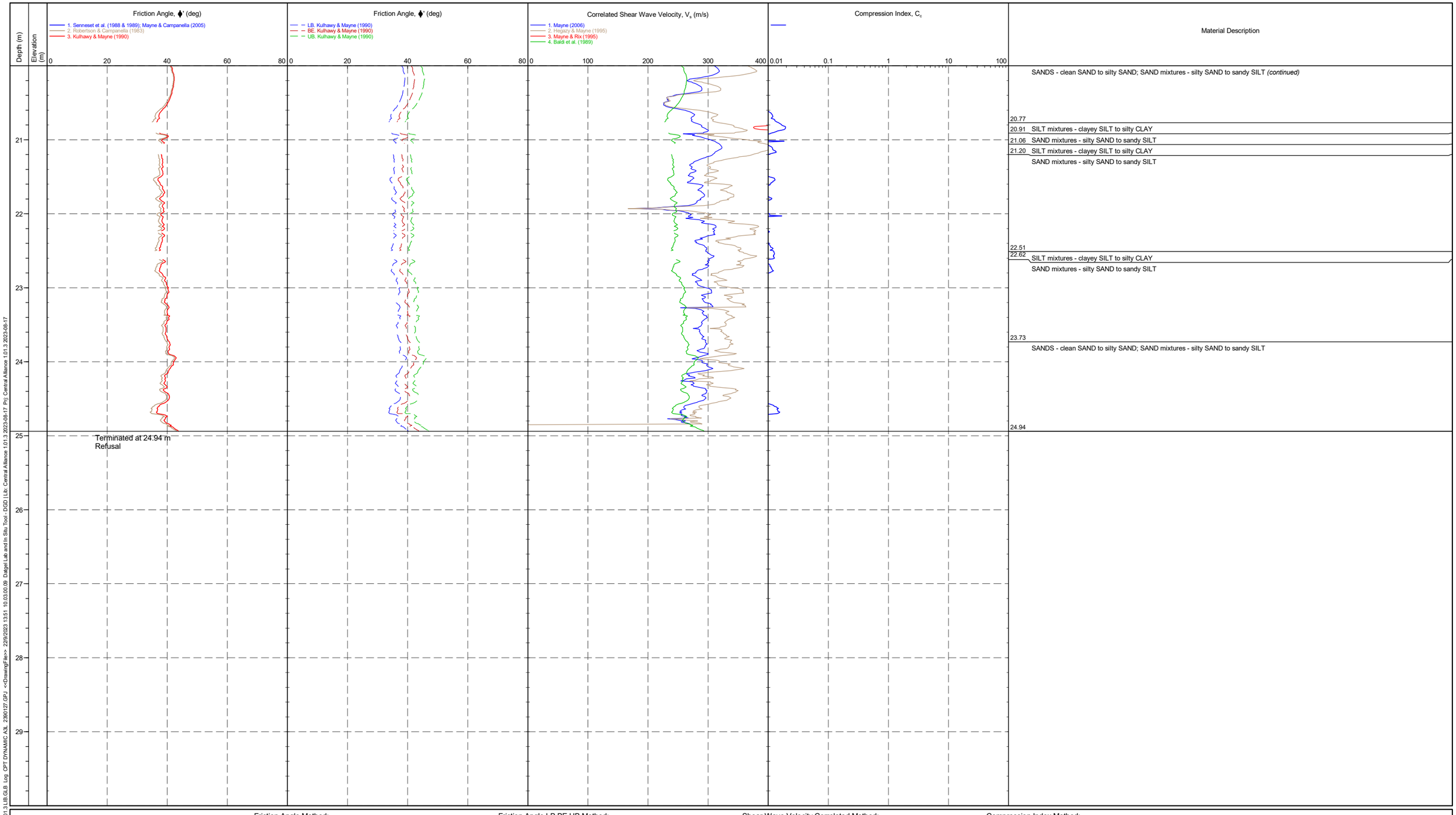
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log_CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:50 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

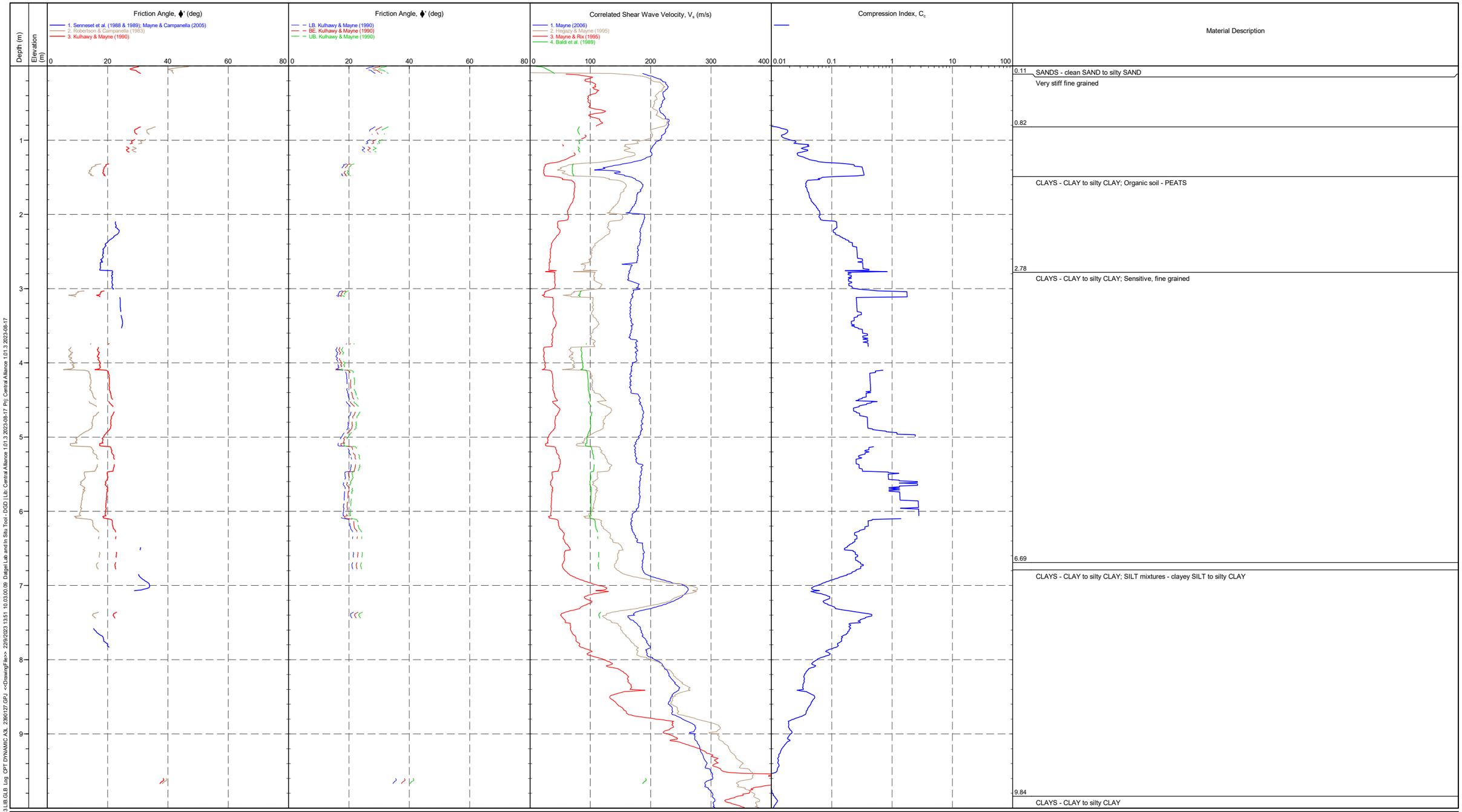
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

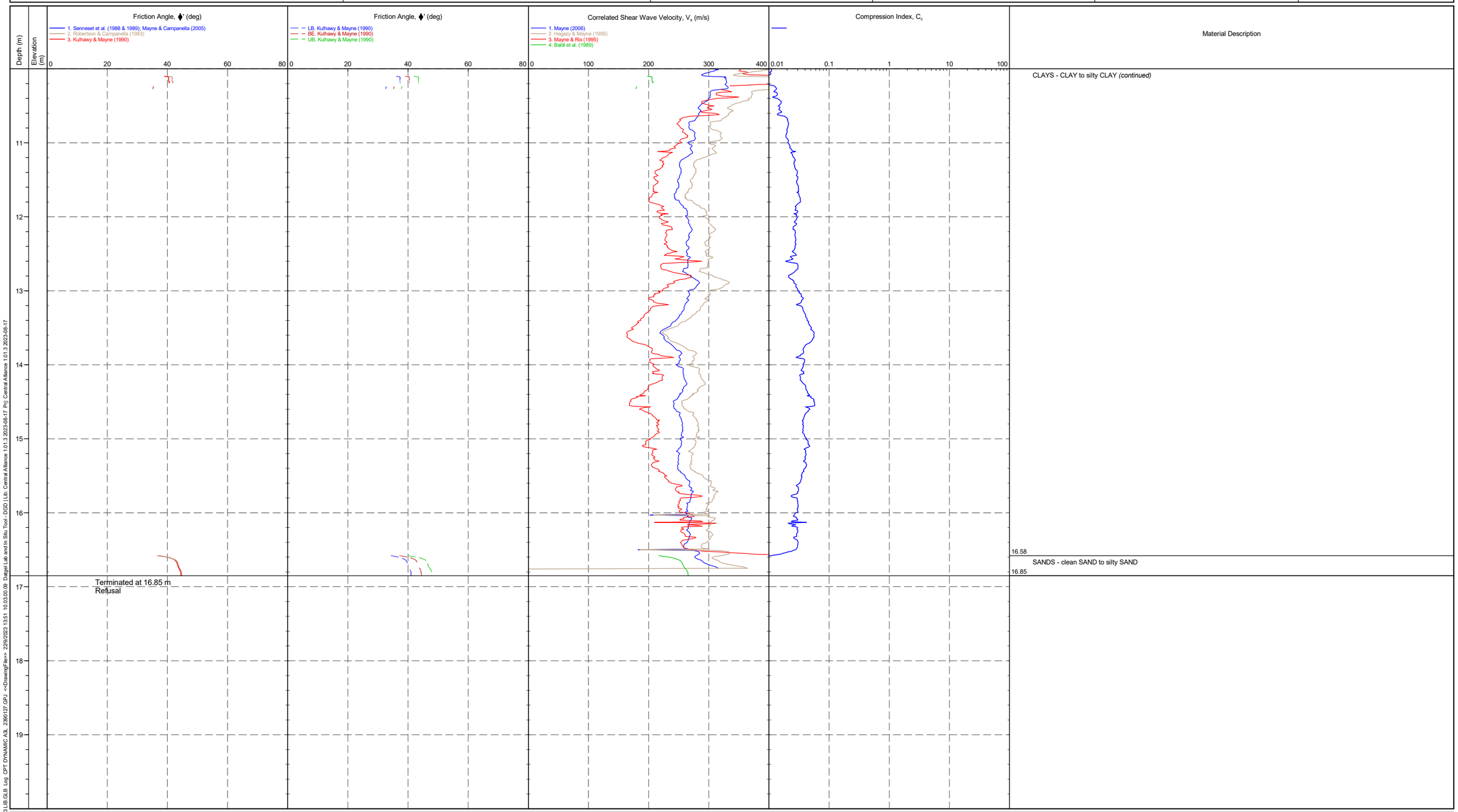
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log_CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 29/9/2023 13:51 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Plt: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

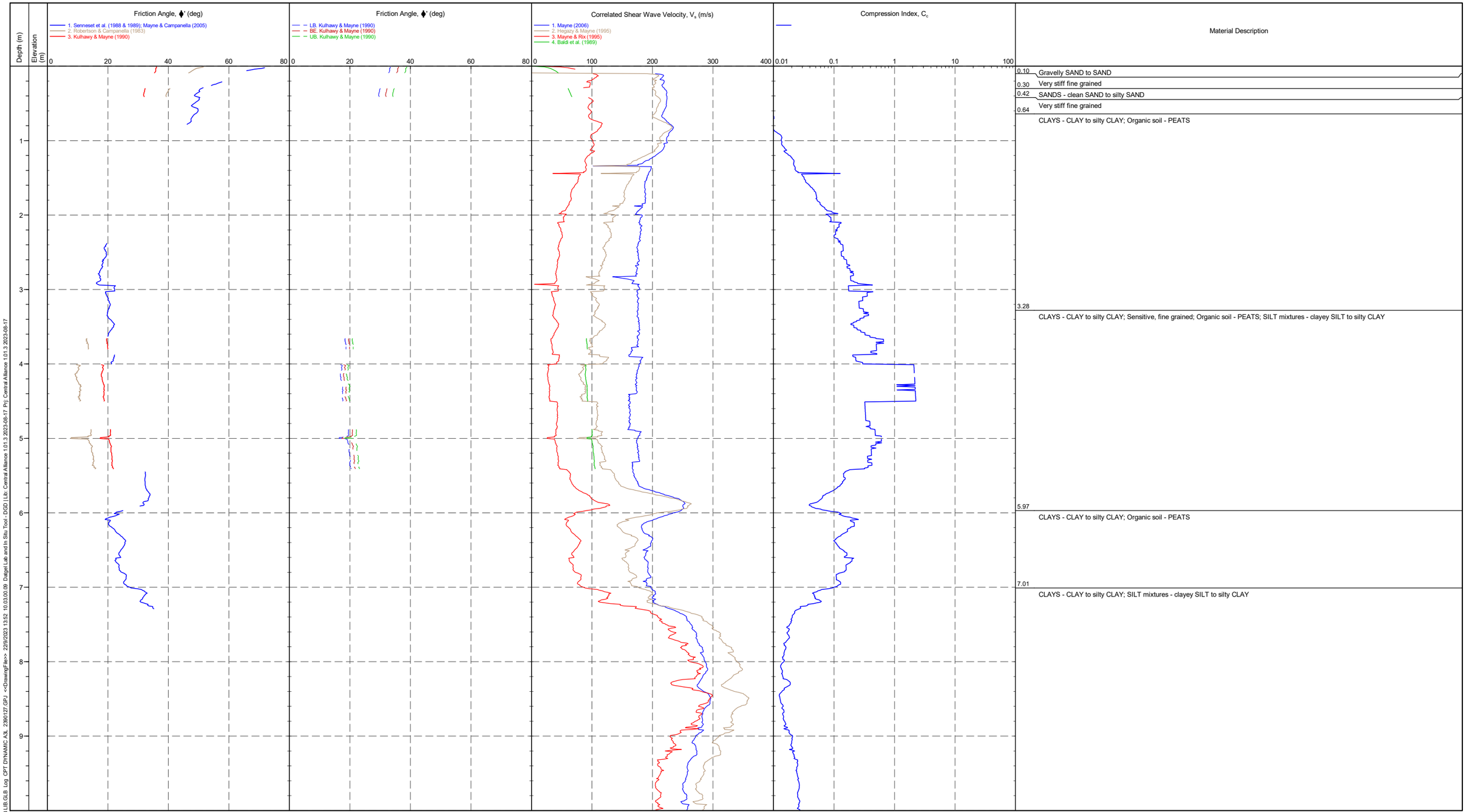
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

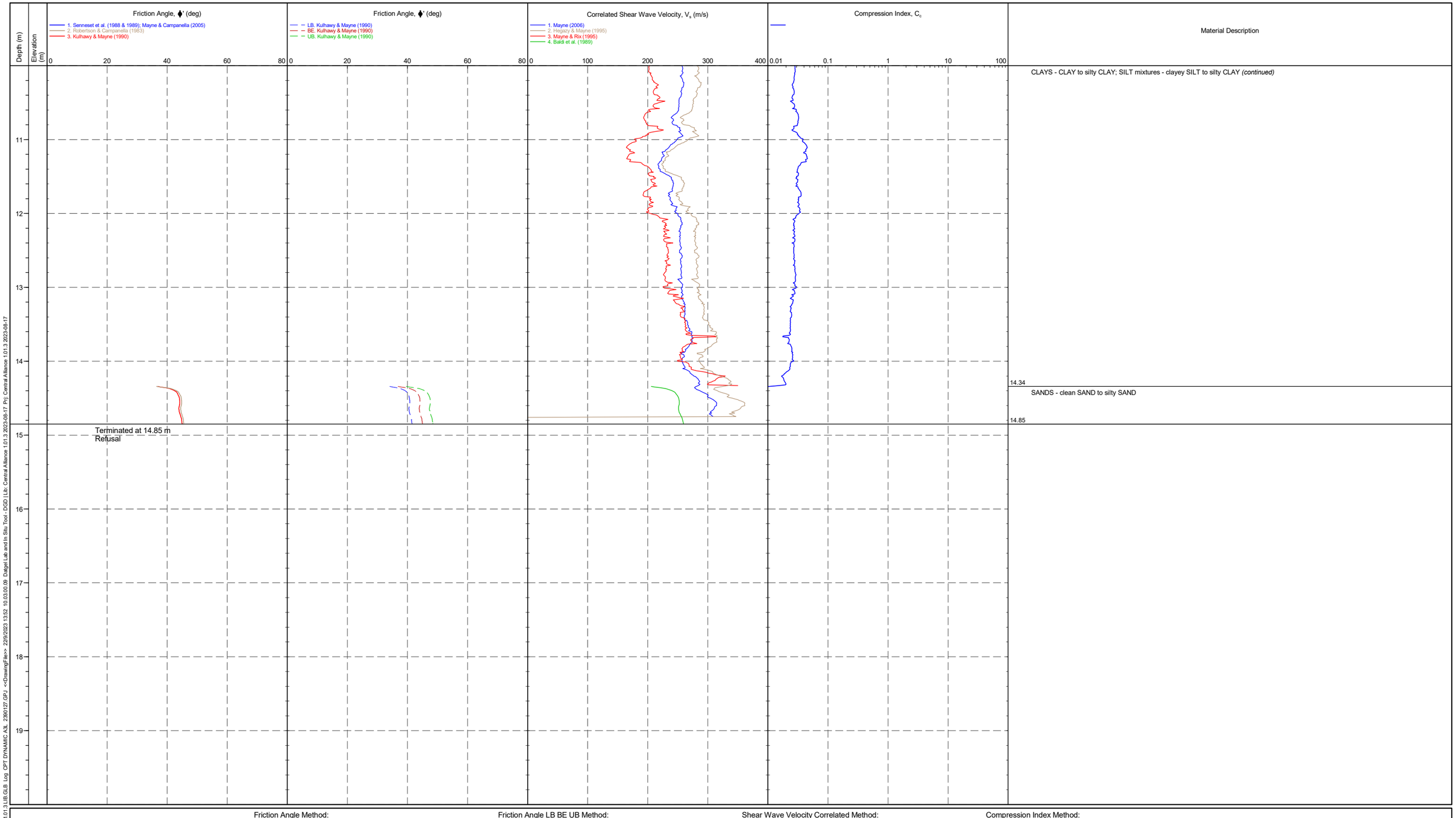
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

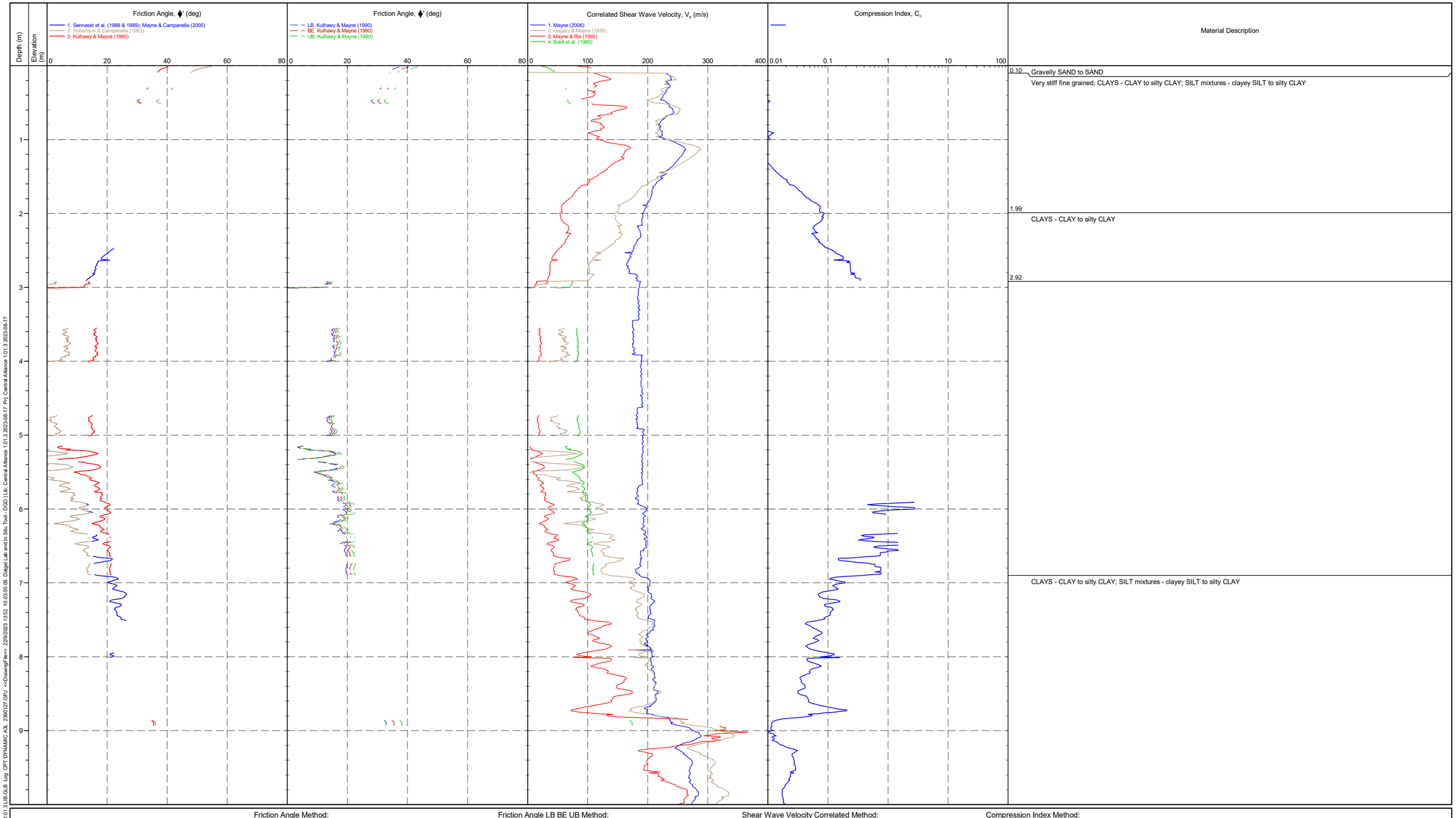
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

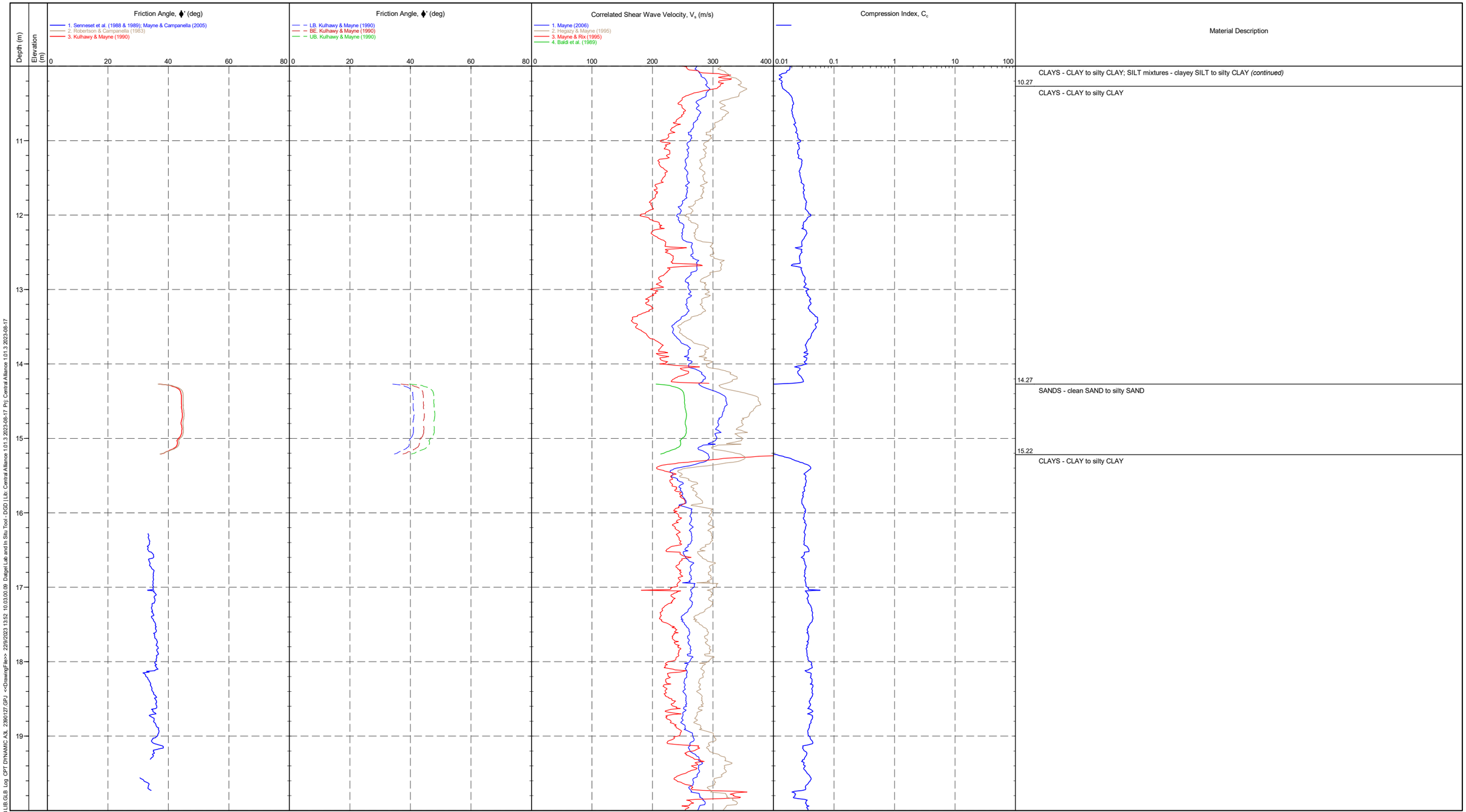
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

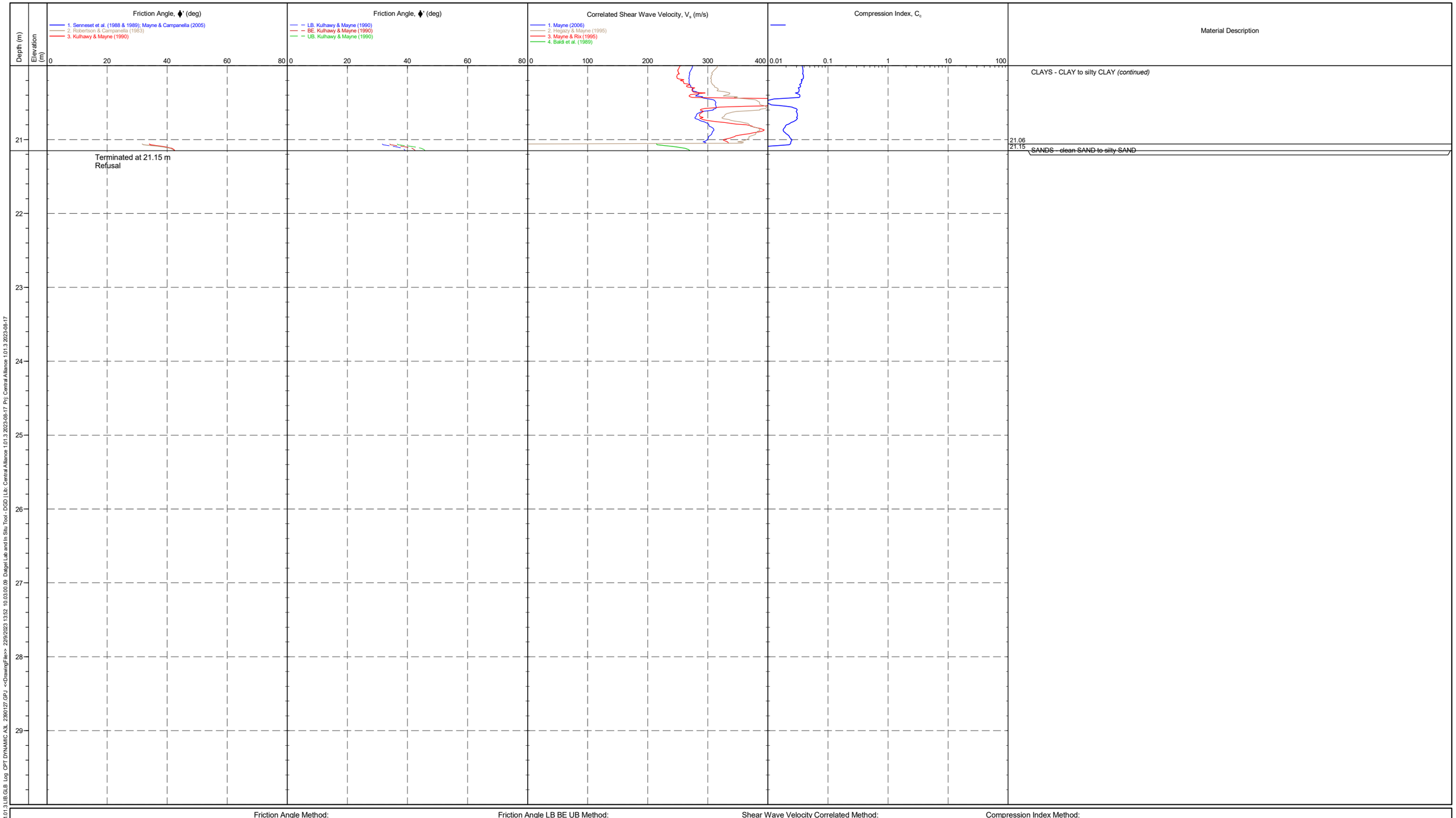
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:52 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

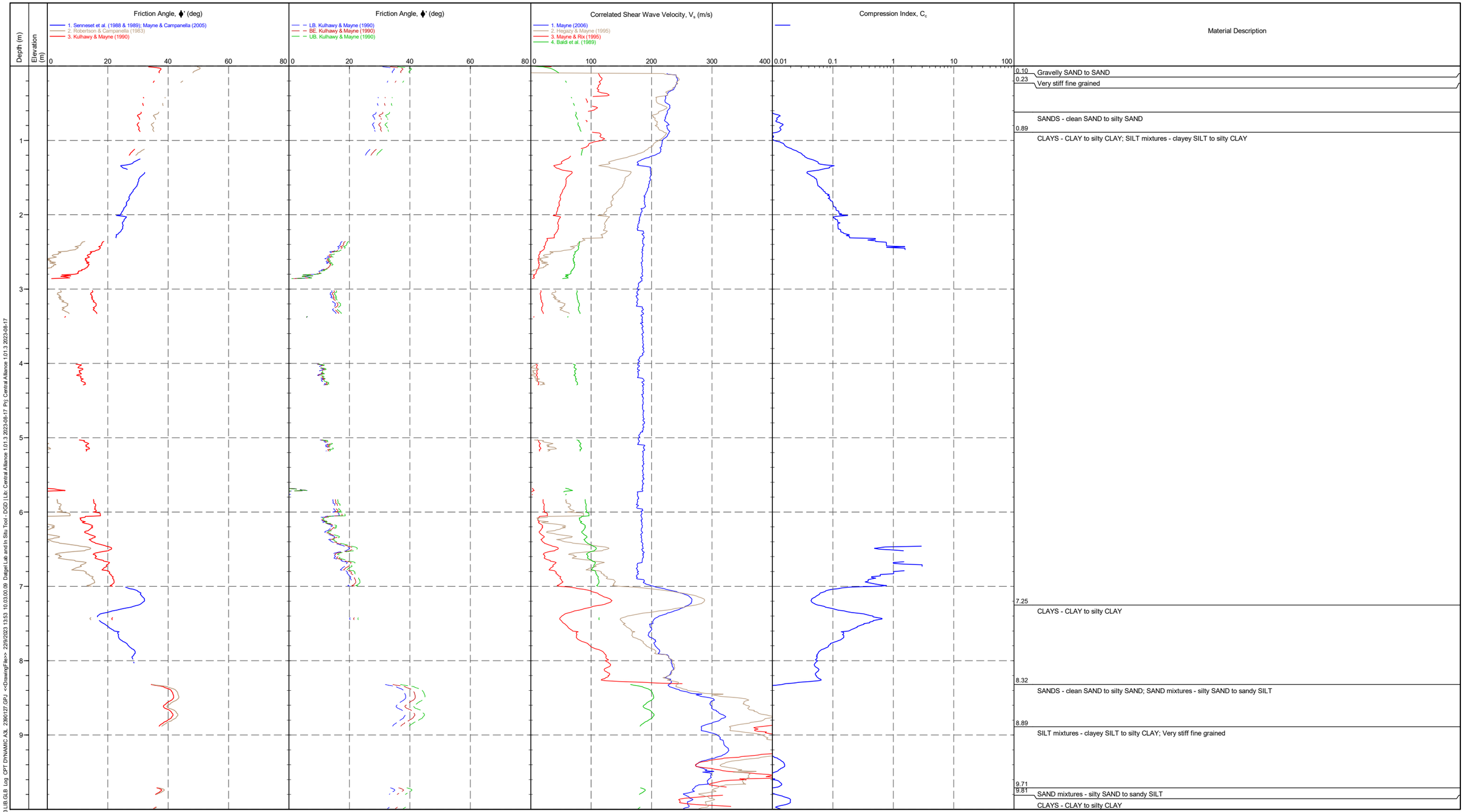
CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:52 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

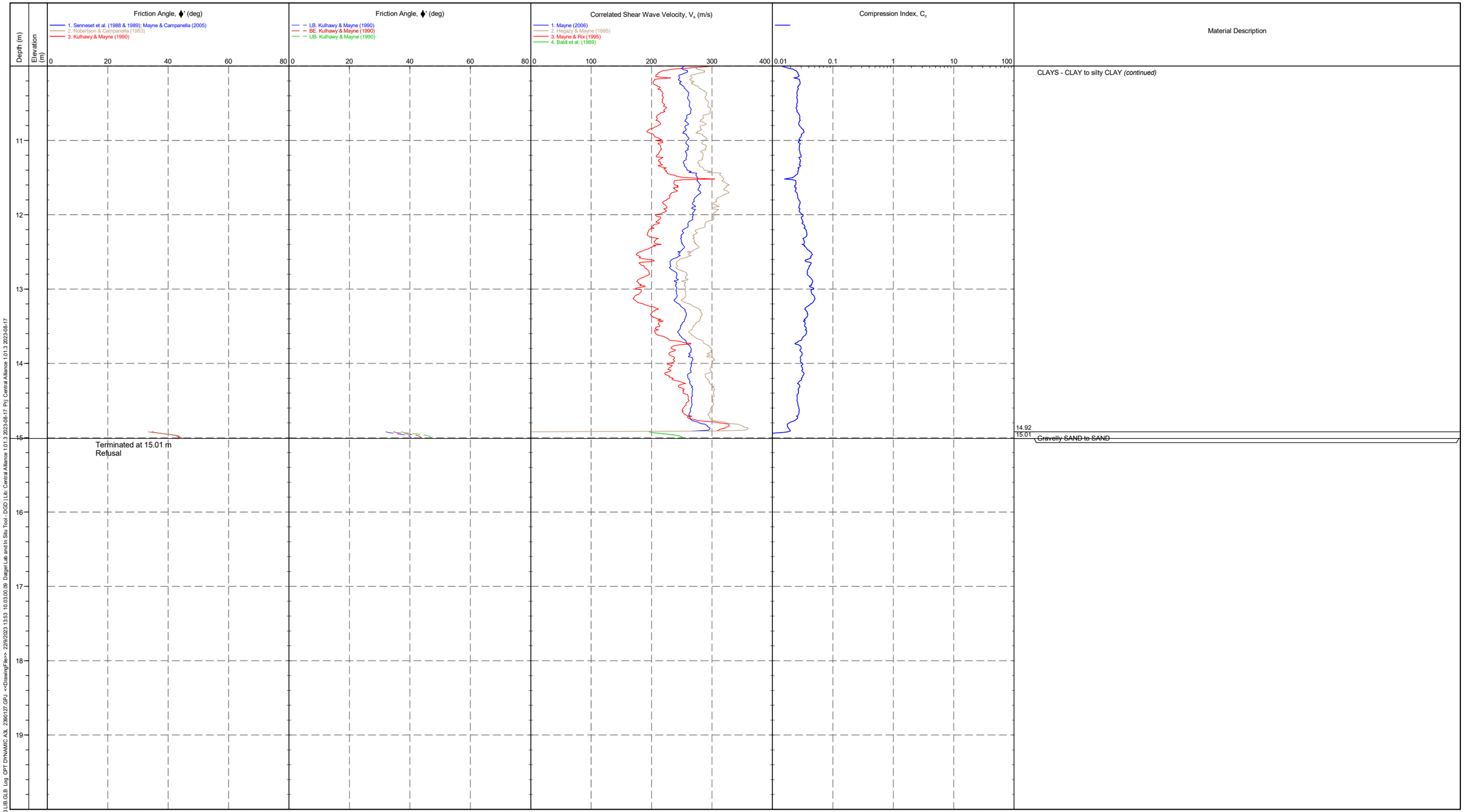
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:53 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

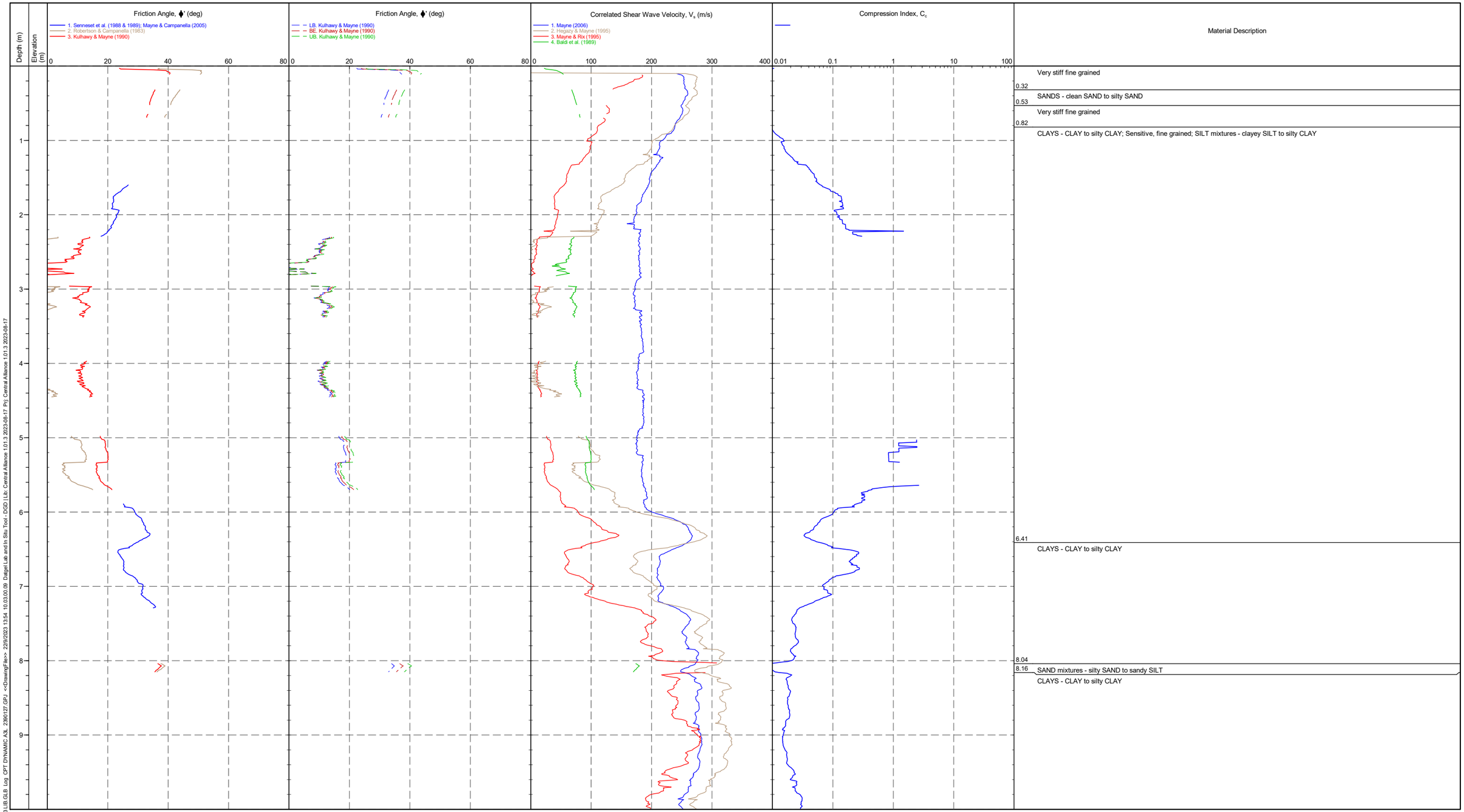
CENTRAL ALLIANCE 1.01.3.UB.GLB Log CPT DYNAMIC AGL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:53 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

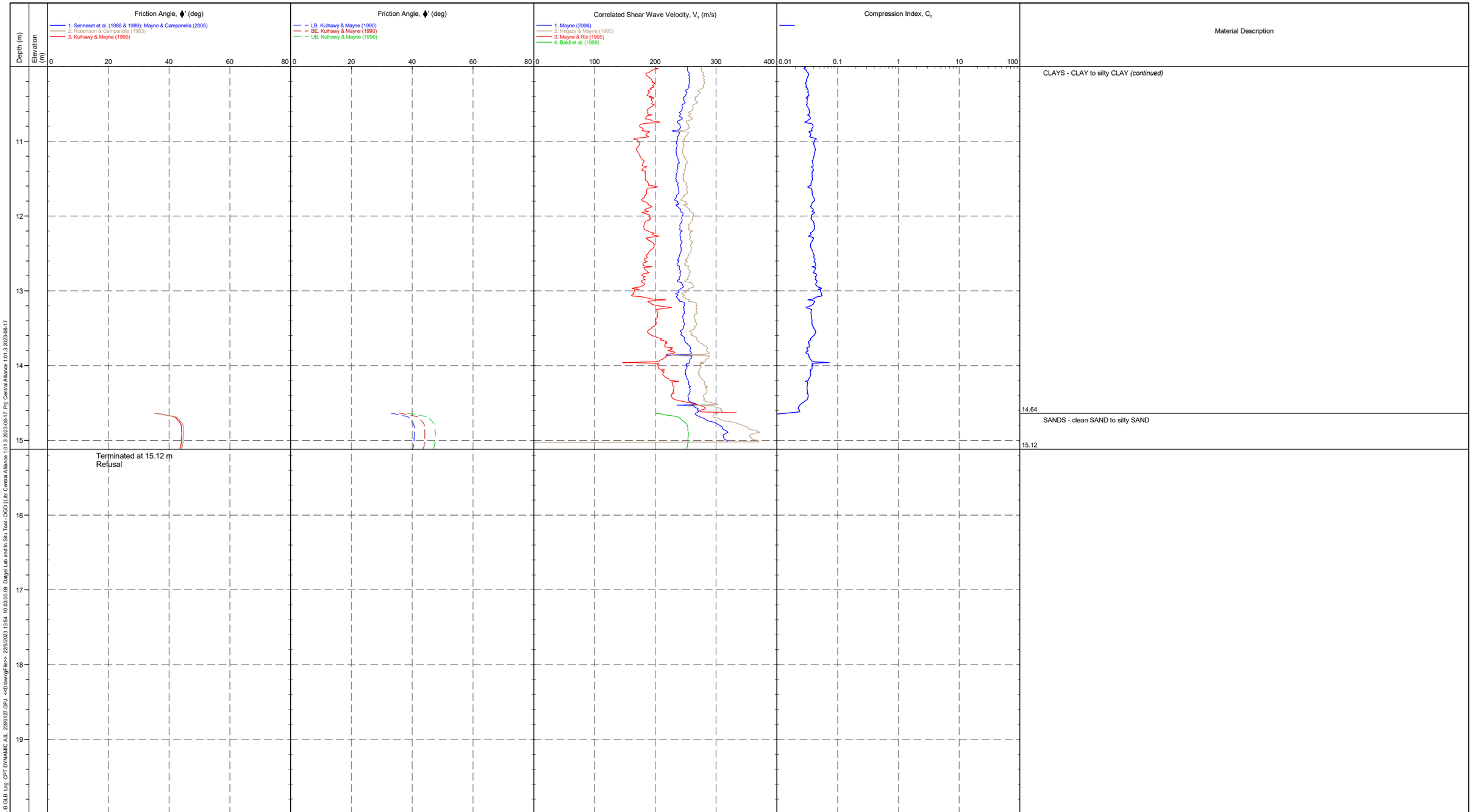
CENTRAL ALLIANCE 1.01.3 LIB.GLB Log CPT DYNAMIC AGL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:54 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023



Friction Angle Method:
1. Senneset et al. (1988 & 1989); Mayne & Campanella (2005)
2. Robertson & Campanella (1983)
3. Kulhawy & Mayne (1990)

Friction Angle LB BE UB Method:
LB. Kulhawy & Mayne (1990)
BE. Kulhawy & Mayne (1990)
UB. Kulhawy & Mayne (1990)

Shear Wave Velocity Correlated Method:

Compression Index Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:54 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.13 Gravelly SAND to SAND
Very stiff fine grained

0.87 CLAYS - CLAY to silty CLAY; Organic soil - PEATS

3.00 CLAYS - CLAY to silty CLAY

4.30 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY; Organic soil - PEATS

7.59 CLAYS - CLAY to silty CLAY

8.93
9.06 SAND mixtures - silty SAND to sandy SILT
9.17 SILT mixtures - clayey SILT to silty CLAY
CLAYS - CLAY to silty CLAY; Organic soil - PEATS

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3i 2390127.GPJ <<DrawingFile>> 22/9/2023 13:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689832.4 m NORTHING : 5942525.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY; Organic soil - PEATS *(continued)*

14.60 SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

16.46

16.60 SILT mixtures - clayey SILT to silty CLAY

CLAYS - CLAY to silty CLAY

19.82 SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 UB.GLB Log CPT DYNAMIC AGL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT01**

CLIENT : Mayer	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : BB	REMARK	SHEET : 3 OF 3
ENGINEER : Ben Bilsbrough	EASTING : 689832.4 m	CONE TYPE : C+F+W2	CHECKED DATE : 20/9/2023		STATUS :
PROJECT : Grimsby CPT	NORTHING : 5942525.0 m	CONE ID : DP15-CFPTxy.71175	APPROVED BY : BB		DATE : 13/9/2023
LOCATION : Grimsby	COORD. SYS. :	OPERATOR : Central Alliance	APPROVED DATE : 20/9/2023		
PROJECT No. : 2390127	ELEVATION :				

Depth (m) | Elevation (m) | Material Description

SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT *(continued)*

20.77
20.91 SILT mixtures - clayey SILT to silty CLAY
21.06 SAND mixtures - silty SAND to sandy SILT
21.20 SILT mixtures - clayey SILT to silty CLAY
SAND mixtures - silty SAND to sandy SILT

22.51
22.62 SILT mixtures - clayey SILT to silty CLAY
SAND mixtures - silty SAND to sandy SILT

23.73
SANDS - clean SAND to silty SAND; SAND mixtures - silty SAND to sandy SILT

24.94
Terminated at 24.94 m
Refusal

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC AJL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:55 10.03.00.09 Datgel Lab and In Situ Tool - DGD] Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.11 SANDS - clean SAND to silty SAND
Very stiff fine grained

0.82 CLAYS - CLAY to silty CLAY; Organic soil - PEATS

2.78 CLAYS - CLAY to silty CLAY; Sensitive, fine grained

6.69 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

9.84 CLAYS - CLAY to silty CLAY

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:58 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT02**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689838.6 m NORTHING : 5942597.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

Small Strain Shear Modulus, G_0 (MPa) — 1. Rix & Stoke (1992); 2. Lunne, Robertson & Powell (1997) — 0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa) — LB. Rix & Stoke (1992); BE. Rix & Stoke (1992); UB. Rix & Stoke (1992) — 0 25 50 75 100

Constrained Modulus, M (MPa) — 1. Kulhawy & Mayne (1990); 2. Burns & Mayne (2002) — 0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN) — 1. Derived from Kulhawy & Mayne (1990) — 0 0.25 0.5 0.75 1

CLAYS - CLAY to silty CLAY *(continued)*

16.58

SANDS - clean SAND to silty SAND

16.85

Terminated at 16.85 m
Refusal

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 101.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 29/9/2023 13:58 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 101.3 2023-08-17 Prj: Central Alliance 101.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 2 STATUS : DATE : 13/9/2023

Depth (m)	Elevation (m)	Material Description
0.10		Gravelly SAND to SAND
0.30		Very stiff fine grained
0.42		SANDS - clean SAND to silty SAND
0.64		Very stiff fine grained
		CLAYS - CLAY to silty CLAY; Organic soil - PEATS
3.28		CLAYS - CLAY to silty CLAY; Sensitive, fine grained; Organic soil - PEATS; SILT mixtures - clayey SILT to silty CLAY
5.97		CLAYS - CLAY to silty CLAY; Organic soil - PEATS
7.01		CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

0 1 2 3 4 5 6 7 8 9

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:56 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT03**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689798.4 m NORTHING : 5942595.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

14.34

SANDS - clean SAND to silty SAND

14.85

Terminated at 14.85 m
Refusal

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC AJL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:56 10.03.00.09 Datgel Lab and In Situ Tool - DGD] Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 1 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

0.10 Gravelly SAND to SAND
Very stiff fine grained; CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

1.99 CLAYS - CLAY to silty CLAY

2.92 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC ASL 2390127.GPJ <<DrawingFile>> 2/9/2023 13:56 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 3 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

10.27 CLAYS - CLAY to silty CLAY; SILT mixtures - clayey SILT to silty CLAY *(continued)*

CLAYS - CLAY to silty CLAY

14.27 SANDS - clean SAND to silty SAND

15.22 CLAYS - CLAY to silty CLAY

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

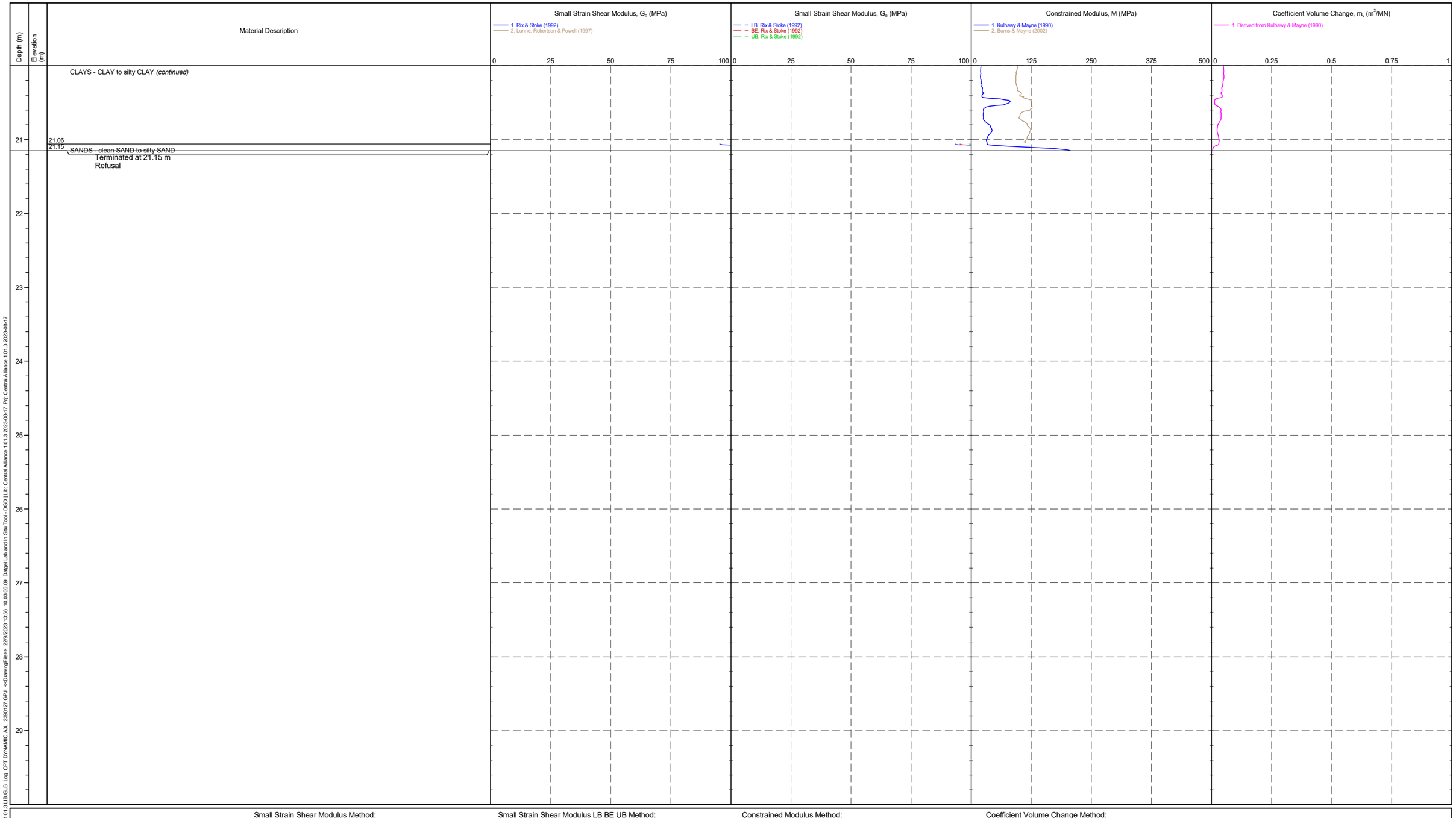
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT04**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689688.9 m NORTHING : 5942719.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 3 OF 3 STATUS : DATE : 13/9/2023



Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

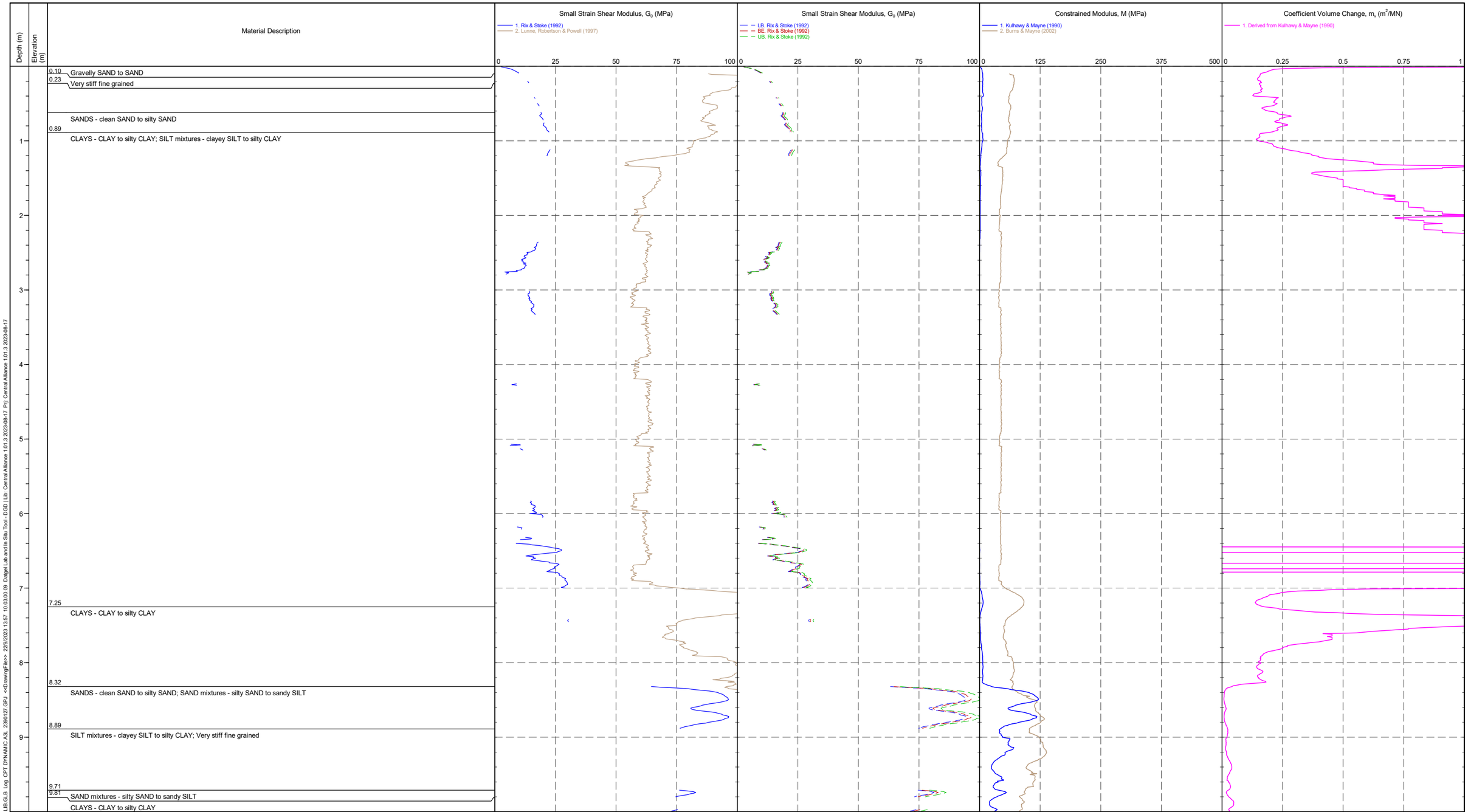
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CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : BB	REMARK	SHEET : 1 OF 2
ENGINEER : Ben Bilsbrough	EASTING : 689687.1 m	CONE TYPE : C+F+W2	CHECKED DATE : 20/9/2023		STATUS :
PROJECT : Grimsby CPT	NORTHING : 5942715.0 m	CONE ID : DP15-CFPTxy.71175	APPROVED BY : BB		DATE : 13/9/2023
LOCATION : Grimsby	COORD. SYS. :	OPERATOR : Central Alliance	APPROVED DATE : 20/9/2023		
PROJECT No. : 2390127	ELEVATION :				



Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:57 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT05**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689687.1 m NORTHING : 5942715.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

Small Strain Shear Modulus, G_0 (MPa) — 1. Rix & Stoke (1992); 2. Lunne, Robertson & Powell (1997) — 0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa) — LB. Rix & Stoke (1992); BE. Rix & Stoke (1992); UB. Rix & Stoke (1992) — 0 25 50 75 100

Constrained Modulus, M (MPa) — 1. Kulhawy & Mayne (1990); 2. Burns & Mayne (2002) — 0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN) — 1. Derived from Kulhawy & Mayne (1990) — 0 0.25 0.5 0.75 1

CLAYS - CLAY to silty CLAY *(continued)*

14.92
15.01 Gravelly SAND to SAND
Terminated at 15.01 m
Refusal

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:57 10.03.00.09 Datgel Lab and In Situ Tool - DGD [Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer	AREA :	RIG : ; Crawler based20 Ton;	CHECKED BY : BB	REMARK	SHEET : 1 OF 2
ENGINEER : Ben Bilsbrough	EASTING : 689770.5 m	CONE TYPE : C+F+W2	CHECKED DATE : 20/9/2023		STATUS :
PROJECT : Grimsby CPT	NORTHING : 5942502.0 m	CONE ID : DP15-CFPTxy.71175	APPROVED BY : BB		DATE : 13/9/2023
LOCATION : Grimsby	COORD. SYS. :	OPERATOR : Central Alliance	APPROVED DATE : 20/9/2023		
PROJECT No. : 2390127	ELEVATION :				

Depth (m) | Elevation (m) | Material Description

0.32 Very stiff fine grained

0.53 SANDS - clean SAND to silty SAND

0.82 Very stiff fine grained

CLAYS - CLAY to silty CLAY; Sensitive, fine grained; SILT mixtures - clayey SILT to silty CLAY

6.41 CLAYS - CLAY to silty CLAY

8.04

8.16 SAND mixtures - silty SAND to sandy SILT

CLAYS - CLAY to silty CLAY

Small Strain Shear Modulus, G_0 (MPa)
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)
0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa)
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)
0 25 50 75 100

Constrained Modulus, M (MPa)
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)
0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN)
1. Derived from Kulhawy & Mayne (1990)
0 0.25 0.5 0.75 1

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3 LIB GLB Log CPT DYNAMIC ADL 2390127.GPJ <<DrawingFile>> 22/9/2023 13:57 10.03.00.09 Dagel Lab and In Situ Tool - DGD | Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

CENTRAL ALLIANCE
GROUND ENGINEERING TECHNICAL SERVICES

CPT LOG

PointID **CPT06**

CLIENT : Mayer ENGINEER : Ben Bilsbrough PROJECT : Grimsby CPT LOCATION : Grimsby PROJECT No. : 2390127	AREA : EASTING : 689770.5 m NORTHING : 5942502.0 m COORD. SYS. : ELEVATION :	RIG : ; Crawler based20 Ton; CONE TYPE : C+F+W2 CONE ID : DP15-CFPTxy.71175 OPERATOR : Central Alliance	CHECKED BY : BB CHECKED DATE : 20/9/2023 APPROVED BY : BB APPROVED DATE : 20/9/2023	REMARK	SHEET : 2 OF 2 STATUS : DATE : 13/9/2023

Depth (m) | Elevation (m) | Material Description

Small Strain Shear Modulus, G_0 (MPa) — 1. Rix & Stoke (1992); 2. Lunne, Robertson & Powell (1997) — 0 25 50 75 100

Small Strain Shear Modulus, G_0 (MPa) — LB. Rix & Stoke (1992); BE. Rix & Stoke (1992); UB. Rix & Stoke (1992) — 0 25 50 75 100

Constrained Modulus, M (MPa) — 1. Kulhawy & Mayne (1990); 2. Burns & Mayne (2002) — 0 125 250 375 500

Coefficient Volume Change, m_v (m^2/MN) — 1. Derived from Kulhawy & Mayne (1990) — 0 0.25 0.5 0.75 1

CLAYS - CLAY to silty CLAY *(continued)*

14.64

SANDS - clean SAND to silty SAND

15.12

Terminated at 15.12 m
Refusal

Small Strain Shear Modulus Method:
1. Rix & Stoke (1992)
2. Lunne, Robertson & Powell (1997)

Small Strain Shear Modulus LB BE UB Method:
LB. Rix & Stoke (1992)
BE. Rix & Stoke (1992)
UB. Rix & Stoke (1992)

Constrained Modulus Method:
1. Kulhawy & Mayne (1990)
2. Burns & Mayne (2002)

Coefficient Volume Change Method:
1. Derived from Kulhawy & Mayne (1990)

CENTRAL ALLIANCE 1.01.3.LIB.GLB Log CPT DYNAMIC A3L 2390127.GPJ <<DrawingFile>> 22/9/2023 13:57 10.03.00.09 Datgel Lab and In Situ Tool - DGD [Lib: Central Alliance 1.01.3 2023-08-17 Prj: Central Alliance 1.01.3 2023-08-17

8 APPENDIX C – CONE CALIBRATION

Gouda Geo-Equipment B.V.
Satellietbaan 8
2181 MH Hillegom
The Netherlands

Tel. + 31 (0)715.318.475
E-mail: info@gouda-geo.com

WWW.GOUDAGEO.COM
Down to Earth

Certificate of Calibration

Certificate No. CMI 23.01.5270

Instrument

Instrument Type:	Electrical Subtraction Cone	Calibration Result:	Certified
Manufacturer:	Gouda Geo-Equipment B.V		
Model No.:	DP15-CFPTxy	Date Calibrated:	20-1-2023
Serial No.:	71175	Next Due Date:	20-7-2023
Cone area factor:	0,75		
Used Calibration Procedure: GGECP004, ISO22476		Location:	Hillegom (The Netherlands)

Customer

Central Alliance

Calibration Instruments

Instrument Type: CPT Logger	Instrument Type: CPT Logger	Instrument Type: Load-cell + amplifier
Manufacturer: Gouda Geo Equipment	Manufacturer: Gouda Geo Equipment	Manufacturer: Futek
Model No.: A	Model No.: A	Model No.: LCF500 + IAA100
Serial No.: 3010	Serial No.: 3129	Serial No.: 668966 + 695054
Accuracy: 0.01% + 2 Counts	Accuracy: 0.01% + 2 Counts	Accuracy: 0.1%
Date Calibrated: 23 December, 2022	Date Calibrated: 23 December, 2022	Date Calibrated: 1 November, 2022
Next Due Date: 23 June, 2023	Next Due Date: 23 June, 2023	Next Due Date: 1 November, 2023
Calibrated By: Manufacturer	Calibrated By: Manufacturer	Calibrated By: Futek
Traceability: CMI 22.12.5177	Traceability: CMI 22.12.5176	Traceability: 2211030065

Calibration Conditions

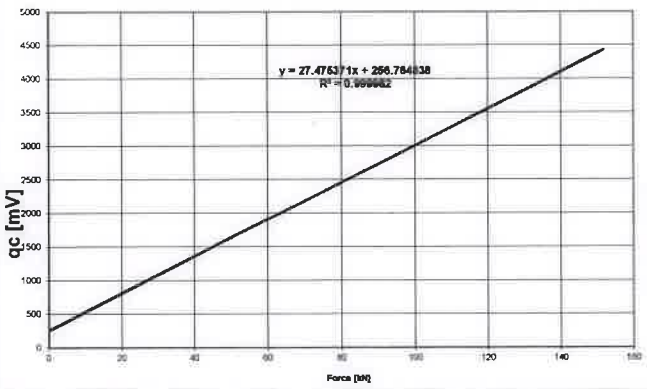
Environmental conditions whilst performing the calibration:

Ambient Tempera 21.4 °C
Relative Humidity: 31.7 %

Condition of Calibrated Apparatus when Received: Fair

Measurement Parameters

zero value	251 mV	zero value	251 mV
Full scale	4121 @ 150 kN	Full scale	4111 @ 150 kN





Remarks

Data "As Received" = "As Left" unless otherwise noted. Calibration data for this item was derived from one or more of the following sources: the Nederlands Meetinstituut (NMI) or other national laboratory, a natural physical constant, or a ratio technique. The data is on file at the NMI. This calibration is compliant with Gouda Geo-Equipment's internal quality system, internal calibration procedure and meets the requirements of standard ISO22476.
The Calibration Interval will vary from customer use and different conditions. All calibrations are verified at a moment in time; and confirmed within controlled temperature and humidity specified standards. Gouda Geo-Equipment is not responsible for future calibrations. Improper use of the apparatus (e.g. dropping) may cause loss of calibration.

Calibration performed by:

Vincent Vermeer
(Engineer)

Approved by:

Rogier Tijm
(Senior Engineer)

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Gouda Geo-Equipment B.V.
Satellietbaan 8
2181 MH Hillegom
The Netherlands

Tel. + 31 (0)715.318.475
E-mail: info@gouda-geo.com

Down to Earth

Certificate of Calibration

Certificate No. CMI 23.01.5270

Instrument

Instrument Type:	Electrical Subtraction Cone
Manufacturer:	Gouda Geo-Equipment B.V
Model No.:	DP15-CFPTxy
Serial No.:	71175
Cone area factor:	0,75

Calibration Result: Certified

Date Calibrated: 20-1-2023
Next Due Date: 20-7-2023

Used Calibration Procedure: GGECP004, ISO22476

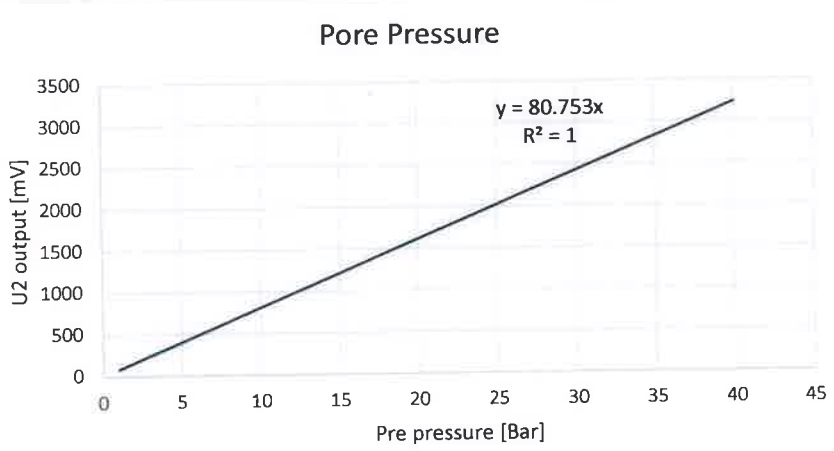
Location: Hillegom (The Netherlands)

Calibration Instruments

Instrument Type: HP Kalibrator
Manufacturer: Keller Druckmesstechnik
Model No.: HPX - 200bar - 80139.31
Serial No.: 5208
Date Calibrated: 17 May, 2022
Next Due Date: 17 May, 2023
Calibrated By: Manufacturer

Pore pressure

AMB =+/-1Bar = 360 Mv	
U2 [bar]	U2 [mV]
1	75
5	399
10	807
15	1211
20	1615
25	2020
30	2424
35	2826
40	3229



Calibration performed by:

Vincent Vermeer
(Engineer)

Gouda Geo-Equipment B.V. WWW.GOUDA-GEO.COM Down to Earth The Netherlands

Approved by:

Rogier Tijm
(Senior Engineer)

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Gouda Geo-Equipment B.V.
Satellietbaan 8
2181 MH Hillegom
The Netherlands

Tel. + 31 (0)715.318.475
E-mail: info@gouda-geo.com

WWW.GOUDAGEO.COM
Down to Earth

Certificate of Calibration

Certificate No. CMI 23.01.5270

Instrument

Instrument Type:	Electrical Subtraction Cone	Calibration Result:	Certified
Manufacturer:	Gouda Geo-Equipment B.V		
Model No.:	DP15-CFPTxy	Date Calibrated:	20-1-2023
Serial No.:	71175	Next Due Date:	20-7-2023
Cone area factor:	0,75		
Used Calibration Procedure: GGECP004, ISO22476		Location: Hillegom (The Netherlands)	

Inclinometer

Degrees	Ix [mV]
20	2856
19	2822
18	2783
17	2744
16	2700
15	2652
14	2612
13	2564
12	2524
11	2481
10	2442
9	2393
8	2348
7	2305
6	2256
5	2217
4	2174
3	2139
2	2086
1	2047
0	1998
-1	1954
-2	1910
-3	1866
-4	1832
-5	1783
-6	1739
-7	1694
-8	1651
-9	1602
-10	1563
-11	1529
-12	1485
-13	1441
-14	1392
-15	1353
-16	1305
-17	1270
-18	1231
-19	1193
-20	1148

Degrees	Iy [mV]
20	3320
19	3272
18	3228
17	3179
16	3135
15	3096
14	3052
13	2998
12	2954
11	2906
10	2857
9	2813
8	2769
7	2725
6	2671
5	2627
4	2574
3	2525
2	2486
1	2437
0	2393
-1	2335
-2	2296
-3	2242
-4	2198
-5	2154
-6	2110
-7	2057
-8	2008
-9	1964
-10	1910
-11	1871
-12	1827
-13	1783
-14	1729
-15	1691
-16	1637
-17	1593
-18	1554
-19	1510
-20	1471

Gouda Geo-Equipment B.V. WWW.GOUDAGEO.COM Down to Earth The Netherlands

Calibration performed by:

Vincent Vermeer
(Engineer)

Approved by:

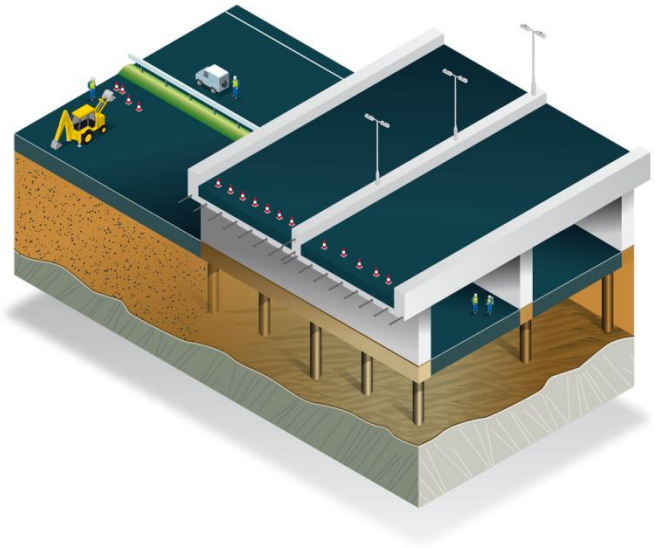
Rogier Tijm
(Senior Engineer)

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Appendix K

Seismic Survey

zetica



engineering

Title:	**Downhole Seismic Survey: BH02**
Client:	Mayer Environmental
Site:	Grimsby
Ref:	P13272-23-R1-A
Date:	01 November 2023

Zetica Limited
Zetica House, Southfield Road
Eynsham, OX29 4JB
United Kingdom
Tel: 01993-886682 Fax: 01993-886683
Email: projects@zetica.com
Website: www.zetica.com

chartered ices

EUROPEAN GPR ASSOCIATION

ISO 9001 REGISTERED FIRM Certificate No.GB2001316

INTERNATIONAL ACCREDITATION BOARD Registration No. 0044/1

Executive Summary

Zetica Ltd was commissioned by Mayer Environmental to conduct a downhole seismic survey in a borehole (BH02) located on disused land behind an industrial complex ~4 km north-west of Grimsby.

The objectives of the survey were to determine the geotechnical properties of the encountered geology by measuring the compressional (P) and shear (S) wave seismic velocities.

An inclined hammer source was used at 2 no. surface locations 3 m from the borehole in orthogonal directions. The P-wave and S-wave components of the generated waves were measured by 2 no. 7-component receivers spaced 2 m apart and clamped at 1 m intervals for the full borehole depth range.

Measurements of borehole verticality were also made. These were used to determine seismic wave pathlengths at each receiver location.

Data quality was excellent, with clear P-wave and S-wave arrivals observed at all receiver locations. P-wave and S-wave velocities were calculated from the identified arrival times and pathlengths. The resulting velocity profiles were compared to the logged geology.

P-wave velocity was observed to increase through varying clays, peat and silt up to ~1600 m/s at ~13.5 m depth. P-wave velocity was then observed to remain at ~1500 m/s to the maximum borehole depth, consistent with that of water and implying highly saturated material.

Low S-wave velocity (<100 m/s) was observed through sandy, silty clay until ~7 m depth before increasing to >325 m/s at ~9.5 m depth, concurrent with a logged silt layer. S-wave velocities then decreased through silty, gravelly clays to ~200 m/s at ~16 m depth, before increasing again towards the end of the borehole.

The calculated P-wave and S-wave velocities and derived geotechnical parameters are summarised in the accompanying Zetica spreadsheet P13272-23-XLS01-A.

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Table 1: Approximate P-wave and S-wave velocity ranges for the expected lithologies. 8

Table 2: Borehole and source locations in OSGB and elevation in metres above ordnance datum (mAOD). 10

1. Introduction

Zetica Ltd was commissioned by Mayer Environmental (the Client) to carry out a downhole seismic survey on Grimsby, located on undeveloped land behind an industrial estate (the Site) off Energy Park Way, ~4 km north-west of Grimsby.

The objective of the survey was to measure the geotechnical properties of the different geological units intersected by the borehole through measurements of seismic velocity.

The survey included measurement of the deviation of the borehole from vertical and was undertaken on the 3rd October 2023.

1.1. Site Description

A Site location map is shown in Figure 1, with an aerial image of the Site shown in Figure 2. Surface vegetation and shallow topsoil had been removed within the working area surrounding the borehole. A period of rainfall before the survey works caused standing water and mud to be present at the time of survey (Figure 3). No rainfall occurred during data collection. Low levels of ambient seismic noise were identified, likely originating from nearby industrial activity, however this did not affect the survey.

Borehole BH02 was drilled to a depth of 23 m and lined using a 90 mm PVC casing and grouted using a bentonite-based cement. The grout material had reached the surface and was observed to be dry and solid with no evidence of voiding around the top of the borehole. The casing head was 0.27 m above ground level.

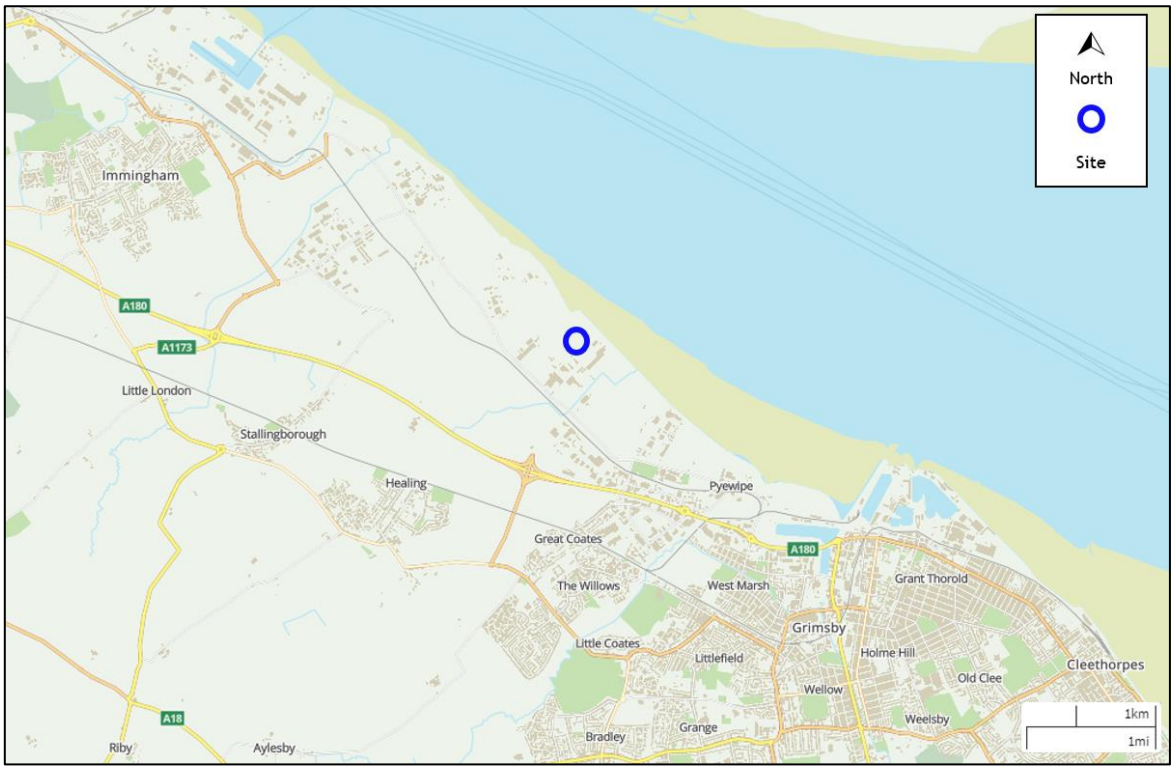


Figure 1: Site location map (Basemap source: OS maps).



Figure 2: Aerial image of the Site showing the location of borehole BH02. Source: Google Earth (2021).

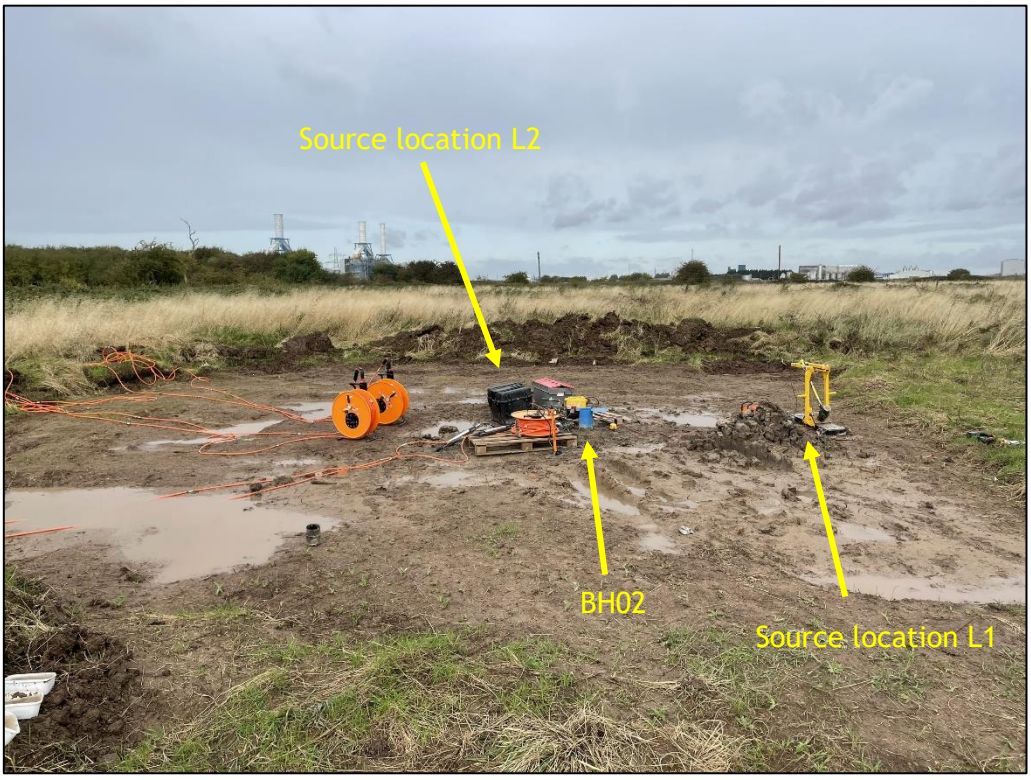


Figure 3: Photograph of the Site during the survey works.

1.2. Geological Background

British Geological Survey (BGS) maps show the Site to be situated on tidal flat deposits of clay and silt overlying Devensian Till. The underlying bedrock is recorded as the Flamborough Chalk Formation.

The Client provided the drillers' log from BH02, which is summarised in Figure 5. The log shows a sandy clay to 7 m depth, above a gravelly clay that extends to 21 m depth. A thin (0.5 m thick) layer of peat defines the boundary between these contrasting clays. Notable layers within the deeper clay include a 0.8 m thick layer of firm silt at 9 m depth and a 2.5 m thick layer of dense sand at 16 m depth. The anticipated chalk bedrock is encountered at 21 m depth and is described as silty/clayey.

Water was logged in the borehole throughout drilling, remaining relatively constant at depths of between 1.3 m and 2.0 m, though was settled at 0.7 m before survey works commenced.

Approximate P-wave and S-wave velocity ranges for materials anticipated from the borehole log are listed in Table 1.

Peat has low expected P- and S-wave velocity ranges but, as the peat layer is thin (0.5 m) and the geophone interval is 2 m, the recorded peat layer is not likely to be resolved by the survey.

Clay layers have a wide range of potential P-wave and S-wave velocities. It is expected that increasing granular content (sand and gravel) of any clay materials encountered is likely to increase the observed velocities.

Chalk layers tend to have significantly higher P-wave and S-wave velocities, except where they are weathered. The upper boundary of the chalk occurs close to the base of the borehole at 21 m depth, and is therefore unlikely to be detectable by the survey.

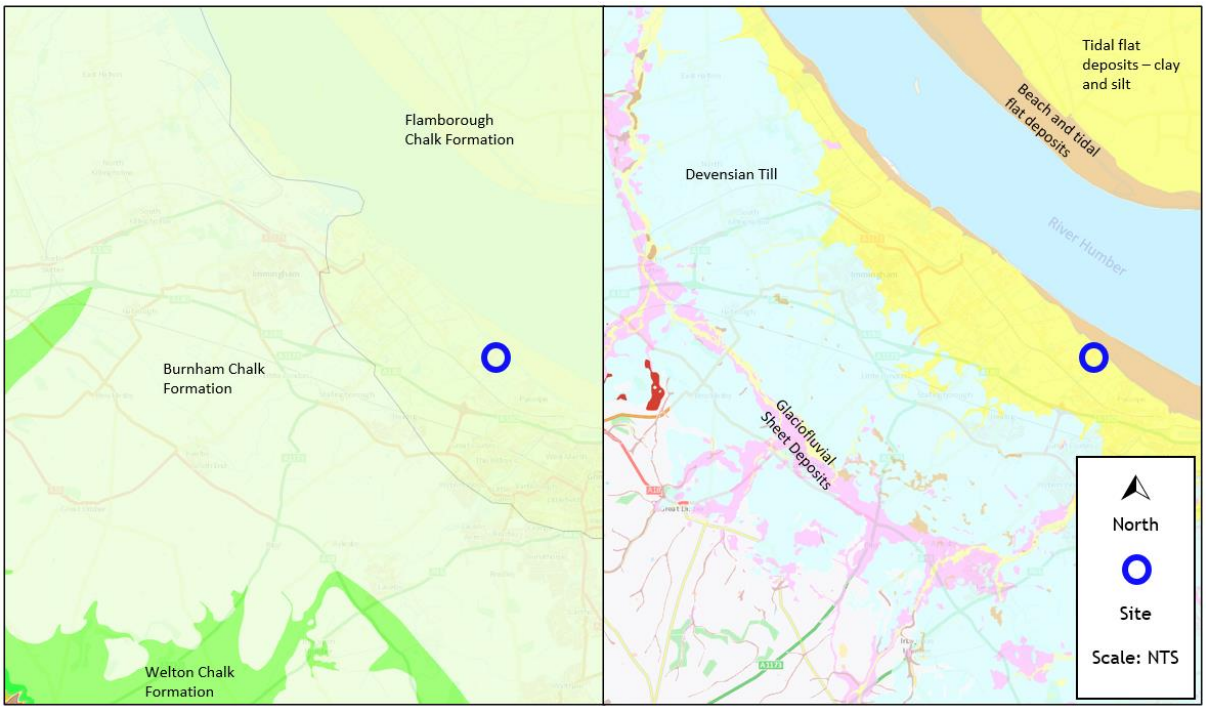


Figure 4: Geological maps of the Site and surrounding areas showing bedrock (left) and superficial sediments (right). Source – BGS.

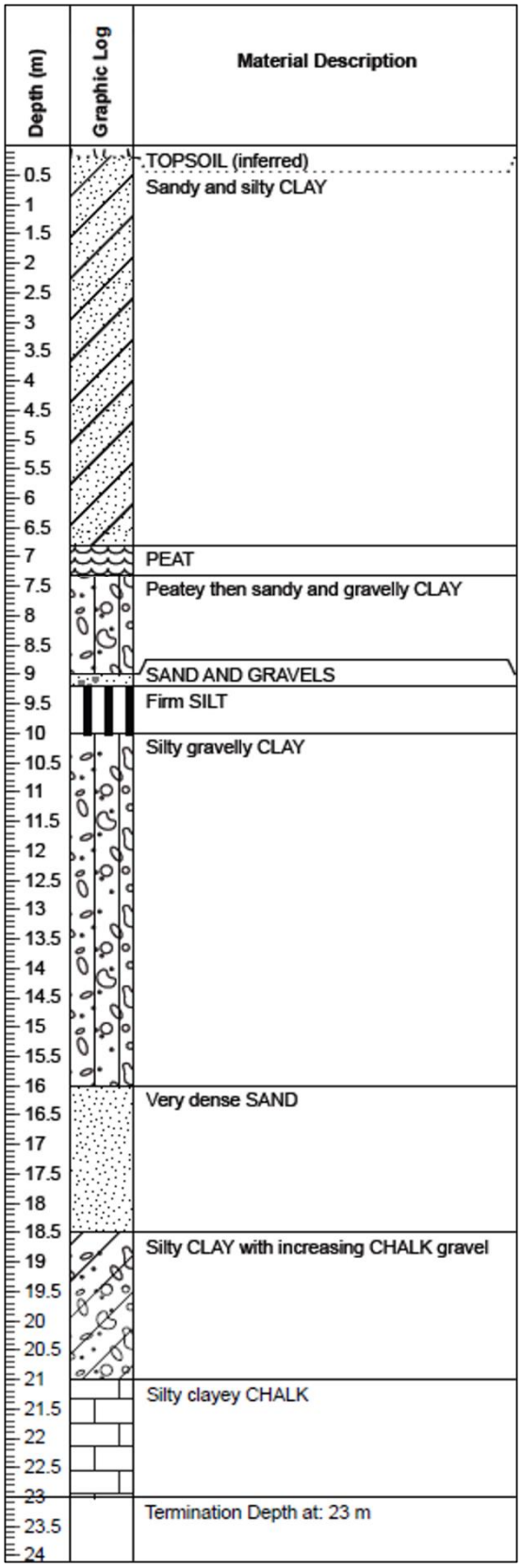


Figure 5: Simplified borehole log derived from the BH02 drillers' log provided by the Client.

Rock / soil / material type	*P-wave velocity (m/s)*	*S-wave velocity (m/s)*
Water	*1500*	*NA*
Topsoil	*300 - 800*	*100 - 400*
Peat	*300 - 1000*	*100 - 250*
Wet Sand	*1500 - 2000*	*400 - 600*
Gravel	*1000 - 2500*	*200 - 750*
Sand & gravel	*400 - 2300*	*250 - 500*
Clay	*1000 - 2500*	*200 - 800*
Weathered Chalk	*1000 - 3000*	*500 - 1100*
Competent Chalk	*2000 - 4000*	*1100 - 1300*

Table 1: Approximate P-wave and S-wave velocity ranges for the expected lithologies.

2. Methodology

The downhole seismic survey was carried out in general accordance with the procedures outlined in ASTM D7400-19; Standard Test Methods for Downhole Seismic Testing.

P-waves and S-waves were recorded at 1 m intervals to the full depth permitted by the boreholes, using a pair of clamping borehole geophones separated by 2 m. The geophones used were 7-component sensors, with 1 no. vertical component and 6 no. horizontal components.

Source events (seismic shots) were made at a distance of 3 m from the borehole in 2 no. orthogonal directions, at source locations labelled L1 and L2. A summary of the borehole and source locations is provided in Table 2.

Seismic energy was imparted into the ground using an integrated hammer and inclined (45°) strike plate, which produces energy rich in P-waves and S-waves (Figure 6). The source was coupled to the ground using metal pins. The interchangeable swing direction and dual strike plate of the source system means recordings can be taken with reversed polarisation directions at a point source location. Each recorded shot was assessed in the field to confirm the presence of P-wave and S-wave arrivals. Where needed, additional shots were stacked to improve the signal-to-noise ratio.

The data were recorded as individual files for each shot direction at each receiver depth with a ~20 µs sample interval over a record length of 0.3 s. The files were concatenated to produce a seismogram over the full borehole depth. Shots from either polarisation direction can be used to identify P-wave events, while the combination of oppositely polarised events is useful for identifying S-wave events.

Interval travel times were measured between the pair of geophones to calculate interval velocities. Additionally, gradient velocities were established by linear regression over a rolling 3 m depth range, which was used as quality control for the interval velocity estimates.

Depths were measured relative to the borehole casing head (0.27 m above ground level) and subsequently corrected to present results with depth below ground surface. Depth accuracies are estimated as +/-40 mm.

Appendix A presents a summary of the downhole seismic interpretation method including the definition of geotechnical moduli in terms of seismic velocities.

In addition to the downhole seismic data collection, borehole verticality data were acquired. A tool was lowered down the borehole, measuring tilt and azimuth in degrees at depth increments of 0.01 m. The borehole deviation from vertical was calculated from the tilt and azimuth data, for use in establishing the direct pathlengths between the source and each receiver location.



Figure 6: Downhole seismic equipment in use on Site.

Location	*Easting OSGB (m)*	*Northing OSGB (m)*	*Elevation (mAOD)*
BH02	*523731.67*	*412820.96*	*2.07*
L1	*523733.25*	*412823.49*	*2.02*
L2	*523729.18*	*412822.57*	*2.01*

Table 2: Borehole and source locations in OSGB and elevation in metres above ordnance datum (mAOD).

2.1. Survey Limitations

The following clarifies some of the limitations relevant to the survey.

- The collection of robust data relies on good coupling of the borehole with the surrounding ground, with no voids present. This can sometimes be evaluated by use of a sonic bond log. No sonic bond logs have been provided to Zetica.
- Geotechnical moduli derived from borehole geophysical surveys must be treated as low strain properties. The results can sometimes be reduced to operational strains using softening factors, based on an assumption of material independent stress-strain ratios.

- Materials with strong fabrics (such as bedding plains) may exhibit strong seismic velocity anisotropy based on the propagation direction being parallel to or perpendicular to the fabric plane. In the case of S-wave measurements, the anisotropy may also arise between polarisation direction parallel to and perpendicular to the material fabric. Downhole surveys involve vertical signal propagation, which is often perpendicular to bedding plains, resulting in lower velocities compared with horizontal propagation.
- High velocity contrasts in near surface materials can result in refracted propagation paths, which may introduce over or underestimates of velocity at depths comparable to source offset.
- Unfavourable ground conditions such as high attenuation rates and ground heterogeneity can have a detrimental effect on signal quality.
- Interval velocities were calculated over the sensor separation of 2 m. Layers thinner than 2 m will have an influence on measured velocities proportional to their velocity contrast and the layer thickness, and may not be detectable.

3. Data

3.1. Data Presentation

Seismograms showing interpreted P-wave and S-wave arrivals from each source location are presented in this report section.

The downhole seismic survey results are presented as plots of calculated P-wave and S-wave velocity and Poisson's Ratio in Section 4. All calculated geotechnical parameters resulting from these velocity profiles (with assumed values of density) are presented in the accompanying Zetica spreadsheet P13272-23-XLS01-A (Downhole Geotechnical Parameters). Further information on the calculation of these parameters is presented in Appendix A.

It should be noted that whilst the drillers' log detailed borehole information to 23 m depth, both the downhole seismic and borehole verticality data collection reached a maximum depth of 20 m. The cause of the difference between the logs and this survey is not clear, however there may have been some collapse or filling of material at the base of the borehole during or after the drilling and grouting process.

3.2. Data Quality

P-wave and S-wave data from both source locations were of excellent quality. Figure 7 to Figure 10 show the picked P-wave and S-wave arrivals for the lower geophone from shots at the L1 and L2 shot locations. First arrivals were easily identifiable for the entire borehole depth. The upper geophone recorded data of equivalent quality.

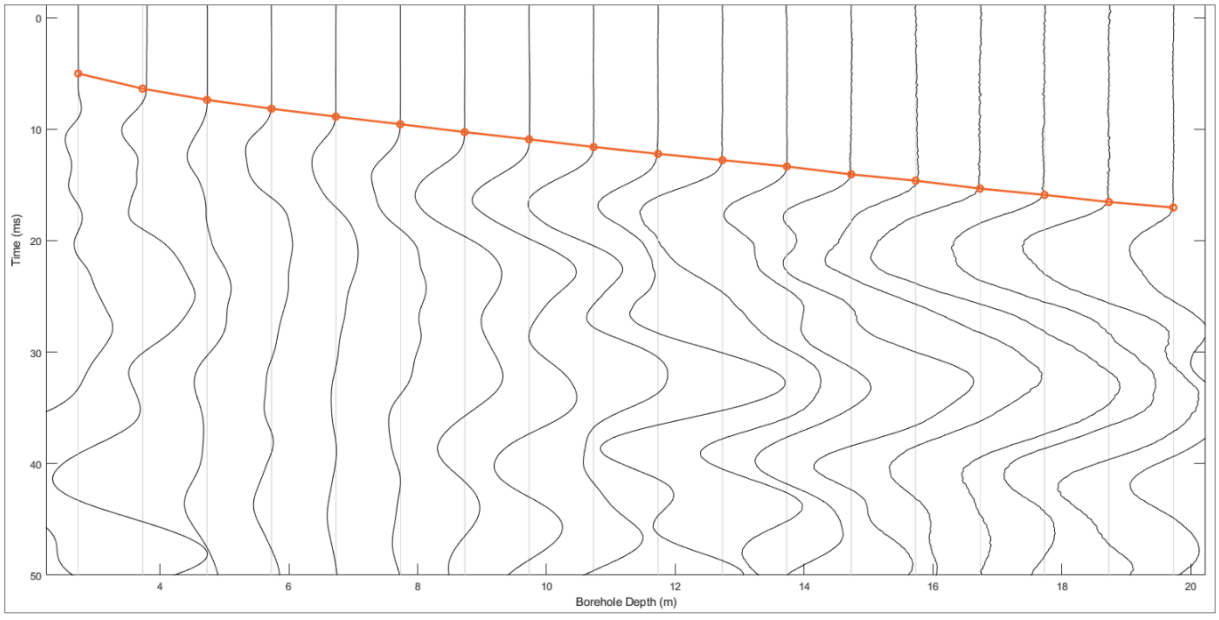


Figure 7: P-wave arrivals at the lower geophone from shot location L1.

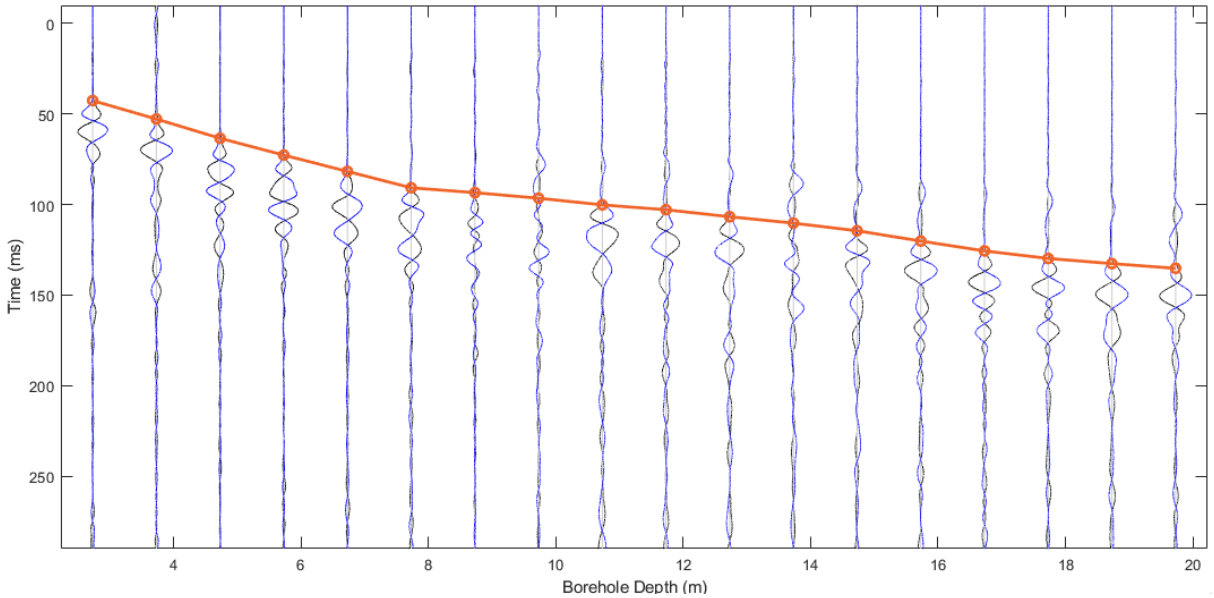


Figure 8: S-wave arrivals at the lower geophone from shot location L1.

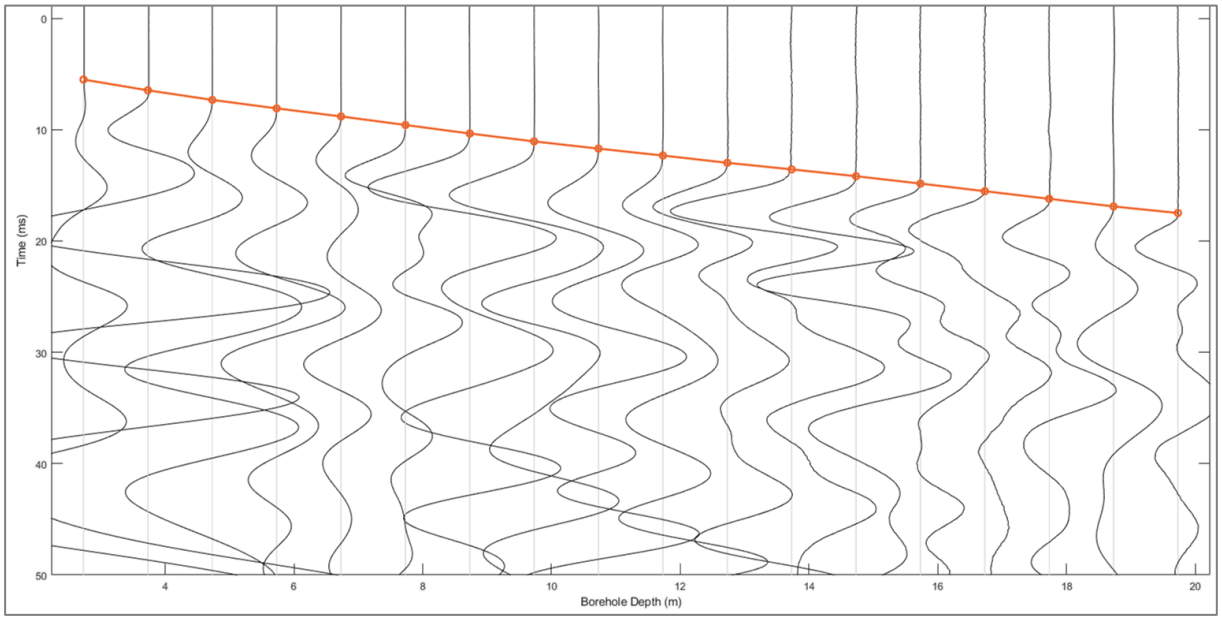


Figure 9: P-wave arrivals at the lower geophone from shot location L2.

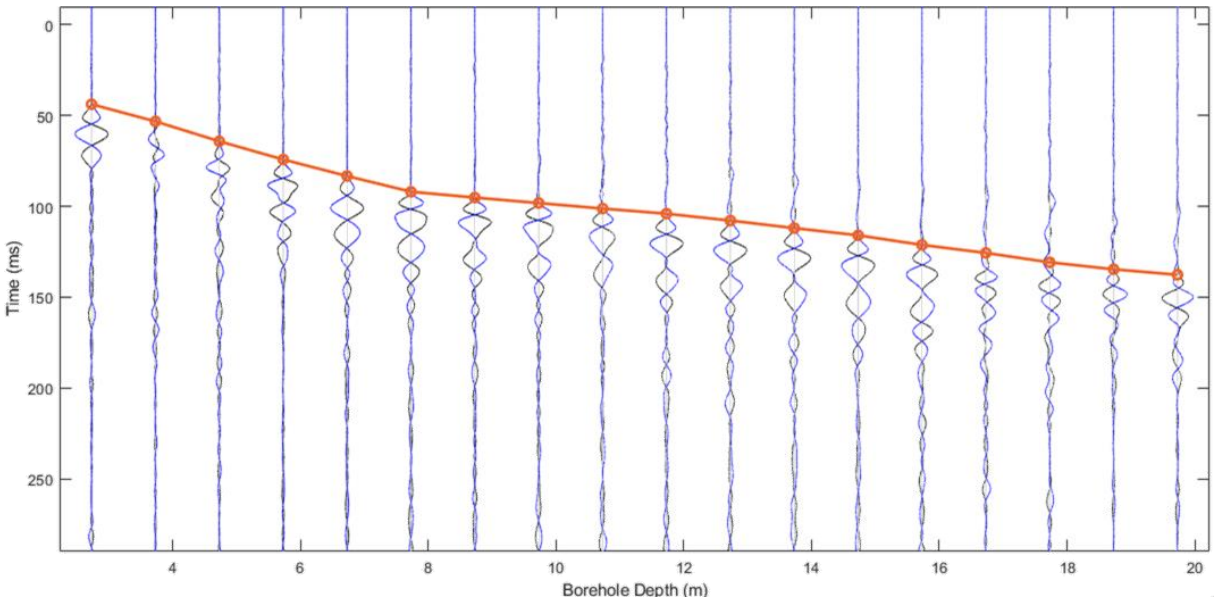


Figure 10: S-wave arrivals at the lower geophone from shot location L2.

4. Results

4.1. Borehole Verticality

Figure 11 shows the deviation of BH02 from vertical. Over the full ~20 m of measured borehole depth there was a lateral deviation of ~0.5 m to the east. This deviation has been factored into the calculation of seismic wave paths and resulting P-wave and S-wave velocities.

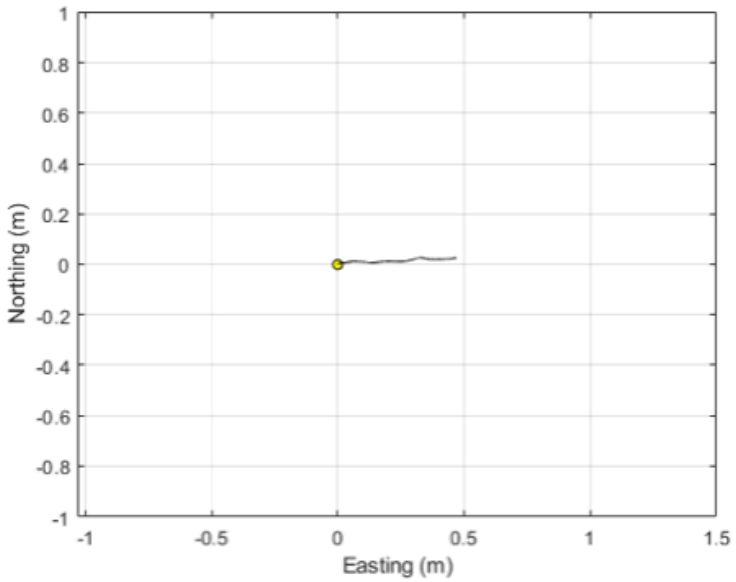


Figure 11: Plan view of BH02 deviation from vertical (top of BH02 set at coordinates 0,0 as identified by yellow circle).

4.2. P-wave

Figure 12 shows the interpreted P-wave arrival times against borehole depth from L1 and L2. Steeper gradients represent lower velocities whilst shallower gradients represent higher velocity material (except in the upper most 3 to 5 m where signal pathways are sub-horizontal).

The arrivals from L1 and L2 show excellent agreement with the similar arrival times and gradients. A slight change from a steeper gradient G1 to a shallower gradient G2 is observed at ~7.5 m depth, inferring an increase in P-wave velocity at that depth.

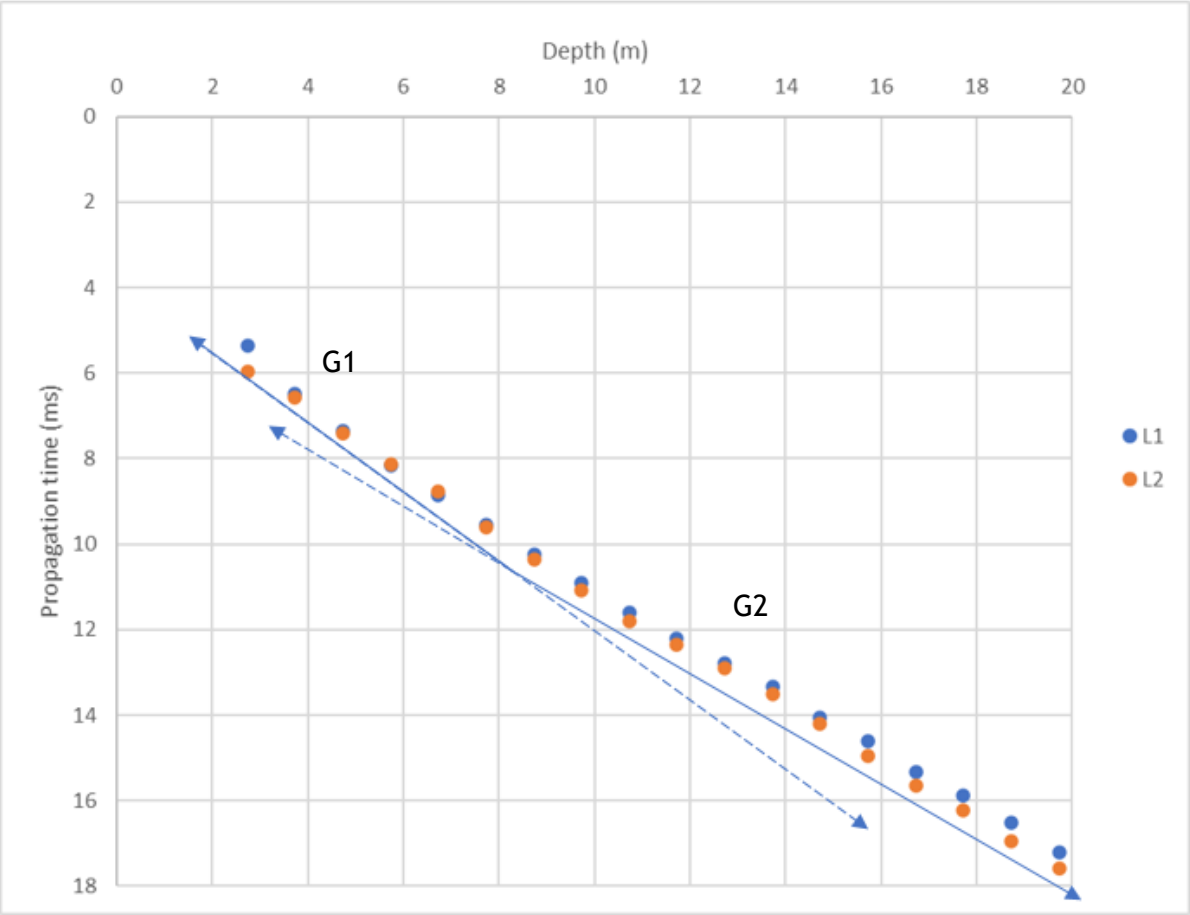


Figure 12: Comparison of L1 and L2 P-wave arrival times.

Figure 13 shows the calculated P-wave velocity profiles from L1 and L2, with information from the borehole log overlaid. Interval and gradient velocities from both shot locations are in excellent agreement with each other. Velocities differ at ~3 m depth (L1 = ~~700 m/s, L2 = ~1100 m/s) but are in agreement (~1200 m/s) by 6 m depth. They then steadily increase (through the thin peat and silt layers) to ~1600 m/s at ~13 m depth. Velocities remain constant (~1500 m/s) down to the deepest measurement at ~20 m depth. It should be noted that this matches the P-wave velocity of water, likely indicating the clay and sand layers are saturated and that this has a dominant effect on the bulk P-wave velocity of these layers.

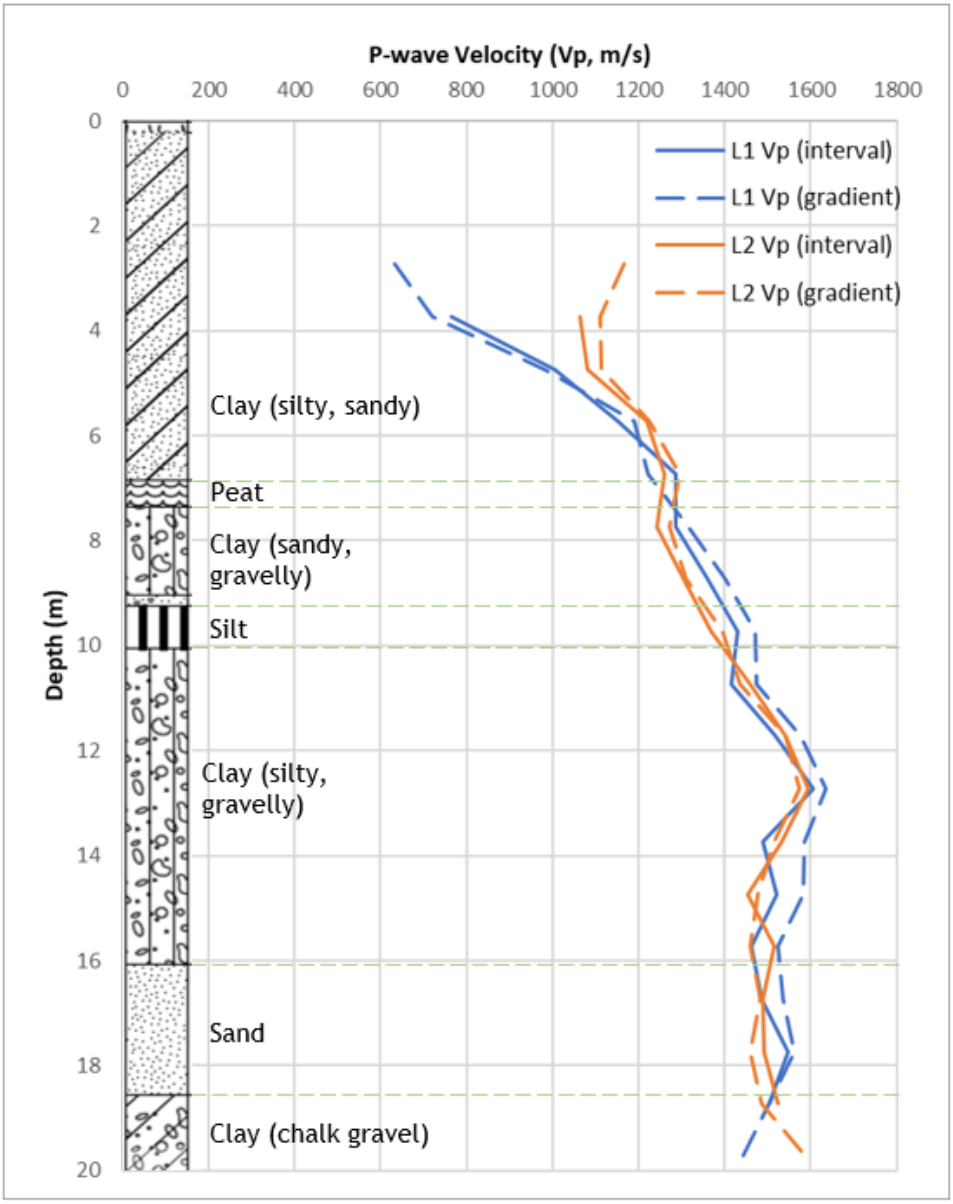


Figure 13: Calculated P-wave velocity profiles from L1 and L2. Borehole log information is overlaid.

4.3. S-wave

Figure 14 shows the interpreted S-wave arrival times against borehole depth from L1 and L2.

The arrival times show excellent agreement between L1 and L2 from surface to ~17 m depth, below which L1 arrival times are slightly (up to 5 ms) earlier than those from L2. This may indicate some anisotropy in the materials at this depth.

2 no. changes in gradient are observed. The first is from G3 (steeper) to G4 (shallower) at ~7 m depth, implying a significant velocity increase. The second is from G4 to a marginally steeper G5, implying a slight reduction in velocity below ~13 m depth.

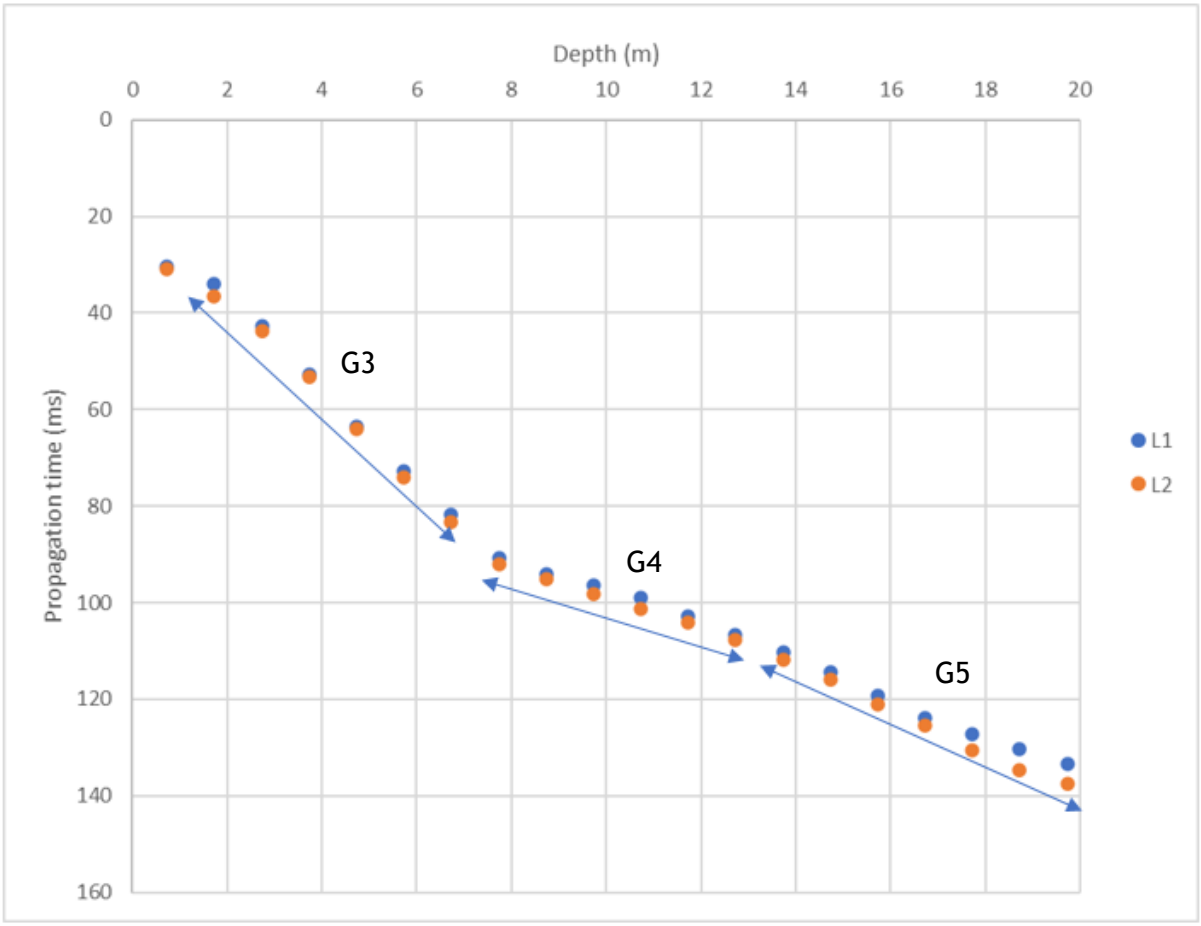


Figure 14: Comparison of L1 and L2 S-wave arrival times.

Figure 15 shows the calculated S-wave velocity profiles from L1 and L2, with information from the borehole log overlaid. Interval and gradient velocities from both shot locations are in excellent agreement with each other.

S-wave velocity is very low (<100 m/s) over the upper clay unit. Velocity then increases through the sandy gravelly clay to peak at ~350 m/s (from L2, ~9.5 m depth) in the logged layer of silt. Velocities then decrease steadily through the silty gravelly clay to ~200 m/s at ~16 m depth, before increasing through the sand and chalk gravel clay to >300 m/s.

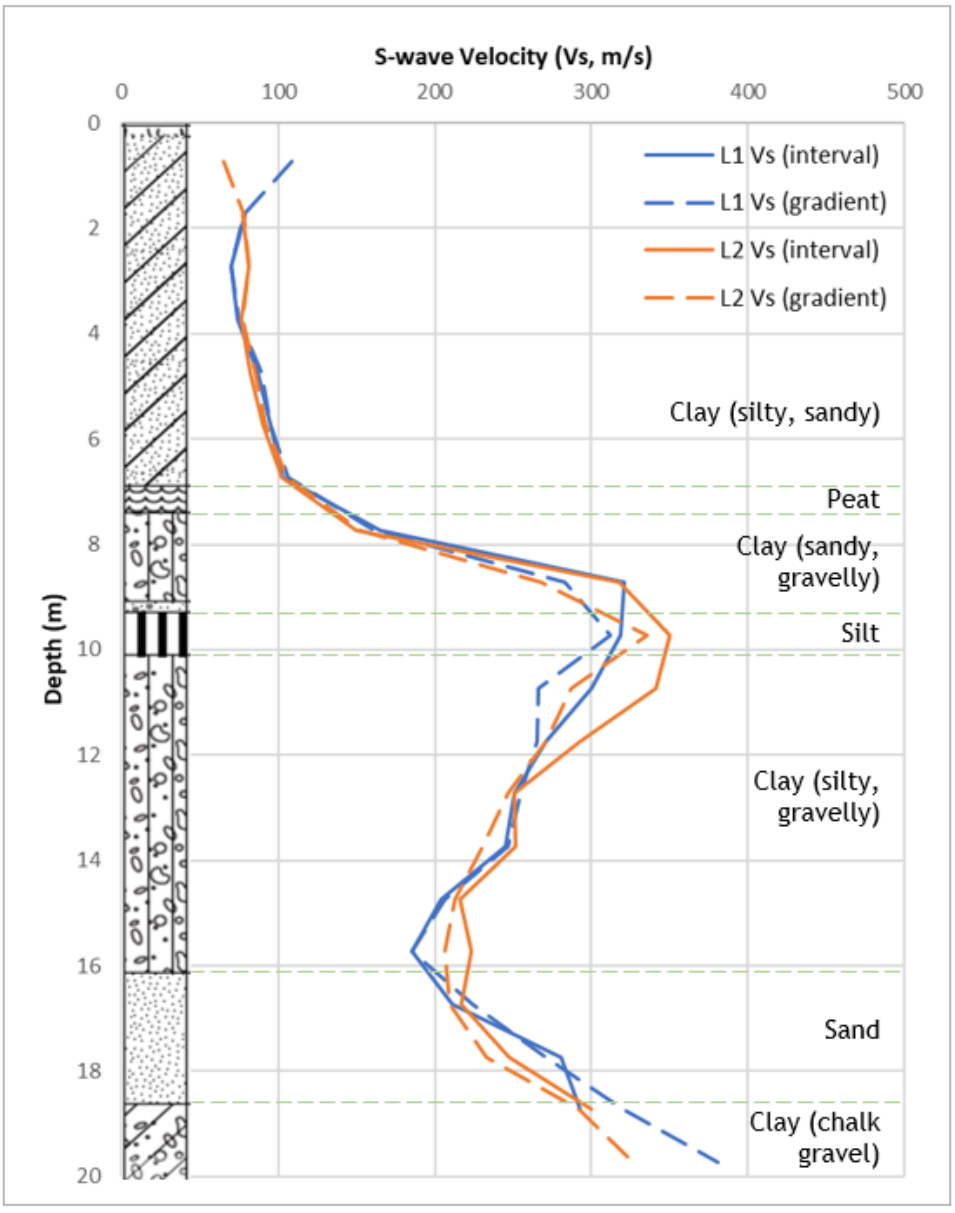


Figure 15: Calculated S-wave velocity profiles from L1 and L2. Borehole log information is overlaid.

5. Discussion

The measured P-wave and S-wave velocities have been compared to the lithological boundaries recorded in the borehole log. The geotechnical properties derived from these velocities have also been reviewed with reference to the lithological units and are presented in the accompanying Zetica spreadsheet P13272-23-XLS01-A.

The silty, sandy clay unit logged from surface to -4.6 mAOD was characterised by a wide P-wave velocity range (600-1200 m/s) and low (<100 m/s) S-wave velocity. Using assumed density values of 1800 kg/m^3, the Poisson's Ratio of this material is >0.49 (Figure 16).

The peat layer at -5.0 mAOD was not thick enough to have its velocities and resulting geotechnical parameters resolved by the downhole seismic survey.

The sandy, gravelly clay logged below -5.5 mAOD was characterised by increasing P-wave (1250 to 1400 m/s) and S-wave (~150 to ~300 m/s) velocities, with the resulting Poisson's Ratio dropping from 0.49 to 0.47.

The silt layer logged at ~-8.0 mAOD exhibited a P-wave velocity of 1300-1500 m/s and an S-wave velocity range of 300-350 m/s. The resulting Poisson's Ratio of between 0.465 (observed from L2 only) was the lowest Poisson's Ratio encountered.

The silty, gravelly clay between -8.0 and -14.0 mAOD was characterised by relatively constant P-wave velocity of 1500 m/s (consistent with that of water) and decreasing S-wave velocity from >325 to ~210 m/s. The Poisson's Ratio in this unit returns to and remains greater than 0.485.

The steady P-wave (~1500 m/s) and increasing (from 200 to 300 m/s) S-wave velocities of the sand layer (-14.0 to -16.5 mAOD) result in a Poisson's Ratio decreasing with depth from 0.49 to 0.48 through this layer.

Poisson's Ratio in the chalk-gravel clay and underlying chalk has not been resolved by the survey.

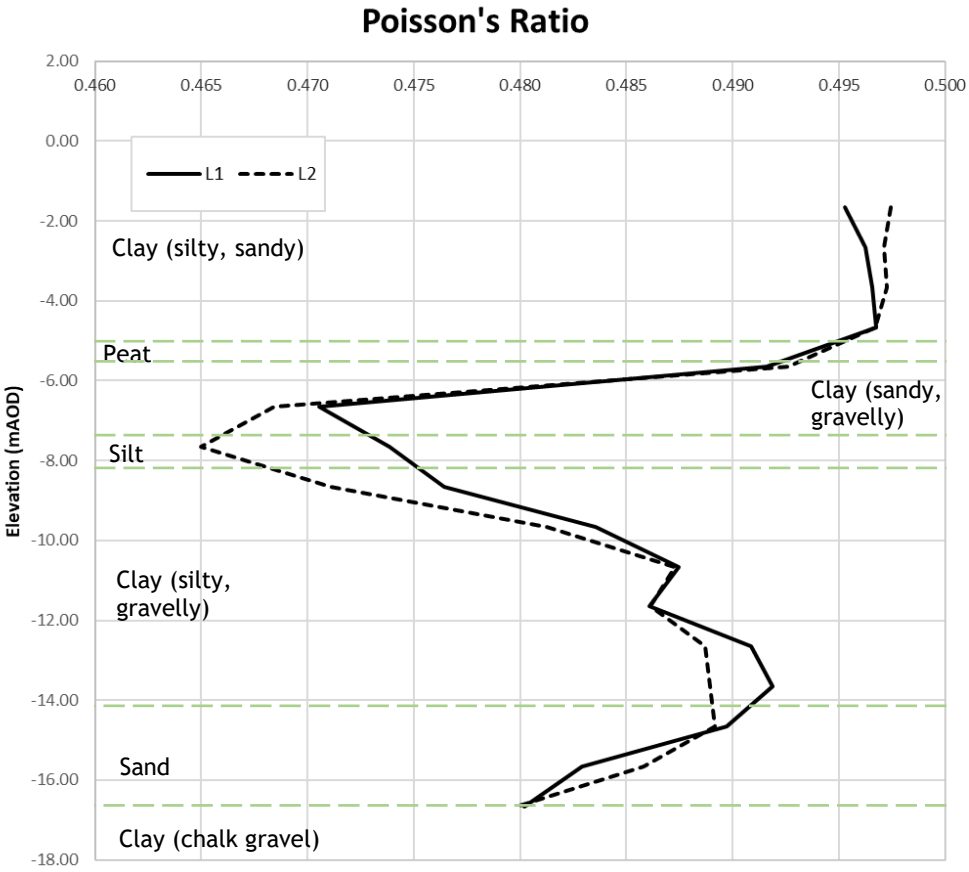


Figure 16: Poisson's Ratio calculated from the velocities derived from the L1 and L2 source locations, varying with elevation (mAOD).

6. Summary

P-wave and S-wave data quality was excellent from the downhole seismic survey at BH02.

P-wave velocity was observed to increase through the logged geology (varying clays, peat and silt) up to ~1600 m/s at ~13 m depth. P-wave velocity was then observed to decrease to and remain at ~1500 m/s, consistent with that of water, for the remainder of the surveyed depth range. This implies that the clays and sand below this point are highly saturated, and that this water saturation dominates the bulk P-wave velocity.

Low S-wave velocity (<100 m/s) was observed through clays until ~7 m depth before increasing to >325 m/s at ~9.5 m depth, peaking within the logged silt layer. The silt exhibited the lowest Poisson's Ratio (0.465) of the units encountered. S-wave velocities then decreased through silty, gravelly clays to ~200 m/s at ~16 m depth, before increasing again through sand and chalk-gravel clay towards the end of the borehole (maximum surveyed depth of ~20 m).

Appendix A Downhole Seismic Analysis

The interpretation methodology used was in line with the ASTM standard: D7400-19; Standard Test Methods for Downhole Seismic Testing.

P waves and S-waves were identified. P waves are typically the first departure of the static horizontal receiver trace after time T=0 (assuming coherent noise or other seismic wave phenomena are not present).

When P and S-waves are displayed simultaneously on the records, the S-waves can be typically identified by a sudden increase in amplitude and an abrupt change in frequency coinciding with the amplitude change. S-wave first arrivals were identified using combined records of positive and negative polarised S-waves for each depth.

Arrival times for P and S-waves were determined from the records as the lapsed time between time zero (activation of the seismic source) and the arrival of the respective wave trains at each of the receiver depths.

P and S-waves gradient velocities were calculated by linear regression of pathlength vs travel time data, over a 2.5 m pathlength window. Incremental (interval) velocities were obtained by dividing the measured distance between receivers R1 and R2 by the difference in arrival times at the two receivers.

Geotechnical parameter equations (CIRIA C562 - 2002; Geophysics in Engineering Investigations):

Shear modulus: $\mu = \rho(Vs)^2$

Young's modulus: $\mathrm{E} = \frac{\rho(Vs)^2\,(3Vp^2-4Vs^2)}{(Vp^2-Vs^2)}$

Poisson's Ratio: $\upsilon = \frac{(\frac{Vp}{Vs})^2-2}{2\,((Vp/Vs)^2-1)}$

Bulk modulus: $K = \frac{E}{3(1-2\upsilon)}$

ρ = density

Vp = P-wave velocity

Vs = S-wave velocity

Appendix B Notes

1. This report has been prepared in relation to the specific requirement of the contract or commission. The report should not be used by third parties without prior consultation with Zetica Ltd. Any advice, recommendations, or statements within the report should be addressed only in the context of the report as a whole.
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6. It should be noted that the detection performance is dependent on a measurable physical contrast between the item for detection and host materials. Where significant noise is present sufficient detection may not be possible.
7. Interpretation relies largely on experience of similar conditions. Site-specific conditions can create variations that may not be detectable by non-intrusive investigation techniques. It should be noted that the detail of an interpretation might vary from that identified by later intrusive investigation, although the general identification of a feature should not vary.
8. The report has been written in Line with relevant guidance and legislation in use at the time of report compilation. Subsequent improvement in techniques, changes in legislation, or changes in Site conditions, may render parts of this report obsolete. After a significant period (i.e. a year) it may be prudent to discuss the report and findings with us.

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