

Phase 2
Ground Investigation
(Disposal Land)

Client: Lidl Great Britain
Ltd

Glan Llyn, Newport

Report No: 1261.04.02

September 2024





Executive Summary

Remada Ltd was commissioned by Lidl Great Britain Ltd to conduct a Phase 2 Ground Investigation in land adjacent to a proposed store at a site at Glan Llyn, Newport. It is understood that the land will be disposed by Lidl for the construction of a nursery and other retail units. This report follows a Phase 1 Preliminary Risk Assessment (Remada report reference 1261.02.01 dated July 2024). Due to the findings of the initial investigation, the client instructed a subsequent phase of intrusive investigation as presented in this updated report which supersedes Remada's Report 1261.04.01.

Summary of Phase 1 Desk Study

The site comprised undeveloped agricultural fields until 1967 by which time the site and its surroundings were developed into a steelworks. The site itself comprised conveyors and ore stockpiles. The steelworks were demolished in the early 2000s and the land is being redeveloped into residences. At the time of writing the site is being used as a construction compound associated with this residential development. Geological mapping indicates the site to be directly underlain by superficial Tidal Flat Deposits, overlying bedrock of the Mercia Mudstone Group.

The superficial deposits are designated as 'Unproductive Strata', the Mercia Mudstone Group bedrock as a Secondary B aquifer. The site is not located within an Environment Agency-designated Source Protection Zone.

The site is not located within an area which may be affected by coal mining activity.

Intrusive Investigation

The investigation comprised five (5 No.) window sample boreholes beneath the proposed store footprint to a depth of 7m or refusal, and four (4 No.) beneath the delivery bay, HGV access and car park area. Four (4 No.) plate bearing tests were conducted within the proposed store footprint for a raft foundation design, and eight (8 No.) DCP CBR tests were conducted in the proposed car park. Four (4 No.) ground gas monitoring visits were undertaken.

Made Ground was encountered from ground surface levels comprising granular material with inclusions of anthropogenic material. Made Ground was found to overly very soft to firm blueish clay over peat. The maximum extent of the peat was not confirmed during the ground investigation, though it should be noted that peat was encountered from depths as shallow as 3.70m bgl. Geological mapping indicates the site to be underlain by superficial Tidal Flat Deposits, designated as unproductive strata, overlying bedrock comprising the Mercia Mudstone Group, a Secondary B Aquifer. The bedrock of the Mercia Mudstone Group was not encountered during the intrusive investigation.

Human Health Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

The proposed development comprises three (3 No.) commercial units and a new nursery which will include a garden area. To provide a conservative risk assessment of the proposed nursery garden, the results of chemical laboratory analyses were compared separately to the GAC appropriate to a commercial redevelopment and to a residential development without the potential for the consumption of homegrown produce. None of the determinants tested for were identified at concentrations exceeding the GAC for a commercial end-use, however within all samples analysed concentration of chromium were found to exceed the GAC for a residential development. A certified clean cover layer will therefore be required within the proposed nursery garden area.



Water Resources Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. Therefore, the risk to groundwater from contaminants within the made ground at the site is considered to be low and does not warrant further consideration.

Waste Classification

The results of the assessment indicated that contaminant concentrations within the Made Ground, were generally low though with concentrations of antimony and pH values within one of the two samples analysed classifying the soils as stable, non-reactive hazardous waste suitable for disposal within a non-hazardous landfill and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

Geotechnical Assessment

The Supplementary CPT investigation within comprised two (1 No.) probe within the footprint of the proposed nursery which refused at a depth of 13.39m. The presence of compacted Made Ground that forms St Modwen's builder's compound prevented penetration of the CPT rig into the underlying natural soils. CPT logs (CPT1 -CPT5) record high strength soil to a depth of 1m overlying soft organic deposits to a depth to 7m bgl overlying low strength silty sand/sandy silt and low strength silty clay / clayey silt which significantly increased in strength at between 11.1m bgl and 12.4m bgl and below 11.5m in CPT5. CPT refusal depths were between 12.5 and 13.1m bgl in CPT1-CTP4 and 13.4m in CTP5. CPT locations are indicated on **Figure 3**. Groundwater was not recorded within the Made Ground that forms the builder's site compound.

Preliminary estimated safe working loads have been tabulated within the report but are indicative only and specialist piling contractors should be consulted with regard to the design and performance of their piled foundations.

It is considered that the floor slab should be suspended on piled foundations.

A Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1 is considered appropriate for the location.

Ground Gas

The calculated GSV for monitoring wells that penetrate the underlying organic clay and PEAT below 4.2m would place the site into Characteristic Situation 2. However, the calculated GSV for WS208A which was installed to 2m bgl is less than 0.07 l/hr and would place the site into Characteristic Situation 1. Given that the natural CLAY prevents a direct pathway for ground gas with the PEAT and the proposed building, it is recommended that Characteristic Situation 2 protection measures should be adopted.



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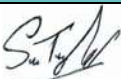
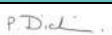
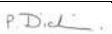
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Issue No	Date	Prepared By	Technical Review	Authorised
01	23.07.2024	S Taylor 	P Dickinson 	G Jones 
02	16.09.2024	G Jones 	P Dickinson 	G Jones 



1 INTRODUCTION

Remada Ltd was commissioned by Lidl Great Britain Ltd (hereafter 'the Client') to undertake a Phase 2 Ground Investigation for proposed retail units and a nursery with associated areas of car parking and soft landscaping on land located to the south of Bessemer Drive, Glan Llyn, Newport, South Wales NP19 4TZ, at the location indicated in **Figure 1**. Due to the findings of the initial investigation, the client instructed a subsequent phase of intrusive investigation as presented in this report which supersedes Remada's Report 1261.04.01.

1.1 Objectives

The objectives of this assessment are as follows:

- to examine whether there have been any potentially contaminative uses on the site or nearby land;
- to develop a conceptual model of the site to identify plausible pollutant linkages;
- to assess ground conditions in relation to the proposed development in relation to construction design issues including the presence, nature, likely severity and extent of soil and groundwater contamination, which may be present, its potential environmental impact and likely requirement for further work; and
- Provide preliminary foundation design recommendations for the proposed development.

1.2 Scope of Work

The scope and layout of this investigation and report is generally in accordance with BS10175:2011+A2 2017 and the Environment Agency's Land Contamination Risk Management guidance for land contamination reports.

The scope of work comprised:

- 5 No window sample boreholes to target depths of 7m including SPTs;
- 4 No window sample boreholes to target depths of 3m including SPTs;
- 3 No combined groundwater and gas monitoring standpipes installed with window sample boreholes;
- 4 No plate bearing tests to 300kPa for raft foundation design;
- 4 No California Bearing Ratio (CBR) tests;
- Suite of geotechnical classification and strength tests;
- 5 No chemical analysis for asbestos (quantitative), pH, Arsenic, Beryllium, Cadmium, Chromium (trivalent & hexavalent), Copper, Mercury, Nickel, Lead, Selenium, Vanadium, Zinc, Fraction of Organic Carbon, TPHCWG, PAH(16) and Phenol, including waste acceptance criteria (WAC) analyses.
- 4 No ground gas and groundwater monitoring visits at different atmospheric pressures; and
- Combined Factual & Interpretative Geoenvironmental Report.

The investigation methodology is presented in Section 3, Findings in Section 4 and the Exploratory Locations are indicated on **Figure 2**.

Due to the findings of the initial investigation, the client instructed a subsequent phase of intrusive works which comprised:



- 7 No Cone Penetrometer Test (CPT) Probe holes to a maximum depth of 15m;
- 4 No shallow ground gas monitoring wells;
- 4 No ground gas monitoring visits.

Supplementary Investigation Exploratory Hole Locations are indicated in **Figure 3**.

1.3 Proposed Development

It is understood that it is proposed to redevelop the site with 3 No retail units and a nursery with an enclosed garden area, with associated areas of car parking and soft landscaping as shown in **Figure 2**.

1.4 Previous Reports

The following Phase 1 Desk Study had been previously prepared for the site:

- Phase 1 Site Investigation & Preliminary Risk Assessment. Remada Ltd Report ref: 1261.02.01, issued in July 2024.

1.5 Limitations

The comments given in this report and the opinions expressed are based on the information reviewed and observations during site work. However, there may be conditions pertaining to the site that have not been disclosed by this assessment and therefore could not be taken into account.



2 SUMMARIES OF PREVIOUS REPORTS

2.1 Remada Phase 1 Report

The Executive Summary and Conceptual Site Model presented within Remada's Phase 1 Desk Study are reproduced below:

2.1.1 Site Setting

The site comprises an irregular plot north of A4810 Queen's Way and west of Kings Wall Drive. At the time of writing the majority of the site is vacant scrubland, with the northeast portion being used as a compound associated with the St. Modwen Homes residential development adjoining the site to the north-east. The yard is mainly used for car parking and the storage of construction plant and materials. Soil stockpiles were noted on-site during Remada's site walkover, likely comprising earthworks from the adjacent housing development. However, no permanent structures were noted on-site.

It is understood that it is proposed to develop approximately the southern two-thirds of the site with a new Lidl retail store. The northern third of the site has been designated as disposal land upon which it is proposed to develop a new nursery and 3 No retail units with associated car parking and landscaped areas. This Phase 1 Site Investigation & Preliminary Risk Assessment report focuses on the proposed Lidl store area of the site only.

2.1.2 Site History

The earliest available historical mapping of 1883 shows the site to comprise agricultural land, devoid of any structures. By 1967, the site had been redeveloped to comprise part of the wider ore stockpiling area for Spencer Steelworks. An east-west orientated conveyor bisected the northern area of the site, whilst a parallel roadway bisected the southern area of the site. Since the mapping of 2004 the site has remained vacant following the demolition of the steelworks. More recently parts of the study site have been used as a construction compound associated with the adjacent (off-site) residential development.

2.1.3 Geology / Hydrogeology

Published geological maps record that the site is underlain by superficial Tidal Flat Deposits, designated as Unproductive Strata, and bedrock of the Mercia Mudstone Group, designated as a Secondary (B) Aquifer. The site is not located within a groundwater Source Protection Zone (SPZ).

2.1.4 Mining

The site is located within an area which might not be affected by coal mining activity

2.1.5 Radon

The site is located in a Lower Probability Radon Area (less than 1% of homes are estimated to be at or above the action level). Consequently, no radon protective measures are considered necessary within the structural design of the proposed development.

2.1.6 Unexploded Ordnance (UXO) Risk

Freely available Zetica Unexploded Ordnance (UXO) risk mapping indicates the site to be located within an area where the bomb risk is 'Low'. Therefore, no UXO precaution measures are considered necessary for any subsequent intrusive investigation, based on the information available for the site to date.

2.1.7 Recommendations

Environmental

The desk study has identified a number of on-site and off-site potential sources of contamination that would require further investigation. The following is recommended:



- Investigation of the lateral and vertical extent of made ground/fill beneath the proposed store footprint;
- Collection of soil and groundwater samples from the areas identified above for contaminants of concern; and
- Ground gas monitoring.

Geotechnical

It is recommended that a ground investigation is undertaken to enable preliminary foundation design.

Given the records in the Coal Authority's Consultants Mining Report, it is not recommended that a Coal Mining Risk Assessment (CMRA) be required for the site. No further action is considered necessary at this stage relating to coal mining at and beneath the site.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground Investigation	Risk (Un-mitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation
<u>On-site Sources</u>				Direct Soil Ingestion	Yes	To be assessed (TBA)	Potential risk	(To be assessed (TBA))	(To be assessed (TBA))
General Made Ground				Indoor Dust ingestion	Yes	As above	Potential risk	TBA	TBA
Former ore stockpiles & conveyor associated with steelworks				Skin Contact with Soils	Yes	As above	Potential risk	TBA	TBA
Stockpiled construction materials				Skin Contact with Dust	Yes	As above	Potential risk	TBA	TBA
<u>Off-site Sources</u>				Inhalation of Outdoor Dust	Yes	As above	Potential risk	TBA	TBA
General Made Ground	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, Boron, TPH /PAH, PCBs	Disturbance due to construction plant causing direct contact, dusts, vapours.	Occupants of the development / building fabric	Inhalation of Outdoor Vapours	Yes	As above	Potential risk	TBA	TBA
Former Steelworks		Direct Contact with occupants of the proposed development		Inhalation of Indoor Vapours	Yes	As above	Potential risk	TBA	TBA
Electricity sub-station		Inhalation of fibres / vapours / gases by occupants of proposed development	Adjacent residents during construction	Inhalation of ground gas	Yes	As above	Potential risk	TBA	TBA
Residential properties				Inhalation of radon gas	No	Lower Probability Area	Negligible	None	Negligible
Llanwern Bull Public House				Ingestion via permeated water supply pipework	Yes	As above	Potential risk	TBA	TBA
		Permeation of water supply pipework		Direct contact with Unproductive Aquifer in Superficial Deposits	Yes	As above	Potential risk	TBA	TBA
		Leachate	Secondary B Aquifer	In-direct contact with Secondary (B) Aquifer in bedrock	Yes	As above	Potential risk	TBA	TBA
			Surface watercourses						

Table 1: Outline Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.



3 SITE WALKOVER

The opportunity was taken to inspect the proposed Lidl store site during the investigation and subsequent monitoring as recorded in the photographs below. The site was being used a builder's compound by St Modwen who were constructing the adjacent residential development. The extent of deposited waste, Made Ground and builders materials varied during the period of Remada's works.



Photo 1: View from proposed Lidl site area towards North/North-West and proposed Nursery from centre of site 10th June 2024.



Photo 2: View from proposed Nursery/Retail Units car park towards North/North-West and proposed Nursery from centre of site 10th June 2024.



Photo 3: View from location of proposed Nursery Unit car park towards North-East over location of proposed retail units 10th June 2024.



Photo 4: View towards South through zone of proposed retail units and car park 10th June 2024.



Photo 5: View towards West from St Modwen's site office 8th August 2024 over proposed car park zone to retail units and towards proposed Nursery.



4 ENVIRONMENTAL & GEOTECHNICAL INVESTIGATION METHODOLOGY

4.1 Investigation Strategy

The investigation comprised the drilling of nine (9 No.) windowless sampler boreholes on the 12th of June 2024; five (5 No.) of which were advanced within the footprint of the proposed nursery and retail units, and four (4 No.) within the proposed car park. Three (3 No.) plate bearing tests were performed; two (2 No.) of which were conducted within the proposed nursery footprint for a raft foundation design, as well as two (2 No.) DCP CBR tests within the footprint of the proposed nursery. Exploratory hole and test locations are indicated on **Figure 2**.

Four (4 No.) ground gas monitoring visits were scheduled for the site to provide the minimum required C665.

The supplementary investigation was carried out on the 8th August 2024 and broadly within the proposed Nursery footprint and proposed retail units car park as constrained by the activities and wastes of the construction site compound. The supplementary investigation comprised CPT probeholes to determine the depth of the competent strata at the locations indicated on **Figure 3**. Additional gas monitoring wells were installed with the proposed Lidl store zone.

All exploratory holes were logged by a suitably qualified Geo-environmental Engineer in general accordance with the recommendations of BS5930:2015+A1:2020. Detailed descriptions, together with relevant comments, are given in the **Exploratory Hole Logs**.

The weather conditions at the site during the fieldwork period were generally warm and dry, with no standing water nor slippery ground conditions being noted.

4.2 Intrusive Investigation

4.2.1 Initial Investigation

All nine (9 No.) of the window sample boreholes (WS201 – WS208A and WS209) were undertaken using a tracked window sampling rig and advanced to a target depth of between 3.0m and 7.0m below existing ground level (bgl). However, due to obstructions encountered at relatively shallow depths, three (WS207, WS208 and WS208A) out of the eight window sample locations were drilled to refusal which was between 1.0m and 2.50m bgl.

Combined Groundwater and Ground Gas monitoring standpipes were installed in WS201, WS205 and WS208A.

4.2.2 Supplementary Investigation

Two (2 No.) Cone Penetration Tests (CPT5 & CTP6A/B) were carried out on the 8th August 2024. CPT1 to CPT4 were located with the proposed Lidl store footprint. Probe locations were limited to locations where the CPT could penetrate the made ground fill and hardstanding that formed St Modwen's builder's compound.

A cone of 36mm diameter is pushed into the ground at a standard penetration rate by a set of hydraulic rams at a rate of two centimetres per second by a rig with a push of 10-20 tonnes. Cone resistance q_c , sleeve friction f_s , and porewater pressure u_2 are measured and recorded to classify soils and processing of the data enables the derivation of geotechnical properties.

Ground gas monitoring was carried out at WS208A and also at supplementary wells WS301-304 within the adjacent proposed Lidl development.



4.3 In-Situ Testing

4.3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) in the window samples were carried out at 1.0m intervals as recorded on the borehole logs to assess the relative density and consistency of soils.

SPTs were conducted in accordance with BS EN ISO 22476-3 and the recorded SPT N-values are summarised on the borehole logs.

The SPT N-values have been corrected based on the Energy Ratio of 68% for the SPT hammer on the window sampling rig. The SPT Hammer Energy Test Report, undertaken in accordance with BS EN ISO 22476-3:2005 is presented in **Appendix A**.

4.3.2 Hand Shear Vane

Hand shear vane tests were undertaken using an Impact SL810 and in general accordance with the manufacturer's instructions on selected samples of cohesive soils.

4.3.3 Plate Bearing Tests

Four plate bearing tests were carried in general accordance with BS EN 1997:2007 Annex K or IAN 73/06 to a minimum pressure of 300kN/m² using a 600mm diameter plate, at the locations in **Figure 2**. A 13-tonne 360 tracked excavator provided the reaction load. Test results are presented in **Appendix B**.

4.3.4 Dynamic Cone Penetrometer (DCP) Tests

Four (4 No.) DCP tests were conducted in order to determine California Bearing Ratio (CBR) values for near surface soils, at the locations on **Figure 2**. A known mass is dropped through a known distance to drive a cone into the ground. The penetration distance per blow is recorded in order to enable the CBR value to be calculated. Test results are presented in **Appendix C**.

4.3.5 Cone Penetrometer (CPT) Tests

One (1 No.) CPT tests was carried within the footprint of the proposed Nursery and one (1 No.) CPT was carried out adjacent to the proposed retail units at a accessible and penetrable location. CPT locations are indicated on Figure 3 and the findings are presented in **Appendix F**.

The tests were carried out in accordance with the *International Standard for Electrical Cone and Piezocone Penetration Test ISO 22476-1:2022(E)*. The final depths of the tests were determined by either completion to the specified test depth or when the maximal safe capacity of the equipment was reached.

4.4 Soil Sampling

4.4.1 Environmental

Made ground and natural soils were selected by visual and olfactory means for subsequent analysis. Samples for chemical laboratory testing purposes were collected in amber glass jars, amber glass vials and plastic tubs and retained in a cool box for transport to the laboratory.

4.4.2 Geotechnical

Geotechnical samples were collected at depths indicated on the window sample logs with samples retrieved from within a sleeve line. The disturbed samples were placed in sealed and correctly



labelled plastic tubs or bags as appropriate. All geotechnical samples were dispatched to the laboratory for testing with a completed chain of custody.

4.5 Gas & Groundwater

4.5.1 Installations

Combined ground gas and groundwater monitoring standpipes were installed in selected wells with a 50mm diameter slotted HDPE pipe and packed with gravel surround as recorded on the exploratory logs. Wells were completed with 0.5 to 1.0m of plain HDPE pipe and bentonite seal, with a gas bung and tap being installed at the top of the pipe.

4.5.2 Monitoring

Ground gas monitoring was undertaken using a GasData GFM436 gas analyser for the parameters reported below. Groundwater levels were measured with a GeoSense OWP30 oil water interface probe.

Permanent ground gas monitoring involved the measurement of the following in the prescribed order:

- Pressure difference between the monitoring well and the atmosphere;
- Peak and steady flow rates of gas into or out of the monitoring well;
- Peak and steady concentrations of carbon dioxide, methane, oxygen (minimum and steady recorded), carbon monoxide, hydrogen sulphide; and
- Depth to groundwater.

Four ground gas monitoring visits were undertaken as a minimum required for a commercial development in accordance with CIRIA C665. Ground gas concentrations were recorded on the 18th of June and the 3rd, 9th, and 16th of July 2024 at WS205, WS202 and WS208A and the results are presented in **Table 2a**.

Four additional ground gas monitoring visits were undertaken on 16th, 23rd, 29th August and 19th September at WS028A and the results are presented in **Table 2b**.

4.6 Quality Assurance and Quality Control

All samples were submitted to a United Kingdom Accredited Laboratory (UKAS) under a completed chain of custody. The laboratory carried out its own QA/QC programme to ensure that the quality of the analytical data conformed to the appropriate test method protocols.

4.7 Laboratory Analysis & Testing

4.7.1 Chemical Analysis – Soil

Five (5 No) soil samples were scheduled for the analysis of asbestos, arsenic, barium, beryllium, cadmium, chromium (III & VI), copper, mercury, nickel, lead, selenium, zinc, fraction of organic carbon, Total Petroleum Hydrocarbons (TPHCWG), Polyaromatic Hydrocarbons (PAH), BTEX compounds (benzene, toluene, ethylbenzene and xylene) and phenols.

In addition, two (2 No) samples were scheduled for Waste Acceptance Criteria (WAC) analysis and two asphalt samples scheduled for PAH-17 analysis.

The results of laboratory chemical analyses are presented at **Appendix D**.



4.7.2 Geotechnical

Samples recovered from the boreholes were submitted to an accredited laboratory for the following tests in general accordance with BS1377:1990:

- 5 No Natural Moisture Contents
- 5 No Plasticity Indices
- 2 No Particle Size Distribution (PSD) tests; and
- 2 No BRE SD1 suites.

The results of the geotechnical testing are presented at **Appendix E**.



5 GEOTECHNICAL & ENVIRONMENTAL INVESTIGATION FINDINGS

5.1 Ground Conditions

A brief description of the published geology is provided together with a summary of the ground conditions encountered during the intrusive investigation. Exploratory logs are presented at the end of the report.

5.1.1 Published Geology

Published geological mapping indicates the site to be directly underlain by superficial Tidal Flat Deposits. The British Geological Survey (BGS) describe these as typically comprising *'a consolidated soft silty clay, with layers of peat, sand and a basal gravel. A stronger, desiccated surface zone is sometimes present'*.

The bedrock underlying the site is formed of the Mercia Mudstone Group. The BGS describes the stratum as typically comprising *'dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basal areas. Thin beds of gypsum/anhydrite are widespread; thin sandstones are also present'*.

The superficial deposits are designated as 'Unproductive Strata', the Mercia Mudstone Group bedrock as a Secondary B Aquifer. The site is not located within an Environment Agency-designated groundwater Source Protection Zone.

5.1.2 Made Ground

Made Ground was encountered within all of the exploratory holes located within the proposed Lidl development site. Made Ground was typically encountered as reworked natural material with anthropogenic inclusions predominantly comprising demolition material with rare industrial by-products (slag). Made Ground was encountered from ground surface levels or below topsoil to depths ranging from 1.0 to 4.7m bgl, though the base of the Made Ground was not encountered within exploratory holed WS206, WS207, WS208, and WS208A.

5.1.3 Superficial Deposits

Tidal flat deposits were encountered as very soft to firm blueish-grey, locally mottled brown, clay overlying pseudo-fibrous peat which was encountered from depths of 4.00 to 4.90m bgl to depths exceeding 7.00m bgl.

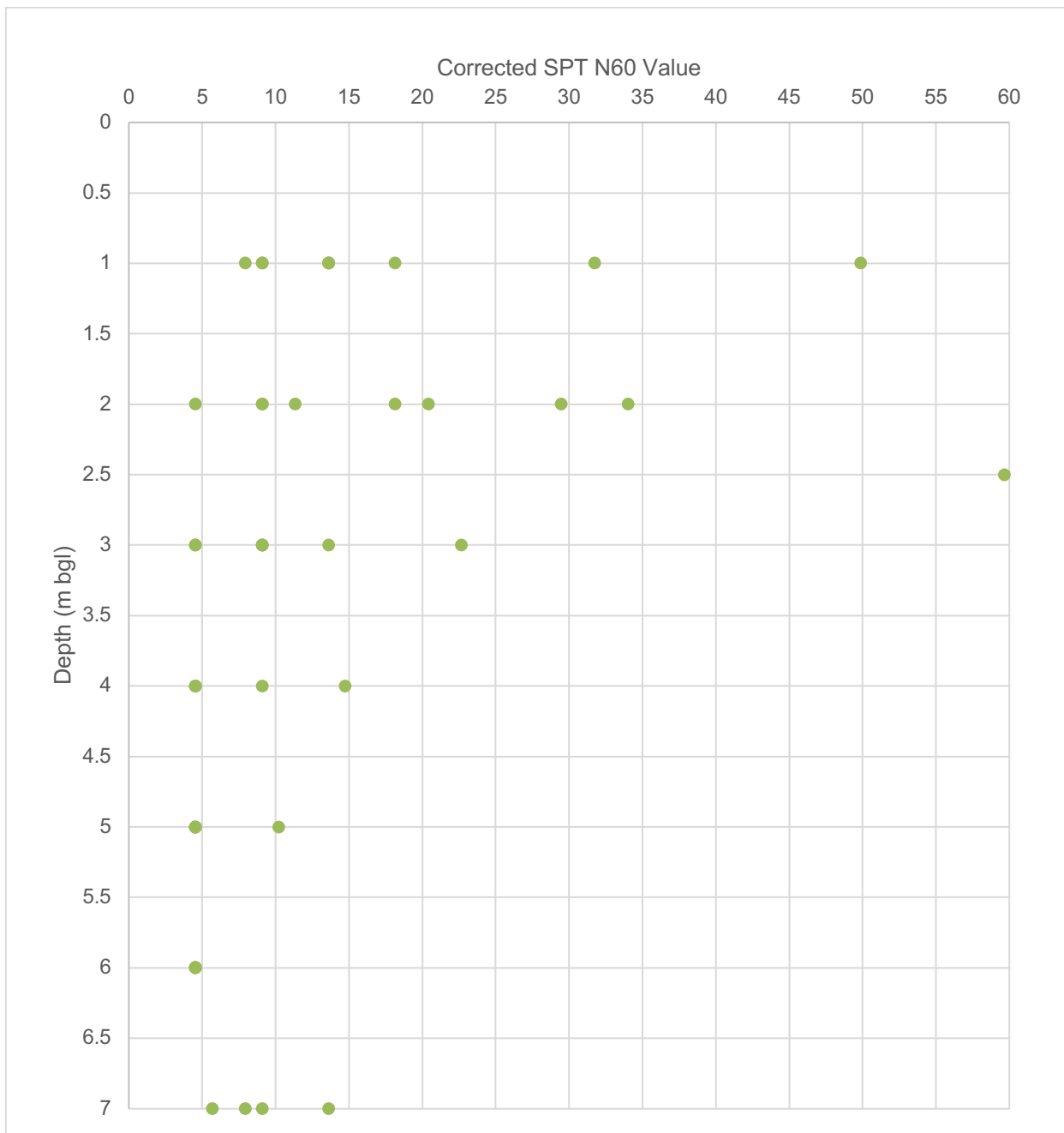
5.1.4 Bedrock

Bedrock was not positively identified during the course of Remada's investigation.

5.2 In-situ Testing

5.2.1 Standard Penetration Tests (SPTs)

In-situ SPTs were undertaken to assist with the interpretation of strata encountered. The results of corrected N-values versus depth are plotted in the graph below:



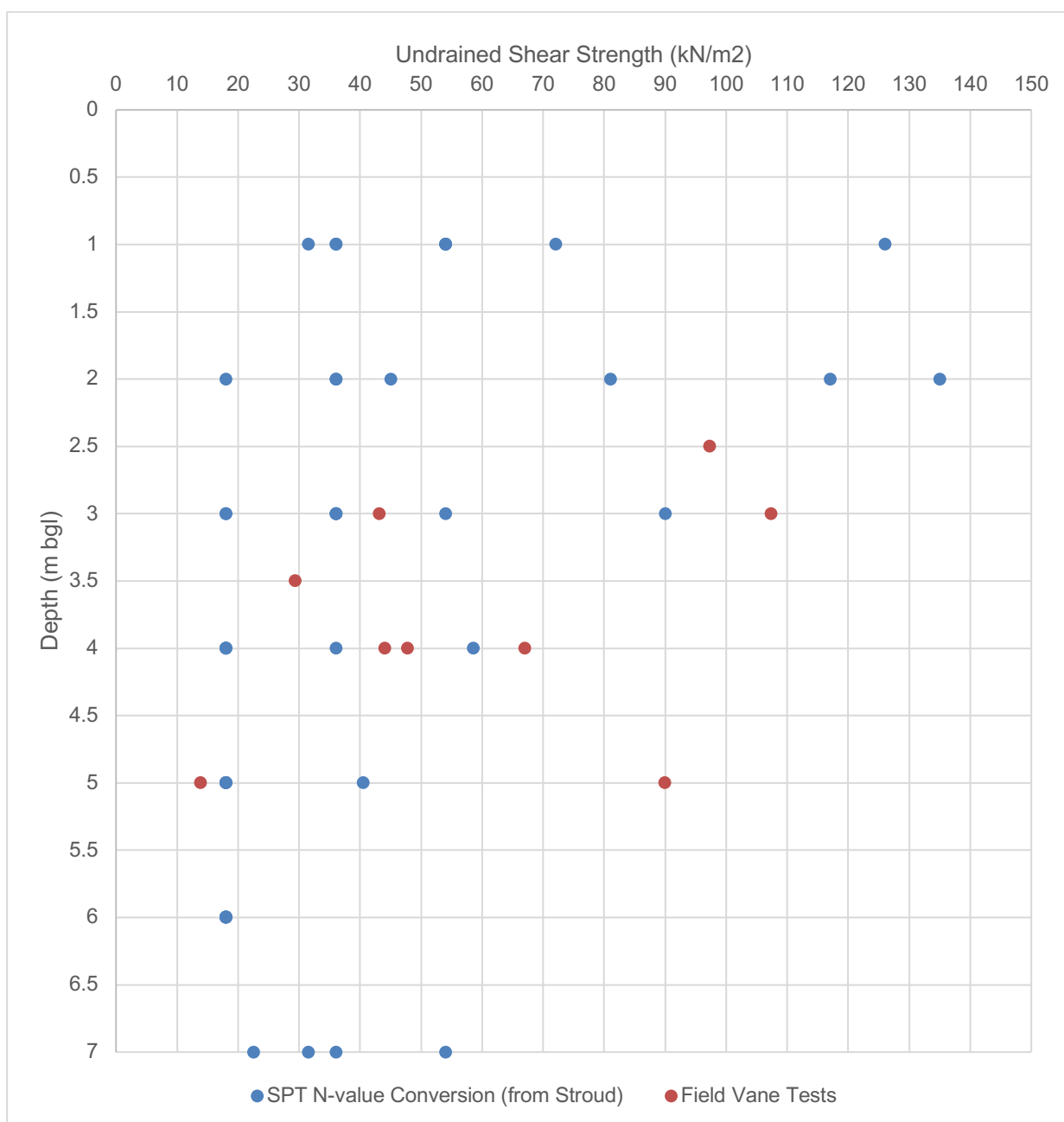
Graph 1: Plot of Corrected SPT N-Values Versus Depth

Undrained shear strengths have been estimated from SPT N values using the relationship developed by Stroud (*The standard penetration test in incentive clays and soft rocks*) and summarised in Tomlinson where:

$$\text{Mass shear strength} = f_1 \times N$$

Where f_1 is based on the plasticity index.

A Plasticity Index of 30% has been assumed (based on geotechnical laboratory testing) which equates to an f_1 factor of 4.5.



Graph 2: Plot of Mass Shear Strength Versus Depth.

5.2.2 Hand Shear Vane

Within the tidal flat deposits encountered, HSV results ranged between 18kPa (in WS201 at 5.00m) and 107kPa (in WS205 at 3.00m bgl). The hand shear vane test results have been plotted along with the results interpreted from the SPT N values in **Graph 3**.

5.2.3 Plate Bearing Test

The results of the three (3 No.) plate bearing tests on sub-base and subsoil within the footprint of the proposed Lidl store produced K762 values of 106 to 366kN/m²/m, with equivalent CBR values ranging from 18% to >100%. The results of the plate bearing tests are presented in **Appendix B**.



5.2.4 CBR Tests

The results of the DCP tests undertaken within the proposed car park area and beneath the store footprint produced values of between c. 3 and 17% within the upper 500mm.

5.2.5 CPT Tests

CPT logs and derivations are presented in **Appendix F**.

5.3 Soil Observations

Made Ground was recovered at all locations as a heterogeneous granular material containing a variety of man-made materials including brick, concrete and slag.

There were no visible or olfactory indicators of contamination within the sampled soils.

5.4 Groundwater Observations

Groundwater was not encountered during the course of the intrusive investigation. Groundwater levels within the monitoring wells were found to range from between 0.41 and 2.60m bgl.

5.5 Chemical Analysis

Results of the soil chemical analysis are presented in **Table 3** and summarised as follows.

The average FOC and pH were 0.014 and 8.9 respectively. Asbestos was not detected in the samples analysed. Detectable concentrations of metals were identified, although these are generally within the range that would typically be expected for Made Ground.

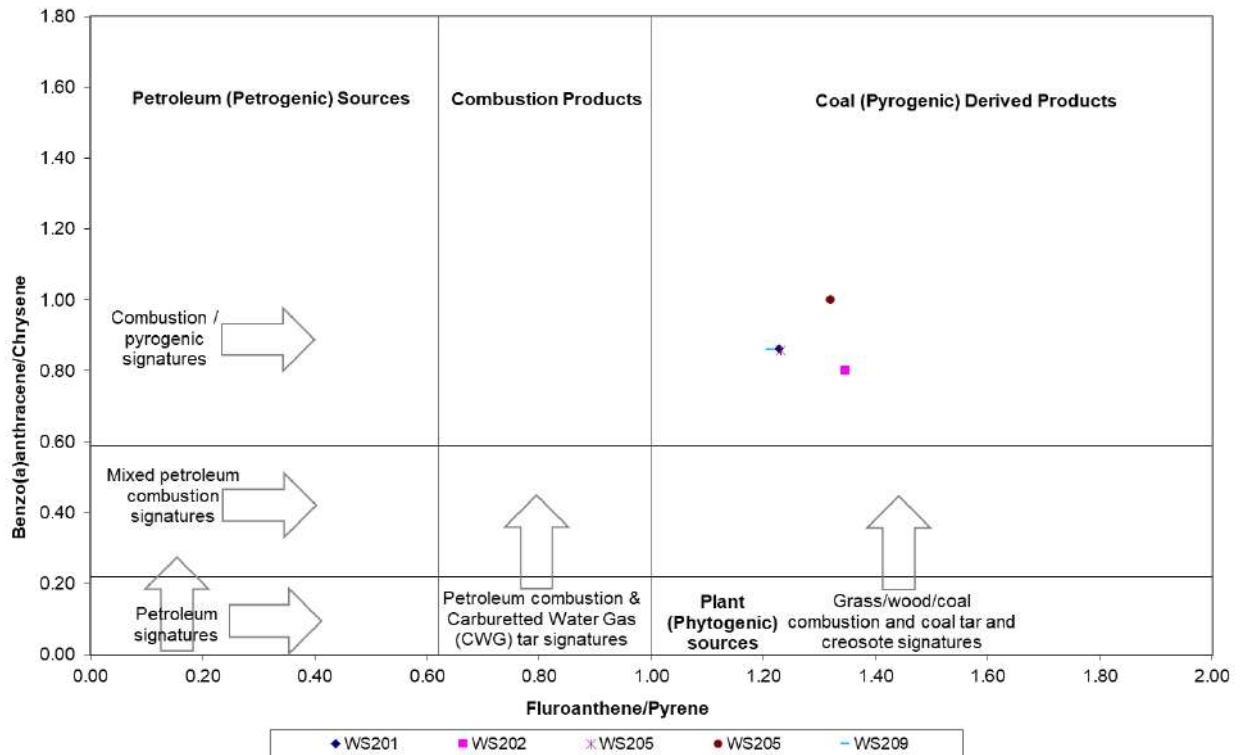
The concentrations of metals did not exceed the GAC appropriate for a commercial end use, however, for the purpose of assessing the suitability of the soils for the proposed nursery garden, these were also compared to the GAC for a residential end-use without the potential for the consumption of homegrown produce. Concentrations of trivalent chromium were found to exceed this GAC in all the samples analysed. None of the other determinants tested for exceeded the GAC for a residential end-use.

Concentrations of PCBs were found to be below the laboratory limit of detection (LoD) within all samples analysed.

Concentrations of TPH were detected above method detection limit (MDL) within all samples analysed. The hydrocarbons detected were heavy end hydrocarbons in the C12 to C35 carbon range.

Concentrations of PAHs were generally low (<5 mg/kg). A maximum concentration of total PAHs of 36.4 mg/kg was encountered in a sample recovered from exploratory hole WS202 at 0.80m bgl.

In addition, the PAH concentrations have been plotted on a double ratio plot to provide an indication of the likely source of the PAHs. All the samples that had detections of the five PAHs used have been plotted and all are indicated to be associated with coal derived (pyrogenic) likely associated with the former on-site steelworks.



Graph 3: PAH Double Ratio Plot

5.6 Geotechnical Testing

Results of the geotechnical testing are summarised below.

5.6.1 Plasticity Testing

Plasticity testing was undertaken on five samples of cohesive soils recovered from the window sample boreholes, with the results ranging between 20% and 40%. These indicate the soils to be of intermediate (CI) to very high (CV) plasticity and low to high volume change potential as summarised in the table below:

Location	Depth (m)	Plasticity Index (%)	Passing .425mm (%)	Modified Plasticity Index	Volume Change Potential
WS201	1.5	35	93	32.6	Medium
WS202	2.0	20	86	17.2	Low
WS203	4.7 – 5.0	39	100	39.0	Medium
WS205	3.0	36	100	36.0	Medium
WS209	2.6 – 3.0	40	100	40.0	Medium / High

Table 4: Plasticity Indices and Volume Change Potentials of the Cohesive Strata

5.6.2 Particle Size Distribution (PSDs)

The PSD tests revealed the following:

- The bulk sample from WS201 at 3.0 – 4.0m comprised brown slightly gravelly slightly sandy CLAY.



- The bulk sample from WS202 at 1.2 – 2.5m comprised brown gravelly very sandy CLAY.

5.6.3 BRE SD1 Analysis

The water-soluble sulphate contents varied from 0.081 to 0.098 g/l in the two soil samples analysed with pH varying from 8.3 to 8.6. The total sulphur content varied from 0.020 to 0.028% and total sulphate (as SO₄) varied from 0.060 to 0.084%.

5.7 Ground Gas Monitoring Results

5.7.1 WS201, WS205 & WS208A

WS201, WS205 were installed with response zones from 1.0m to 6.0 m bgl through a soft CLAY and pseudo-fibrous PEAT below 4.2m bgl. WS208A was installed to a depth of 2.0m within Made Ground.

The results of the ground gas and groundwater monitoring are summarised below:

- A maximum steady state concentration of methane was recorded as of 38.7% v/v in WS205 on 16th July 2024.
- A maximum steady state concentration of Carbon Dioxide was recorded as 3.7% v/v in WS201 on 3rd July 2024.
- A minimum steady stated concentration of Oxygen was recorded 1.2 % v/v in WS208A on 3rd July 2024.
- Ground gas flow rates were recorded at a maximum of 60 litres per hour (l/hr) in WS101 on 16th July 2024.
- Groundwater was encountered in all monitoring wells at between 0.41m and 2.270m bgl.
- Atmospheric pressure at the time of sampling varied between a high of 1011 millibar (mbar) on 18th June 2024 and a low of 1003 of 3rd July 2024. The monitoring visits were undertaken during periods of rising, steady and falling pressure trends over the preceding forty-eight hours.

5.7.2 WS208A

Supplementary ground gas monitoring was carried out in WS208A whilst monitoring within the adjacent Lidl store footprint.

The results of the ground gas and groundwater monitoring are summarised below:

- A maximum steady state concentration of methane was recorded as of 0.0% v/v.
- A maximum steady state concentration of Carbon Dioxide was recorded as 0.2% v/v on 23rd August 2024.
- A minimum steady stated concentration of Oxygen was recorded as 4.0 % v/v on 29th August 2024.
- Ground gas flow rates were recorded at a maximum of 0.0 litres per hour.
- Atmospheric pressure at the time of sampling varied between a high of 1015 millibar (mbar) on 29th August 2024 and a low of 1001 of 23rd August 2024. The monitoring visits were undertaken during periods of rising, steady and falling pressure trends over the preceding forty-eight hours.



6 GENERIC QUANTITATIVE RISK ASSESSMENT

6.1 Human Health Risk Assessment

In order to provide an up to date assessment of the risks to human health, Remada has adopted the most recent Generic Assessment Criteria (GAC) published by LQM/CIEH (S4ULs) and CL:AIRE/EIC/AGS for the assessment of potential risks to human health. The derivation of GAC, methodology, input parameters and technical guidance (CLEA) may be obtained upon request.

The proposed site layout for the retail units, nursery and car park is presented in **Figure 3**.

Default parameters have been adopted for sandy loam of pH 7 and commercial land use. FOC ranged from 0.0075 to 0.0300 giving a Soil Organic Matter (SOM) content range of between 0.17 to 5.17% with an average result of 2.57%. To present a conservative assessment, the SOM content of 2.5% has been adopted for the assessment.

The depth to potential sources of contamination for indoor air pathways has been assumed to be 0.5m below building foundation level. The source has been conservatively assumed to be at ground level for outdoor air and direct contact pathways.

For commercial land use the CLEA version 1.06 critical receptor is conservatively modelled as a female working adult with an exposure duration of 49 years. In accordance with the default parameters, it was assumed that employees spend most of their time indoors and that 80% of outdoor area is covered by hardstanding. As such, the potential exposure pathways have been assumed to be:

- Direct Soil and Indoor Dust Ingestion;
- Skin contact with soils and dusts;
- Inhalation of indoor and outdoor dusts and vapours.

Where GAC values for individual TPH fractions are not exceeded, the potential additive effect has been assessed by calculating overall TPH hazard index for each sample.

To give a conservative assessment for the proposed nursery garden, the results have also been compared to the GAC for a residential end-use without the potential for the consumption of homegrown produce.

Default parameters have been adopted for sandy loam of pH 7 and residential end use with homegrown produce. FOC ranged from 0.0058 to 0.14 giving a Soil Organic Matter (SOM) content range of between 1.0% and 24.1%, with an average result of 10.61%. To present a conservative assessment, the SOM content of 6% has been adopted for the assessment.

The depth to potential sources of contamination for indoor air pathways has been assumed to be 0.5m below building foundation level. The source has been conservatively assumed to be at ground level for outdoor air and direct contact pathways.

For residential land with home grown produce the CLEA version 1.06 critical receptor is conservatively modelled as a female child of age 0 to 6. In accordance with the default parameters, it was assumed that the child would spend most of their time indoors and have frequent short duration direct contact with garden soils. As such, the potential exposure pathways have been assumed to be:

- Direct soil and indoor dust ingestion.
- Consumption of home grown produce.
- Skin contact with soils and dusts.



- Inhalation of indoor and outdoor dusts and vapours.

Where GAC values for individual TPH fractions are not exceeded, the potential additive effect has been assessed by calculating overall TPH hazard index for each sample.

6.2 Comparison of Soil Analysis Results with Human Health GAC

6.2.1 Proposed Retail Units, Car Parking, and Nursery Building (commercial end-use)

A comparison of soil chemical analysis with GAC for a commercial end-use is presented as **Table 3A**.

TPH, PAH & BTEX

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Metals & Inorganics Excluding Asbestos

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Asbestos

There was no asbestos detected in the samples selected for analysis.

6.2.2 Proposed Nursery Garden (residential end-use without homegrown produce)

A comparison of soil chemical analysis with the GAC for a residential end-use without the potential for the consumption of homegrown produce is presented as **Table 3B**.

TPH, PAH & BTEX

None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Metals & Inorganics Excluding Asbestos

Concentrations of trivalent chromium (Cr^{III}) were found to exceed the GAC for a residential end-use without the potential for the consumption of homegrown produce within all the soil samples analysed, ranging from 33 to 81mg/kg, compared to a GAC of 6mg/kg. None of the other analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

Asbestos

There was no asbestos detected in the samples selected for analysis.

6.3 Controlled Waters Risk Assessment

6.3.1 Sensitivity – Groundwater

The site is not indicated to be within a Groundwater Source Protection Zone. The superficial Tidal Flat Deposits underlying the site are designated as unproductive strata, and the Mercia Mudstone Group bedrock underlying the site is designated as a Secondary 'B' Aquifer. There are no groundwater abstractions recorded within 1km of the site.

6.3.2 Sensitivity – Surface Waters

The nearest surface water feature is a stream/inland river bounding the site to the northwest. There are no surface water abstractions recorded within 1km of the site.



Investigation has revealed that the site is underlain by unproductive strata in the superficial deposits and Secondary B Aquifer in the bedrock.

6.3.3 Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range that would be expected for 'typical' Made Ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. Concentrations of PCBs were below the limit of detection within all samples analysed.

The groundwater was encountered at depths of between 0.41m and 2.60m bgl during the monitoring programme.

Post-development, the site will continue to be predominantly covered by a retail building and areas of hardstanding. Consequently, the risk of leaching of contaminants as a result of infiltration of groundwater is limited. Therefore, the risk to controlled waters from contaminants within the Made Ground and natural soils at the site is considered to be low and does not warrant further consideration at this stage.

6.4 Ground Gas Assessment

In order to understand the gassing regime at the site, a Characteristic Situation (as defined in CIRIA C665 and BS8576:2013) is determined for the site. CIRIA C665 and BS8576 provides definitions for each Characteristic Situation based on Gas Screening Values (GSV) which are calculated as follows:

- $GSV = \text{Gas Concentration (\% v/v)} \times \text{Measured Borehole Flow Rate (l/hr)}$

BS8576 makes a distinction between the GSV and the Hazardous Gas Flow Rate (Q_{hg}) which is also calculated using the above calculation. BS8576 states that Q_{hg} is calculated for each individual borehole for each monitoring visit, whereas the GSV is taken as the representative value for the site or site zone.

As a worst case assessment, the GSV for the site is therefore taken as the maximum steady-state carbon dioxide/methane concentration recorded in the boreholes which is multiplied by the maximum flow rate recorded during the same monitoring event.

WS201, WS205 were installed with response zones from 1.0m to 6.0 m bgl through a soft CLAY and pseudo-fibrous PEAT below 4.2m bgl and for which:

- Methane GSV = $38.7\% \times 0.1 \text{ l/hr} = 0.039 \text{ l/hr}$
- Carbon Dioxide GSV = $3.7\% \times 0.1 \text{ l/hr} = 0.0037 \text{ l/hr}$

WS208A was installed to a depth of 2.0m within Made Ground and for which:

- Methane GSV = $0.1\% \times 0.1 \text{ l/hr} = 0.0001 \text{ l/hr}$
- Carbon Dioxide GSV = $0.2\% \times 0.1 \text{ l/hr} = 0.0002 \text{ l/hr}$ (a minimum value of 0.1% has been adopted).



The calculated GSV for WS201 & WS205 would place the site into Characteristic Situation 2. However, the calculated GSV for WS208A is less than 0.07 l/hr and would place the site into Characteristic Situation 1.

Given that the natural CLAY prevents a direct pathway for ground gas with the PEAT and the proposed building, it is recommended that Characteristic Situation 2 protection measures should be adopted.

It is anticipated that the proposed Nursery would be a private or commercial building of Type B and at a site classified as Characteristic Situation 2 the required minimum gas protection score for a low risk site in accordance with BS 8485:2015+A1:2019 (Table 4) is 3.5. For proposed retail units of Type C and at a site classified as Characteristic Situation 2 the required minimum gas protection score for a low risk site in accordance with BS 8485:2015+A1:2019 (Table 4) is 2.5. Appropriate forms of floor and substructure designs are listed Table 5 of BS 8485:2015+A1:2019; it is likely that structural barriers, ventilation and a ground gas membrane would comprise suitable mitigation measures.

6.5 Revised Conceptual Site Model

A revised Conceptual Site Model is presented as **Table 4** below.

6.6 Waste Classification & Waste Acceptance

Waste classification has been undertaken following guidance set out in WM3 EA Technical Guidance 'Guidance on the classification and assessment of waste', 1st Edition, Version 1.2GB, October 2021. The results of this assessment determine the appropriate List of Waste (LoW) Code and whether the waste should be classified as hazardous or non-hazardous. Classification is undertaken using the results of solid (total) analyses and not on the results of the WAC analyses.

Once the waste has been classified as either hazardous or non-hazardous then the WAC testing determines if the waste meets the requirements for disposal in the required landfill. Therefore, If the waste is classified as hazardous waste, then the waste would also need to meet the hazardous waste WAC requirements to be disposed of in a hazardous waste landfill. However, if the final destination of the waste is not to landfill then WAC analysis is not required.

The WAC testing also allows for a distinction to be made between inert and non-hazardous waste. Waste that does not fall within the hazardous waste category and meets the requirements for disposal in an inert landfill can therefore be disposed of in an inert landfill. However, waste that does not meet the requirements for inert landfill will need to be disposed of in a non-hazardous landfill. In certain circumstances hazardous waste can be disposed of in a designated cell within a non-hazardous landfill. In this case the waste would need to meet more stringent leachate requirements for stable non-reactive hazardous waste.

6.6.1 Waste Classification

The results of the assessment indicated that contaminant concentrations within the Made Ground, were generally low though with concentrations of antimony and pH values within one of the two samples analysed classifying the soils as stable, non-reactive hazardous waste suitable for disposal within a non-hazardous landfill and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

6.6.2 Waste Acceptance

Waste Acceptance Criteria (WAC) analysis was undertaken on two samples of Made Ground. The assessment indicated that the sample recovered from exploratory hole WS202 at 0.80m bgl met



the requirements for disposal in a non-hazardous landfill as stable, non-reactive hazardous waste. The sample of Made Ground recovered from exploratory hole WS205 at a depth of 1.0m bgl met the requirement for disposal in an inert landfill.

6.7 Health & Safety Considerations

To ensure direct exposure of construction workers involved in the site redevelopment to any impacted contaminated shallow soils is minimised, the guidance stated in HSG 66 "Protection of Workers and the General Public During Redevelopment of Contaminated Land" should be followed.



Potential Source Areas	Potential Contaminant of Concern	Pathways	Potential Receptor	Exposure Route (Human unless otherwise stated)	Potential Identified Linkage (unmitigated)	Findings of Ground Investigation	Risk (Unmitigated)	Proposed Remediation (Mitigation) Measures	Residual Risk Estimation	
<u>On-site Sources</u>	Asbestos / Metals As, Be, Cd, Cu, Cr (VI), Cr (III) Hg, Ni, Se, Va, Zn, Boron, TPH /PAH, PCBs	Disturbance due to construction plant causing direct contact, dusts, vapours.	Occupants of the development / building fabric	Direct Soil Ingestion	Yes	No exceedances of commercial GAC. Elevated Cr ^{III} compared to residential GAC	Low to moderate	Certified clean cover layer within proposed nursery garden	Low	
General Made Ground				Indoor Dust ingestion	Yes	As above	Low to moderate	As above	Low	
Former ore stockpiles & conveyor associated with steelworks				Skin Contact with Soils	Yes	As above	Low to moderate	As above	Low	
Stockpiled construction materials				Skin Contact with Dust	Yes	As above	Low to moderate	As above	Low	
<u>Off-site Sources</u>		Direct Contact with occupants of the proposed development	Adjacent residents during construction	Inhalation of Outdoor Dust	Yes	As above	Low to moderate	As above	Low	
				Inhalation of Outdoor Vapours	Yes	As above	Low	None required	Low	
				Inhalation of Indoor Vapours	Yes	As above	Low	None required	Low	
				Inhalation of ground gas	Yes	CS-2	Low	Ground Gas Protection System in design of new building	Low	
		Permeation of water supply pipework	Secondary A / Principal Aquifer	Inhalation of radon gas	No	Lower Probability Area	Negligible	None	Negligible	
				Ingestion via permeated water supply pipework	Yes	No exceedances of GAC	Low	None required	Low	
				Direct contact with Unproductive Aquifer in Superficial Deposits	Yes	As above	Low	None required	Low	
General Made Ground		Leachate								
Former Steelworks										
Electricity sub-station										
Residential properties										
Llanwern Bull Public House										

Table 5: Refined Conceptual Site Model

Direct contact with subsurface soil and/or groundwater during redevelopment works are not assessed as part of the CSM. It is considered that risks to workers will be managed as part of any the redevelopment works at the site through the application of health and safety procedures, where required.



7 GEOTECHNICAL SITE ASSESSMENT

7.1 Geotechnical Considerations

An indicative site layout has been made available to Remada, illustrating proposed a nursery, three retail units, car parking and landscape zones within the disposal land area.

Remada's boreholes WS201 to WS203 were located in the proposed nursery footprint and car park, whilst WS204-209 were located in the proposed retail units and car park as indicated on **Figure 2**. At BH201 & BH202 in the zone of the proposed nursery, Made Ground extended to 4m and 2m bgl respectively, overlying soft CLAY and PEAT to 7m bgl. Similarly, at WS205 in the most northerly of the three retail units, Made Ground extended to 2.7m overlying soft CLAY and PEAT to 7m bgl. In the south-east of the site, obstructions were encountered within the Made Ground but at WS209 within the car park, Made Ground was present to 2.6m bgl overlying CLAY and PEAT with no recovery below 6m bgl.

Corresponding SPT N-values within boreholes WS201 - WS209 were between 4 & 28 in the Made Ground where not obstructed, 4 – 13 within the CLAY and 4 in the PEAT. Groundwater was recorded at a minimum depth of 0.41m bgl in WS208.

The Supplementary CPT investigation comprised two (1 No.) probe within the footprint of the proposed nursery, which refused at a depth of 13.39m. The presence of compacted Made Ground that forms St Modwen's builder's compound prevented penetration of the CPT rig into the underlying natural soils. CPT logs (CPT1 -CPT5) record high strength soil to a depth of 1m overlying soft organic deposits to a depth to 7m bgl overlying low strength silty sand/sandy silt and low strength silty clay / clayey silt which significantly increased in strength at between 11.1m bgl and 12.4m bgl and below 11.5m in CPT5. CPT refusal depths were between 12.5 and 13.1m bgl in CPT1-CTP4 and 13.4m in CTP5. CPT locations are indicated on **Figure 3**. No groundwater was encountered during the initial intrusive investigation, but during the subsequent monitoring programme standing water was recorded at in the proposed Lidl site depths of between 0.38 and 1.80m bgl. Groundwater was not recorded within the Made Ground that forms the builder's site compound.

Details of the proposed permanent and variable design loads (actions) are not currently known although an indicative column load of 400kN has been provided.

7.2 Foundations

Based on the findings of CPT1 to CPT5 the following idealised soil profile has been adopted:

Depth	Description	q_c MPa*	SPT N_{60} *	S_u (Kpa) *	Comment
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mbgl					
0 to 1	High Strength fine grained soils	5	10	150	Not used in pile capacity estimate
1 to 10.7	Low strength soils/organic material	1	2	20	Not used in pile capacity estimate
11.0 to 13.0	Medium to High Strength soils	2	7	100	
13.0 to 13.39	High Strength soil	10	20	250	Assumed to represent bedrock

Table 6: Idealised Soil Profile

Note*: Taken from Q_c (measured) and SPT N_{60} * & S_u (Kpa) * Derived Values on CPT Logs. Groundwater has been assumed to be at <1mbgl.

Either driven or continuous flight auger (CFA) piles could be utilised. Driven piles have the advantage of improving the density of the ground whereas CFA piles could potentially loosen the granular deposits and thus result in a reduced safe working load. The main disadvantage of driven piles is that they can cause unacceptable amounts of vibration that could potentially damage nearby above and underground structures. If driven piles are used then assurances will need to be sought from the piling contractor that damage will not be caused to nearby structures, including buried infrastructure on the site.

The following table provides a summary of the estimated safe working loads base on the assumptions detailed above:

Pile Toe Depth (m)	Pile Type	Pile Diameter (mm)	Estimated Safe Working Load (kN)
15	CFA	250	420
15	CFA	350	755
15	CFA	450	1160
15	Driven	250	445
15	Driven	350	800
15	Driven	450	1235

Table 7: Preliminary Estimated Pile Capacities

The safe working load has been calculated by two different methods. In the first method a factor of safety of 2.5 is applied to both the end bearing and skin friction components. In the second method a factor of safety of 3.0 is applied to the end bearing component and 1.5 to the skin friction component. The safe working load is calculated by both methods and the lower of the two adopted.

Piles should be driven a minimum of 9 pile diameters into the bearing stratum.

The estimated safe working load is indicative only and specialist piling contractors should be consulted with regard to the design and performance of their piled foundations. The calculated safe



working load has been calculated for a single isolated pile. The effect of group action has not been taken into consideration. In addition, negative skin friction in the made ground have not been taken into consideration.

It should be noted that the depth to bedrock is likely to vary across the site and therefore, piles of differing lengths are likely to be required. If driven piles are adopted then provisions should be made to enable pile lengths to be easily varied. In addition, several of the exploratory holes encountered obstructions within the made ground. Provision should be allowed for pre-probing of pile locations.

7.3 Floor Slabs

It is considered that the floor slabs should be suspended on piled foundations.

7.4 Shrinkage and Swelling

Samples of CLAY were found to range from LOW to MEDIUM / HIGH plasticity with up to 100% passing a 0.425mm sieve. The modified plasticity index equates to High Volume Change Potential.

BRE 412 states that where the natural moisture content is less than 0.4 times the Liquid Limit ($w < 0.4 w_L$) it is indicative of desiccation. Within all five samples analysed, the moisture content was greater than 0.4 w_L , so there was no evidence for desiccation within the underlying cohesive soils.

The minimum foundation depths outside the zone of tree influence as specified by the NHBC have been reproduced in **Table 6** below, however:

Volume Change Potential	A) Minimum foundation depth (m) (allowing for restricted new planting)	B) Minimum foundation depth (m) (where planting is outside the zone of influence of trees)
High	1.50	1.0
Medium	1.25	0.9
Low	0.9	0.75

Table 6: NHBC 2023 Table 4 Minimum Foundation Depths

7.5 Imported Fill

All imported fill material should comply with an earthworks specification to be prepared by the engineer and not contain concentrations of contaminants at greater than the Generic Assessment Criteria (GAC) presented in **Table 3**.

7.6 Excavations and Temporary Works

Side slopes within the Made Ground and the underlying natural deposits are unlikely to remain stable even in the short term without support or without being battered back to a safe slope gradient. A detailed inspection of the side slopes should be made during excavation and a risk assessment carried out to fully assess the support measures required.

Resting groundwater within the monitoring wells standing within Made Ground at a minimum depth of 0.41m bgl.

7.6 External Car Park Construction

CBR values estimated from the DCP tests indicated variable values within Made Ground from 5% to 100%, but the probe is unlikely to have penetrated natural ground given its recorded depth in nearby window sample logs.



7.7 Protection of Buried Concrete

In accordance with BRE SD1 for buried concrete in a brownfield site with mobile groundwater, analysis of selected samples for water soluble sulphate returned values of up to 0.098 g/l and pH >5.5. A total potential sulphate value of 0.084% was also calculated from the total sulphur results. Therefore, a Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1 is considered appropriate for the location.

7.8 General Construction Advice

All formations should be cleaned, and subsequently inspected, by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Where applicable ground beneath the proposed building footprint and potentially car parking may require to be stripped to reveal localised areas of made ground and structures. Excavations should be backfilled with suitably re-compacted materials to achieve formation level.

During foundation excavation works arisings should be constantly monitored for the presence of contamination.



8 CONCLUSIONS & RECOMMENDATIONS

8.1 Conclusions

The following conclusions have been made based on the findings of this investigation.

8.1.1 Phase 2 Site Investigation

The investigation comprised the drilling of nine (9 No.) windowless sampler boreholes on the 12th of June 2024; five (5 No.) of which were advanced within the footprint of the proposed nursery and retail units, and four (4 No.) within the proposed car park. Three (3 No.) plate bearing tests were performed; two (2 No.) of which were conducted within the proposed nursery footprint for a raft foundation design, as well as two (2 No.) DCP CBR tests within the footprint of the proposed nursery. Four (4 No.) ground gas monitoring visits were scheduled for the site to provide the minimum required C665.

Published geological mapping indicates the site to be directly underlain by superficial Tidal Flat Deposits overlying the Mercia Mudstone Group bedrock.

Made Ground was encountered within all of the exploratory holes located within the proposed Lidl development site. Made Ground was typically encountered as reworked natural material with anthropogenic inclusions predominantly comprising demolition material with rare industrial by-products (slag). Made Ground was encountered from ground surface levels or below topsoil to depths ranging from 1.0 to 4.7m bgl.

Tidal flat deposits were encountered as very soft to firm blueish grey, locally mottled brown, clay overlying pseudo-fibrous peat which was encountered from depths of 4.00 to 4.90m bgl to depths exceeding 7.00m bgl.

Bedrock was not positively identified during the course of Remada's investigation.

8.1.2 Human Health Risk Assessment

The results of soil chemical analysis were compared to Human Health Generic Assessment Criteria for commercial land use. None of the analytes tested were detected at concentrations that exceeded the human health GAC protective of on-site workers.

The proposed development comprises three (3 No.) commercial units and a new nursery which will include a garden area. To provide a conservative risk assessment of the proposed nursery garden, the results of chemical laboratory analyses were compared separately to the GAC appropriate to a commercial redevelopment and to a residential development without the potential for the consumption of homegrown produce. None of the determinants tested for were identified at concentrations exceeding the GAC for a commercial end-use, however within all samples analysed concentration of chromium were found to exceed the GAC for a residential development. A certified clean cover layer will therefore be required within the proposed nursery garden area.

8.1.3 Water Resources Risk Assessment

The results of the soil chemical analysis undertaken has identified that concentrations of metals and inorganic contaminants are within the range of typical made ground. Detectable concentrations of TPH and PAHs were encountered in some samples. However, the contaminants identified are of low solubility and mobility and as such are unlikely to present a risk to groundwater beneath the site. In addition, it should be noted that the site will be predominantly covered with the building and areas of hardstanding. Therefore, the risk of leaching of contaminants as a result of infiltration of groundwater is likely to be limited. Therefore, the risk to groundwater from contaminants within the made ground at the site is considered to be low and does not warrant further consideration.



8.1.4 Waste Classification

The results of the assessment indicated that contaminant concentrations within the Made Ground, were generally low though with concentrations of antimony and pH values within one of the two samples analysed classifying the soils as stable, non-reactive hazardous waste suitable for disposal within a non-hazardous landfill and would classify the soils as non-hazardous with LoW Code 17 05 04 (soils and stones other than those mentioned in 17 05 03).

8.2 Recommendations

The Supplementary CPT investigation comprised two (1 No.) probe within the footprint of the proposed nursery, which refused at a depth of 13.39m. The presence of compacted Made Ground that forms St Modwen's builder's compound prevented penetration of the CPT rig into the underlying natural soils. CPT logs (CPT1 -CPT5) record high strength soil to a depth of 1m overlying soft organic deposits to a depth to 7m bgl overlying low strength silty sand/sandy silt and low strength silty clay / clayey silt which significantly increased in strength at between 11.1m bgl and 12.4m bgl and below 11.5m in CPT5. CPT refusal depths were between 12.5 and 13.1m bgl in CPT1-CTP4 and 13.4m in CTP5. CPT locations are indicated on **Figure 3**. Groundwater was not recorded within the Made Ground that forms the builder's site compound.

Preliminary estimated safe working loads have been tabulated within the report but are indicative only and specialist piling contractors should be consulted with regard to the design and performance of their piled foundations.

It is considered that the floor slab should be suspended on piled foundations.

A Design Sulphate Class DS-1 is considered appropriate for buried concrete and an ACEC Class of AC-1 is considered appropriate for the location.

8.3 Ground Gas

The calculated GSV for monitoring wells that penetrate the underlying organic clay and PEAT below 4.2m would place the site into Characteristic Situation 2. However, the calculated GSV for WS208A which was installed to 2m bgl is less than 0.07 l/hr and would place the site into Characteristic Situation 1. Given that the natural CLAY prevents a direct pathway for ground gas with the PEAT and the proposed building, it is recommended that Characteristic Situation 2 protection measures should be adopted.



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STUDY LIMITATIONS

IMPORTANT. This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by Remada, Ltd with all reasonable skill, care and diligence within the terms of the Appointment and with the resources and manpower agreed with (the 'Client'). Remada does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client unless agreed otherwise in writing.

3. Unless stated otherwise, no consultations with authorities or funders or other interested third parties have been carried out. Remada is unable to give categorical assurance that the findings will be accepted by these third parties as such bodies may have published, more stringent objectives. Further work may be required by these parties.

4. All work carried out in preparing this report has used, and is based on, Remada's professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. In giving opinions and advice pending changes in legislation, of which Remada is aware, have been considered. Following delivery of the report Remada has no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are to the best of Remada's belief, Remada cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme. All information relevant to the scope may not have received.

8. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of changes in the condition of the site since the time of the investigation.

9. The content of this report represents the professional opinion of experienced environmental consultants. Remada does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

13. Unless otherwise stated, samples from the site (soil, groundwater, building fabric or other samples) have NOT been analysed or assessed for waste classification purposes.



TABLES

Table 2A: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA													REMADA GEO CONSULTANTS							
SITE		Glan Llyn, Newport																		
PROJECT No.		1261.03			Atmospheric & Ground Conditions															
Visit 1 of 4				Atmospheric Pressure Variations During Visit									Ground Surface Conditions							
Carried Out by:		J Ramos			1011									Damp						
Date:		18.06.2024																		
Instrument Details	GFM436 14048				Atmospheric Pressure Trend Over Previous 48hrs								Weather Conditions							
					Steady								Cloudy, warm							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments	
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady						
WS201		50	0.0	0.0	0.0	0.1	0.1	20.8	20.8	60	0.0	0.00	1.0	-	1011	1.900		2.100		
WS205		50	1.3	0.0	0.0	0.1	0.1	20.8	20.8	60	0.0	0.00	1.0	-	1011	2.600		5.700		
WS208A		50	0.0	0.0	0.0	0.1	0.1	20.7	20.7	60	0.0	0.00	1.0	-	1011	1.400		1.860		

NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																				
SITE		Glan Llyn, Newport																		
PROJECT No.		1261.04																		
Visit 2 of 4				Atmospheric Pressure Variations During Visit								Ground Surface Conditions								
Carried Out by:		U Khan			1004								dry							
Date:		03-Jul-24																		
Instrument Details	GFM436 14048			Atmospheric Pressure Trend Over Previous 48hrs								Weather Conditions								
				steady								light rain, warm								
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments	
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady						
WS201		50	5.8	5.4	0.0	3.7	3.7	16.6	16.6	60	0.0	-	-	-	1005	1.350		2.100		
WS205		50	5.8	4.7	0.0	2.7	0.9	3.0	3.0	60	0.0	-	-	-	1003	2.270		5.700		
WS208A		50	3.4	0.0	0.0	0.9	0.1	9.6	12.3	60	0.0	-	-	-	1003	1.490		1.860		

Notes:

NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

Table 2A: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA													REMADA GEO CONSULTANTS						
SITE		Glan Llyn, Newport																	
PROJECT No.		1261.04		Atmospheric & Ground Conditions															
Visit 3 of 4				Atmospheric Pressure Variations During Visit								Ground Surface Conditions							
Carried Out by:		S Taylor		1005mB								Wet							
Date:		09.07.24																	
Instrument Details	GFM436 14048			Atmospheric Pressure Trend Over Previous 48hrs								Weather Conditions							
				Rising								Dry							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady					
WS201		50	0.0	0.0	0.0	0.2	0.2	11.4	17.7	60	0.0	-	-	-	1005	1.410		2.100	
WS205		50	1.2	0.0	0.0	0.0	0.0	6.0	9.3	60	0.0	-	-	-	1005	1.610		5.700	
WS208A		50	2.1	0.0	0.0	0.9	0.0	1.2	1.2	60	0.0	-	-	-	1005	1.190		1.860	

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																				
SITE		Glan Llyn, Newport																		
PROJECT No.		1261.04		Atmospheric & Ground Conditions																
Visit 4 of 4				Atmospheric Pressure Variations During Visit									Ground Surface Conditions							
Carried Out by:		L Hillman		1006mB									Wet							
Date:		16.07.24		Atmospheric Pressure Trend Over Previous 48hrs									Weather Conditions							
Instrument Details	GFM436 14048			Rising									Raining							
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments	
			Peak	Steady		Peak	Steady	Minimum	Steady				Peak	Steady						
WS201		50	0.0	0.0	0.0	0.4	0.3	19.4	19.5	60	0.0	-	-	-	1005	1.580		2.100		
WS205		50	38.7	38.7	774.0	1.4	0.0	6.2	13.3	60	0.0	-	-	-	1005	0.630		5.700		
WS208A		50	5.5	0.0	0.0	0.9	0.0	10.1	10.1	60	0.0	-	-	-	1005	0.410		1.860		

Notes: NR = Not Recorded ^ For measurement of gas concentrations > = Above LEL WST = Water Sample Taken GL = Ground Level

Table 2b: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA																	REMADA GEO CONSULTANTS						
SITE		Glan Llyn																					
PROJECT No.		1261.05		Atmospheric & Ground Conditions																			
Visit 1 of 4				Atmospheric Pressure Variations During Visit													Ground Surface Conditions						
Carried Out by:		Lewis Hillman		1013-1014													Dry						
Date:		16.08.2024																					
Instrument Details	GFM436 14048			Atmospheric Pressure Trend Over Previous 48hrs													Weather Conditions						
				Rising													Sunny, Dry						
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		H2S		CO (ppm)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments
			Peak	Steady		Peak	Steady	Minimum	Steady	Minimum	Steady	Minimum	Steady				Peak	Steady					
WS301	0.650	50	0.0	0.0		2.8	1.0	16.2	18.7					60	0.0		-	-	1014			1.350	
WS302	0.560	50	0.0	0.0		1.0	1.0	17.9	18.6					60	0.0		-	-	1014			0.440	
WS303	0.410	50	2.2	0.0		1.8	1.8	18.4	18.9					60	0.0		-	-	1014			0.830	
WS304	0.400	50	1.1	0.0		1.6	0.1	20.4	20.7					60	0.0		-	-	1014			0.850	
WS208A	0.000	50	0.0	0.0		0.3	0.0	4.4	4.9					60	0.0		-	-	1013			1.800	

NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																REMADA GEO CONSULTANTS											
SITE		Glan Llyn																									
PROJECT No.		1261.05				Atmospheric & Ground Conditions																					
Visit 2 of 4																											
Carried Out by:		Lewis Hillman				1001mb														Ground Surface Conditions							
Date:		23.08.2024																		Dry							
Instrument Details	GFM436 14048				Atmospheric Pressure Trend Over Previous 48hrs														Weather Conditions								
					Falling														Warm, dry								
Well No.	Cover Height (m AGL)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		H ₂ S (ppm)		CO (ppm)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments				
			Peak	Steady		Peak	Steady	Minimum	Steady	Minimum	Steady	Minimum	Steady				Peak	Steady									
WS301	0.650	50	1.1	0.0		1.3	0.9	16.9	18.8					60	0.0		-	-	1001			1.350					
WS302	0.560	50	0.5	0.0		0.3	0.1	19.4	20.4					60	0.0		-	-	1001			0.440					
WS303	0.410	50	0.0	0.0		1.2	1.2	19.0	19.2					60	0.0		-	-	1001			0.830					
Ws304	0.400	50	0.0	0.0		1.3	1.2	18.9	19.0					60	0.0		-	-	1001			0.850					
WS208A	0.000	50	1.1	0.0		1.2	0.2	19.7	20.3					60	0.0		-	-	1001			1.800					

NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

Table 2: Gas and Groundwater Monitoring Data

Table 2b: Gas Groundwater Monitoring Data

GAS & GROUNDWATER MONITORING DATA																								
SITE		Glan Llyn																						
PROJECT No.		1261.05																						
Visit 3 of 4		Atmospheric Pressure Variations During Visit															Ground Surface Conditions							
Carried Out by:		Lewis Hillman			1015mb															Dry				
Date:		29.08.2024			Atmospheric Pressure Trend Over Previous 48hrs															Weather Conditions				
Instrument Details		GFM436 14048			Falling															Overcast, dry				
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		H2S (ppm)		CO (ppm)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m bgl)	Comments	
			Peak	Steady		Peak	Steady	Minimum	Steady	Minimum	Steady	Minimum	Steady				Peak	Steady						
WS301	0.650	50	0.0	0.0		4.1	1.0	16.1	18.4					60	0.0		-	-	1015			1.350		
WS302	0.560	50	0.0	0.0		1.0	0.0	18.2	19.3					60	0.0		-	-	1015			0.440		
WS303	0.410	50	2.2	0.0		1.8	1.3	16.9	19.0					60	0.0		-	-	1015			0.830		
WS304	0.400	50	0.0	0.0		1.2	1.1	15.0	18.9					60	0.0		-	-	1015			0.850		
WS208A	0.000	50	0.0	0.0		1.2	0.0	3.9	4.0					60	0.0		-	-	1015			1.800		

Notes: NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

GAS & GROUNDWATER MONITORING DATA																														
SITE		Glan Llyn																												
PROJECT No.		1261.05					Atmospheric & Ground Conditions																							
Visit 4 of 4																	Ground Surface Conditions													
Carried Out by:		Lewis Hillman					1004-1005mb																							
Date:		10.09.2024																												
Instrument Details		GFM436 14048					Atmospheric Pressure Trend Over Previous 48hrs																	Weather Conditions						
							Rising																	Raining						
Well No.	Cover Height (m AOD)	Well Diameter (mm)	CH ₄ (% v/v)		CH ₄ Steady LEL (%)	CO ₂ (% v/v)		O ₂ (% v/v)		H ₂ S (ppm)		CO (ppm)		Duration (secs)^	Flow Rate (l/hr)	Relative Pressure (mb)	PID (ppm)		Atmospheric Pressure (mb)	Water Level (m bgl)	Water Level (m AoD)	Depth of Pipe (m)	Comments							
			Peak	Steady		Peak	Steady	Minimum	Steady	Minimum	Steady	Minimum	Steady				Peak	Steady												
WS301	0.650	50	0.0	0.0		1.2	0.2	18.9	19.5					60	0.0		-	-	1005			1.350								
WS302	0.560	50	0.0	0.0		0.2	0.1	13.8	14.1					60	0.0		-	-	1005			0.440								
WS303	0.410	50	0.0	0.0		0.4	0.2	19.0	19.4					60	0.0		-	-	1005			0.830								
WS304	0.400	50	0.0	0.0		1.1	0.3	19.8	20.1					60	0.0		-	-	1004			0.850								
WS208A	0.000	50															-	-				1.800	Unable to record, well blocked by parked vehicle							

Notes: NR = Not Recorded

^ For measurement of gas concentrations

> = Above LEL

WST = Water Sample Taken

GL = Ground Level

Table 2: Gas and Groundwater Monitoring Data

Table 3A: Comparison of Soil Chemical Analyses with GAC
(Commercial GAC)

Borehole: Top Depth (m): Date Sampled:				Commercial GAC (2.5% SOM)	WS201	WS202	WS202	WS203	WS205	WS205	WS205	WS205	WS207	WS209
					1.00	0.00-0.80	1.20	0.50	1.00	0.00-0.20	2.70	0.00-0.20	0.30-0.70	
					11/06/2024	11/06/2024	11/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Determinand	Units	Limit of detection	Accreditation Status	[mg/kg unless stated]										
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	Not-detected	-	Not-detected	Not-detected	-	-	-	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	n/a	n/a	-	n/a	n/a	-	-	-	-	n/a
Moisture	%	0.01	NONE	-	21	8.6	12	12	12	1.1	19	0.8	12	
pH	pH Units	N/A	MCERTS	-	9.1	9.2	8.6	10.6	10.5	-	8.3	-	8.9	
Arsenic	mg/kg	1.00	MCERTS	640	13	11	-	9.8	14	-	-	-	10	
Beryllium	mg/kg	0.06	MCERTS	12	2	1.1	-	0.99	1.4	-	-	-	0.96	
Boron	mg/kg	0.20	MCERTS	240000	3.6	1.5	-	0.5	1	-	-	-	0.9	
Cadmium	mg/kg	0.20	MCERTS	190	< 0.2	1.6	-	0.7	2.5	-	-	-	1.4	
Chromium (Hexavalent)	mg/kg	1.80	MCERTS	33	< 1.8	< 1.8	-	< 1.8	< 1.8	-	-	-	< 1.8	
Chromium (Trivalent)	mg/kg	1.00	NONE	8600	55	33	-	81	61	-	-	-	43	
Chromium	mg/kg	1.00	MCERTS	-	55	33	-	81	61	-	-	-	43	
Copper	mg/kg	1.00	MCERTS	68000	13	20	-	17	18	-	-	-	28	
Lead	mg/kg	1.00	MCERTS	NC	56	130	-	53	200	-	-	-	68	
Mercury	mg/kg	0.30	MCERTS	58 ^{US} (25.8)	< 0.3	< 0.3	-	< 0.3	< 0.3	-	-	-	< 0.3	
Nickel	mg/kg	1.00	MCERTS	980	26	20	-	20	22	-	-	-	16	
Selenium	mg/kg	1.00	MCERTS	12000	< 1.0	< 1.0	-	2.8	< 1.0	-	-	-	< 1.0	
Vanadium	mg/kg	1.00	MCERTS	9000	78	47	-	79	83	-	-	-	58	
Zinc	mg/kg	1.00	MCERTS	730000	180	360	-	170	570	-	-	-	210	
Total Cyanide	mg/kg	1.00	MCERTS	-	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	< 1.0	
Fraction Organic Carbon (FOC)	N/A	0.00	MCERTS	-	0.011	0.012	-	0.009	0.019	-	-	-	0.019	
Calculated SOM from FOC	-	-	-	-	1.90	2.07	-	1.55	3.28	-	-	-	3.28	
Calculated TOC from FOC	-	-	-	-	1.10	1.20	-	0.90	1.90	-	-	-	1.90	
Aliphatic TPH >C5-C6	mg/kg	0.00	NONE	5900sol (558)	< 0.020	< 0.020	-	< 0.020	< 0.020	-	-	-	< 0.020	
Aliphatic TPH >C6-C8	mg/kg	0.00	NONE	17000sol (322)	< 0.020	< 0.020	-	< 0.020	< 0.020	-	-	-	< 0.020	
Aliphatic TPH >C8-C10	mg/kg	0.00	NONE	4800vap (190)	< 0.050	< 0.050	-	< 0.050	< 0.050	-	-	-	< 0.050	
Aliphatic TPH >C10-C12	mg/kg	1.00	MCERTS	23000vap (118)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	< 1.0	
Aliphatic TPH >C12-C16	mg/kg	2.00	MCERTS	82000sol (59)	< 2.0	< 2.0	-	4.4	< 2.0	-	-	-	3.3	
Aliphatic TPH >C16-C21	mg/kg	8.00	MCERTS	-	< 8.0	< 8.0	-	9.6	10	-	-	-	14	
Aliphatic TPH >C21-C35	mg/kg	8.00	MCERTS	1700000	16	24	-	42	45	-	-	-	120	
Total Aliphatic Hydrocarbons:	mg/kg	10.00	NONE	-	16	24	-	56	55	-	-	-	140	
Aromatic TPH >C5-C7	mg/kg	0.00	NONE	46000sol (2280)	< 0.010	< 0.010	-	< 0.010	< 0.010	-	-	-	< 0.010	
Aromatic TPH >C7-C8	mg/kg	0.00	NONE	110000sol (1920)	< 0.010	< 0.010	-	< 0.010	< 0.010	-	-	-	< 0.010	
Aromatic TPH >C8-C10	mg/kg	0.00	NONE	8100vap (1500)	< 0.050	< 0.050	-	< 0.050	< 0.050	-	-	-	< 0.050	
Aromatic TPH >C10-C12	mg/kg	1.00	MCERTS	28000sol (899)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	< 1.0	
Aromatic TPH >C12-C16	mg/kg	2.00	MCERTS	37000	< 2.0	5.9	-	2.7	< 2.0	-	-	-	< 2.0	
Aromatic TPH >C16-C21	mg/kg	10.00	MCERTS	28000	< 10	18	-	23	10	-	-	-	< 10	
Aromatic TPH >C21-C35	mg/kg	10.00	MCERTS	28000	< 10	33	-	76	16	-	-	-	94	
Total Aromatic Hydrocarbons	mg/kg	10.00	NONE	-	< 10	57	-	100	26	-	-	-	94	
Naphthalene	mg/kg	0.05	MCERTS	460sol (183)	0.14	0.36	-	0.28	0.73	< 0.05	-	< 0.05	0.36	
Acenaphthylene	mg/kg	0.05	MCERTS	97000sol (212)	0.06	0.18	-	0.28	0.26	< 0.05	-	< 0.05	0.17	
Acenaphthene	mg/kg	0.05	MCERTS	97000sol (141)	< 0.05	0.39	-	0.06	< 0.05	0.28	-	< 0.05	< 0.05	
Fluorene	mg/kg	0.05	MCERTS	68000	< 0.05	0.55	-	0.17	0.16	0.18	-	< 0.05	0.1	
Phenanthrene	mg/kg	0.05	MCERTS	22000	0.27	4.5	-	2.2	1.5	2.4	-	< 0.05	0.7	
Anthracene	mg/kg	0.05	MCERTS	540000	0.09	1.6	-	0.73	0.48	< 0.05	-	< 0.05	0.24	
Fluoranthene	mg/kg	0.05	MCERTS	23000	0.7	6.6	-	5.1	3.2	3.3	-	< 0.05	1.2	
Pyrene	mg/kg	0.05	MCERTS	54000	0.57	4.9	-	4.2	2.6	2.5	-	< 0.05	0.99	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	170	0.38	3.2	-	3.5	1.8	1.3	-	< 0.05	0.74	
Chrysene	mg/kg	0.05	MCERTS	350	0.44	4	-	3.4	2.1	1.3	-	< 0.05	0.86	
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	45	0.53	3.3	-	3.9	2.8	1.4	-	< 0.05	1.2	
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1200	0.17	1.3	-	1.6	0.93	0.5	-	< 0.05	0.35	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	35	0.37	2.4	-	3	2	1.1	-	< 0.05	0.84	
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.05	MCERTS	510	0.23	1.3	-	1.5	1.2	0.68	-	< 0.05	0.51	
Dibenz(a,h)Anthracene	mg/kg	0.05	MCERTS	3.6	< 0.05	0.4	-	0.48	0.3	< 0.05	-	< 0.05	0.13	
Benzo(a,h)perylene	mg/kg	0.05	MCERTS	4000	0.28	1.3	-	1.7	1.4	0.9	-	< 0.05	0.63	
Total Of 16 PAH's	mg/kg	0.8	ISO 17025	-	4.22	36.4	-	32.1	21.5	15.9	-	< 0.80	9.94	
Benzene	µg/kg	5.00	MCERTS	47*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
Toluene	µg/kg	5.00	MCERTS	11000vap (1920)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
Ethylbenzene	µg/kg	5.00	MCERTS	13000vap (1220)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
p- and m-xylene	µg/kg	5.00	MCERTS	14000sol (1350)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
o-xylene	µg/kg	5.00	MCERTS	15000sol (1120)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5.00	NONE	13000	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	< 5.0	
Total Phenols	mg/kg	1.00	MCERTS	6900dir (30000)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	< 1.0	

	Determinand concentration below the MDL
	Determinand concentration below the GAC
	Determinand concentration in exceedance of GAC
	Determinand concentration in exceedance of the vapour/solubility saturation limit.

NC: No published criteria. US: Unsuitable sample.
vap: Screening criteria presented exceed the vapour saturation limit, which is presented in brackets.
sol: Screening criteria presented exceed the solubility saturation limit, which is presented in brackets.
dir: Screening criteria based on threshold protective of direct skin contact (guideline in brackets based on health effects following long term exposure provided for illustration only).
(1): For assessment based on the use of the surrogate marker approach the GAC for Coal Tar must be used instead of benzo(a)pyrene.
* Value presented in mg/kg

Table 3A: Comparison of Soil Chemical Analyses with GAC
(Commercial GAC)

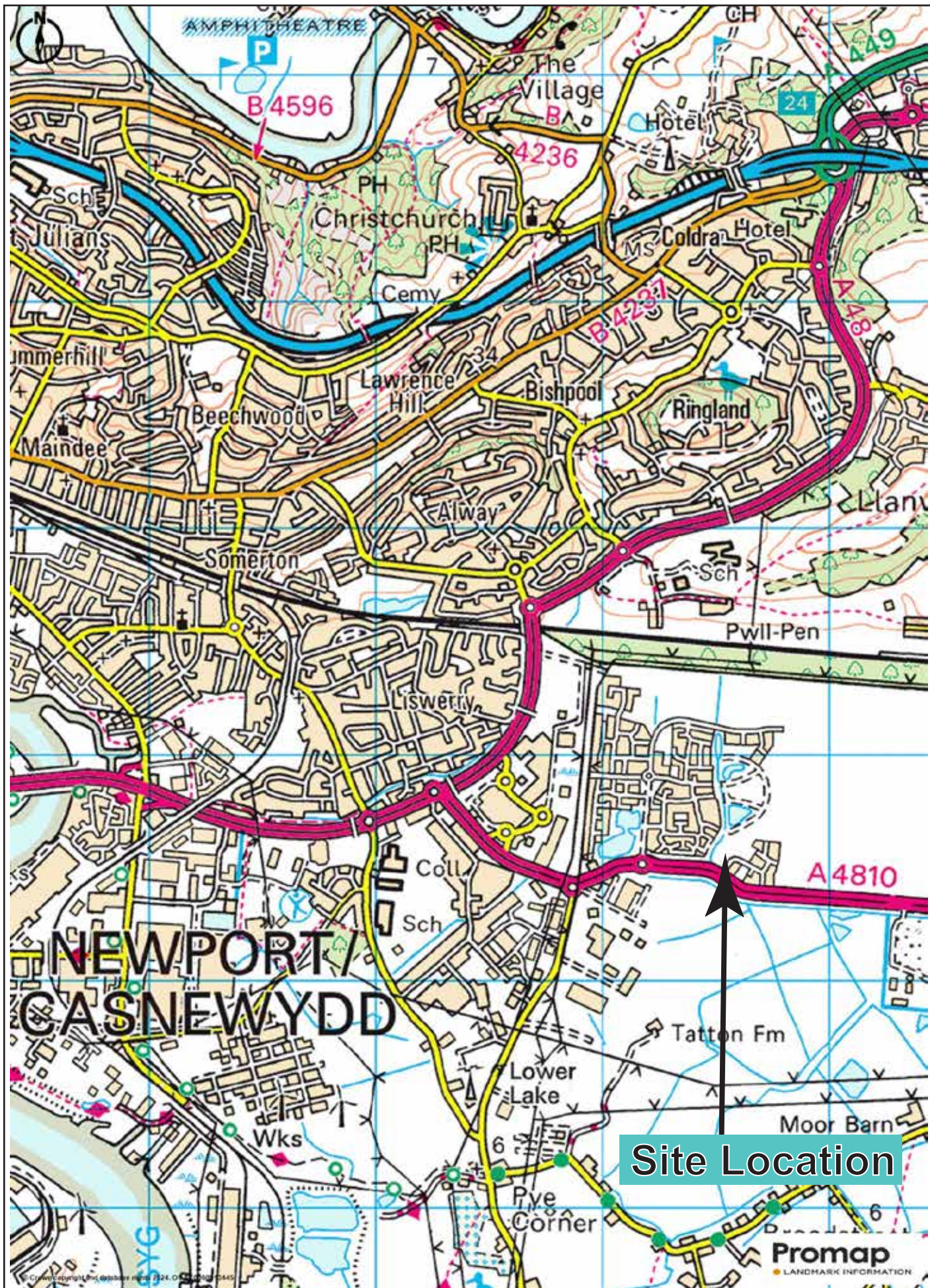
Borehole: Top Depth (m): Date Sampled:				Commercial GAC (2.5% SOM)	WS201	WS202	WS202	WS203	WS205	WS205	WS205	WS205	WS207	WS209
Limit of detection					1.00	0.00-0.80	1.20	0.50	1.00	0.00-0.20	2.70	0.00-0.20	0.30-0.70	
Accreditation Status					11/06/2024	11/06/2024	11/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Determinand	Units	Limit of detection	Accreditation Status	[mg/kg unless stated]										
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	Not-detected	-	Not-detected	Not-detected	-	-	-	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	n/a	n/a	-	n/a	n/a	-	-	-	-	n/a
Moisture	%	0.01	NONE	-	21	8.6	12	12	12	1.1	19	0.8	-	12
pH	pH Units	N/A	MCERTS	-	9.1	9.2	8.6	10.6	10.5	-	8.3	-	-	8.9
Arsenic	mg/kg	1.00	MCERTS	640	13	11	-	9.8	14	-	-	-	-	10
Beryllium	mg/kg	0.06	MCERTS	12	2	1.1	-	0.99	1.4	-	-	-	-	0.96
Boron	mg/kg	0.20	MCERTS	240000	3.6	1.5	-	0.5	1	-	-	-	-	0.9
Cadmium	mg/kg	0.20	MCERTS	190	< 0.2	1.6	-	0.7	2.5	-	-	-	-	1.4
Chromium (Hexavalent)	mg/kg	1.80	MCERTS	33	< 1.8	< 1.8	-	< 1.8	< 1.8	-	-	-	-	< 1.8
Chromium (Trivalent)	mg/kg	1.00	NONE	8600	55	33	-	81	61	-	-	-	-	43
Chromium	mg/kg	1.00	MCERTS	-	55	33	-	81	61	-	-	-	-	43
Copper	mg/kg	1.00	MCERTS	68000	13	20	-	17	18	-	-	-	-	28
Lead	mg/kg	1.00	MCERTS	NC	56	130	-	53	200	-	-	-	-	68
Mercury	mg/kg	0.30	MCERTS	56 ^{US} (25.6)	< 0.3	< 0.3	-	< 0.3	< 0.3	-	-	-	-	< 0.3
Nickel	mg/kg	1.00	MCERTS	980	26	20	-	20	22	-	-	-	-	16
Selenium	mg/kg	1.00	MCERTS	12000	< 1.0	< 1.0	-	2.8	< 1.0	-	-	-	-	< 1.0
Vanadium	mg/kg	1.00	MCERTS	9000	78	47	-	79	83	-	-	-	-	58
Zinc	mg/kg	1.00	MCERTS	730000	180	360	-	170	570	-	-	-	-	210
Total Cyanide	mg/kg	1.00	MCERTS	-	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	-	< 1.0
Fraction Organic Carbon (FOC)	N/A	0.00	MCERTS	-	0.011	0.012	-	0.009	0.019	-	-	-	-	0.019
Calculated SOM from FOC	-	-	-	-	1.90	2.07	-	1.55	3.28	-	-	-	-	3.28
Calculated TOC from FOC	-	-	-	-	1.10	1.20	-	0.90	1.90	-	-	-	-	1.90
Aliphatic TPH >C5-C6	mg/kg	0.00	NONE	5900sol (558)	< 0.020	< 0.020	-	< 0.020	< 0.020	-	-	-	-	< 0.020
Aliphatic TPH >C6-C8	mg/kg	0.00	NONE	17000sol (322)	< 0.020	< 0.020	-	< 0.020	< 0.020	-	-	-	-	< 0.020
Aliphatic TPH >C8-C10	mg/kg	0.00	NONE	4800vap (190)	< 0.050	< 0.050	-	< 0.050	< 0.050	-	-	-	-	< 0.050
Aliphatic TPH >C10-C12	mg/kg	1.00	MCERTS	23000vap (118)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	-	< 1.0
Aliphatic TPH >C12-C16	mg/kg	2.00	MCERTS	82000sol (59)	< 2.0	< 2.0	-	4.4	< 2.0	-	-	-	-	3.3
Aliphatic TPH >C16-C21	mg/kg	8.00	MCERTS	-	< 8.0	< 8.0	-	9.6	10	-	-	-	-	14
Aliphatic TPH >C21-C35	mg/kg	8.00	MCERTS	1700000	16	24	-	42	45	-	-	-	-	120
Total Aliphatic Hydrocarbons:	mg/kg	10.00	NONE	-	16	24	-	56	55	-	-	-	-	140
Aromatic TPH >C5-C7	mg/kg	0.00	NONE	46000sol (2280)	< 0.010	< 0.010	-	< 0.010	< 0.010	-	-	-	-	< 0.010
Aromatic TPH >C7-C8	mg/kg	0.00	NONE	110000sol (1920)	< 0.010	< 0.010	-	< 0.010	< 0.010	-	-	-	-	< 0.010
Aromatic TPH >C8-C10	mg/kg	0.00	NONE	8100vap (1500)	< 0.050	< 0.050	-	< 0.050	< 0.050	-	-	-	-	< 0.050
Aromatic TPH >C10-C12	mg/kg	1.00	MCERTS	28000sol (899)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	-	< 1.0
Aromatic TPH >C12-C16	mg/kg	2.00	MCERTS	37000	< 2.0	5.9	-	2.7	< 2.0	-	-	-	-	< 2.0
Aromatic TPH >C16-C21	mg/kg	10.00	MCERTS	28000	< 10	18	-	23	10	-	-	-	-	< 10
Aromatic TPH >C21-C35	mg/kg	10.00	MCERTS	28000	< 10	33	-	76	16	-	-	-	-	94
Total Aromatic Hydrocarbons	mg/kg	10.00	NONE	-	< 10	57	-	100	26	-	-	-	-	94
Naphthalene	mg/kg	0.05	MCERTS	460sol (183)	0.14	0.36	-	0.28	0.73	< 0.05	-	< 0.05	-	0.36
Acenaphthylene	mg/kg	0.05	MCERTS	97000sol (212)	0.06	0.18	-	0.28	0.26	< 0.05	-	< 0.05	-	0.17
Acenaphthene	mg/kg	0.05	MCERTS	97000sol (141)	< 0.05	0.39	-	0.06	< 0.05	0.28	-	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	68000	< 0.05	0.55	-	0.17	0.16	0.18	-	< 0.05	-	0.1
Phenanthrene	mg/kg	0.05	MCERTS	22000	0.27	4.5	-	2.2	1.5	2.4	-	< 0.05	-	0.7
Anthracene	mg/kg	0.05	MCERTS	540000	0.09	1.6	-	0.73	0.48	< 0.05	-	< 0.05	-	0.24
Fluoranthene	mg/kg	0.05	MCERTS	23000	0.7	6.6	-	5.1	3.2	3.3	-	< 0.05	-	1.2
Pyrene	mg/kg	0.05	MCERTS	54000	0.57	4.9	-	4.2	2.6	2.5	-	< 0.05	-	0.99
Benzo(a)anthracene	mg/kg	0.05	MCERTS	170	0.38	3.2	-	3.5	1.8	1.3	-	< 0.05	-	0.74
Chrysene	mg/kg	0.05	MCERTS	350	0.44	4	-	3.4	2.1	1.3	-	< 0.05	-	0.86
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	45	0.53	3.3	-	3.9	2.8	1.4	-	< 0.05	-	1.2
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1200	0.17	1.3	-	1.6	0.93	0.5	-	< 0.05	-	0.35
Benzo(a)pyrene	mg/kg	0.05	MCERTS	35	0.37	2.4	-	3	2	1.1	-	< 0.05	-	0.84
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.05	MCERTS	510	0.23	1.3	-	1.5	1.2	0.68	-	< 0.05	-	0.51
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3.6	< 0.05	0.4	-	0.48	0.3	< 0.05	-	< 0.05	-	0.13
Benzo(a,h)pyrene	mg/kg	0.05	MCERTS	4000	0.28	1.3	-	1.7	1.4	0.9	-	< 0.05	-	0.63
Total Of 16 PAH's	mg/kg	0.8	ISO 17025	-	4.22	36.4	-	32.1	21.5	15.9	-	< 0.80	-	9.94
Benzene	µg/kg	5.00	MCERTS	47*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
Toluene	µg/kg	5.00	MCERTS	11000vap (1920)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
Ethylbenzene	µg/kg	5.00	MCERTS	13000vap (1220)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
p & m-xylene	µg/kg	5.00	MCERTS	14000sol (1350)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
o-xylene	µg/kg	5.00	MCERTS	15000sol (1120)*	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5.00	NONE	13000	< 5.0	< 5.0	-	< 5.0	< 5.0	-	-	-	-	< 5.0
Total Phenols	mg/kg	1.00	MCERTS	6900dir (30000)	< 1.0	< 1.0	-	< 1.0	< 1.0	-	-	-	-	< 1.0

	Determinand concentration below the MDL
	Determinand concentration below the GAC
	Determinand concentration in exceedance of GAC
	Determinand concentration in exceedance of the vapour/solubility saturation limit.

NC: No published criteria. US: Unsuitable sample.
vap: Screening criteria presented exceed the vapour saturation limit, which is presented in brackets.
sol: Screening criteria presented exceed the solubility saturation limit, which is presented in brackets.
dir: Screening criteria based on threshold protective of direct skin contact (guideline in brackets based on health effects following long term exposure provided for illustration only).
(1): For assessment based on the use of the surrogate marker approach the GAC for Coal Tar must be used instead of benzo(a)pyrene.
* Value presented in mg/kg



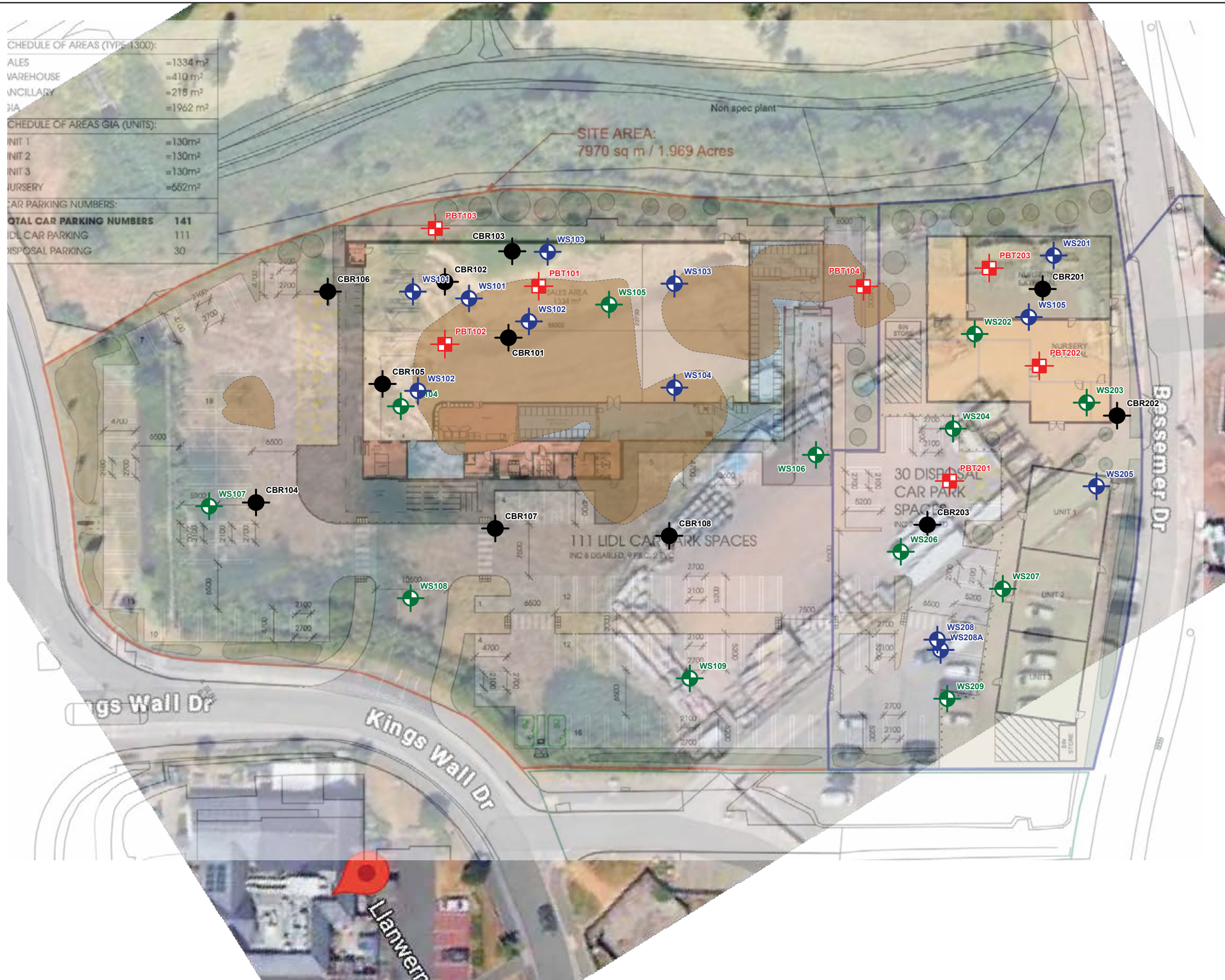
FIGURES



Notes

Revision	Approved	Date	Project Title	Scale	Drawn	Size
			Glan Llyn, Newport	as shown	PD	A4
			Drawing Title	Date	Job No.	Figure No.
			Site Location Plan	08.07.24	1161	01
			Client	 		
			Lidl Great Britain Ltd			

SCHEDULE OF AREAS (TYPE 1300):	
SALES AREA	=1334 m ²
WAREHOUSE	=410 m ²
INCILLARY	=218 m ²
SA	=1962 m ²
SCHEDULE OF AREAS GIA (UNITS):	
UNIT 1	=130m ²
UNIT 2	=130m ²
UNIT 3	=130m ²
NURSERY	=652m ²
CAR PARKING NUMBERS:	
TOTAL CAR PARKING NUMBERS	141
LIDL CAR PARKING	111
DISPOSAL PARKING	30



Legend

WS01

Window Sample & Installation

WS02

Window Sample

PBT01

Plate Bearing Test

CBR1

CBR Test

Stockpile Location

Notes

Stockpile locations are accurate as of the date of survey, however it should be noted that the site at the time of writing comprises an active construction compound and the extent of these stockpiles was noted to vary greatly during the course of the investigation.

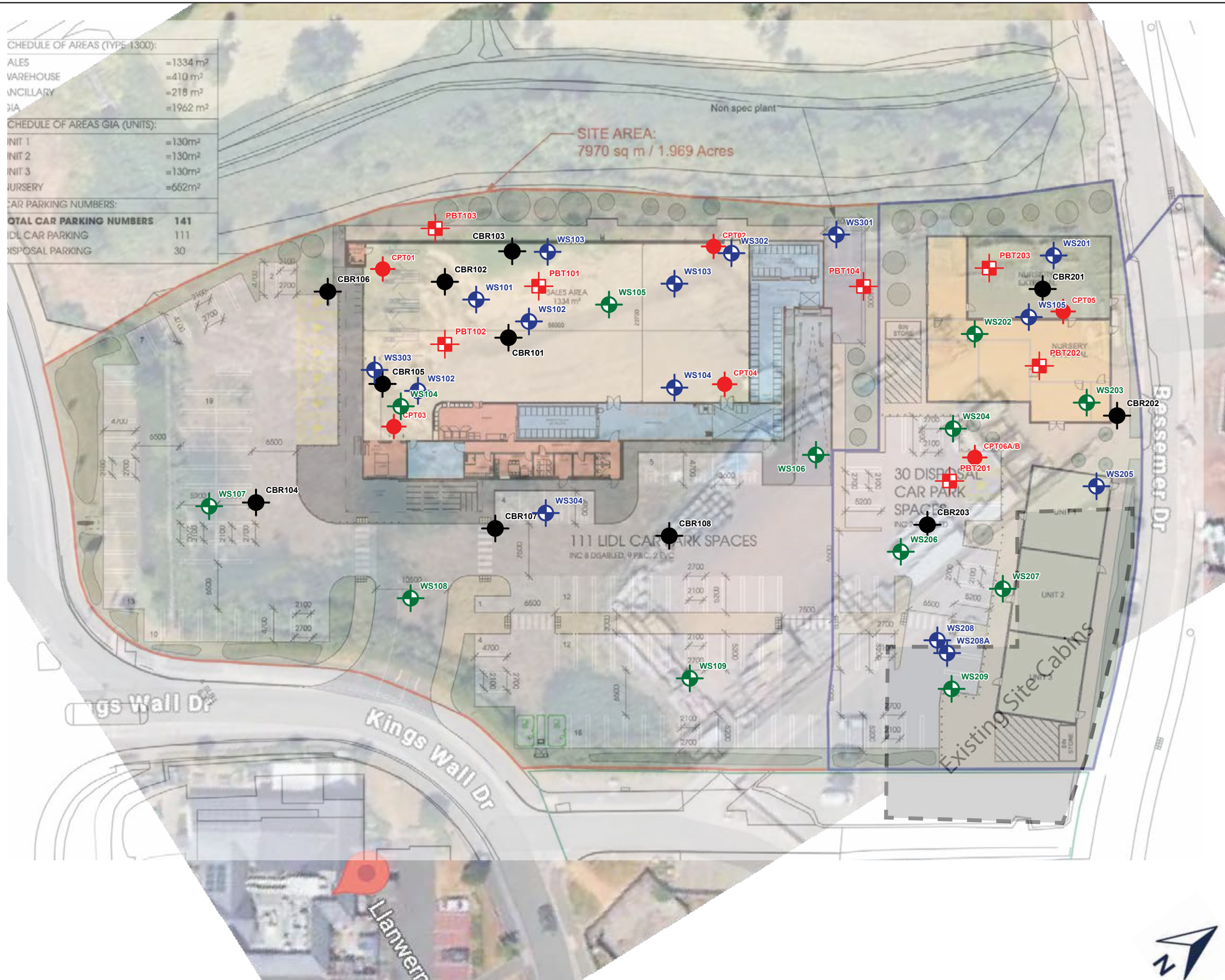
Exploratory hole positions were restricted by the presence of on-site stockpiles, plant movements, parked cars, and materials storage areas.

Proposed Layout reproduced from HTC Architects Proposed Site Plan - Option 14, drawing ref: 3211_F414_Rev K, dated July 2023.

Revision	Approved	Date
	PD	09/05/24
	PD	24/05/24
	GJ	05/08/24

Project Title		
Lidl Newport (Glan Llyn)		
Drawing Title		
Exploratory Hole Location Plan		
Client		
Lidl Great Britain Ltd		
Scale	Drawn	Size
as shown	GJ	A4
Date	Job No.	Figure No.
05.08.24	1261	02

SCHEDULE OF AREAS (TYPE 1300):	
SALES AREA	=1334 m ²
WAREHOUSE	=410 m ²
INCILLARY	=218 m ²
SA	=1962 m ²
SCHEDULE OF AREAS GIA (UNITS):	
UNIT 1	=130m ²
UNIT 2	=130m ²
UNIT 3	=130m ²
NURSERY	=652m ²
CAR PARKING NUMBERS:	
TOTAL CAR PARKING NUMBERS	141
LIDL CAR PARKING	111
DISPOSAL PARKING	30



Legend

WS01 Window Sample & Installation

WS02 Window Sample

PBT01 Plate Bearing Test

CBR1 CBR Test

CPT1 Cone Penetration Test

Notes

Exploratory hole positions were restricted by the presence of on-site stockpiles, plant movements, parked cars, and materials storage areas.

Proposed Layout reproduced from HTC Architects
 Proposed Site Plan - Option 14, drawing ref: 3211_F414_Rev K, dated July 2023.

Revision	Approved	Date
	PD	09/05/24
	PD	24/05/24
	GJ	05/08/24

Project Title		
Lidl Newport (Glan Llyn)		
Drawing Title		
CPT Probe Locations & Supplementary Gas Monitoring		
Client		
Lidl Great Britain Ltd		
Scale	Drawn	Size
as shown	GJ	A4
Date	Job No.	Figure No.
05.08.24	1261	03

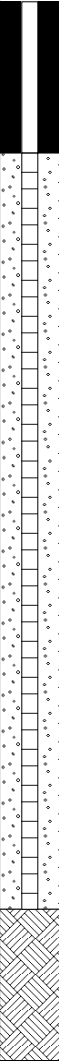




EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 11/06/2024	
Location: Newport		Contractor:		Co-ords: E335551.00 N186635.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS201	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

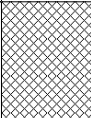
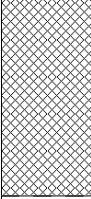
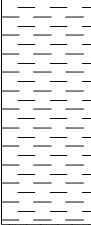
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.70			MADE GROUND: Grey, slightly clayey, sandy, angular to subangular gravel of mixed lithologies including road aggregate, brick fragments, and concrete fragments.	
		1.00	ES						
		1.00	SPT	N=8 (2,2/2,2,2,2)				MADE GROUND: Soft, dark-brown, bluish-grey, gravelly clay, with low cobble content. Gravel is angular to subangular, fine to medium of road aggregate and concrete. Cobbles are angular of concrete.	1
		1.50	D						
					1.70				
		2.00	SPT	N=4 (1,1/1,1,1,1)	2.00			MADE GROUND: Grey, orange, sandy, slightly clayey angular to subangular gravel of brick, concrete and road aggregate, with high cobble content. Cobbles are angular of brick and concrete. <i>Cobbles of concrete between 1.70m and 2.0m bgl.</i>	2
					2.40				
		3.00 - 4.00	B		2.80			MADE GROUND: Loose, dark-brown, sandy, clayey gravel. Gravel is subangular to subrounded, fine to coarse of road aggregate, and brick fragments.	3
		3.00	SPT	N=12 (3,3/3,3,3,3)				MADE GROUND: Dark-grey, slightly gravelly clay. Gravel is subangular to subrounded, fine to medium of brick and concrete.	
					4.00			MADE GROUND: Medium-dense, dark-brown, slightly clayey, slightly sandy, angular to subangular gravel of road aggregate, brick and concrete. Firm, bluish-grey CLAY.	4
		4.00	SPT	HVP=48 N=13 (6,8/4,3,3,3)					
					4.90				
		5.00	SPT	HVP=14 N=4 (1,1/1,1,1,1)	5.00			Dark-brown, pseudo-fibrous PEAT. Soft, bluish-grey CLAY.	5
					5.70				
		6.00	SPT	N=4 (1,1/1,1,1,1)				Dark brown, pseudo-fibrous PEAT.	6
					7.00				
		7.00	SPT	N=8 (2,2/2,2,2,2)				End of Borehole at 7.000m	7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks 1. Groundwater encountered at 2.00m bgl. 2. Terminated at 7.0m bgl. 3. Installation to 6m; 4.0m slotted pipe, 2.0m plain pipe.										
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Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 11/06/2024	
Location: Newport		Contractor:		Co-ords: E335560.00 N186620.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS202	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

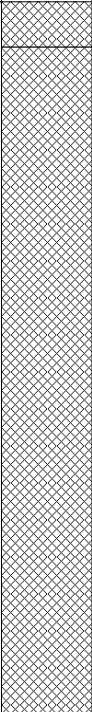
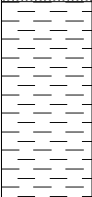
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.80	ES					MADE GROUND: Dark-grey, sandy, gravelly clay. Gravel is angular to subangular, fine to coarse of brick, concrete, road aggregate and slag.	
		1.00	SPT	N=8 (2,3/2,2,2,2)	0.80			MADE GROUND: Reddish-brown, gravelly clay. Gravel is angular to subrounded, fine to coarse of sandstone, brick and quartzite.	1
		1.20	D		1.20			MADE GROUND: Loose, reddish-brown, slightly gravelly clay. Gravel is subangular to subrounded, fine to coarse of sandstone, quartzite and concrete.	
		1.20 - 2.50	B						
		2.00	D						2
		2.00	SPT	N=8 (2,2/2,2,2,2)					
		2.50		HVP=97	2.50			Soft to firm, bluish-grey CLAY.	
		3.00	SPT	N=8 (2,2/2,2,2,2)					3
		4.00	SPT	N=4 (2,1/1,1,1,1)	4.00				
		5.00	SPT	N=4 (1,1/1,1,1,1)				Brown, clayey pseudo-fibrous PEAT.	4
		6.00	SPT	N=4 (1,1/1,1,1,1)					5
		6.70			6.70				6
		7.00	SPT	N=12 (2,2/3,3,3,3)	7.00			Firm, bluish-grey CLAY.	7
								End of Borehole at 7.000m	
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks 1. No groundwater encountered. 2. Terminated at 7.0m bgl.										
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Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335573.00 N186626.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS203	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30			0.30			MADE GROUND: Grey, clayey, sandy angular to subangular, fine to coarse gravel of road aggregate and brick.	
		0.50	ES					MADE GROUND: Loose, dark-brown, sandy, gravelly clay, with medium cobble content. Gravel is angular to subangular, fine to coarse of brick, concrete, quartzite and glass fragments. Cobbles are angular of concrete and brick.	1
		1.00	SPT	N=7 (1,2/1,2,2,2)				<i>Cobbles of brick and concrete between 0.90m and 1.0m bgl.</i>	
		2.00	SPT	N=8 (2,2/2,2,2,2)					2
		3.00	SPT	N=4 (1,1/1,1,1,1)				<i>Cobble of concrete between 2.60m and 2.70m bgl.</i>	3
		4.00	SPT	N=8 (2,2/2,2,2,2)				<i>Cobble of brick and concrete between 3.0m and 3.20m bgl.</i>	4
		4.70 - 5.00	D		4.70			Soft, bluish-grey mottled brown CLAY.	5
		5.00	SPT	HVP=90 N=9 (3,2/1,2,3,3)					
		5.00							
		6.00	SPT	N=4 (1,1/1,1,1,1)	6.00			End of Borehole at 6.000m	6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks 1. Groundwater encountered at 2.80m bgl. 2. Terminated at 6.0m bgl.										
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Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335569.00 N186608.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS204	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20			MADE GROUND: Grey, sandy, angular to subangular, fine to coarse gravel of road aggregate.	
		1.00	SPT	N=28 (6,7/13,5,5,5)	1.00			MADE GROUND: Reddish-brown, gravelly clay, with medium cobble content. Gravel is angular to subangular, fine to coarse of brick and concrete. Cobbles are angular of brick and concrete.	1
		2.00	SPT	N=16 (4,4/4,4,4,4)	2.00			<i>Cobble of concrete between 0.20 and 0.40m bgl.</i> <i>Cobble of concrete between 0.60m and 0.70m bgl.</i> MADE GROUND: Medium dense, grey, orange, sandy, angular to subangular, fine to coarse gravel of concrete and brick, with medium cobble content. Cobbles are angular of concrete.	2
		3.00	SPT	N=8 (1,2/2,2,2,2)	3.00			<i>Cobble of concrete between 1.0m 1.60m bgl.</i> <i>Cobble of concrete between 1.60m and 1.80m bgl.</i> MADE GROUND: Firm, bluish-grey, slightly gravelly clay . Gravel is subangular to subrounded, fine to medium of slag and brick.	3
								MADE GROUND: Firm, bluish-grey, dark-brown, gravelly clay, with occasional cobble content. Gravel is angular to subrounded, fine to coarse of brick, slag and concrete. Cobble is angular concrete.	4
								End of Borehole at 3.000m	4
									5
									6
									7
									8
									9
									10

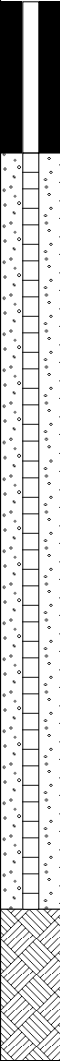
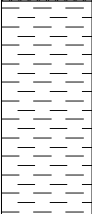
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
 1. No groundwater encountered.
 2. Terminated at 3.0m bgl.



Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335587.00 N186620.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS205	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

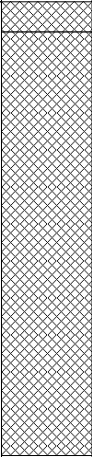
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	ES		0.20			MADE GROUND: Asphalt	
					0.70			MADE GROUND: Grey, sandy angular to subangular gravel of road aggregate (subbase).	
		1.00	ES						1
		1.00	SPT	N=44 (5,12/12,12,10,10)				MADE GROUND: Dense, dark-grey, sandy, clayey gravel, with medium cobble content. Gravel is angular to subrounded, fine to coarse of quartzite, concrete and brick. Cobble is angular of concrete. <i>Cobble of concrete below 1.0m bgl.</i>	
		2.00	SPT	N=26 (12,12/11,5,5,5)					2
		2.70	D		2.70				
		3.00	D						
		3.00	SPT	HVP=107 N=4 (1,1/1,1,1,1)				Soft, bluish-grey mottled brown CLAY.	3
		3.50		HVP=29					
		4.00	SPT	HVP=44 N=4 (1,1/1,1,1,1)	4.20				4
		5.00	SPT	N=4 (1,1/1,1,1,1)				Dark-brown, pseudo-fibrous PEAT (strong organic odour).	5
		6.00	SPT	N=4 (1,1/1,1,1,1)					6
		7.00	SPT	N=7 (2,1/1,2,2,2)	6.90 7.00			Dark-brown, bluish, clayey PEAT. End of Borehole at 7.000m	7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks 1. No groundwater encountered. 2. Terminated at 7.0m bgl. 3. Installation to 6.0m; 5.0m slotted pipe, 1.0m plain pipe.										
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Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 13/06/2024	
Location: Newport		Contractor:		Co-ords: E335576.00 N186592.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS206	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.00	SPT	N=16 (1,4/4,4,4,4)	0.20			MADE GROUND: Grey, sandy angular to subangular, fine to coarse of mixed lithologies including road aggregate and brick. MADE GROUND: Medium dense, reddish-brown, dark-grey, slightly sandy, clayey gravel, with medium cobble content. Gravel is angular to subangular, fine to coarse of concrete, slag and brick. Cobble is angular of concrete. <i>Cobble of concrete between 0.30m and 0.40m bgl.</i> <i>Cobble of concrete between 0.80m and 0.90m bgl.</i>	1
		2.00	SPT	N=30 (4,4/9,7,7,7)					2
		3.00	SPT	N=20 (5,5/5,5,5,5)	3.00			End of Borehole at 3.000m	3
									4
									5
									6
									7
									8
									9
									10

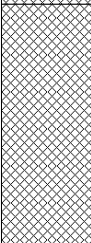
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
 1. Groundwater encountered at 2.0m.
 2. Terminated at 3.0m bgl.



Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335590.00 N186606.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS207	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	ES		0.20			MADE GROUND: Asphalt.	
					0.40			MADE GROUND: Grey, orange, angular to subangular, fine to coarse gravel of brick, road aggregate.	
		1.00	SPT	N=12 (3,3/3,3,3,3)				MADE GROUND: Medium dense to dense, dark-brown, clayey, sandy gravel, with low cobble content. Gravel is angular to subangular, fine to coarse of brick and concrete. Cobble is angular of concrete. <i>Cobble of concrete between 0.90 and 1.00m bgl.</i>	1
		2.00	SPT	N=50 (12,13/50 for 245mm)	2.00			End of Borehole at 2.000m	2
									3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

1. No groundwater encountered.

2. Refusal at 2.0m on a concrete cobble.



Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335593.00 N186596.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS208	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.00	SPT	50 (4,12/50 for 230mm)	1.00			MADE GROUND: Grey, sandy, angular to subangular, fine to coarse GRAVEL of mixed lithologies including brick and concrete fragments. MADE GROUND: Dense, orange, sandy, clayey gravel, with medium cobble content. Cobble is angular of concrete.	1
								End of Borehole at 1.000m	2
									3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

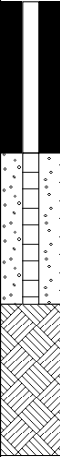
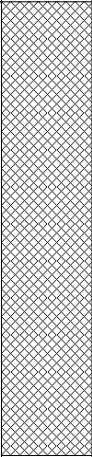
1. No groundwater encountered.

2. Refusal at 1.0m due to a concrete cobble.



Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 13/06/2024	
Location: Newport		Contractor:		Co-ords: E335596.00 N186593.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS208A	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		1.00	SPT	N=12 (3,3/3,3,3,3)	3.00			MADE GROUND: Medium dense to dense, dark-brown, sandy, clayey gravel, with occasional cobble content. Gravel is angular to subangular, fine to coarse of brick and concrete. Cobble is angular of concrete.	1
		2.00	SPT	N=18 (2,2/2,2,2,12)				<u>Cobble between 1.80m and 2.0m bgl.</u> <u>Cobble of concrete below 2.0m bgl.</u>	2
		2.50	SPT	50 (25 for 125mm/50 for 285mm)					3
								End of Borehole at 3.000m	3
									4
									5
									6
									7
									8
									9
									10

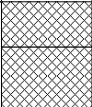
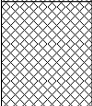
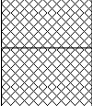
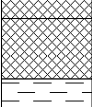
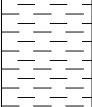
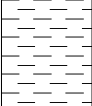
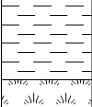
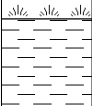
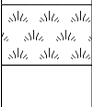
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

- No groundwater encountered.
- Terminated at 2.50m bgl due to refusal.
- Installation to 2.0m; 1.0m slotted pipe, 1.0m plain pipe.

Percussion Drilling Log

Project Name: Glan Llyn		Client: Lidl Great Britain Ltd		Date: 12/06/2024	
Location: Newport		Contractor:		Co-ords: E335608.00 N186585.00	
Project No. : 1261.04		Crew Name:		Drilling Equipment: Tracked rig	
Borehole Number WS209	Hole Type WS	Level	Logged By JR	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.70	ES		0.30			MADE GROUND: Grey, sandy angular to subangular, fine coarse of road aggregate.	1
					0.70			MADE GROUND: Dark-brown, gravelly clay. Gravel is angular to subangular, fine to coarse of concrete and brick.	
		1.00	SPT	N=12 (6,3/3,3,3,3)				MADE GROUND: Medium dense, dark-brown, sandy, clayey gravel, with occasional cobbles. Gravel is angular to subangular, fine to coarse of brick and concrete. Cobble is angular of concrete. <i>Cobble is angular of concrete.</i>	1
					1.70			MADE GROUND: Loose, reddish-brown, sandy, gravelly clay. Gravel is angular to subangular, fine to coarse of concrete, quartzite and brick.	2
		2.00	SPT	N=10 (1,1/2,2,2,4)				MADE GROUND: Medium dense, grey, orange, clayey gravel. Gravel is subangular to subrounded, fine to coarse gravel of mixed lithologies including concrete.	3
		2.60 - 3.00	D		2.60			Firm to soft bluish-grey CLAY.	
		3.00	SPT	HVP=43 N=8 (2,2/2,2,2,2)					4
		4.00	SPT	HVP=67 N=4 (1,1/1,1,1,1)				<i>Becoming soft below 4.0m bgl.</i>	
					4.70			Dark-brown, pseudo-fibrous PEAT.	5
		5.00	SPT	N=4 (1,1/1,1,1,1)	5.00			Soft, bluish-grey CLAY.	
					5.60			Dark-brown, pseudo-fibrous PEAT.	6
		6.00	SPT	N=4 (1,1/1,1,1,1)	6.00			No recovery.	
								End of Borehole at 7.000m	7
		7.00	SPT	N=5 (1,1/2,1,1,1)	7.00				8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks 1. Groundwater encountered at 1.90m bgl. 2. Terminated at 7.0m bgl.										
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APPENDIX A

SPT Hammer Energy Test Certificate

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING UK LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref: GTR780
Test Date: 01/12/2023
Report Date: 01/12/2023
File Name: GTR780.spt
Test Operator: CM

Instrumented Rod Data

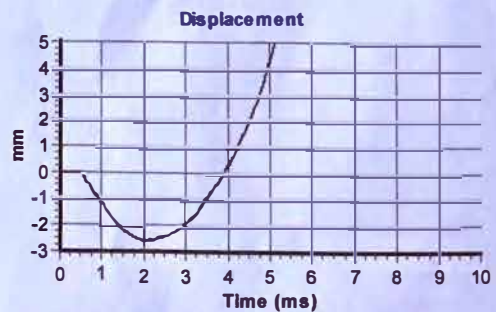
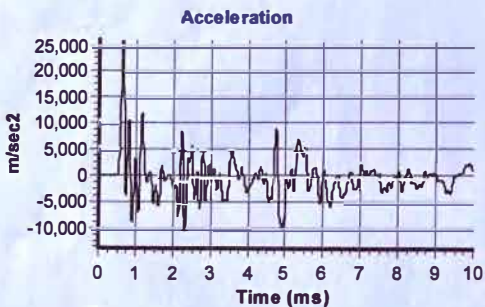
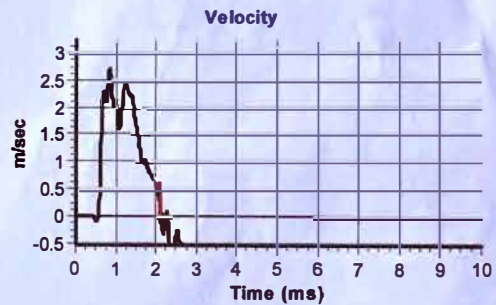
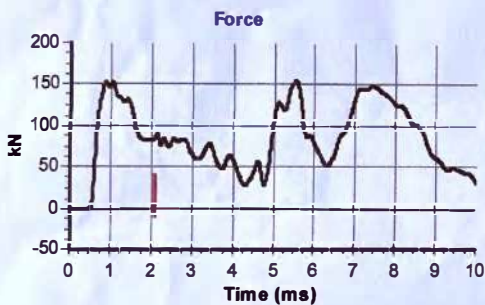
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.5
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 72572
Accelerometer No.2: 72757

SPT Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
SPT String Length L (m): 10.0

Comments / Location

REGIONAL DRILLING LTD - 82191



Calculations

Area of Rod A (mm²): 970
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 321

Energy Ratio E_r (%): **68**

Signed: C. McCLUSKEY
Title: FITTER



APPENDIX B

Plate Bearing Test Results

Plate Bearing Test Report

In-house Plate Bearing Test procedure based on BS1377 Part 9:1990 and IAN 73/06 (Incremental Loading)

Client :	Lidl Great Britain Ltd
Job Name:	Lidl, Newport
Job Number	1261.04
Site	Glan Llyn, Newport

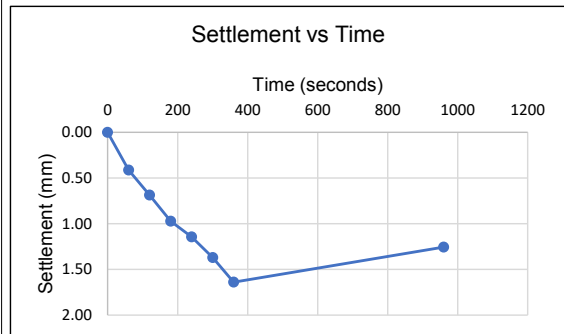
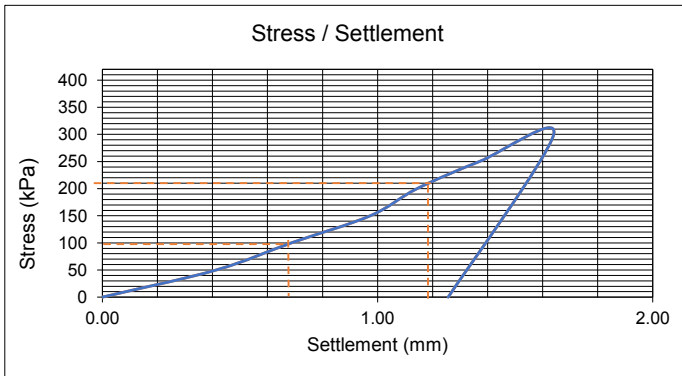
Test Date:	03/07/2024
Reaction Load	14 tonne excavator
Plate Diameter (mm)	600
Layer Thickness (mm)	0

Test Location	PBT201
Test Strata	Engineered fill
Ground Condition	Dry
Material	Engineered fill
Weather	Dry

Equivalent CBR Value (%)	53
Maximum Applied Stress (kPa)	300.0
Maximum Settlement (mm)	1.64
Bearing Pressure at 1.25mm Settlement	223.5
K762 (at 1.25mm settlement) kN/m2/m	183

Time (s)	Stress (kPa)	Settlement (mm)
0	0	0.00
60	50	0.41
120	100	0.69
180	150	0.97
240	200	1.14
300	250	1.37
360	300	1.64
960	0	1.26

Remarks:



Deformation Modulus (EV Calculation)

Plate Diameter (mm)	Maximum σ [kN/m ²]	0.3 σ [kN/m ²]	0.7 σ [kN/m ²]	s1 (mm)	s2 (mm)	Ev [MN/m ²]
600	300.0	90.00	210.00	0.63	1.19	97.01

$$E_v = 1.5 \cdot r \cdot \frac{\Delta \sigma}{\Delta s} \quad (4)$$

where r is the radius of the loading plate (mm), Δs is the difference in the settlement amount between the points with 30% and 70% of the maximum stress, and $\Delta \sigma$ is the difference in the stress.

Report Prepared By: Usamah Khan
Approved By: G Jones

Date: 05/07/2024
Date: 05/07/2024

Plate Bearing Test Report

In-house Plate Bearing Test procedure based on BS1377 Part 9:1990 and IAN 73/06 (Incremental Loading)

Client :	Lidl Great Britain Ltd
Job Name:	Lidl, Newport
Job Number	1261.04
Site	Glan Llyn, Newport

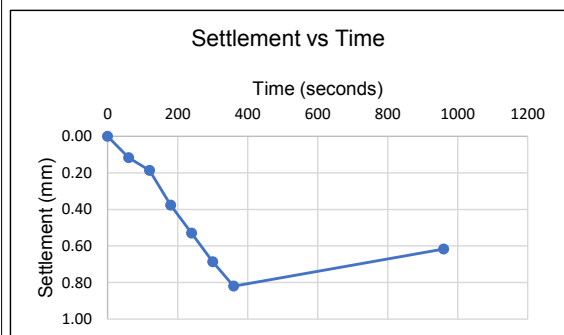
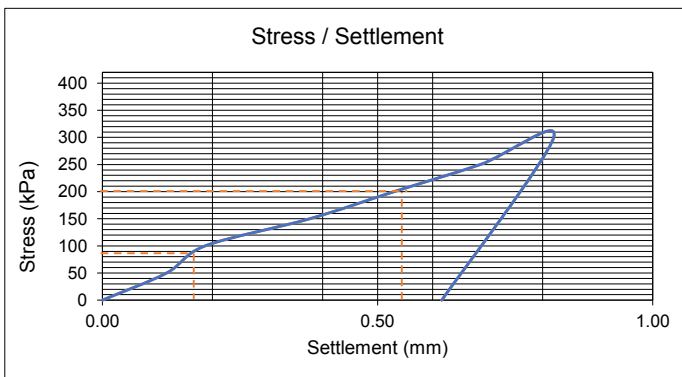
Test Date:	03/07/2024
Reaction Load	14 tonne excavator
Plate Diameter (mm)	600
Layer Thickness (mm)	0

Test Location	PBT202
Test Strata	Engineered fill
Ground Condition	Dry
Material	Engineered fill
Weather	Dry

Equivalent CBR Value (%)	>100
Maximum Applied Stress (kPa)	300.0
Maximum Settlement (mm)	0.82
Bearing Pressure at 1.25mm Settlement	461.3
K762 (at 1.25mm settlement) kN/m2/m	366

Time (s)	Stress (kPa)	Settlement (mm)
0	0	0.00
60	50	0.12
120	100	0.19
180	150	0.38
240	200	0.53
300	250	0.69
360	300	0.82
960	0	0.62

Remarks:



Deformation Modulus (EV Calculation)

Plate Diameter (mm)	Maximum σ [kN/m ²]	0.3 σ [kN/m ²]	0.7 σ [kN/m ²]	s1 (mm)	s2 (mm)	Ev [MN/m ²]
600	300.0	90.00	210.00	0.17	0.56	138.94

$$E_v = 1.5 \cdot r \cdot \frac{\Delta \sigma}{\Delta s} \quad (4)$$

where r is the radius of the loading plate (mm), Δs is the difference in the settlement amount between the points with 30% and 70% of the maximum stress, and $\Delta \sigma$ is the difference in the stress.

Report Prepared By: Usamah Khan
Approved By: G Jones

Date: 05/07/2024
Date: 05/07/2024

Plate Bearing Test Report

In-house Plate Bearing Test procedure based on BS1377 Part 9:1990 and IAN 73/06 (Incremental Loading)

Client :	Lidl Great Britain Ltd
Job Name:	Lidl, Newport
Job Number	1261.04
Site	Glan Llyn, Newport

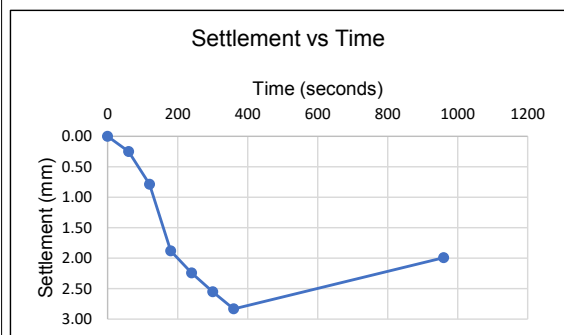
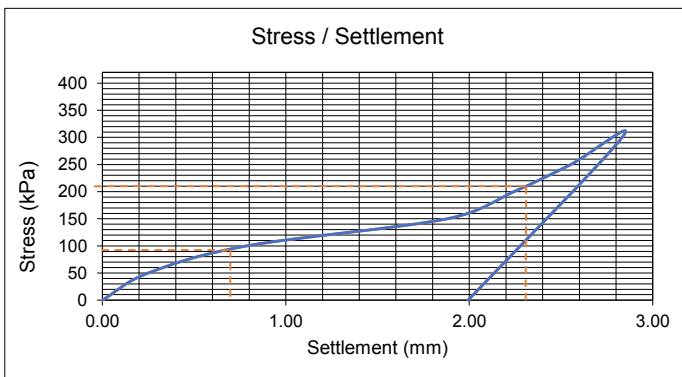
Test Date:	03/07/2024
Reaction Load	14 tonne excavator
Plate Diameter (mm)	600
Layer Thickness (mm)	0

Test Location	PBT203
Test Strata	Engineered fill
Ground Condition	Dry
Material	Engineered fill
Weather	Dry

Equivalent CBR Value (%)	18
Maximum Applied Stress (kPa)	300.0
Maximum Settlement (mm)	2.83
Bearing Pressure at 1.25mm Settlement	121.2
K762 (at 1.25mm settlement) kN/m2/m	106

Time (s)	Stress (kPa)	Settlement (mm)
0	0	0.00
60	50	0.25
120	100	0.79
180	150	1.88
240	200	2.24
300	250	2.55
360	300	2.83
960	0	1.99

Remarks:



Deformation Modulus (EV Calculation)

Plate Diameter (mm)	Maximum σ [kN/m ²]	0.3 σ [kN/m ²]	0.7 σ [kN/m ²]	s1 (mm)	s2 (mm)	Ev [MN/m ²]
600	300.0	90.00	210.00	0.68	2.31	33.21

$$E_v = 1.5 \cdot r \cdot \frac{\Delta \sigma}{\Delta s} \quad (4)$$

where r is the radius of the loading plate (mm), Δs is the difference in the settlement amount between the points with 30% and 70% of the maximum stress, and $\Delta \sigma$ is the difference in the stress.

Report Prepared By: Usamah Khan
Approved By: G Jones

Date: 05/07/2024
Date: 05/07/2024



APPENDIX C

Dynamic Cone Penetrometer (DCP) Test Results

TRL Dynamic Cone Penetrometer Test Results



Client:	Lidl Great Britain Ltd	Site Location:	Glan Llyn, Newport	Test No:	CBR201	Location:	355866, 186647
Project No:	1261.04	Date:	09.07.2024	Start Depth:	Surface	Test Strata:	Subsoil
$\text{Log10(CBR)} = 2.480 - 1.057 \times \text{Log10(mm/blow)}$						Weather:	Wet ground, overcast

No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %	Estimated CBR %
0	80	0		
1	142	62.0	3.8	
2	176	34.0	7.3	
3	216	40.0	6.1	
4	300	84.0	2.8	
5	376	76.0	3.1	
6	462	86.0	2.7	
7	481	19.0	13.4	
8	496	15.0	17.3	
9	521	25.0	10.1	
10	550	29.0	8.6	
11	552	2.0	145.1	
16	566	2.8	101.7	
21	592	5.2	52.9	
26	651	11.8	22.2	
28	697	23.0	11.0	
29	721	24.0	10.5	
30	753	32.0	7.7	
31	769	16.0	16.1	
32	784	15.0	17.3	
33	794	10.0	26.5	
36	826	10.7	24.7	
39	872	15.3	16.9	
40	912	40.0	6.1	
41	954	42.0	5.8	

Notes:	
Tested by S Taylor Date: 09.07.24	Checked by: P Dickinson Date: 09.07.24

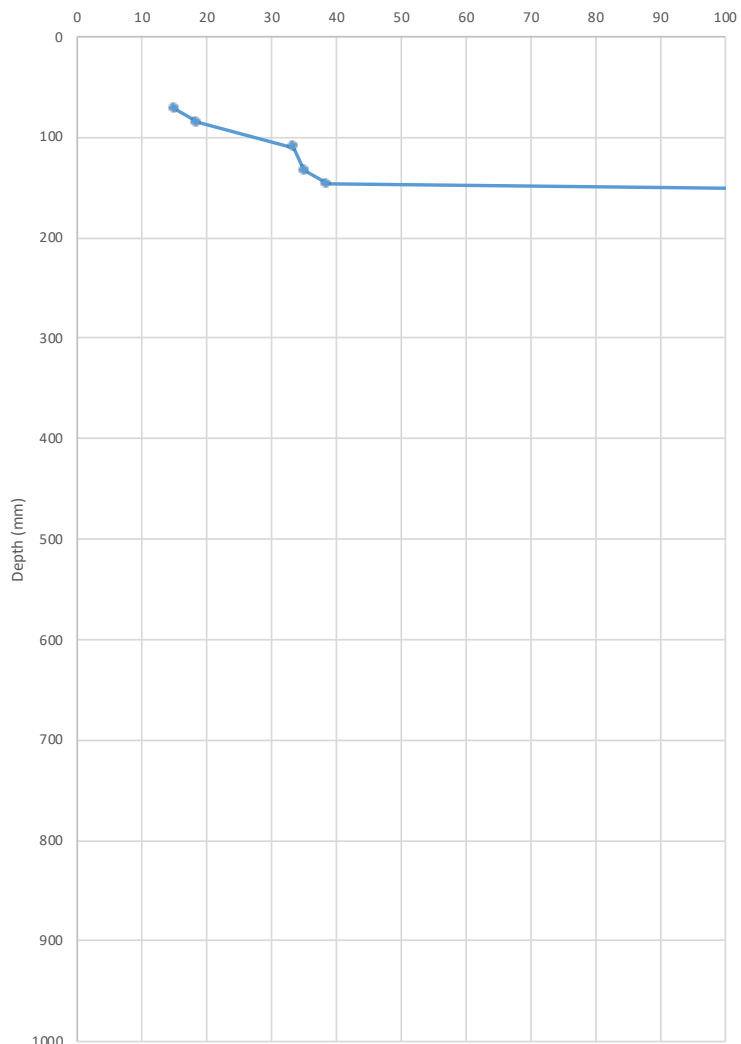
TRL Dynamic Cone Penetrometer Test Results



Client:	Lidl Great Britain Ltd	Site Location:	Glan Llyn, Newport	Test No:	CBR202	Location:	335591, 186628
Project No:	1261.04	Date:	09.07.2024	Start Depth:	Surface	Test Strata:	Subsoil
$\text{Log10(CBR)} = 2.480 - 1.057 \times \text{Log10(mm/blow)}$						Weather:	Wet ground, overcast

No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %	Estimated CBR %
0	66	0		
1	112	46.0	5.3	
2	157	45.0	5.4	
3	180	23.0	11.0	
4	221	41.0	6.0	
5	293	72.0	3.3	
6	354	61.0	3.9	
7	401	47.0	5.2	
8	473	72.0	3.3	
9	490	17.0	15.1	
10	517	27.0	9.3	
11	536	19.0	13.4	
14	562	8.7	30.8	
17	589	9.0	29.6	
19	634	22.5	11.2	
21	667	16.5	15.6	
22	701	34.0	7.3	
23	718	17.0	15.1	
24	742	24.0	10.5	
25	765	23.0	11.0	
26	793	28.0	8.9	
29	829	12.0	21.8	
34	898	13.8	18.8	
35	922	24.0	10.5	
36	950	28.0	8.9	

Notes:	
Tested by S Taylor Date: 09.07.24	Checked by: P Dickinson Date: 09.07.24

TRL Dynamic Cone Penetrometer Test Results						REMADA GEO CONSULTANTS	
Client:	Lidl Great Britain Ltd	Site Location:	Glan Llyn, Newport	Test No:	CBR203	Location:	335591 , 186628
Project No:	1261.04	Date:	18.07.2024	Start Depth:	Surface	Test Strata:	Subsoil
$Log10(CBR) = 2.480 - 1.057 \times Log10(mm/blow)$						Weather:	Wet ground, overcast
No of Blows	Depth Reading mm	Penetration/ Blow mm	CBR %	Estimated CBR % 			
0	55	0					
1	72	17.0	15.1				
2	86	14.0	18.6				
5	110	8.0	33.5				
8	133	7.7	35.1				
10	147	7.0	38.6				
20	160	1.3	228.9				
Notes:							
Tested by L Hillman Date: 18.07.24				Checked by: S Taylor Date: 18.07.24			



APPENDIX D

Laboratory Chemical Analysis

Remada Ltd
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B955AA

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

e: joana.ramos@remada.co.uk
info@remada.co.uk

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-025559

Project / Site name:	Newport (Glan Llyn)	Samples received on:	14/06/2024
Your job number:	1261.04	Samples instructed on/ Analysis started on:	17/06/2024
Your order number:	1261.04	Analysis completed by:	02/07/2024
Report Issue Number:	1	Report issued on:	02/07/2024
Samples Analysed:	9 soil samples		


Signed: _____

Dominika Liana
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-025559
Project / Site name: Newport (Glan Llyn)
Your Order No: 1261.04

Lab Sample Number	230374	230375	230376	230377	230378
Sample Reference	WS201	WS202	WS202	WS203	WS205
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.00	0.00-0.80	1.20	0.50	1.00
Date Sampled	11/06/2024	11/06/2024	11/06/2024	12/06/2024	12/06/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	21	8.6	12	12	12
Total mass of sample received	kg	0.1	NONE	0.8	1.4	0.5	0.8	1.5

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	-	WEM	WEM

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	9.1	9.2	8.6	10.6	10.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	-	-	0.053	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	200	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	98.1	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	4.1	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	210	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.021	-	-
Ammoniacal Nitrogen as NH ₄ ⁺	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH ₄ ⁺ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.05	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.011	0.012	-	0.009	0.019
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-	-	< 2.0	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	< 2.0	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.14	0.36	-	0.28	0.73
Acenaphthylene	mg/kg	0.05	MCERTS	0.06	0.18	-	0.28	0.26
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.39	-	0.06	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.55	-	0.17	0.16
Phenanthrene	mg/kg	0.05	MCERTS	0.27	4.5	-	2.2	1.5
Anthracene	mg/kg	0.05	MCERTS	0.09	1.6	-	0.73	0.48
Fluoranthene	mg/kg	0.05	MCERTS	0.7	6.6	-	5.1	3.2
Pyrene	mg/kg	0.05	MCERTS	0.57	4.9	-	4.2	2.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.38	3.2	-	3.5	1.8
Chrysene	mg/kg	0.05	MCERTS	0.44	4	-	3.4	2.1
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.53	3.3	-	3.9	2.8
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.17	1.3	-	1.6	0.93
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.37	2.4	-	3	2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.23	1.3	-	1.5	1.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.4	-	0.48	0.3
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.28	1.3	-	1.7	1.4
Coronene	mg/kg	0.05	NONE	-	-	-	-	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	4.22	36.4	-	32.1	21.5
Total WAC-17 PAHs	mg/kg	0.85	NONE	-	-	-	-	-

Analytical Report Number: 24-025559
Project / Site name: Newport (Glan Llyn)
Your Order No: 1261.04

Lab Sample Number	230374	230375	230376	230377	230378
Sample Reference	WS201	WS202	WS202	WS203	WS205
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	1.00	0.00-0.80	1.20	0.50	1.00
Date Sampled	11/06/2024	11/06/2024	11/06/2024	12/06/2024	12/06/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	11	-	9.8	14
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2	1.1	-	0.99	1.4
Boron (water soluble)	mg/kg	0.2	MCERTS	3.6	1.5	-	0.5	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	1.6	-	0.7	2.5
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	-	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	55	33	-	81	61
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	55	33	-	81	61
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	20	-	17	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	56	130	-	53	200
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	20	-	20	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	2.8	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	78	47	-	79	83
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	180	360	-	170	570

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	12	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	-	23	-	-

Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.02	NONE	< 0.020	< 0.020	-	< 0.020	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.02	NONE	< 0.020	< 0.020	-	< 0.020	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.05	NONE	< 0.050	< 0.050	-	< 0.050	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	-	4.4	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	-	9.6	10
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	16	24	-	42	45
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	16	24	-	56	55

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	NONE	< 0.010	< 0.010	-	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	NONE	< 0.010	< 0.010	-	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.05	NONE	< 0.050	< 0.050	-	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	< 2.0	5.9	-	2.7	< 2.0
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	18	-	23	10
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	< 10	33	-	76	16
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	< 10	57	-	100	26

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	-	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-025559
Project / Site name: Newport (Glan Llyn)
Your Order No: 1261.04

Lab Sample Number	230379	230380	230381	230382
Sample Reference	WS205	WS205	WS207	WS209
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.00-0.20	2.70	0.00-0.20	0.30-0.70
Date Sampled	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	1.1	19	0.8	12
Total mass of sample received	kg	0.1	NONE	0.3	0.6	0.3	0.8

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	-	-	-	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	-	-	-	[Z]

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	-	8.3	-	8.9
Total Cyanide	mg/kg	1	MCERTS	-	-	-	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	-	0.038	-	-
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	160	-	-
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	81	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	50	-	-
Total Sulphur	mg/kg	50	MCERTS	-	280	-	-
Total Sulphur	%	0.005	MCERTS	-	0.028	-	-
Ammoniacal Nitrogen as NH ₄ ⁺	mg/kg	0.5	MCERTS	-	16	-	-
Ammonium as NH ₄ ⁺ (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	1.01	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	-	-	-	0.019
Water Soluble Nitrate (2:1) as N	mg/kg	2	NONE	-	< 2.0	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	-	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.36
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.17
Acenaphthene	mg/kg	0.05	MCERTS	0.28	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.18	-	< 0.05	0.1
Phenanthrene	mg/kg	0.05	MCERTS	2.4	-	< 0.05	0.7
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.24
Fluoranthene	mg/kg	0.05	MCERTS	3.3	-	< 0.05	1.2
Pyrene	mg/kg	0.05	MCERTS	2.5	-	< 0.05	0.99
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.3	-	< 0.05	0.74
Chrysene	mg/kg	0.05	MCERTS	1.3	-	< 0.05	0.86
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.4	-	< 0.05	1.2
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.5	-	< 0.05	0.35
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.1	-	< 0.05	0.84
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.68	-	< 0.05	0.51
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	0.13
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.9	-	< 0.05	0.63
Coronene	mg/kg	0.05	NONE	< 0.05	-	< 0.05	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	15.9	-	< 0.80	9.04
Total WAC-17 PAHs	mg/kg	0.85	NONE	15.9	-	< 0.85	-

Analytical Report Number: 24-025559
Project / Site name: Newport (Glan Llyn)
Your Order No: 1261.04

Lab Sample Number	230379	230380	230381	230382
Sample Reference	WS205	WS205	WS207	WS209
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.00-0.20	2.70	0.00-0.20	0.30-0.70
Date Sampled	12/06/2024	12/06/2024	12/06/2024	12/06/2024
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	10
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	-	0.96
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	-	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	-	1.4
Chromium (hexavalent)	mg/kg	1.8	MCERTS	-	-	-	< 1.8
Chromium (III)	mg/kg	1	NONE	-	-	-	43
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	43
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	28
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	68
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	16
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	58
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	-	210

Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	14	-	-
Magnesium (water soluble)	mg/kg	5	NONE	-	29	-	-

Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS_1D_AL}	mg/kg	0.02	NONE	-	-	-	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 _{HS_1D_AL}	mg/kg	0.02	NONE	-	-	-	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 _{HS_1D_AL}	mg/kg	0.05	NONE	-	-	-	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 _{EH_CU_1D_AL}	mg/kg	1	MCERTS	-	-	-	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 _{EH_CU_1D_AL}	mg/kg	2	MCERTS	-	-	-	3.3
TPHCWG - Aliphatic >EC16 - EC21 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	14
TPHCWG - Aliphatic >EC21 - EC35 _{EH_CU_1D_AL}	mg/kg	8	MCERTS	-	-	-	120
TPHCWG - Aliphatic >EC5 - EC35 _{EH_CU+HS_1D_AL}	mg/kg	10	NONE	-	-	-	140

TPHCWG - Aromatic >EC5 - EC7 _{HS_1D_AR}	mg/kg	0.01	NONE	-	-	-	< 0.010
TPHCWG - Aromatic >EC7 - EC8 _{HS_1D_AR}	mg/kg	0.01	NONE	-	-	-	< 0.010
TPHCWG - Aromatic >EC8 - EC10 _{HS_1D_AR}	mg/kg	0.05	NONE	-	-	-	< 0.050
TPHCWG - Aromatic >EC10 - EC12 _{EH_CU_1D_AR}	mg/kg	1	MCERTS	-	-	-	< 1.0
TPHCWG - Aromatic >EC12 - EC16 _{EH_CU_1D_AR}	mg/kg	2	MCERTS	-	-	-	< 2.0
TPHCWG - Aromatic >EC16 - EC21 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	< 10
TPHCWG - Aromatic >EC21 - EC35 _{EH_CU_1D_AR}	mg/kg	10	MCERTS	-	-	-	94
TPHCWG - Aromatic >EC5 - EC35 _{EH_CU+HS_1D_AR}	mg/kg	10	NONE	-	-	-	94

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	-	< 5.0
Benzene	µg/kg	5	MCERTS	-	-	-	< 5.0
Toluene	µg/kg	5	MCERTS	-	-	-	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	-	-	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	-	-	-	< 5.0
o-Xylene	µg/kg	5	MCERTS	-	-	-	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-025559
Project / Site name: Newport (Glan Llyn)

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
230374	WS201	None Supplied	1	Brown clay and sand with gravel and vegetation
230375	WS202	None Supplied	0.00-0.80	Brown clay and loam with gravel and vegetation
230376	WS202	None Supplied	1.2	Light brown clay and sand with gravel
230377	WS203	None Supplied	0.5	Brown clay and sand with gravel and vegetation
230378	WS205	None Supplied	1	Brown clay and sand with gravel and vegetation
230379	WS205	None Supplied	0.00-0.20	Grey tar with gravel and rubble ^{*b}
230380	WS205	None Supplied	2.7	Brown clay and sand with gravel
230381	WS207	None Supplied	0.00-0.20	Non Soil. ^{*b}
230382	WS209	None Supplied	0.30-0.70	Brown clay and sand with gravel and vegetation

Analytical Report Number : 24-025559

Project / Site name: Newport (Glan Llyn)

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES	In-house method based on TRL 447	L038B	D	NONE
Total sulphate (as SO ₄ in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
TPH Chromatogram in soil	TPH Chromatogram in soil	In-house method	L064B	D	NONE
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction	L078B	W	NONE
Chromium III in soil	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS

Analytical Report Number : 24-025559
Project / Site name: Newport (Glan Llyn)

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser	In-house method	L082B	D	MCERTS
Ammonium as NH ₄ in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082B	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate	In-house method	L009B	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

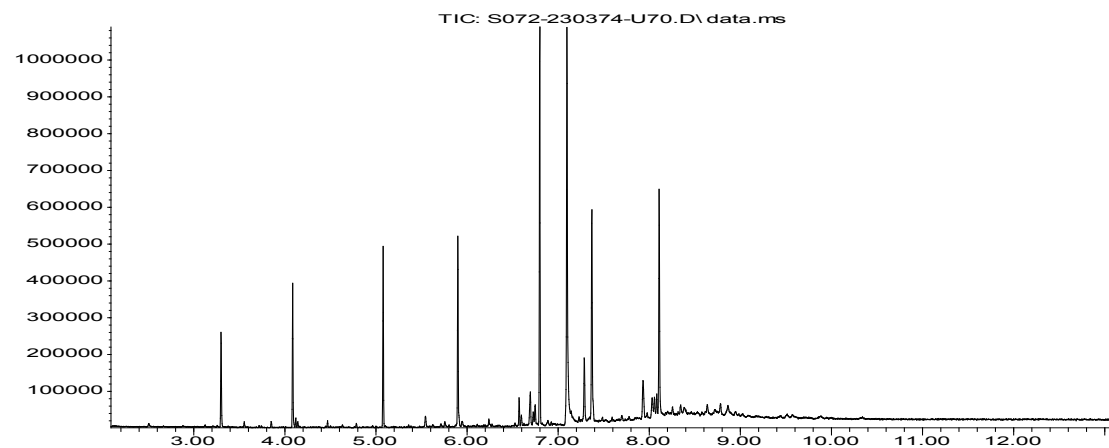
List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

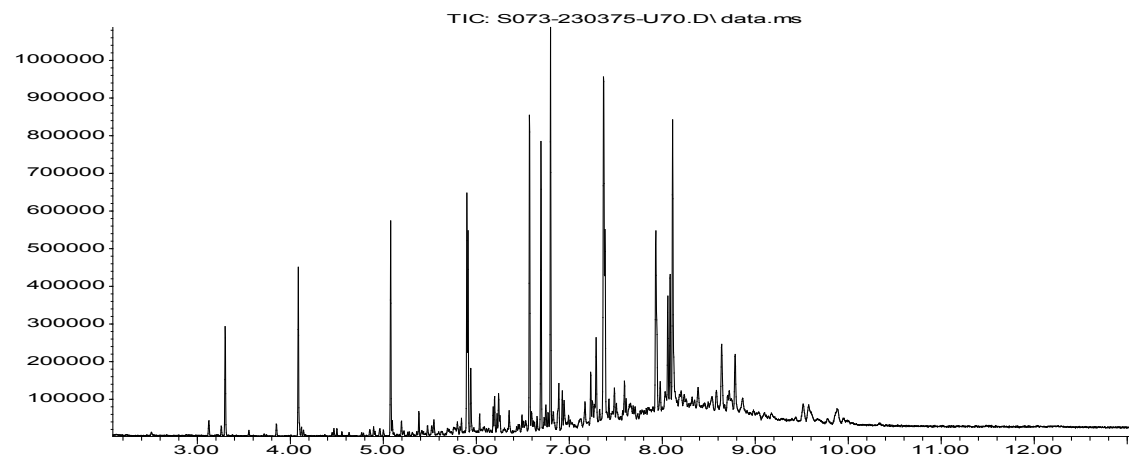
*b - Unaccredited sample matrix.

Abundance



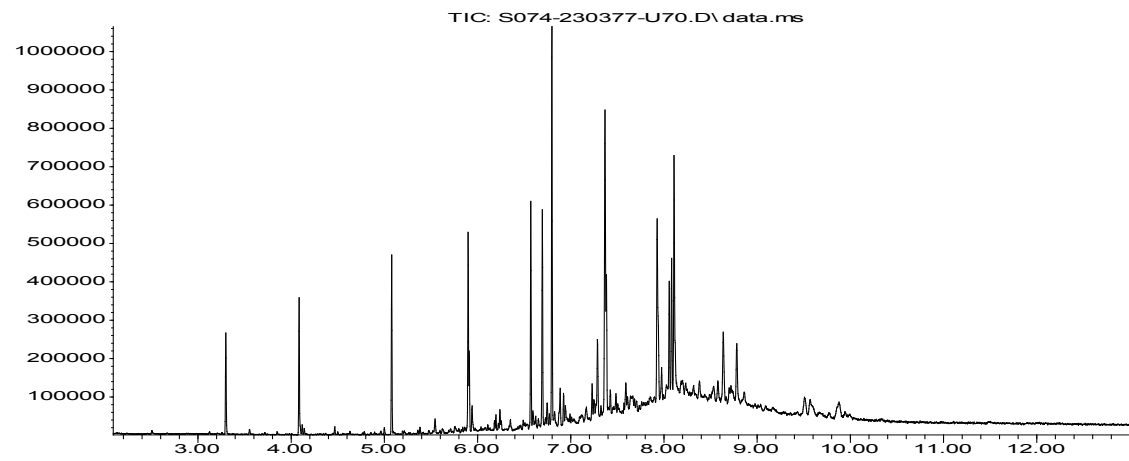
Time-->

Abundance



Time→

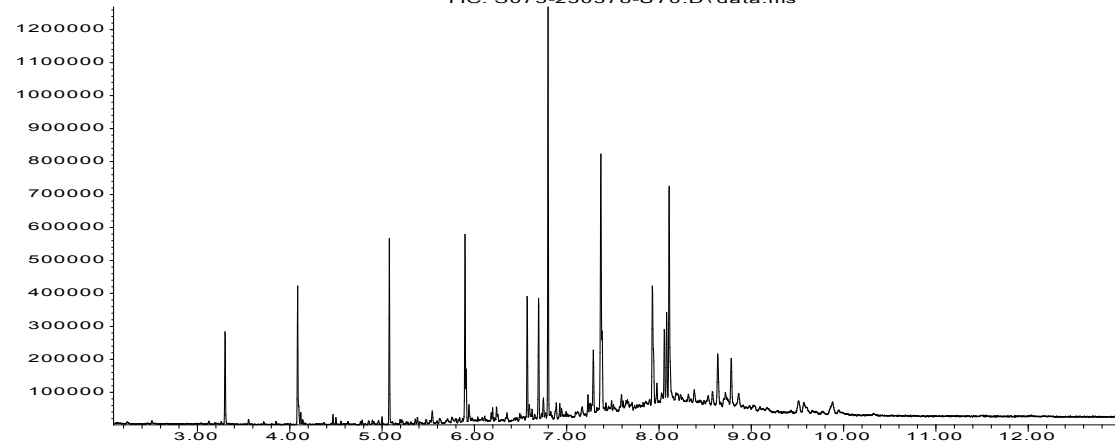
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Time→

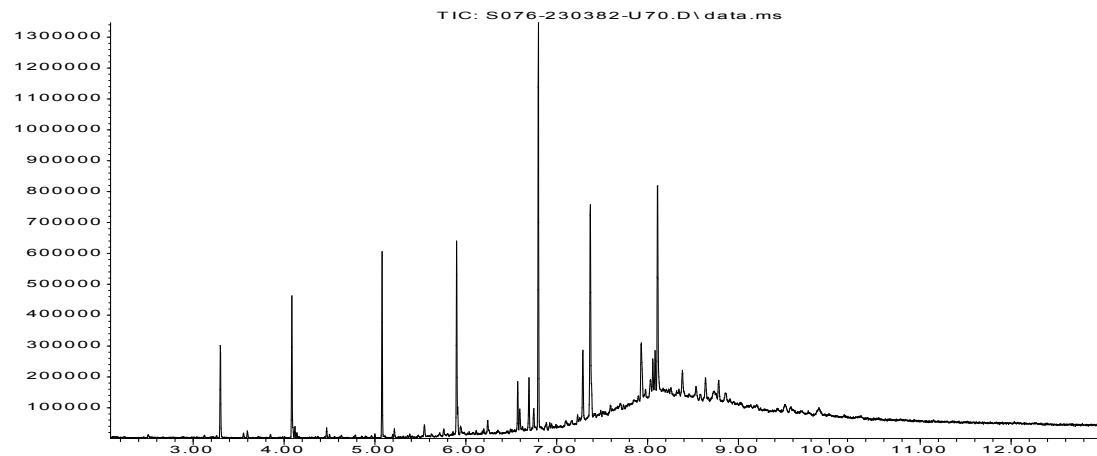
Abundance

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Time-->

Abundance



Time-->

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Analytical Report Number : 24-025561

Project / Site name:	Newport (Glan Llyn)	Samples received on:	14/06/2024
Your job number:	1261.04	Samples instructed on/ Analysis started on:	17/06/2024
Your order number:	1261.04	Analysis completed by:	26/06/2024
Report Issue Number:	1	Report issued on:	26/06/2024
Samples Analysed:	2 10:1 WAC samples		

Signed: 

Joanna Szwagrak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-025561
 Project / Site name: Newport (Glan Llyn)
 Your Order No: 1261.04

Lab Sample Number				230398	230399
Sample Reference				WS202	WS205
Sample Number				None Supplied	None Supplied
Depth (m)				0.00-0.80	1.00
Date Sampled				11/06/2024	12/06/2024
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	8.6	12
Total mass of sample received	kg	0.1	NONE	1.4	1.6

General Inorganics

pH (L005B)	pH Units	N/A	MCERTS	9	9.1
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	1.2	2.1
Loss on Ignition @ 450°C	%	0.2	MCERTS	3.3	5.6
Acid Neutralisation Capacity	mmol/kg	-9999	NONE	19	36

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.37	0.69
Acenaphthylene	mg/kg	0.05	MCERTS	0.17	0.28
Acenaphthene	mg/kg	0.05	MCERTS	0.35	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.53	0.18
Phenanthrene	mg/kg	0.05	MCERTS	4.5	1.5
Anthracene	mg/kg	0.05	MCERTS	1.6	0.49
Fluoranthene	mg/kg	0.05	MCERTS	6.7	3.2
Pyrene	mg/kg	0.05	MCERTS	4.9	2.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.4	1.8
Chrysene	mg/kg	0.05	MCERTS	3.8	2.2
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.7	2.7
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1	1.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.4	2
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3	1.2
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.44	0.27
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.3	1.4
Coronene	mg/kg	0.05	NONE	0.61	0.64

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	36.6	21.6
Total WAC-17 PAHs	mg/kg	0.85	NONE	37.3	22.2

Petroleum Hydrocarbons

Mineral Oil (EC10 - EC40) _{EH_CU_10_AL}	mg/kg	10	NONE	59	35
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VOCs

Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0

Total BTEX	µg/kg	5	MCERTS	< 5.0	< 5.0
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Analytical Report Number: 24-025561
 Project / Site name: Newport (Glan Llyn)
 Your Order No: 1261.04

Lab Sample Number				230398	230399
Sample Reference				WS202	WS205
Sample Number				None Supplied	None Supplied
Depth (m)				0.00-0.80	1.00
Date Sampled				11/06/2024	12/06/2024
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection
				Accreditation Status	

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	< 0.001
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	< 0.001

Total PCBs	mg/kg	0.007	MCERTS	< 0.007	< 0.007
------------	-------	-------	--------	---------	---------

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

i2 Analytical

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Waste Acceptance Criteria Analytical Results

Report No:	24-025561						
				Client: REMADALT			
Location	Newport (Glan Llyn)						
Lab Reference (Sample Number)	230398			Landfill Waste Acceptance Criteria			
				Limits			
Sampling Date	11/06/2024			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS202						
Depth (m)	0.00-0.80						
Solid Waste Analysis							
TOC (%)**	1.2			3%	5%	6%	
Loss on Ignition (%) **	3.3			--	--	10%	
BTEX (µg/kg) **	< 5.0			6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007			1	--	--	
Mineral Oil (mg/kg) EH, ID, CU, AL	59			500	--	--	
Total PAH (WAC-17) (mg/kg)	37.3			100	--	--	
pH (units)**	9.0			--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	19			--	To be evaluated	To be evaluated	
Eluate Analysis		10:1		10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)		mg/l		mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0220			0.220	0.5	2	25
Barium *	0.0385			0.385	20	100	300
Cadmium *	< 0.000100			< 0.00100	0.04	1	5
Chromium *	0.0018			0.018	0.5	10	70
Copper *	0.025			0.25	2	50	100
Mercury *	< 0.000500			< 0.00500	0.01	0.2	2
Molybdenum *	0.00581			0.0581	0.5	10	30
Nickel *	0.0022			0.022	0.4	10	40
Lead *	0.014			0.14	0.5	10	50
Antimony *	0.015			0.15	0.06	0.7	5
Selenium *	0.0053			0.053	0.1	0.5	7
Zinc *	0.0087			0.087	4	50	200
Chloride *	6.4			64	800	15000	25000
Fluoride*	0.46			4.6	10	150	500
Sulphate *	32			320	1000	20000	50000
TDS*	68			680	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	10.7			107	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.4						
Dry Matter (%)	91						
Moisture (%)	8.6						
Results are expressed on a dry weight basis, after correction for moisture content where applicable.							
* = UKAS accredited (liquid eluate analysis only)							
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation							
** = MCERTS accredited							

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Waste Acceptance Criteria Analytical Results

Report No:	24-025561						
				Client: REMADALT			
Location	Newport (Glan Llyn)						
Lab Reference (Sample Number)	230399			Landfill Waste Acceptance Criteria			
				Limits			
Sampling Date	12/06/2024			Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID	WS205						
Depth (m)	1.00						
Solid Waste Analysis							
TOC (%)**	2.1			3%	5%	6%	
Loss on Ignition (%) **	5.6			--	--	10%	
BTEX (µg/kg) **	< 5.0			6000	--	--	
Sum of PCBs (mg/kg) **	< 0.007			1	--	--	
Mineral Oil (mg/kg) EH, ID, CU, AL	35			500	--	--	
Total PAH (WAC-17) (mg/kg)	22.2			100	--	--	
pH (units)**	9.1			--	>6	--	
Acid Neutralisation Capacity (mmol / kg)	36			--	To be evaluated	To be evaluated	
Eluate Analysis		10:1		10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)				using BS EN 12457-2 at L/S 10 l/kg (mg/kg)			
	mg/l			mg/kg			
Arsenic *	0.00949			0.0949	0.5	2	25
Barium *	0.0584			0.584	20	100	300
Cadmium *	< 0.000100			< 0.00100	0.04	1	5
Chromium *	0.0033			0.033	0.5	10	70
Copper *	0.018			0.18	2	50	100
Mercury *	< 0.000500			< 0.00500	0.01	0.2	2
Molybdenum *	0.00132			0.0132	0.5	10	30
Nickel *	0.0022			0.022	0.4	10	40
Lead *	0.015			0.15	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.027			0.27	4	50	200
Chloride *	1.1			11	800	15000	25000
Fluoride*	0.82			8.2	10	150	500
Sulphate *	23			230	1000	20000	50000
TDS*	75			750	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	6.93			69.3	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	1.6						
Dry Matter (%)	88						
Moisture (%)	12						
Results are expressed on a dry weight basis, after correction for moisture content where applicable.							
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation							
** = MCERTS accredited							

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 24-025561

Project / Site name: Newport (Glan Llyn)

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
230398	WS202	None Supplied	0.00-0.80	Brown clay and loam with gravel and vegetation
230399	WS205	None Supplied	1	Brown clay and sand with gravel and vegetation

Analytical Report Number : 24-025561

Project / Site name: Newport (Glan Llyn)

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031B	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1 ratio with a buffer solution followed by Ion Selective Electrode	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination	L033B	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Sample Preparation		In-house method	L043B	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe	In-house method based on Guidance on Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046B	W	NONE
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS	In-house method	L076B/L088	D/W	NONE

Analytical Report Number : 24-025561
Project / Site name: Newport (Glan Llyn)

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser	In-house based on MEWAM Method ISBN 0117516260	L082B	W	ISO 17025
WAC Leachate 10:1		In-house method	L043B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution



APPENDIX E

Laboratory Geotechnical Tests



LABORATORY REPORT



Contract Number: PSL24/4326

Report Date: 15 July 2024

Client's Reference: 1261.04

Client Name: Remada Limited
Forward House
17 High Street
Henley-in-Arden
Warwickshire
B95 5AA

For the attention of: Joana Ramos

Contract Title: Glan Llyn, Newport

Date Received: 19/6/2024

Date Commenced: 19/6/2024

Date Completed: 15//7/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Managing Director)

R Berriman
(Associate Director)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)


D Nicholson
(Senior Technician)

T Watkins
(Senior Technician)

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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Glan Llyn, Newport

Contract No:

PSL24/4326

Client Ref:

1261.04

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



Glan Llyn, Newport

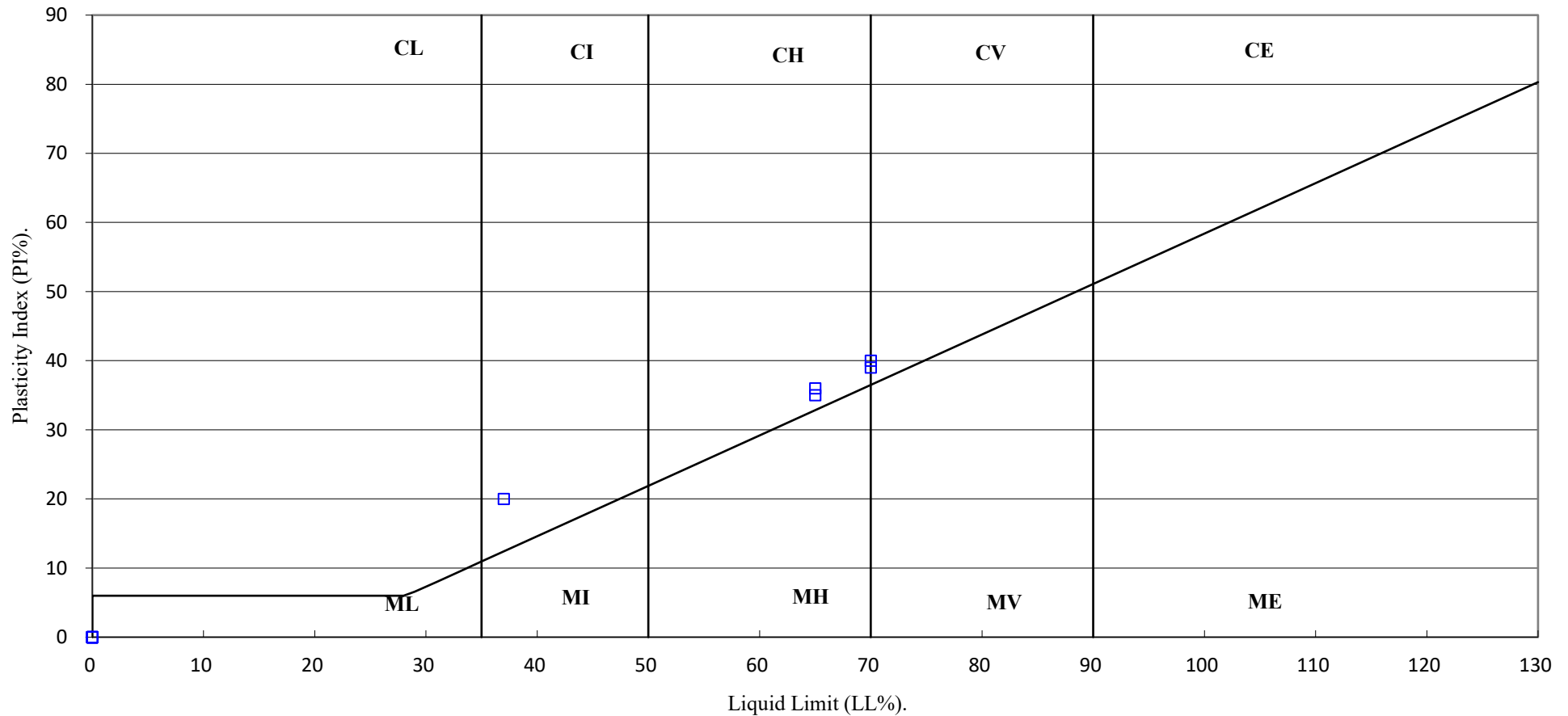
Contract No:

PSL24/4326

Client Ref:

1261.04

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Glan Llyn, Newport

Contract No:

PSL24/4326

Client Ref:

1261.04

PARTICLE SIZE DISTRIBUTION TEST

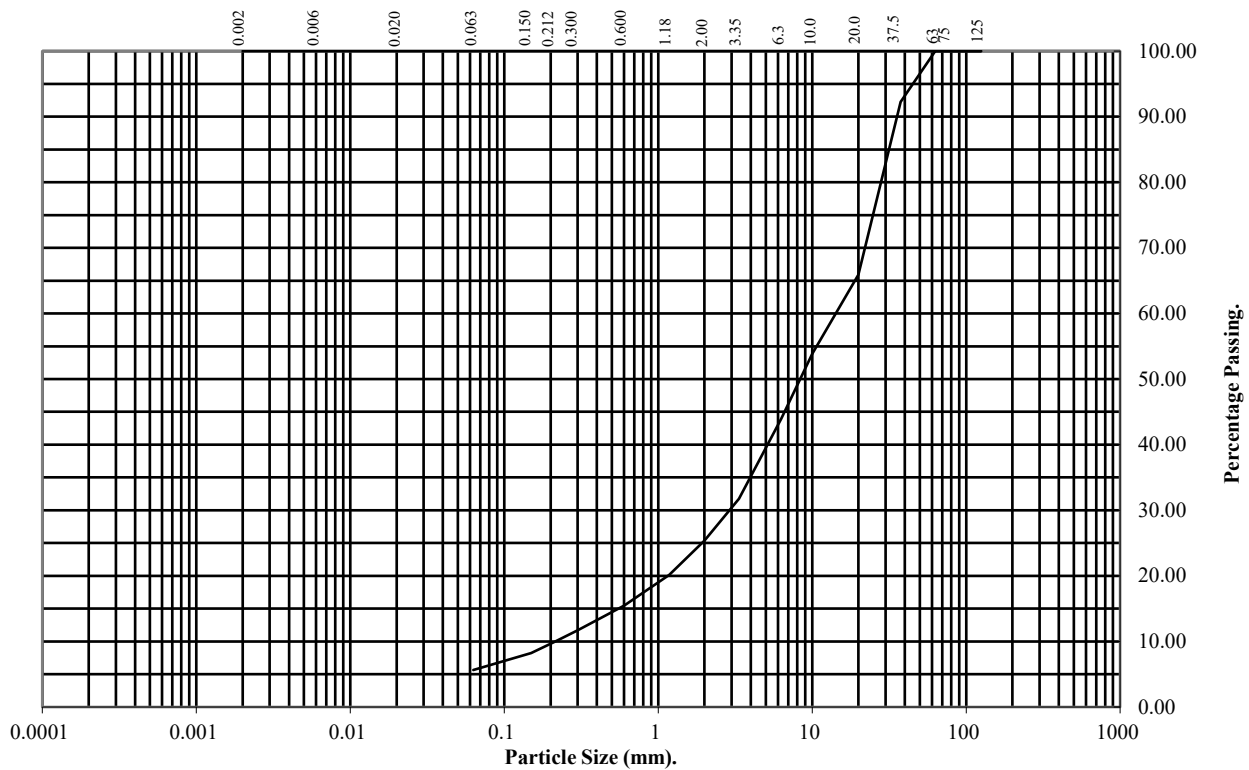
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS201** Top Depth (m): **3.00**

Sample Number: Base Depth(m): **4.00**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	92
20	66
10	54
6.3	44
3.35	32
2	25
1.18	20
0.6	15
0.3	12
0.212	10
0.15	8
0.063	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	75
Sand	19
Silt/Clay	6

Remarks:

See Summary of Soil Descriptions



Glan Llyn, Newport

Contract No:
PSL24/4326
Client Ref:
1261.04

PARTICLE SIZE DISTRIBUTION TEST

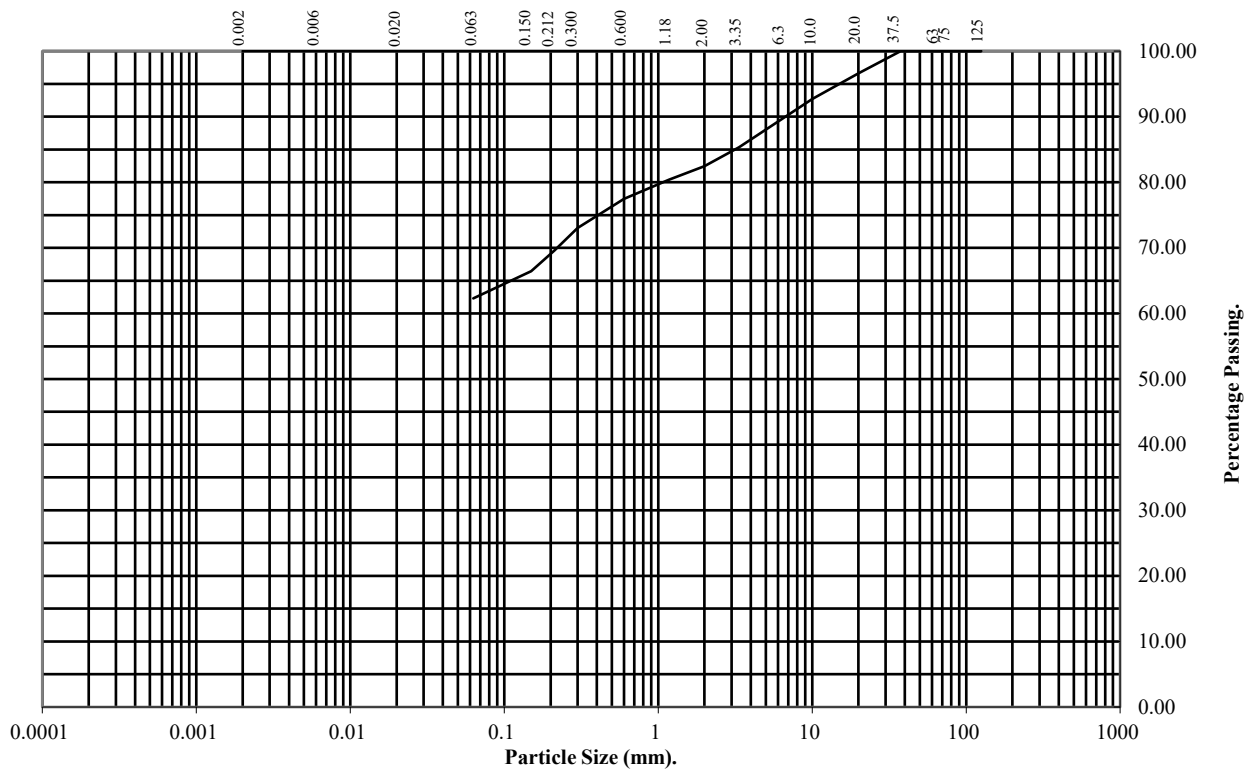
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS202** Top Depth (m): **1.20**

Sample Number: Base Depth(m): **2.50**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	97
10	93
6.3	90
3.35	85
2	82
1.18	80
0.6	77
0.3	73
0.212	70
0.15	66
0.063	62

Soil Fraction	Total Percentage
Cobbles	0
Gravel	18
Sand	20
Silt/Clay	62

Remarks:

See Summary of Soil Descriptions



Glan Llyn, Newport

Contract No:
PSL24/4326
Client Ref:
1261.04



APPENDIX F

CPT Report

IN SITU
SITE INVESTIGATION

STATIC CONE PENETRATION TEST

FACTUAL REPORT

CLIENT: Remada Ltd

PROJECT: Glad Llyn



Project	Glan Llyn
Project No.	1240380
Client	Remada Ltd
Address	17 High Street, Henley in Arden, B95 5AA

Attention: Greg Jones

Dear Greg,

We have pleasure in providing a digital copy of our report and data in AGS format for the above project.

We hope that you are satisfied with the performance of our staff, equipment and reporting on this project. If you should have any queries about any aspect of the works carried out, please do not hesitate to contact us. We look forward to being of service to you in the future.

Yours faithfully,

In Situ Site Investigation Limited



Darren Ward

Director

Report Issue

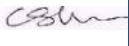
Issue	Date	Prepared	Sign	Checked	Sign	Approved	Sign
01	19/08/2024	Chloe Donovan		Darren Ward		Darren Ward	

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1.0 INTRODUCTION

In Situ Site Investigation Limited (In Situ) was engaged in a geotechnical site investigation at Glan Llyn at the request of Ramada Ltd. The site investigation consisted of completing 9 Static Piezocone Penetration Tests (CPTU), to provide information on the soil conditions and derived geotechnical parameters at:

Bessemer Drive,
Glan Llyn,
Newport,
South Wales
NP19 4TZ

All test locations were provided by the client. A site map is included in the end of Appendix A of this report (if provided by the client). The tests were stopped when they reached the target depth as per the client's technical specifications or for other technical reasons, as detailed in the *Project Summary Table* in *Appendix A.1* and on each CPTU log included in Appendix B of this report.

The fieldwork was carried out on 8th August 2024 as per the client's request.

The work on site and the final factual reporting have been undertaken in accordance with the international technical standard *ISO 22476-1:2022(E)*.

2.0 FIELDWORK

2.1 CONE PENETRATION TESTS

The fieldwork activity is summarised in Table 2.1.

Table 2.1 Fieldwork Summary	
CPT Operator/s	Josh Cogle & Rob Bennett
Date Started	8 th August 2024
Date Finished	8 th August 2024
In Situ S.I. Project Manager	Darren Ward
Main Contractor's Site Manager	Greg Jones

2.1.1 Rig Information

Details of CPTU rig used in this project are shown in Table 2.2. Full data sheet for the rig is presented in *Appendix A.2*.

Table 2.2 Rig Summary	
Rig Name	Rig Description
CPT006	14 Tonne Track Mounted CPT Rig

2.1.2 CPTU Cone

Details of electric CPTU cone (Type TE2) used in this project conforming to the requirements of Application Class 2 of *ISO 22476-1:2022*, are shown in Table 2.3.

Table 2.3 Cone Summary		
Number	Cross-section area	Filter position
S15-CFIP.1999	15cm ²	U ₂

A full datasheet of the cone used is shown in *Appendix A.3*.

The cone's measured parameters are shown in Table 2.4.

Table 2.4 Completed Fieldwork Summary
9 CPTU to a maximum depth of 13.68m. Each test measured Cone Resistance, q_c , Sleeve Friction, f_s , Porewater Pressure in the shoulder position, u_2 , Inclination in X and Y axes.
<i>Provision of factual report with estimated soil type, derived geotechnical parameters & AGS data file.</i>

2.1.3 CPTU Cone Calibration

The cone resistance and sleeve friction are recorded by calibrated load cells in the cone. The CPTU load cells and pressure transducers are regularly calibrated in line with *ISO 22476-1:2022(E)* standard by the cone manufacturer. The cone calibration certificate for the cone used at this site are presented in *Appendix A.4*.

2.1.4 CPTU Cone Saturation

The pore water pressure is recorded using a calibrated pressure transducer located in the piezocone. To ensure pore water pressure measurements are not affected by the presence of air in the measuring transducer, a de-airing procedure is carried out prior to each test. The cone and filter are saturated using a glycerine fluid with a viscosity of 10,000 CST.

2.1.5 Test Procedure

The tests are carried out in accordance with the *International Standard for Electrical Cone and Piezocone Penetration Test ISO 22476-1:2022(E)*.

The final depths of the tests were determined by either completion to the specified test depth or when the maximal safe capacity of the equipment was reached. A schedule of the tests performed is shown in *Appendix A.1*, which has been compiled from the operators' daily progress reports.

The data is transmitted from the digital CPTU through an umbilical cable that runs through the push rods to the data acquisition system. Results are displayed instantaneously on the computer logging screen. The results are recorded on the computer hard disc.

The rate of penetration is kept constant at 20 mm/s $\pm$ 5 mm/s except when penetrating very dense or hard strata. Before each test is carried out zero values are taken of the cone to check if it is within calibration. At the end of each test, zero values are taken again to see if there has been any drift during the test. These values are inspected during the post processing stage. This is a quality check on the data and the testing procedure. Individual test zero values are shown on their corresponding test results in *Appendix B*.

2.1.6 In Situ Pore Pressure (u_0)

The in situ or hydrostatic pore pressure is required for the calculation of several derived parameters included in this report. For this report, the groundwater level is assumed at 0.5m below ground surface, for calculation purposes. The in situ pore pressure, u_0 values are presented on the pore pressure plot, on *CPT Log 01*, which is included in *Appendix B*.

2.2 POSITIONING

Positioning and surveying of all investigated locations was the responsibility of the client.

3.0 CONE PENETRATION MEASURED PARAMETERS

All measured parameters of tests carried with the CPTU cone are shown in *Appendix B* and all the information about data processing and results are given in sections 3.1, 3.2 and 3.3.

3.1 DATA PROCESSING

The measured parameters, cone end resistance, q_c , sleeve friction, f_s , porewater pressure measurements with filter in shoulder position, u_2 and inclination for x and y axis, I_x , I_y , were recorded for every 10 mm of penetration keeping a constant speed of 20 mm/s $\pm$ 5 mm/s, which may slightly change when the cone is penetrating hard strata.

The measured data from the site works is processed and presented using specialised CPT software. The interpretations on the CPTU results were carried out following the recommendations of *ISO 22476-1:2022(E)*, *Lunne et al. (1997)* and *Robertson (2015)*. Measured parameters, mentioned in *Sections 3.2* and *3.3*, were used to derive all the geotechnical parameters, which are presented in *Chapter 4.0*. The soil behaviour type method used on this report is *Robertson et al. (1986)*, shown in *Figure 3.2*.

3.1.1 Zero Measurements

Before and after each CPTU test, zero measurements are recorded for each channel of the cone. The zero measurements are presented on the logs in *Appendix B*. This is a routine quality check carried out on site.

3.2 MEASURED PARAMETERS

3.2.1 Cone Resistance (q_c)

Cone resistance, q_c , is measured as the total force acting on the cone, divided by the projected area of the cone. The results are presented in MPa, on *CPT Log 01*, in *Appendix B*, scale 0-20 MPa with a minor scale printing on the same graph at 0-4 MPa.

3.2.2 Sleeve Friction (f_s)

Sleeve friction, f_s , is measured as the total frictional force acting on the friction sleeve divided by its surface area. The results are presented in kPa, on *CPT Log 01*, in *Appendix B*, using a scale of 0-500 kPa.

3.2.3 Porewater pressure (u_2)

The pore pressure, u_2 , is measured during the test. If the material is free draining and saturation is maintained it will normally measure hydrostatic pore pressure. In materials that are not free draining, it will record the total pore pressure (hydrostatic plus any excess pore pressures generated) created by the cone penetration through this material.

The filter element can be mounted in one of three positions. For all tests carried out in this project the filter was mounted in the u_2 position (see *Figure 3.1*).

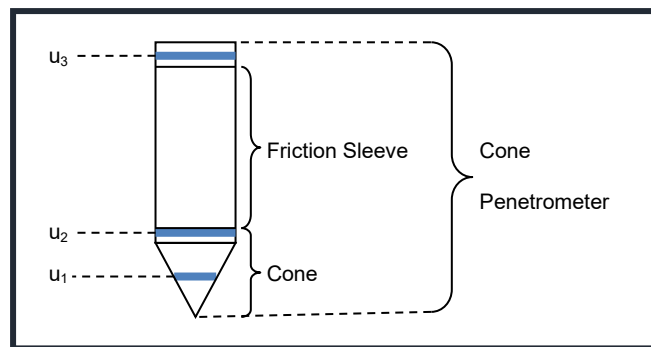


Figure 3.1: Diagram showing pore pressure filter locations (after Lunne et al., 1997)

3.2.4 Inclination (I_x , I_y)

The CPT rig was set up to obtain a thrust direction as near as possible to vertical. The CPTU cones have inclinometers incorporated to measure the non-verticality of the test. For test depths less than 15 m, significant non-verticality is unusual, provided the initial thrust direction is vertical.

3.3 ESTIMATED SOIL BEHAVIOUR TYPE

3.3.1 Friction Ratio (R_f)

The friction ratio, R_f is the ratio between the sleeve friction and the cone resistance (Lunne et al., 1997).

$$\text{Friction Ratio } (R_f) = \left(\frac{\text{Sleeve Friction } (f_s)}{\text{Cone Resistance } (q_c)} \right) \times 100$$

3.3.2 Estimated Soil Behaviour Type (SBT)

The estimation of soil behaviour type, *SBT*, using measurements of cone resistance and sleeve friction is based upon the variations of the friction ratio and cone resistance. The friction

ratio varies depending upon whether the soil is cohesive or granular. The cone resistance varies depending on the strength and densities of the soil.

The interpretation used in this report is *Robertson et al. (1986)*, which is shown in Figure 3.2. The results are presented on *CPT Log 01*, in *Appendix B*.

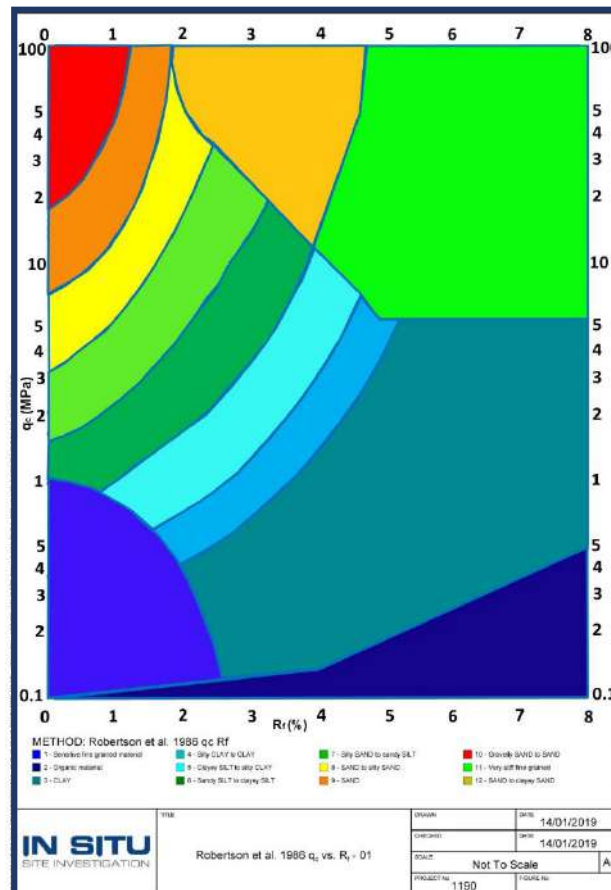


Figure 3.2: *Robertson et al., 1986 soil behaviour type chart.*

3.3.3 Pore Pressure Ratio (B_q)

Pore pressure ratio, B_q is the ratio between the measured pore pressure generated during penetration and the corrected cone resistance minus the total overburden stress.

Pore pressure ratio as defined by *Senneset and Janbu (1985)* is defined as:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{vo}}$$

where

- u_2 is pore pressure measured between the cone and the friction sleeve
- u_0 is equilibrium pore pressure
- σ_{vo} is total overburden stress
- q_t is cone resistance corrected for unequal end area effects

3.4 APPLIED CORRECTIONS

3.4.1 Corrected Cone Resistance (q_t)

For each penetration test, the measured cone resistance, q_c , can be corrected for the “unequal area effect” due to the influence of the ambient pore water pressure acting on the cone.

The correction has been applied using the following equation by Lunne et al., 1997:

$$q_t = q_c + [u_2 \cdot (1 - \alpha)]$$

where

α is the cone area ratio

The cone area ratio used for this project is stated on both the cone calibration certificate and the data footer. This value is geometrically measured.

3.4.2 Depth Correction

All tests in the report have been corrected for depth difference caused by inclination. This has been calculated using the method described in ISO 22476-1:2022.

To calculate the corrected depth the following formula is used:

$$z = \int_0^l C_{inc} \cdot dl$$

where

z is penetration depth, in m

l is penetration length, in m

C_{inc} is correction factor for the effect of the inclination of the CPTU relative to the vertical axis.

The equation for calculating the correction factor for the influence of the inclination for a bi-axial inclinometer is:

$$C_{inc} = \frac{1}{\sqrt{(1 + \tan^2 \beta_1 + \tan^2 \beta_2)}}$$

where

β_1 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees

β_2 is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1 , in degrees

4.0 GEOTECHNICAL DERIVED PARAMETERS

A number of empirical correlations can be used to derive geotechnical parameters from CPTU data. This report includes only the parameters which are described in this chapter. The results of all correlations used to obtain the geotechnical derived parameters are presented on *CPT Log 02* and *CPT Log 03* in *Appendix B*.

Please, note that each empirical correlation is derived for a certain type of soil, and may not be appropriate for all the soil types encountered on this project.

4.1 SOIL BEHAVIOUR TYPE INDEX (I_c)

The soil behaviour type index, I_c , was derived by *Jefferies and Davies (1991)*, and was created to simplify the application of CPTU SBT chart shown in *Chapter 3, Figure 3.2*. This approach has been modified for use with the *Robertson (1990)* normalised CPT soil classification chart, *Figure 4.1*. The normalised cone parameters Q_t and F_r (for definitions see *Appendix A5 Symbol List*) can be combined into one Soil Behaviour Type Index, I_c , (*Lunne et al., 1997*).

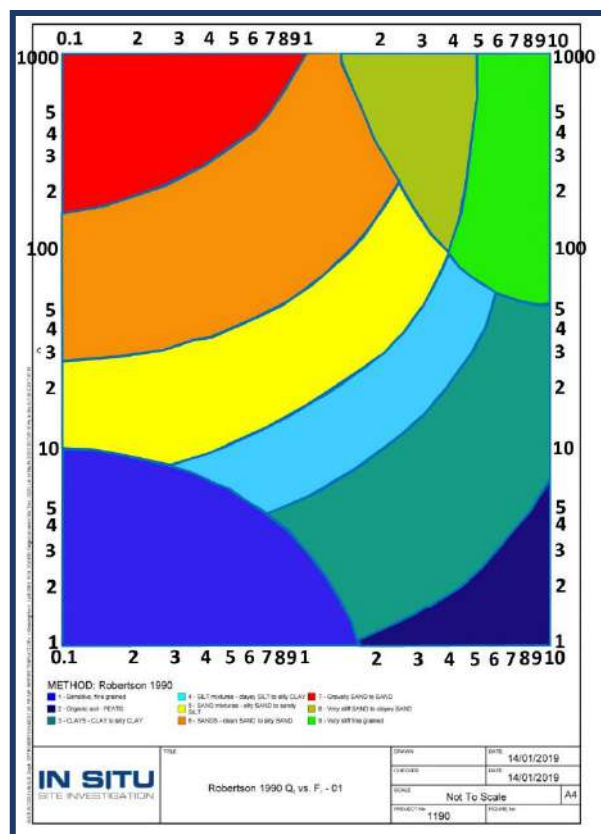


Figure 4.1: Robertson 1990 soil behaviour type chart.

The soil behaviour type index, I_c , can then be defined using *Robertson (2010)* formula, given below:

$$I_c = ((3.47 - \log Q_t)^2 + (\log F_r + 1.22)^2)^{0.5}$$

where

Q_t is the normalized cone resistance which represents the simple normalization with a stress exponent (n) of 1.0, which applies well to clay-like soils

F_R is the normalized friction ratio, in %

The boundaries of soil behaviour type are then given in terms of the index, I_c , presented in *Table 4.1* below.

The soils behaviour type index does not apply to zones 1, 8 and 9. The profiles of I_c provide a simple guide to the continuous variation of soil behaviour type in a given soil profile based on CPTU results, with a reliability greater than 80% compared with soil samples (*Robertson, 2015*).

Zone	Soil Behaviour Type	I_c
1	Sensitive fine grained	N/A
2	Organic Soils – clay	>3.6
3	Clays – silty clay to clay	2.95 – 3.6
4	Silt mixtures – clayey silt to silty clay	2.60 – 2.95
5	Sand mixtures – silty sand to sandy silt	2.05 – 2.6
6	Sands – clean sand to silty sand	1.31 – 2.05
7	Gravelly sand to dense sand	<1.31
8	Very stiff sand to clayey sand*	N/A
9	Very stiff fine grained *	N/A

* Heavily over consolidated or cemented

Table 4.1: Normalized CPTU Soil Behaviour Type (SBT_n) Index values, I_c . (*Robertson, 2010*)

4.2 N VALUE OF STANDARD PENETRATION TEST (SPT) (N_{60})

The derived N value of SPT, N_{60} , is strongly and directly related to the cone resistance, q_c .

In this report the N_{60} value is derived using the following correlations, developed by *Robertson and Wride (1998)*, *Jefferies and Davies (1998)* and *Robertson (2012)*:

1) *Robertson & Wride (1998)*

$$N_{60} = \frac{q_c}{8.5 \cdot p_a \left(1 - \frac{I_c}{4.6}\right)}$$

2) *Jefferies and Davies (1993)*

$$N_{60} = \frac{q_c}{0.85 \cdot \left(1 - \frac{I_c}{4.75}\right)}$$

3) *Robertson (2012)*

$$N_{60} = \frac{\frac{q_c}{p_a}}{10^{1.1268 - 0.2817 I_c}}$$

where

- q_c is the cone resistance
- p_a is the atmospheric pressure equal to *100 kPa*
- I_c is the soil behaviour type index calculated as given in *section 4.1*

It is suggested that these methods provide a better estimation of the N_{60} value than the actual measured N , due to the poor repeatability of SPT test. However, in fine grained soil with high sensitivity these methods may overestimate N_{60} (*Jefferies and Davies, 1991*). The third method suggested by *Robertson (2012)* provides improved estimates of N_{60} for insensitive clays.

4.3 RELATIVE DENSITY (D_r)

Relative density, D_r , is an intermediate parameter for coarse grained soils, widely used to describe sand deposits. All the research on deriving the relative density from CPTU tests results are carried out for **clean predominantly quartz sands**. The studies have shown that CPTU resistance in granular soils is controlled by sand relative density, in situ effective stresses and compressibility. The more compressible sands tend to give lower penetration resistance for a given relative density than less compressible sands.

In this report relative density is calculated using the methods suggested by *Baldi et al., (1986)*, *Jamiolkowski et al., (2001)* and *Kulhawy and Mayne (1990)* as shown in the equations below:

1) Baldi et al., (1986)

$$D_r = \frac{1}{C_2} \cdot \ln \left(\frac{q_c \cdot Wehr}{C_1 \cdot (\sigma'_{v0})^{0.55}} \right) \cdot 100$$

where

C_1 is a consolidation coefficient which is 157 for normally consolidated soils and 181 for over consolidated soils

C_2 is a consolidation coefficient which is 2.41 for normally consolidated soils and 2.46 for over consolidated soils

Wehr is a correction coefficient for calcareous soils

2) Jamiolkowski et al., (2001)

$$D_r = 100 \cdot \left[0.268 \cdot \ln \left(\frac{q_t / \sigma_{atm}}{\sqrt{\sigma'_{v0} / \sigma_{atm}}} \right) + C_1 \right]$$

where

C_1 is a compressibility coefficient which is -0.675 for average compressible soils, ≤ 1.0 for high compressible soils and carbonate or calcareous sands and ≥ -2.0 for low compressible soils

q_t is corrected cone resistance

σ_{atm} is the atmospheric pressure

3) Kulhawy and Mayne, (1990)

$$D_r = \left[\frac{q_{c1}}{305 \cdot C_1 \cdot OCR^{0.18} \cdot (1.2 + 0.05 \cdot \log(t/100))} \right]^{0.5} \cdot 100$$

where

q_{c1} is the cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{c1} = \frac{q_c}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

where

q_c is the cone resistance in kPa

σ'_{v0} is the initial vertical effective stress in kPa

C_1 is a compressibility coefficient which is -0.91 for low compressible sands, 1.0 for medium compressible sands and 1.09 for high compressible sands

t is time in years

4.4 FRICTION ANGLE (ϕ')

Friction angle, ϕ' , is used to express the shear strength of uncemented, coarse grained soils. In this report friction angle is derived by the correlations of *Mayne and Campanella (2005)*, *Robertson and Campanella (1983)* and *Kulhawy and Mayne (1990)*.

- 1) Mayne and Campanella, (2005)

$$\phi' = 29.5^0 \cdot B_q^{0.121} \cdot [0.256 + 0.336 \cdot B_q + \log Q_t]$$

where

B_q is the pore pressure ratio, calculated as in Session 3.3

Q_t is the normalized cone resistance

- 2) Robertson and Campanella, (1983)

$$\phi' = \tan^{-1} \left(0.1 + 0.38 \cdot \log \left(\frac{q_t}{\sigma'_{v0}} \right) \right)$$

where

q_c is the cone resistance in *kPa*

σ'_{v0} is the initial vertical effective stress in *kPa*

- 3) Kulhawy and Mayne, (1990)

$$\phi' = 17.6^0 + 11.0^0 \cdot \log(q_{t1})$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

The method suggested by *Mayne and Campanella (2005)* will not provide reliable results for heavily over consolidated soils, fissured geomaterials and highly cemented or structures clays. This approach gives reliable results when pore pressure is positive and varies $0.1 < B_q < 1.0$. The correlation suggested by *Robertson and Campanella (1983)* estimates the peak friction angle for uncemented, unaged, moderately compressible, predominately quartz sands. For sands of higher compressibility, the method will tend to predict low friction angles. The method suggested by *Kulhawy and Mayne (1990)* is an alternate relationship for clean, rounded, uncemented, quartz sands.

4.5 FINES CONTENT (FC)

The fines content, FC , in this report is estimated using two different methods, one from *Robertson and Wride (1998)* and the other, *Suzuki et al. (1998)* as presented below:

- 1) Robertson and Wride (1998)

$$I_c < 1.26: FC = 0$$

$$1.26 \leq I_c \leq 3.5: FC(\%) = 1.75I_c^{3.25} - 3.7$$

$$3.5 < I_c: FC = 100\%$$

- 2) Suzuki et al. (1998)

$$FC(\%) = 2.8I_c^{2.6}$$

where

I_c is the soil behaviour type index, calculated as in section 4.1

4.6 UNDRAINED SHEAR STRENGTH (s_u)

Estimation of undrained shear strength, s_u , from CPTU tests using corrected cone resistance is carried out using the following correlation from *Lunne et al. (1981)*:

$$S_u = \frac{(q_t - \sigma_{vo})}{N_{kt}}$$

where

N_{kt} is the empirical cone factor, which varies from 10 (6 for very soft sensitive fine grained soils) to 20. In this report 3 values are considered: 15, 17.5 and 20. N_{kt} tends to increase with increasing plasticity and decrease with increasing soil sensitivity. It decreases as B_q increases. (*Lunne et al., 1997*)

σ_{vo} = total overburden stress.

This report only presents the undrained shear strength data on soils with soil behaviour type index, I_c values greater than 2.60.

The value of undrained shear strength, s_u to be used in analysis depends on the design problem. In general, the simple shear in the direction of loading often represents the average undrained strength. For larger, moderate to high risk projects, where high quality field and laboratory data may be available, site specific correlations should be developed based on appropriate and reliable values of s_u .

4.7 SENSITIVITY (S_t)

The sensitivity, S_t of clays is defined as the ratio of undisturbed peak undrained shear strength to totally remoulded undrained shear strength.

In this report S_t is calculated using two correlations developed by *Schmertmann (1978)* and *Mayne (2007)*.

1) Schmertmann (1978)

$$S_t = \frac{s_u}{s_{u(rem)}} = \frac{q_t - \sigma_v}{N_{kt}} \left(\frac{1}{f_s} \right)$$

where

$s_{u(rem)}$ is the remoulded undrained shear strength. It can be assumed equal to the sleeve resistance, f_s .

2) Mayne (2007)

$$S_t = \frac{0.073 \cdot (q_t - \sigma_{v0})}{f_s}$$

For relatively sensitive clays, $S_t > 10$, the value of f_s can be very low and not very accurate, hence the estimate of sensitivity should be used as a guide only.

4.8 SOIL UNIT WEIGHT (γ)

Soil unit weight, γ in this report is calculated by using one method for sands, considered under dry conditions and two methods for clays, considered under saturated conditions. These relationships are developed by *Mayne (2007)* and the equations are presented below:

Dry unit weight for sands:

$$\gamma_{dry} = 1.89 \cdot \log(q_{t1}) + 11.82$$

Saturated unit weight for clays method 1

$$\gamma_{sat} = 8.32 \cdot \log(V_s) - 1.61 \cdot \log(z)$$

Saturated unit for clays method 2

$$\gamma_{sat} = 2.60 \cdot \log(f_s) + 15 \cdot G_s - 26.5$$

where

q_{t1} is the corrected cone resistance corrected for initial vertical effective stress and atmospheric pressure, calculated by the following formula:

$$q_{t1} = \frac{q_t}{\sqrt{\sigma'_{v0} \cdot \sigma_{atm}}}$$

z is the depth

V_s is the shear wave velocity, calculated as $V_s = 118.8 \cdot \log(f_s) + 18.5$

G_s is the specific gravity of solids, typically between 2.40 and 2.90

5.0 REFERENCES

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APPENDIX A

APPENDIX A1 – Project Summary Sheet

Piezocene Tests Summary Sheet

HOLE ID	Final Depth (m)	Date of Test	Cone Used	Test Remarks
CPT01	11.91	08/08/2024	S15-CFIP.1999	Test refused on total pressure.
CPT02	12.57	08/08/2024	S15-CFIP.1999	Test refused on total pressure.
CPT03	13.68	08/08/2024	S15-CFIP.1999	Test stopped due to buckling rods.
CPT04	0.70	08/08/2024	S15-CFIP.1999	Test refused on inclination.
CPT04A	13.13	08/08/2024	S15-CFIP.1999	Test refused on total pressure.
CPT05	13.39	08/08/2024	S15-CFIP.1999	Test stopped due to buckling rods.
CPT06	2.03	08/08/2024	S15-CFIP.1999	Test refused on total pressure.
CPT06A	0.13	08/08/2024	S15-CFIP.1999	Test refused on total pressure.
CPT06B	2.00	08/08/2024	S15-CFIP.1999	Test refused on total pressure.

APPENDIX A2 – CPT Rig Datasheet

RIGS

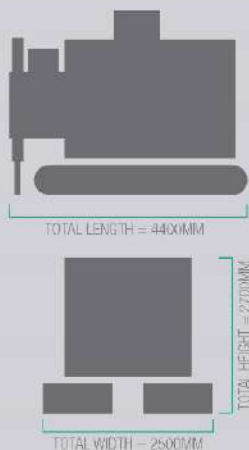
14 TONNE MOUNTED RIGS (CPT005 and CPT006)

We have two 14 tonne track mounted CPT rigs, each weighing 14 tonnes. One of our rigs, CPT005, 'Erik' is based in the Middle East and the other, CPT006, 'Zoe' in the UK. These rigs have low ground bearing pressure and are ideal for soft, boggy sites. They are capable of pushing up to 120 metres a day, depending on access to positions.

CPT RIG DETAILS

TOTAL WEIGHT	14 TONNES
CPT RAM THRUST CAPACITY	20 TONNES
MAXIMUM PENETRATION	20-30M DEPENDING ON THE GROUND CONDITIONS
PERFORMANCE RATES	120M OF TESTING IN A DAY DEPENDING ON ACCESS TO POSITIONS
TYPICAL SITES FOR THIS RIG	SOFT BOGGY SITES. THE RIG HAS LOW GROUND BEARING PRESSURE

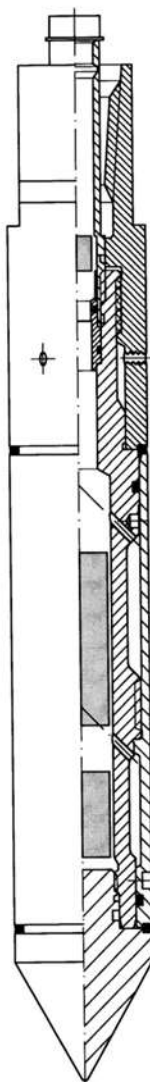
CPT RIG DIMENSIONS



APPENDIX A3 – Cone Datasheet



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SPECIFICATIONS

S15 SERIES

ELECTRICAL CONES

The electronic subtraction cones have been developed to address the durability problems inherent in other cone designs. The unit consists of a single element temperature compensated strain gauge transducer for measuring both cone resistance and local sleeve friction. This design is therefore more robust than a compression type cone. The cone support electronics package is located directly behind the transducer. The precision strain gauge amplifiers and power supply eliminate the effects of cable resistance on the measurements. A standard subtraction cone is capable of measuring simultaneously the following channels: Tip, Local friction, Pore pressure, Temperature and Inclination.

GENERAL SPECIFICATIONS

Cone Tip Section Area	1,500 mm ²
Friction Sleeve Surface	22,500 mm ²
Total Length	325 mm
Weight	4200 g
Power Supply	± 15 VDC, 100 mA.
Output	0 – 10 VDC*
Working Temperature	0 - 60°C
Storage Temperature	- 40 to + 85°C
Connector	Lemo 10 pins (others on request)

TIP RESISTANCE

Range	100/150* kN
Accuracy	0.25 % FS
Maximum Load	150 % of range
Cone Area Ratio	0.75

LOCAL SLEEVE FRICTION

Range	100/150* kN
Accuracy	0.50 % FS
Maximum Load	150 %
Sleeve Area Ratio	1.0 (EA)

PORE PRESSURE

Range	1/2/5/10* MPa
Accuracy	0.5 % FS
Maximum Load	150 % of range

INCLINATION

Range	25 ° (biaxial)
Accuracy	< 2 °

All our equipment complies with the ISSMGE, ASTM, DIN and NEN Standards.

**Other output and voltage ranges available on request. Loadcells may be calibrated for lower ranges.*

APPENDIX A4 – Cone Calibration Certificate

Eijkelpamp GeoPoint
SoilSolutionsRijkstraatweg 22F
2171 AL Sassenheim
The NetherlandsT +31 71 301 9251
E info@eijkelpamp-geopoint.com
I eijkelpamp-geopoint.com**Cone Calibration Certificate**

Certificate: **GS-1999-006**
Instrument Type: Electric Subtraction Cone
Model: S15-CFIIP
Serial number: 1999
Calibration date: 05-09-2023
Client: In Situ
Calibrated by: R. Wesselink
Calibration instruments
Manufacturer: Hottinger Baldwin Messtechnik GmbH
NMI certificate: 2461165.00501
Calibration conditions
Ambient temperature: 22.5 °C
Atmospheric pressure: 1021 mBar
Cone specifications
Cone base area: 1500 mm²
Load tip resistance (nom.): 100 kN
Friction sleeve area: 22500 mm²
Load tip + local friction (nom.): 100 kN
Load friction sleeve (nom.): 22.5 kN
Load pore pressure (nom.): 2 MPa
Inclination (nom.): +/- 20 °
Temperature compensation (all channels): 0...+40 °C
Maximum overload capacity (all channels): 100 %
Cone area ratio (a): 0.79
Max. inaccuracy, relative to measurement value: 1.0 %

Zero points:	Tip:		Sleeve:		Pore Pressure:		Inclinometer:		
	qc in kN	mV	fs in kN	mV	MPa	mV	Degrees	X (mV)	Y (mV)
	0	0	0	0	0	0	0	2486	2510
	5	0296	5	0306	0.4	1770	-20	0620	0732
	10	0592	10	0611	0.8	3537	20	4366	4386
	15	0888	15	0917	1.2	5294			
	20	1186	20	1223	1.6	7050			
	25	1483	25	1530	2	8809			
	30	1779	30	1838					
	35	2075	35	2144					
	40	2371	40	2451					
	45	2667	45	2759					
	50	2963	50	3066					
	75	4444	75	4601					
	100	5919	100	6132					

Max. error, abs. qc: 35 kPa
Max. error, abs. fs: 5 kPa
Max. error, abs. u2: 10 kPa
Max. error, abs. I: 1 °

This calibration is compliant with Eijkelpamp GeoPoint SoilSolutions internal quality system, internal calibration procedures and meets the requirements of NEN2649, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-)National Standards.

Approved by:
Date:R. Mosterd
05-09-2023Eijkelpamp GeoPoint SoilSolutions
V.A.T. NO. NL 8584.21.422.B01
Trade Reg. Arnhem no. 70686149IBAN NL43 RABO 0326 7904 38
BIC: RABONL2U

APPENDIX A5 – Symbol List

English

a	is area ratio of the cone ($= A_n/A_c$)
A	is area
A_c	is projected area of the cone
A_n	is cross sectional area of load cell or shaft
A_s	is area of friction sleeve
A_{sb}	is bottom end area of friction sleeve
A_{st}	is top end area of friction sleeve
B_q	is pore pressure parameter ($= (u_2 - u_0)/(q_t - \sigma_{v0})$)
C_h	is horizontal coefficient of consolidation
C_v	is vertical coefficient of consolidation
D	is diameter
D_r	is relative density ($= \frac{e_{max}-e}{e_{max}-e_{min}} \times 100\%$)
e	is void ratio
e_{max}	is maximum void ratio
e_{min}	is minimum void ratio
E	is Young's modulus
f_s	is unit sleeve friction resistance
f_t	is sleeve friction corrected for pore pressure effects
F_s	is total force acting on friction sleeve
F_R	is normalized friction ratio ($= f_s/(q_t - \sigma_{v0})$)
FoS	is factor of safety
FC	is fines content
g	is acceleration due to gravity
G_0	is initial or maximum shear modulus, shear stiffness
I_c	is soil behavior type index
I_r	is rigidity index ($= G/s_u$)
I_p	is plasticity index
k	is coefficient of permeability
k_h	is coefficient of permeability in horizontal direction
k_v	is coefficient of permeability in vertical direction
K_0	is coefficient of earth pressure at rest ($= \sigma'_{h0}/\sigma'_{v0}$)
L	is length
m_v	is coefficient of volume change
M	is constrained deformation modulus
M7.5	is earthquake magnitude of 7.5 Richter scale
N	is number of blows of SPT
N_{60}	is SPT energy ratio
N_k	is cone factor
N_{ke}	is cone factor
N_{kt}	is cone factor
$N_{\Delta u}$	is cone factor
p_a	is reference stress ($= 100 \text{ kPa}$)
q_c	is measured cone resistance
q_e	is effective cone resistance ($= q_t - u_2$)
q_n	is net cone resistance ($= q_t - \sigma_{v0}$)
q_t	is corrected cone resistance ($= q_c - (1 - a)u_2$)
Q_c	is total force acting on the cone
Q_t	is normalized cone resistance ($= q_t - \sigma_{v0}/\sigma'_{v0}$)

R_f	is friction ratio ($= (f_t/q_t) \times 100\%$ or alternatively $= (f_t/q_t) \times 100\%$)
s_u	is undrained shear strength
s_{ur}	is remoulded undrained shear strength
S_t	is sensitivity
t	is time
t_{50}	is time for 50% dissipation of excess pore water pressure
T_{50}	is time factor at $U = 50\%$
u	is pore water pressure
u_0	is in situ pore pressure
u_1	is pore pressure measured on the cone
u_2	is pore pressure measured behind the cone
u_3	is pore pressure measured behind sleeve friction
Δu	is excess pore water pressure
U	is normalized excess pore pressure
V_s	is shear wave velocity
z	is depth

Greek

α	is constant
α	is cone roughness
β	is constant
β_1	is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane, in degrees
β_2	is the angle between the vertical axis and the projection of the axis of the CPTU on a vertical plane that is perpendicular to the plane of angle β_1 , in degrees
γ	is unit weight of soil
γ_w	unit weight of water
Δ	is change
Δu	is excess pore pressure ($= u - u_0$)
μ	is Poisson's ratio
ρ	is density
ψ	is state parameter
σ, σ'	is normal stress (total, effective)
σ_h, σ'_h	is horizontal stress (total, effective)
σ_v, σ'_v	is horizontal stress (total, effective)
$\sigma_{v0}, \sigma'_{v0}$	is overburden stress (total, effective)
T_{av}	is average cyclic shear stress
T_{cy}	is cyclic shear stress
ϕ'	is effective friction angle

APPENDIX A6 – Abbreviations

ASTM	American Society for Testing and Materials
CPTU	Cone Penetration Test with Pore Pressure Measurement (Piezocone Test)
CRR	Cyclic Resistance Ratio
CSR	Cyclic Stress Ratio
GWT	Ground Water Table
NC	Normally Consolidated
OC	Over consolidated
OCR	Over consolidation Ratio
PL	Limit Pressure
SCPT	Seismic Cone Penetration
SDMT	Seismic Dilatometer Marchetti
SPT	Standard Penetration Test
TC	Technical Committee

APPENDIX A7 – Glossary

CPT

Cone Penetration Test.

Cone

The part of the cone penetrometer on which the end bearing is developed.

Cone Penetrometer

The assembly containing the *cone*, *friction sleeve*, any other sensors and measuring systems, as well as the connections to the *push-rods*.

Cone resistance, q_c

The total force acting on the cone, Q_c , divided by the projected area of the cone, A_c . $q_c = Q_c / A_c$

Corrected cone resistance, q_t

The *cone resistance*, q_c corrected for pore water pressure effects.

Corrected sleeve friction, f_t

The *sleeve friction* corrected for pore water pressure effects on the ends of the *friction sleeve*.

Data acquisition system

The system used to measure and record the measurements made by the *cone penetrometer*.

Dissipation Test

A test when the decay of the pore water pressure is monitored during a pause in penetration.

Filter element

The porous element inserted into the cone penetrometer to allow transmission of the pore water pressure to the pore pressure sensor, while maintaining the correct profile of the *cone penetrometer*.

Friction ratio, R_f

The ratio, expressed as a percentage of the *sleeve friction*, f_s , to the *cone resistance*, q_c , both measured at the same depth.

Friction reducer

A local enlargement on the push-rod surface, placed at a distance above the cone penetrometer, and provided to reduce the friction on the *push-rods*.

Friction sleeve

The section of the *cone penetrometer* upon which the *sleeve friction* is measured.

Normalized cone resistance, Q_c or Q_t

The *cone resistance* expressed in a non-dimensional form and taking account of stress changes *in situ*, $Q_c = (q_c - \sigma_{v0}) / \sigma'_{v0}$, or when the *corrected cone resistance* is used $Q_t = (q_t - \sigma_{v0}) / \sigma'_{v0}$. Where σ_{v0} and σ'_{v0} are the total and effective vertical stress respectively.

Net cone resistance, q_n

The *corrected cone resistance* minus the vertical total stress. $q_n = q_t - \sigma_{v0}$

Normalized friction ratio, F_r

The *sleeve friction* normalized by the *net cone resistance*.

Piezocone

A *cone penetrometer* containing a pore pressure sensor.

Pore pressure, u

The pore pressure generated during penetration and measured by a pore pressure sensor, u_1 when measured on the cone, u_2 when measured just behind the cone and u_3 when measured just behind the friction sleeve.

Pore pressure ratio, B_q

The *net pore pressure* normalized with respect to the *net cone resistance*.

Push-rods

The thick-walled tubes or rods used for advancing the cone penetrometer.

Rig machine

The equipment which pushes the cone penetrometer and rods into the ground.

Sleeve friction, f_s

The total frictional force acting on the *friction sleeve*, F_s , divided by its *surface area*, A_s . $f_s = F_s / A_s$

APPENDIX A8 – Soils Description Tables

GRANULAR SOILS (Sands and Gravels)

Description	Relative Density D_r (%)	SPT N value, N_{SPT}
Very Loose	0 – 15	0 - 4
Loose	15 – 35	4 - 10
Medium Dense	35 – 65	10 - 30
Dense	65 – 85	30 - 50
Very Dense	>85	>50

COHESIVE SOILS (Clays and Silts)

Term based on measurement	Undrained Shear Strength Classification, s_u (kPa)
Extremely low	<10
Very low	10 - 20
Low	20 - 40
Medium	40 - 75
High	75 - 150
Very high	150 - 300
Extremely high	>300

APPENDIX B

Cone Penetration Measured Parameters and Geotechnical Derived Parameters

PointID

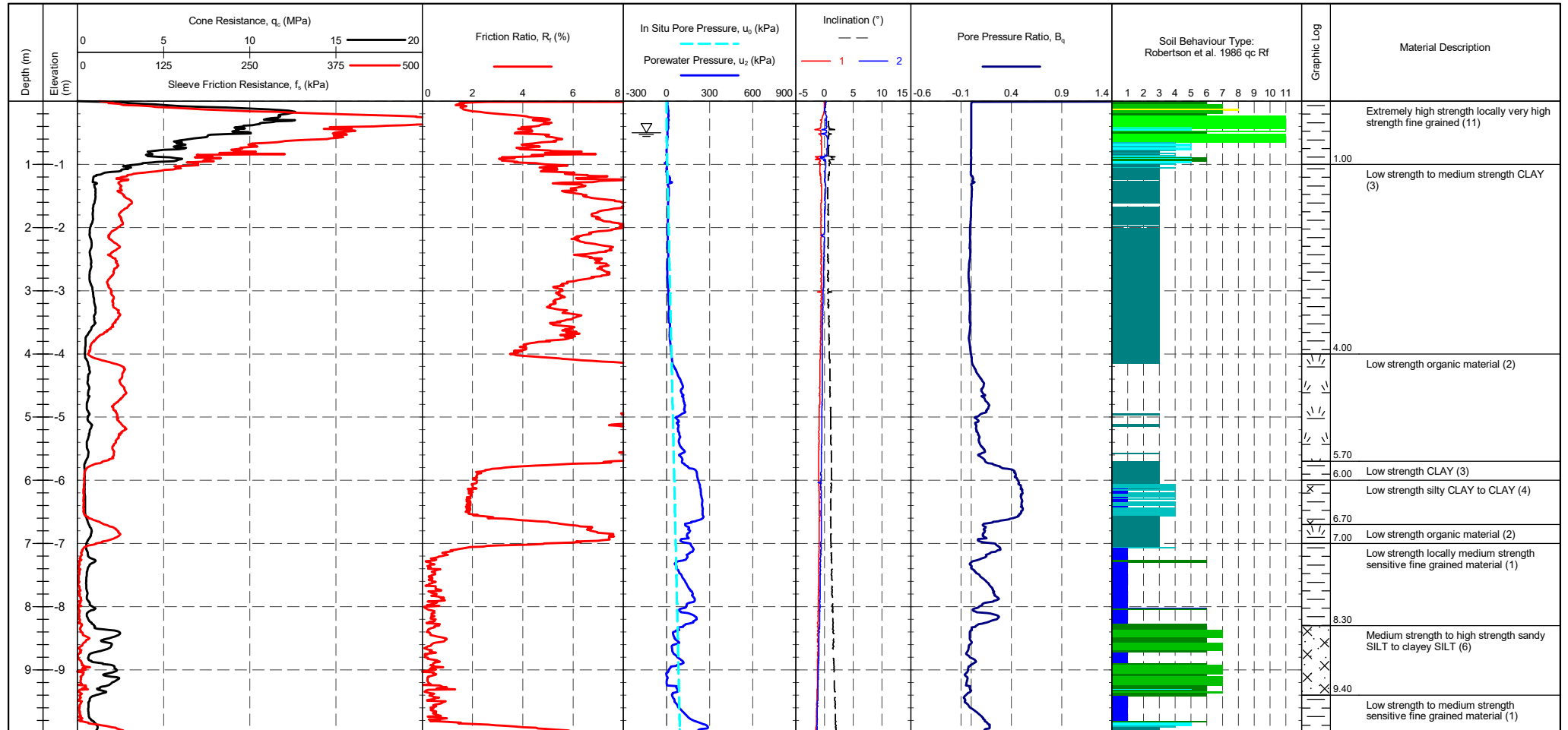
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	170 mV	188 mV	0.203 MPa
Sleeve	276 mV	287 mV	0.008 kPa
Pore Pressure 2	335 mV	408 mV	0.017 kPa
X-Y Inclinator	2492 mV	2473 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level
Dissipation Test

PointID

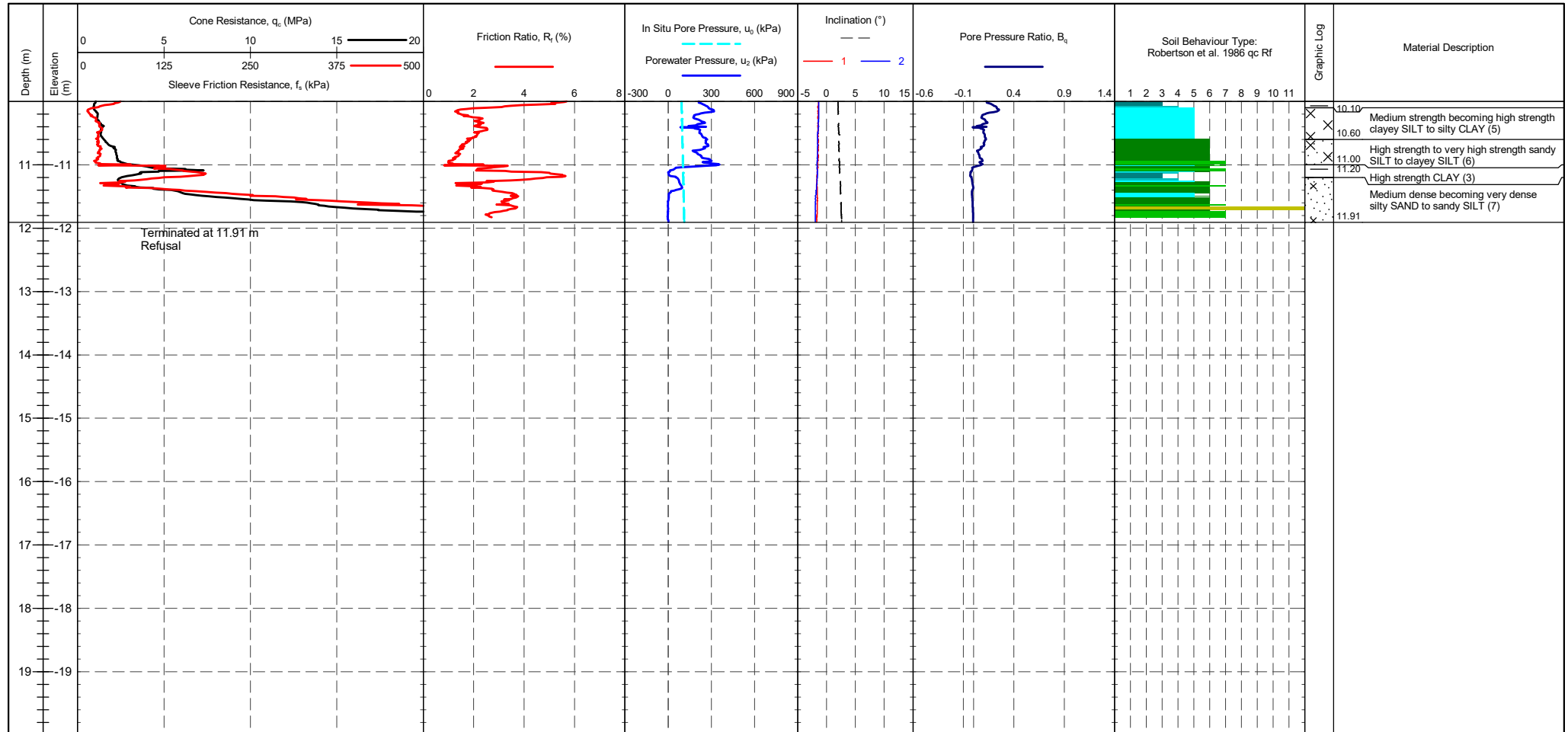
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	170 mV	188 mV	0.203 MPa
Sleeve	276 mV	287 mV	0.008 kPa
Pore Pressure 2	335 mV	408 mV	0.017 kPa
X-Y Inclinator	2492 mV	2473 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

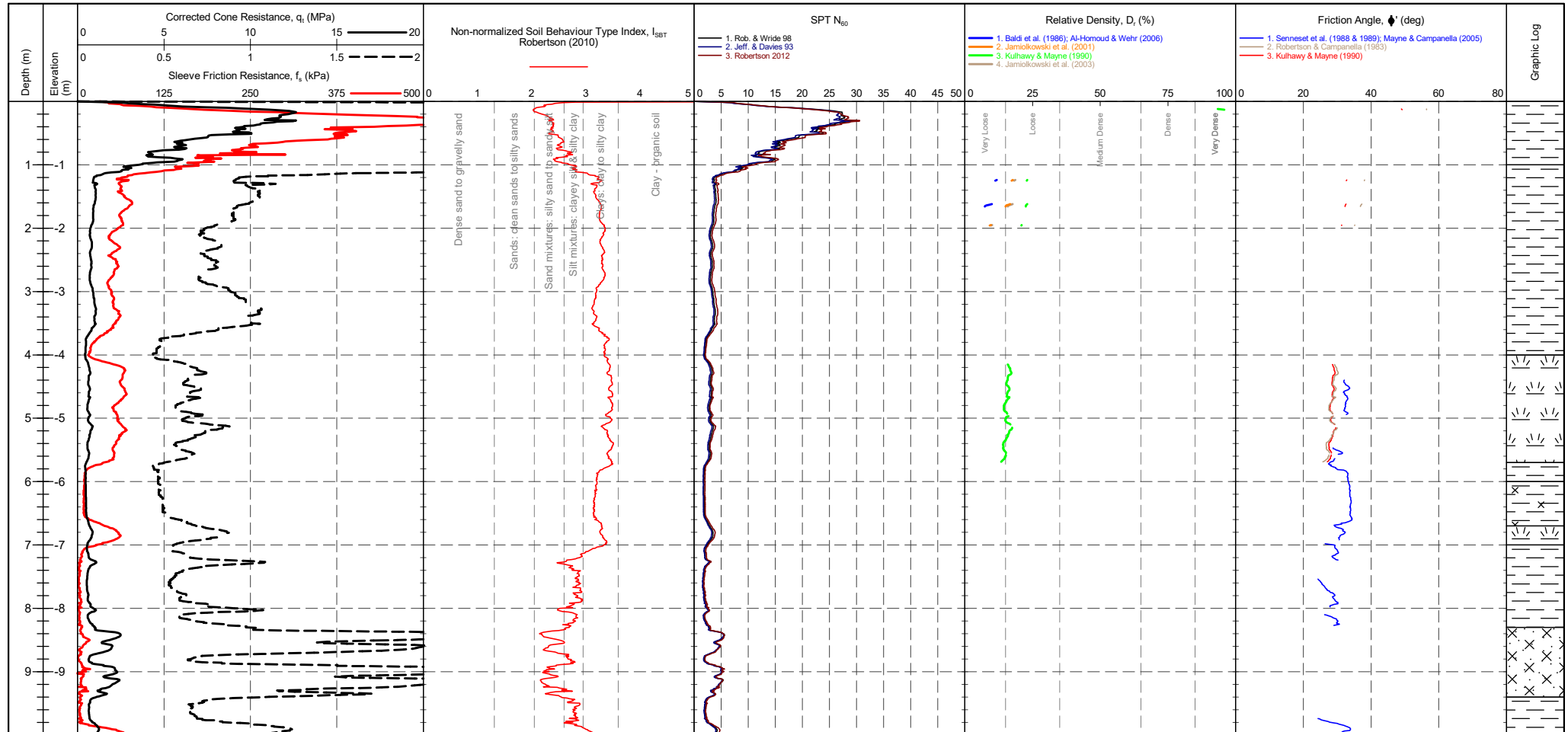
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	170 mV	188 mV	0.203 MPa
Sleeve	276 mV	287 mV	0.008 kPa
Pore Pressure 2	335 mV	408 mV	0.017 kPa
X-Y Inclinator	2492 mV	2473 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

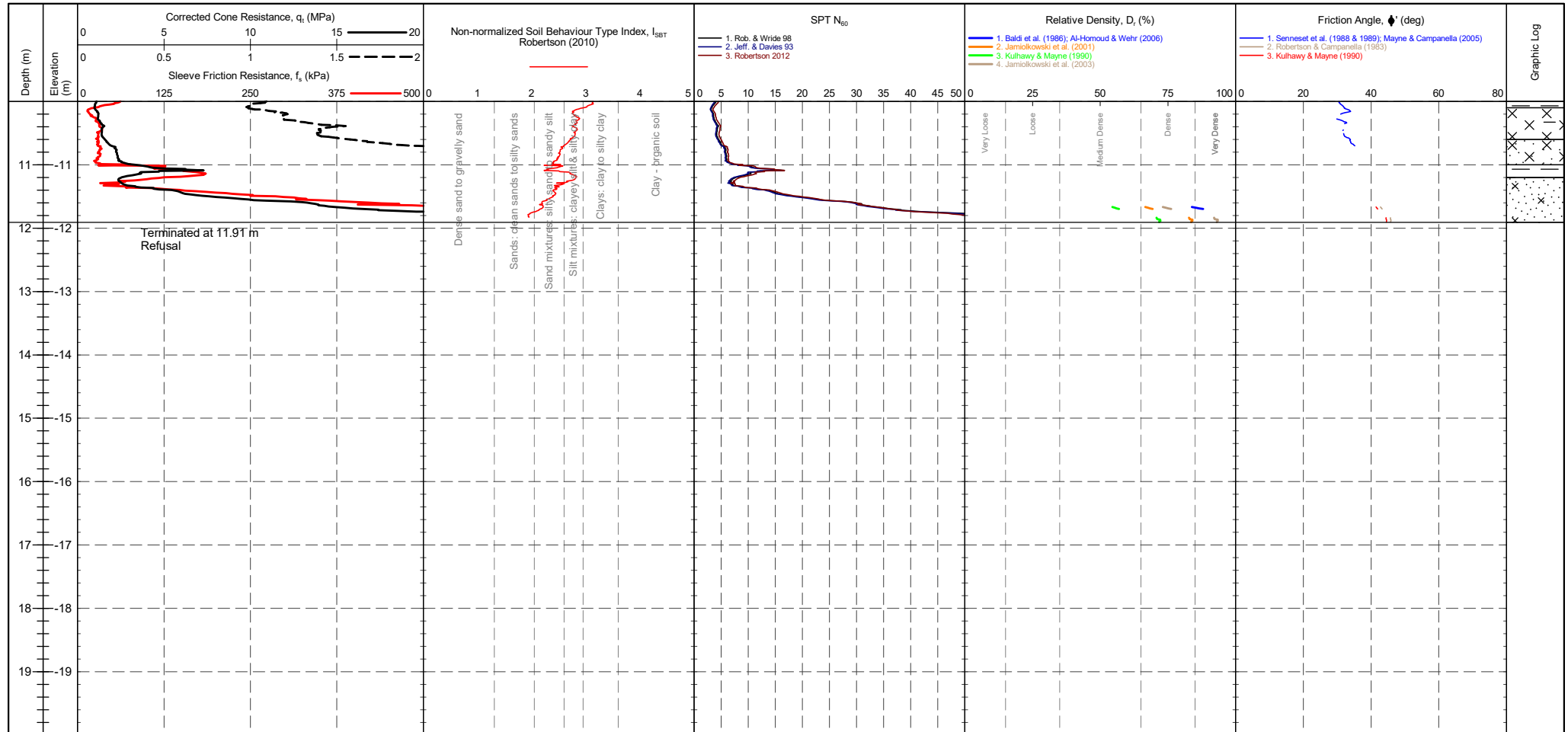
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre :
Post :
Difference :
170 mV : 188 mV : 0.203 MPa
276 mV : 287 mV : 0.008 kPa
335 mV : 408 mV : 0.017 kPa
2492 mV : 2473 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

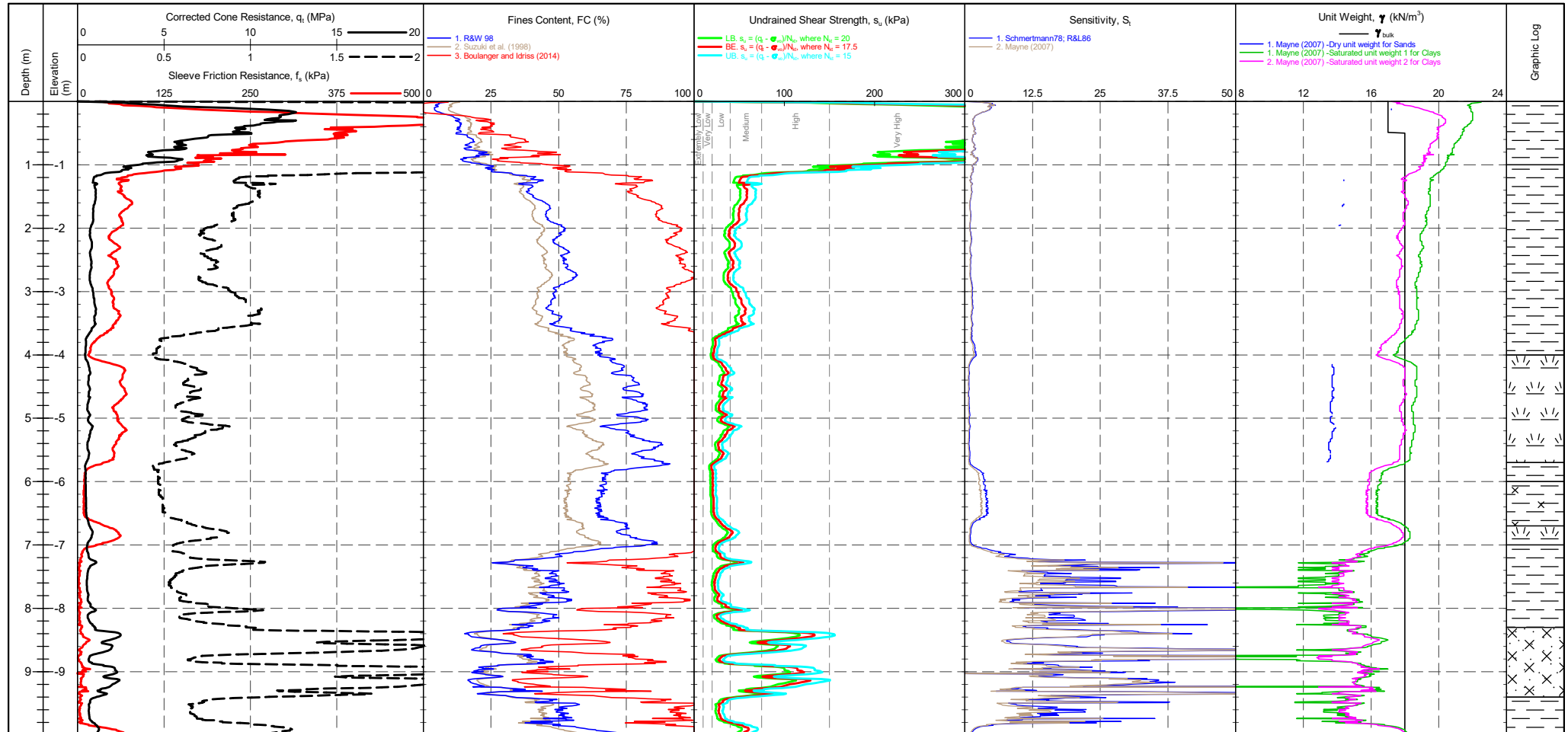
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
170 mV
276 mV
335 mV
2492 mV

Post
188 mV
287 mV
408 mV
2473 mV

Difference
0.203 MPa
0.008 kPa
0.017 kPa

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test

PointID

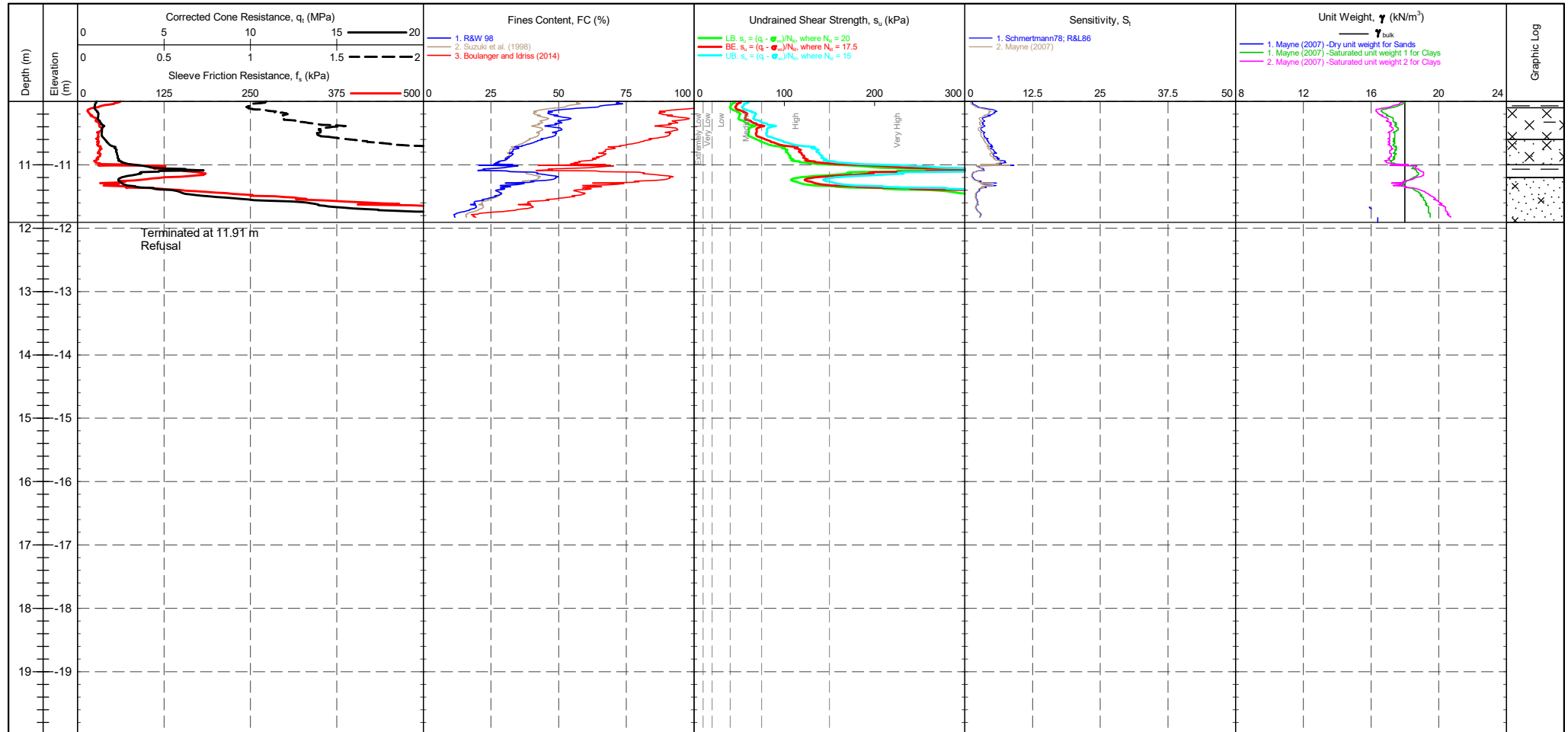
CPT01

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer
Pre Post Difference
Tip 170 mV 188 mV 0.203 MPa
Sleeve 276 mV 287 mV 0.008 kPa
Pore Pressure 2 335 mV 408 mV 0.017 kPa
X-Y Inclinator 2492 mV 2473 mV

CPTU ZERO VALUES

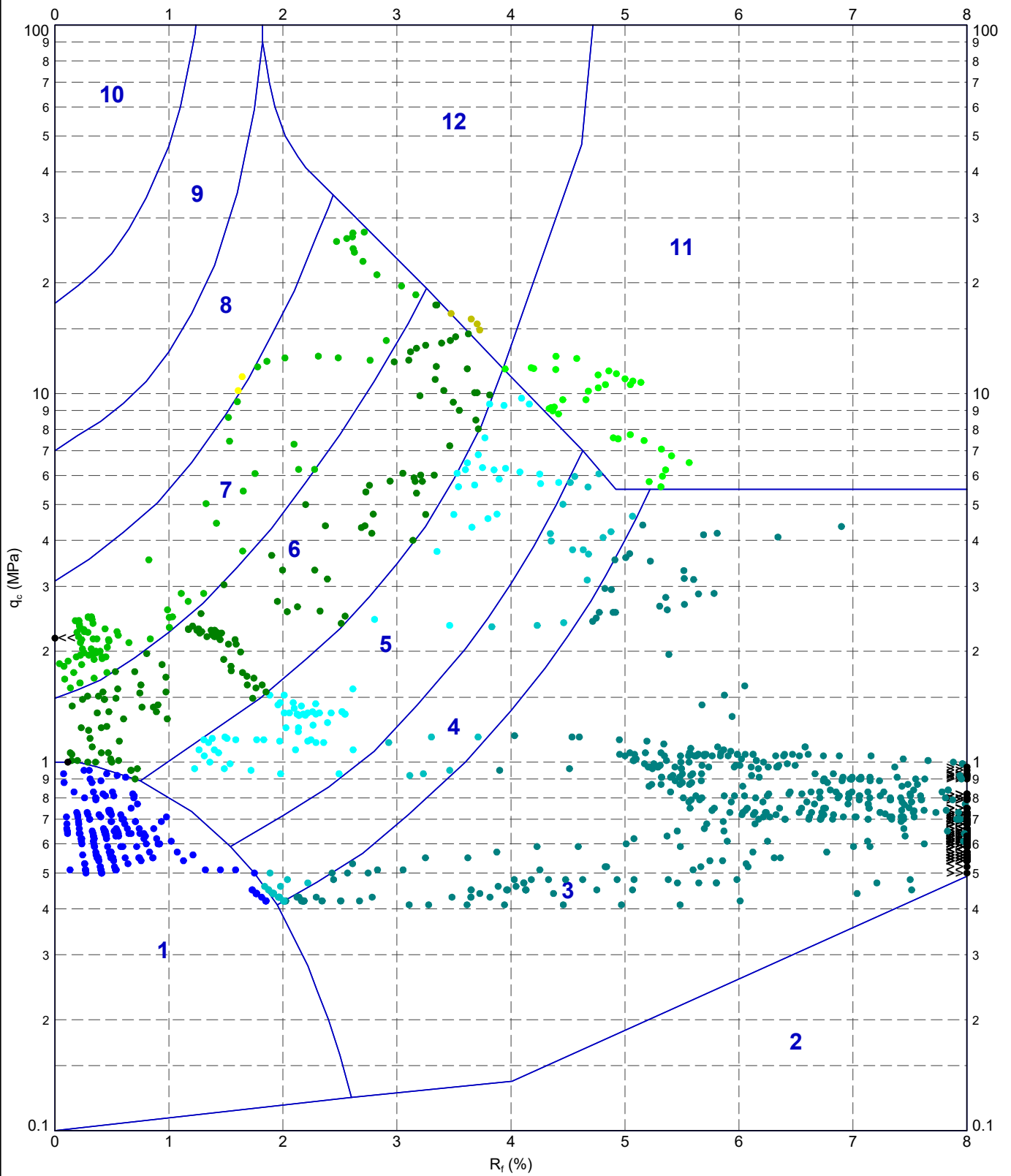
COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	su (kPa)	Term based on measurement	su (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF MAP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:09 10.03.00.09 Dated Lab and In Situ Test - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c vs. R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT01

DRAWN	DATE	16/08/2024
CHECKED	DATE	16/08/2024
SCALE	Not To Scale	
PROJECT No	FIGURE No	
1240380		A4

PointID

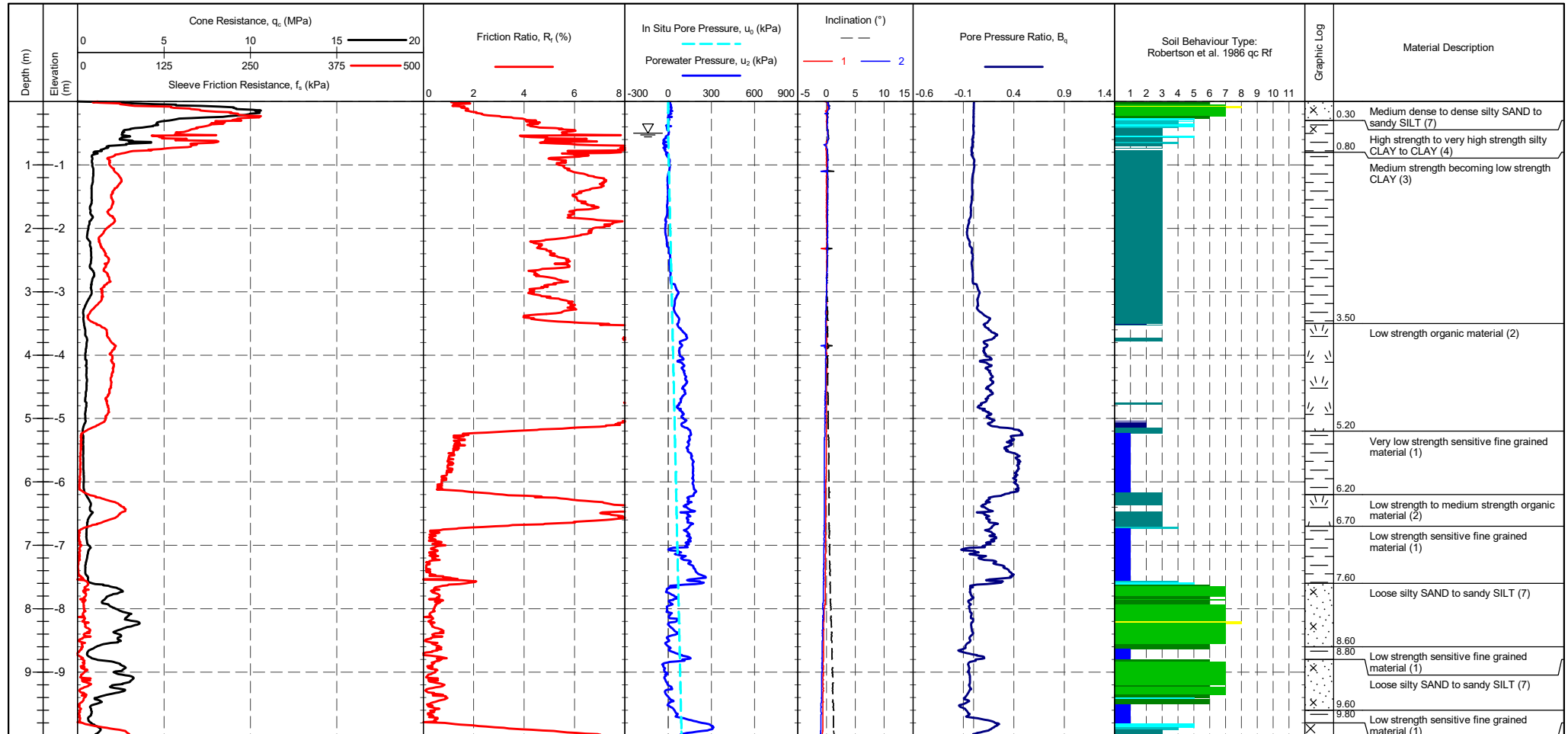
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	173 mV	169 mV	-0.045 MPa
Sleeve	277 mV	276 mV	-0.001 kPa
Pore Pressure 2	378 mV	322 mV	-0.013 kPa
X-Y Inclinator	2443 mV	2492 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

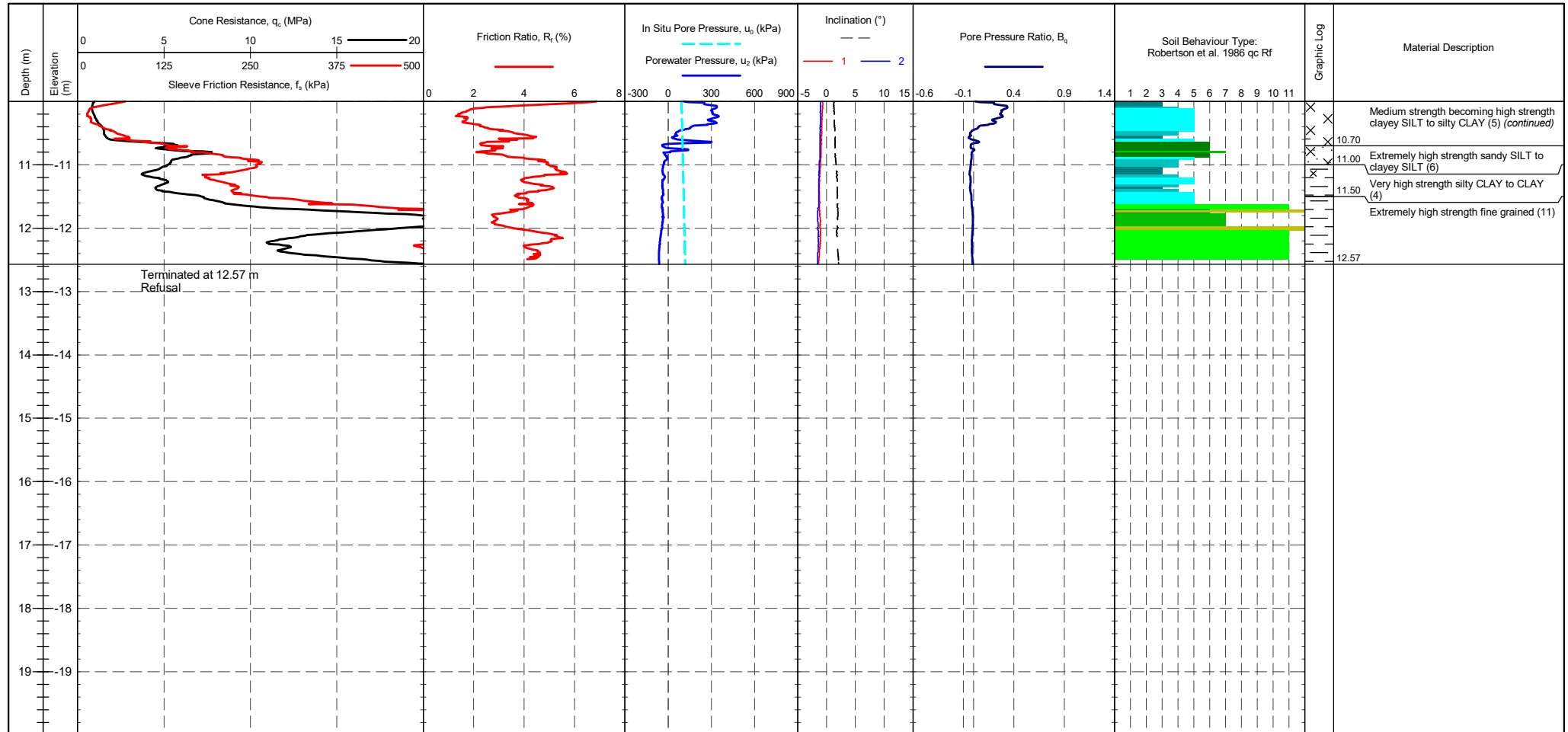
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	173 mV	169 mV	-0.045 MPa
Sleeve	277 mV	276 mV	-0.001 kPa
Pore Pressure 2	378 mV	322 mV	-0.013 kPa
X-Y Inclinator	2443 mV	2492 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

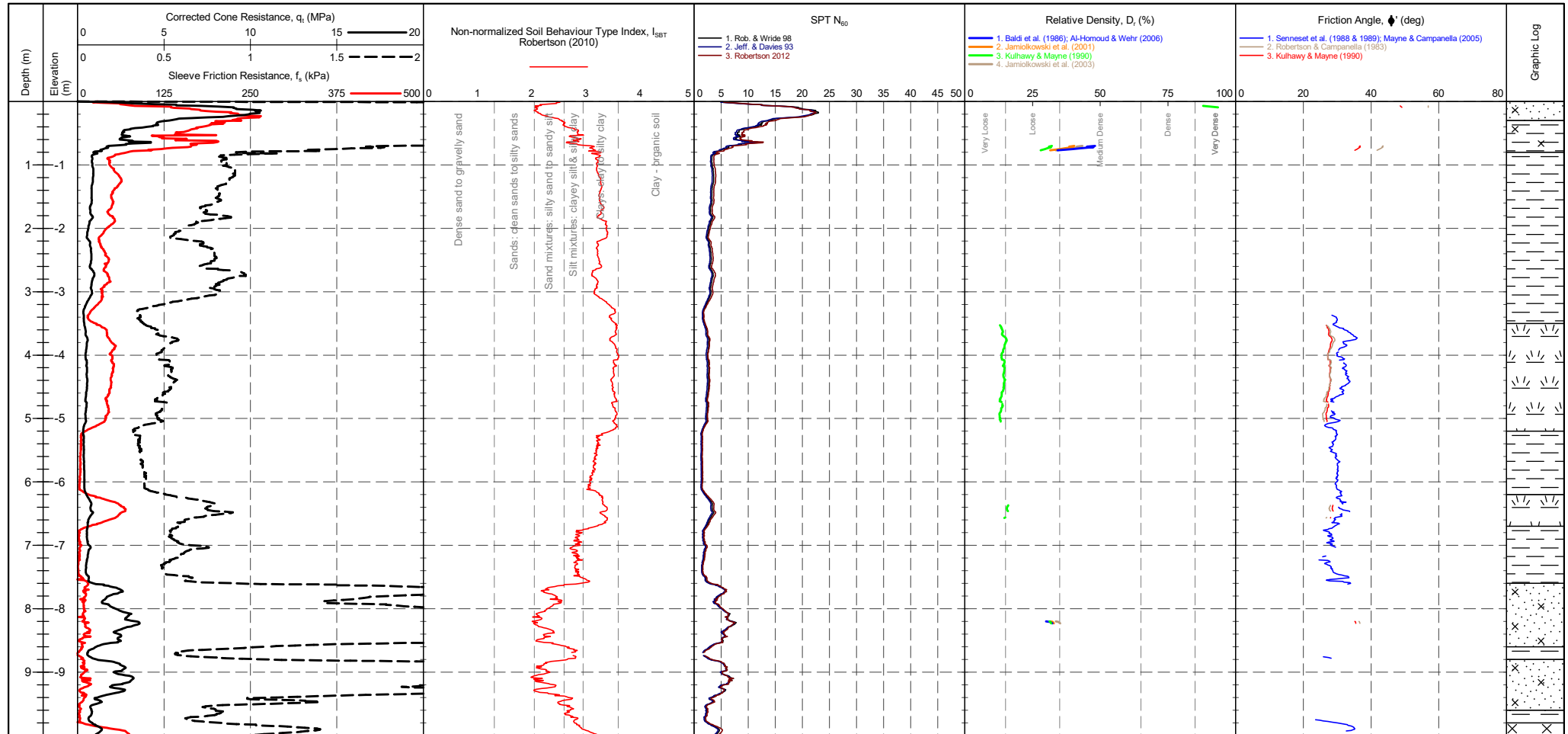
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	173 mV	169 mV	-0.045 MPa
Sleeve	277 mV	276 mV	-0.001 kPa
Pore Pressure 2	378 mV	322 mV	-0.013 kPa
X-Y Inclinator	2443 mV	2492 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12					
Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

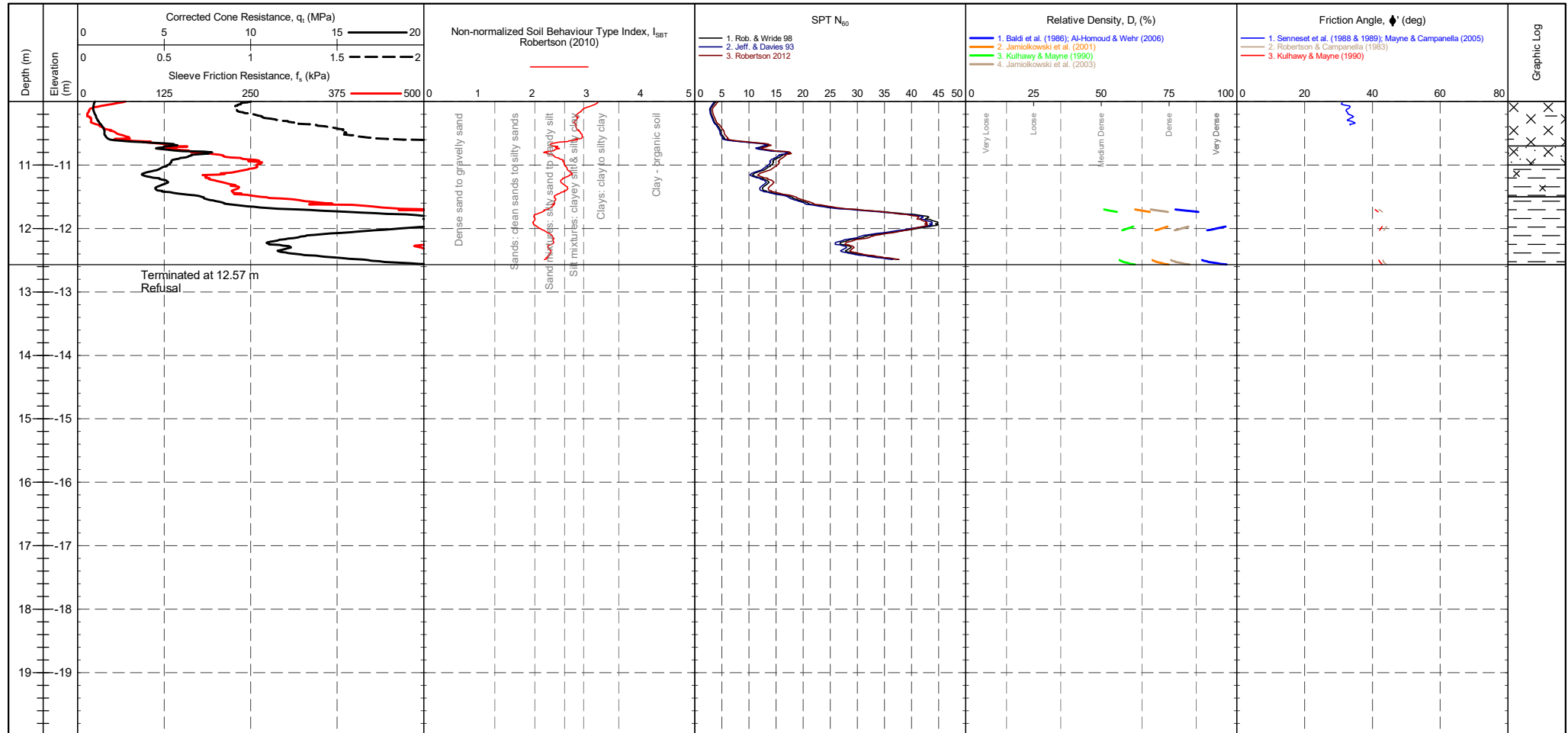
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	173 mV	169 mV	-0.045 MPa
Sleeve	277 mV	276 mV	-0.001 kPa
Pore Pressure 2	378 mV	322 mV	-0.013 kPa
X-Y Inclinator	2443 mV	2492 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level
Dissipation Test

PointID

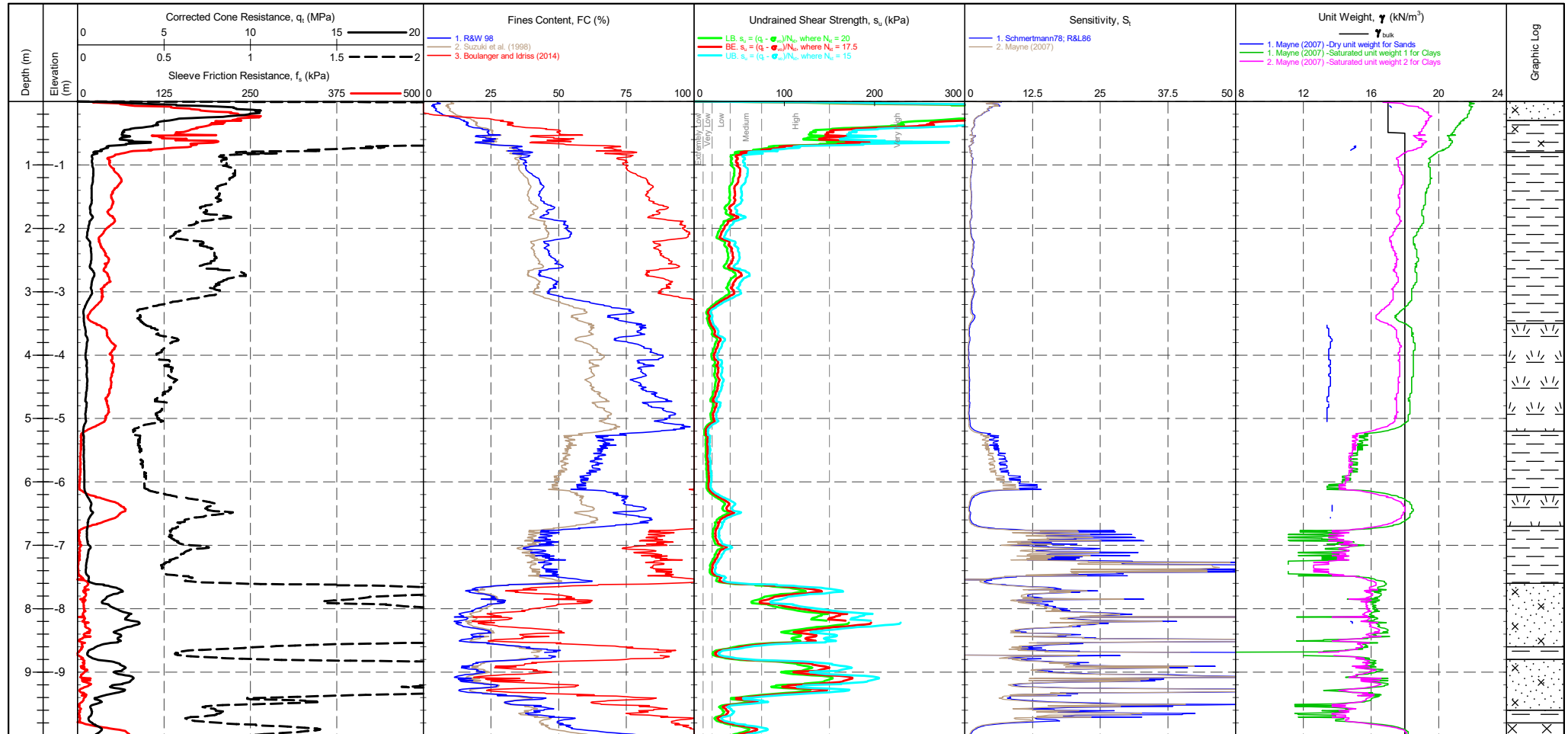
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
173 mV	169 mV	-0.045 MPa
277 mV	276 mV	-0.001 kPa
378 mV	322 mV	-0.013 kPa
2443 mV	2492 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

PointID

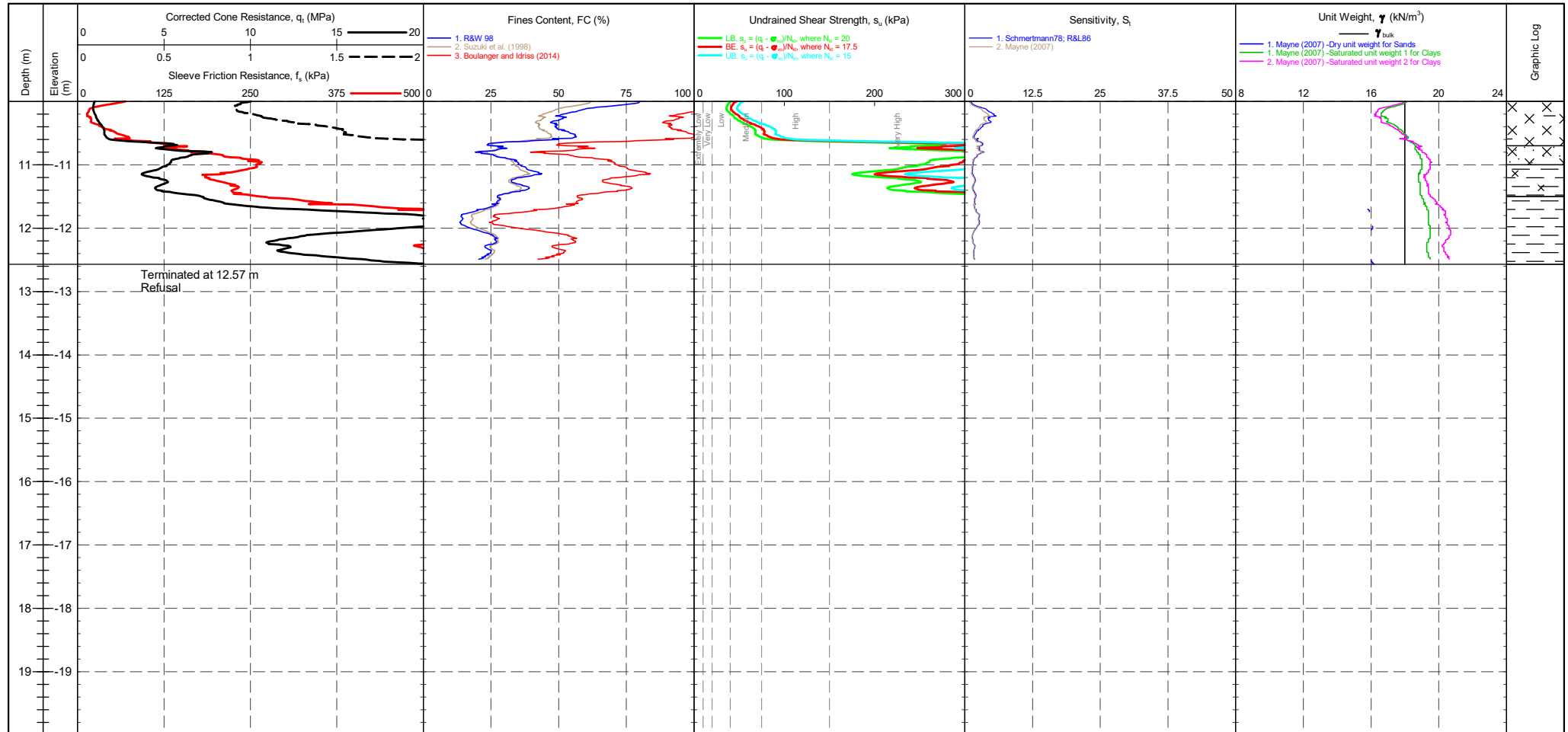
CPT02

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

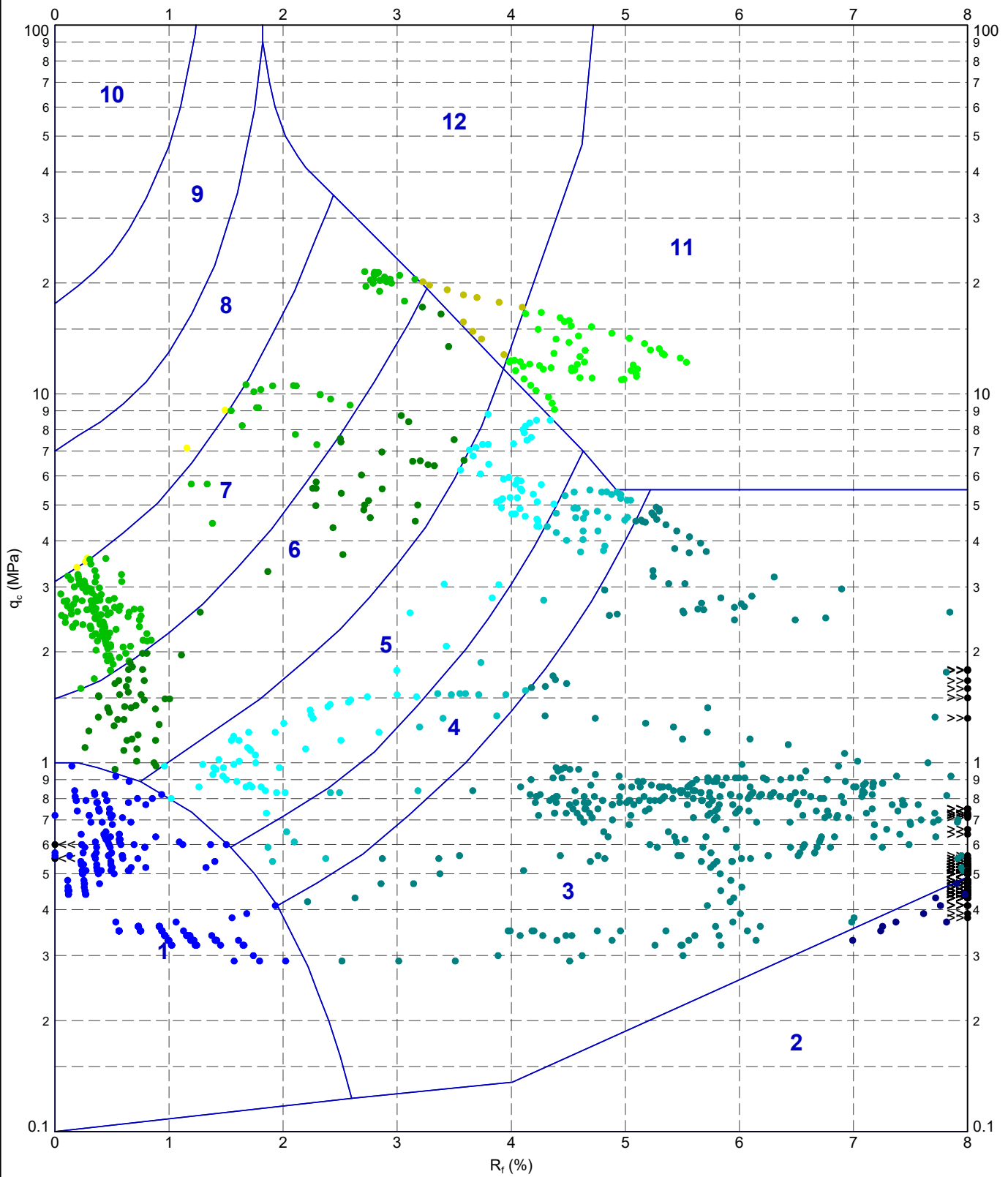
Transducer	Pre	Post	Difference
Tip	173 mV	169 mV	-0.045 MPa
Sleeve	277 mV	276 mV	-0.001 kPa
Pore Pressure 2	378 mV	322 mV	-0.013 kPa
X-Y Inclinator	2443 mV	2492 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF MAP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:10 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10]



METHOD: Robertson et al. 1986 qc Rf

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

IN SITU
SITE INVESTIGATION

TITLE

Remada
Newport
Glan Llyn
Robertson et al. 1986 qc vs. Rf - CPT02

DRAWN

DATE

16/08/2024

CHECKED

DATE

16/08/2024

SCALE

Not To Scale

A4

PROJECT No

1240380

FIGURE No

PointID

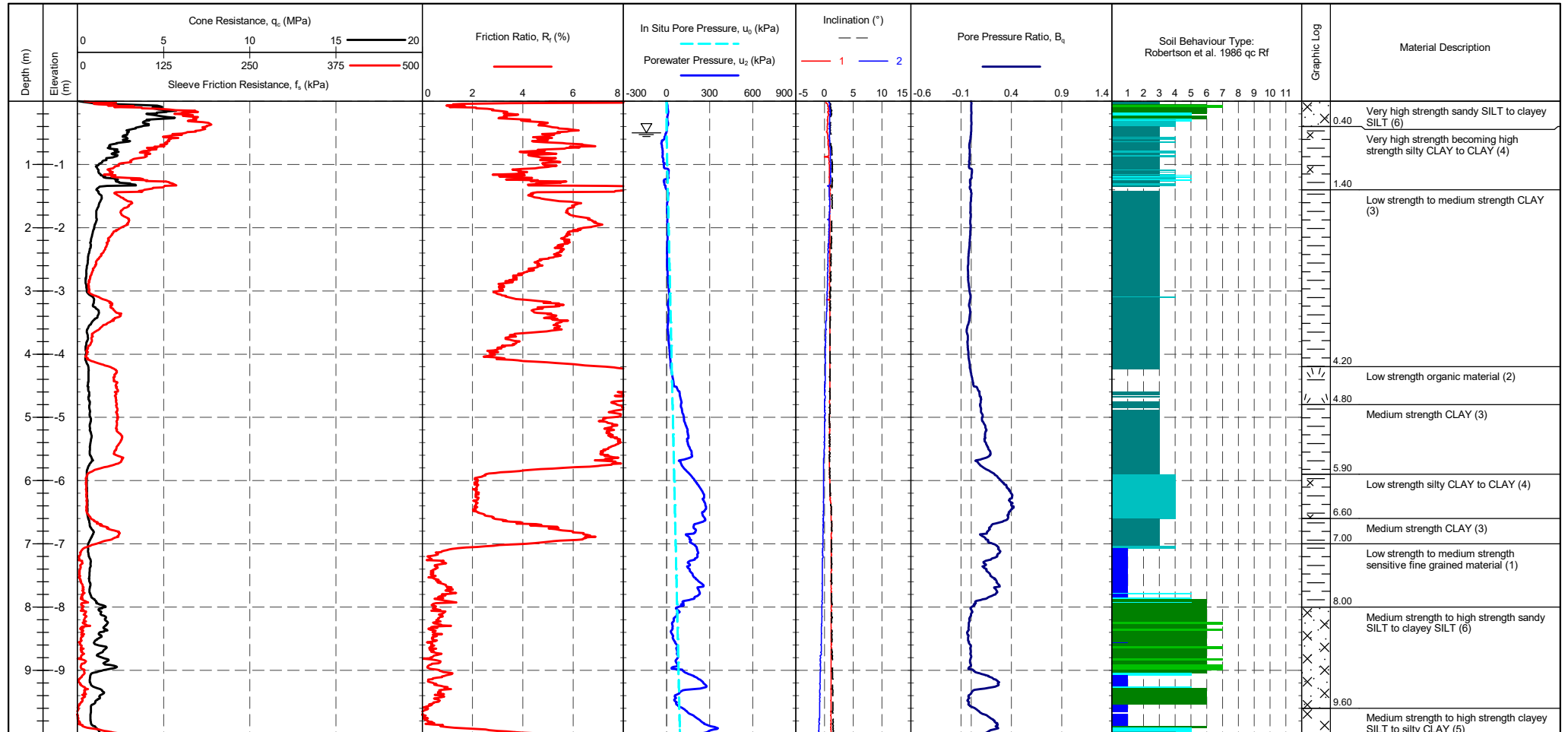
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	166 mV	180 mV	0.158 MPa
Sleeve	277 mV	281 mV	0.003 kPa
Pore Pressure 2	367 mV	331 mV	-0.008 kPa
X-Y Inclinator	2463 mV	2463 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

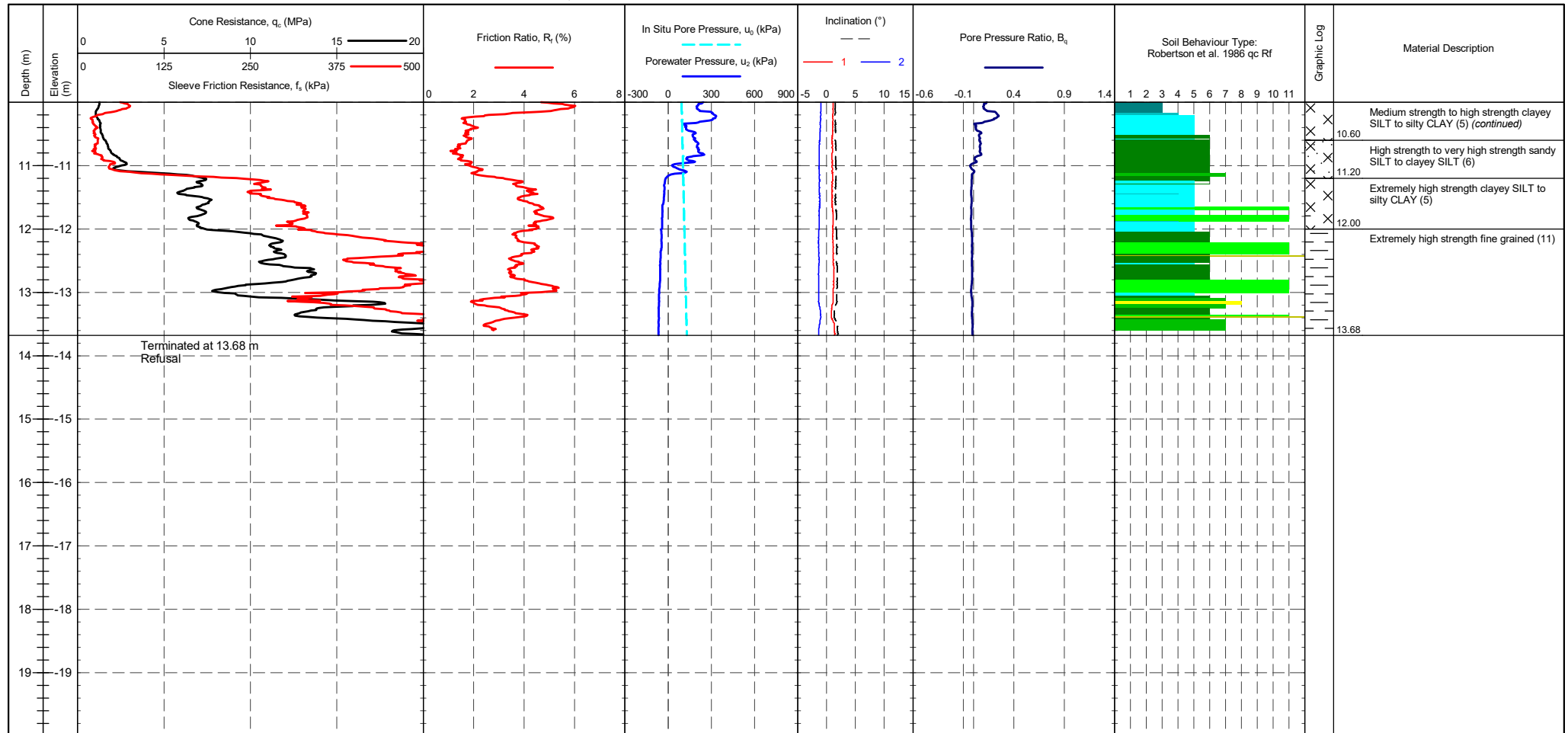
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	166 mV	180 mV	0.158 MPa
Sleeve	277 mV	281 mV	0.003 kPa
Pore Pressure 2	367 mV	331 mV	-0.008 kPa
X-Y Inclinator	2463 mV	2463 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

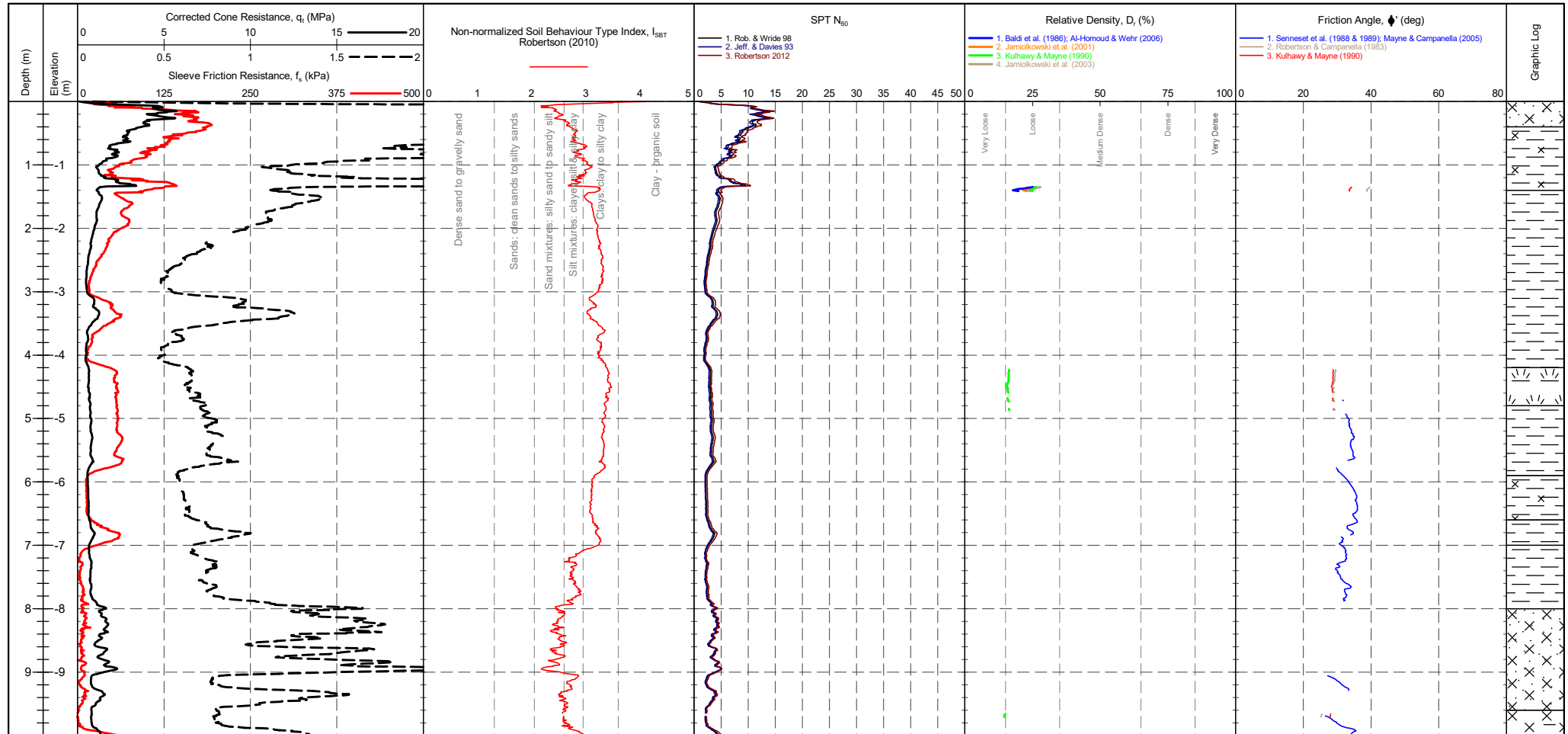
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre Post Difference
166 mV 180 mV 0.158 MPa
277 mV 281 mV 0.003 kPa
367 mV 331 mV -0.008 kPa
2463 mV 2463 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12				
Description	SBT Index, I_c	Description	SPT N value, NSPT	Description
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense
Sands	1.31-2.05	Dense	30 - 50	Dense
Gravelly sand	<1.31	Very Dense	>50	Very Dense

Groundwater Level

Dissipation Test

PointID

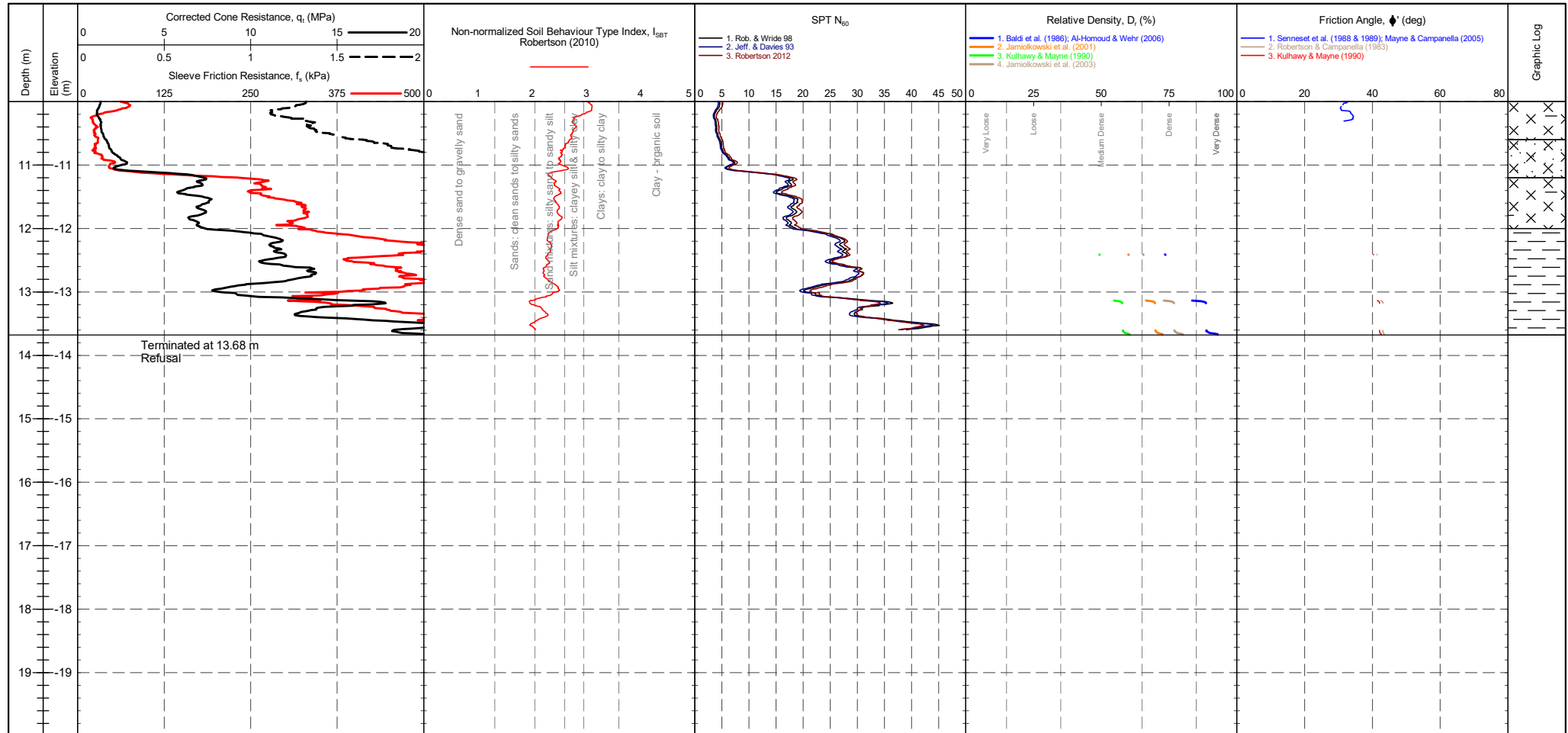
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre :
Post :
Difference :
166 mV : 180 mV : 0.158 MPa
277 mV : 281 mV : 0.003 kPa
367 mV : 331 mV : -0.008 kPa
2463 mV : 2463 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level
Dissipation Test

PointID

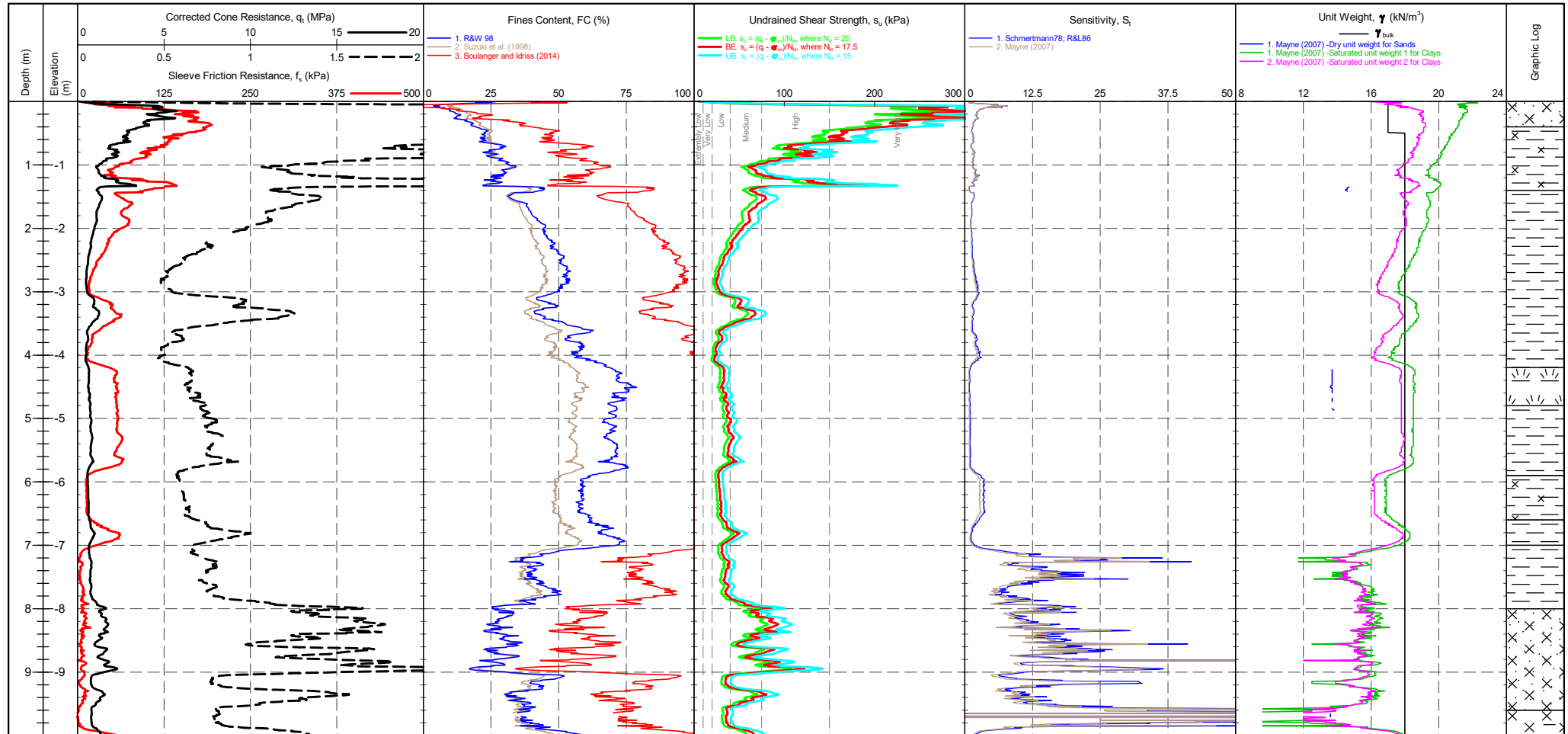
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer : Pre Post Difference
Tip : 166 mV 180 mV 0.158 MPa
Sleeve : 277 mV 281 mV 0.003 kPa
Pore Pressure 2 : 367 mV 331 mV -0.008 kPa
X-Y Inclinator : 2463 mV 2463 mV

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test

PointID

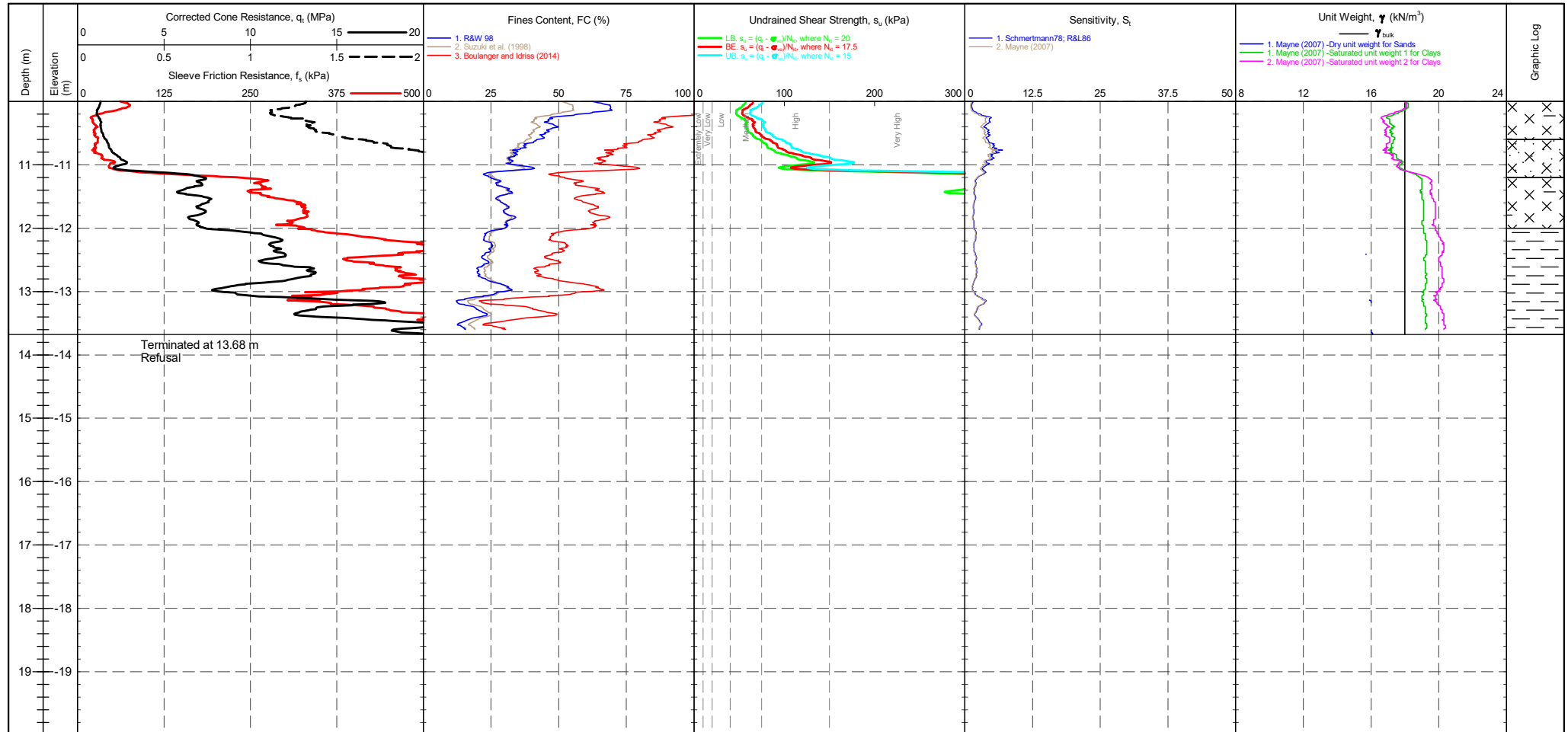
CPT03

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

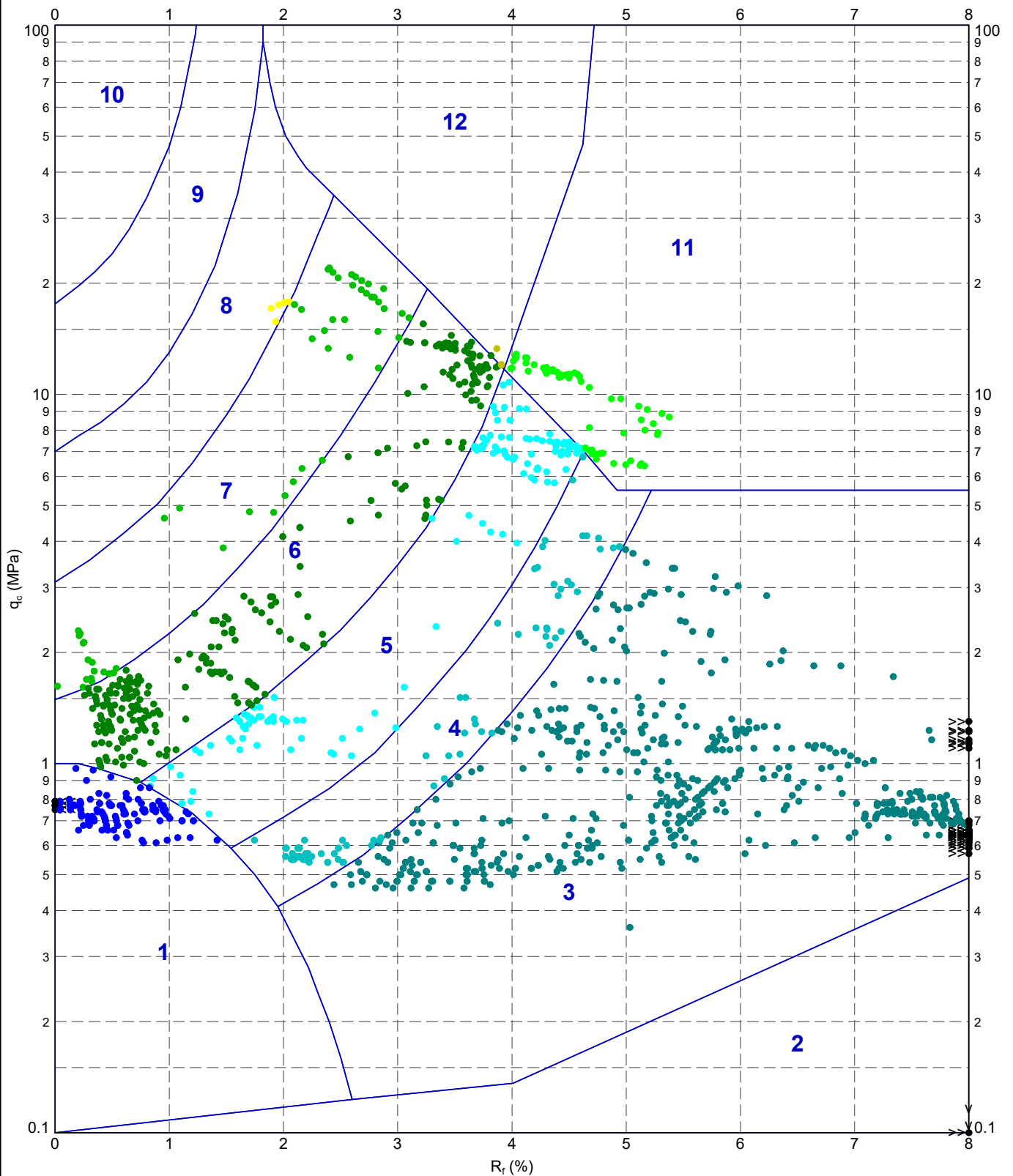
Transducer	Pre	Post	Difference
Tip	166 mV	180 mV	0.158 MPa
Sleeve	277 mV	281 mV	0.003 kPa
Pore Pressure 2	367 mV	331 mV	-0.008 kPa
X-Y Inclinator	2463 mV	2463 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:11 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 qc Rf

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT03

DRAWN	DATE	16/08/2024
CHECKED	DATE	16/08/2024
SCALE	Not To Scale	
PROJECT No	FIGURE No	A4
1240380		

PointID

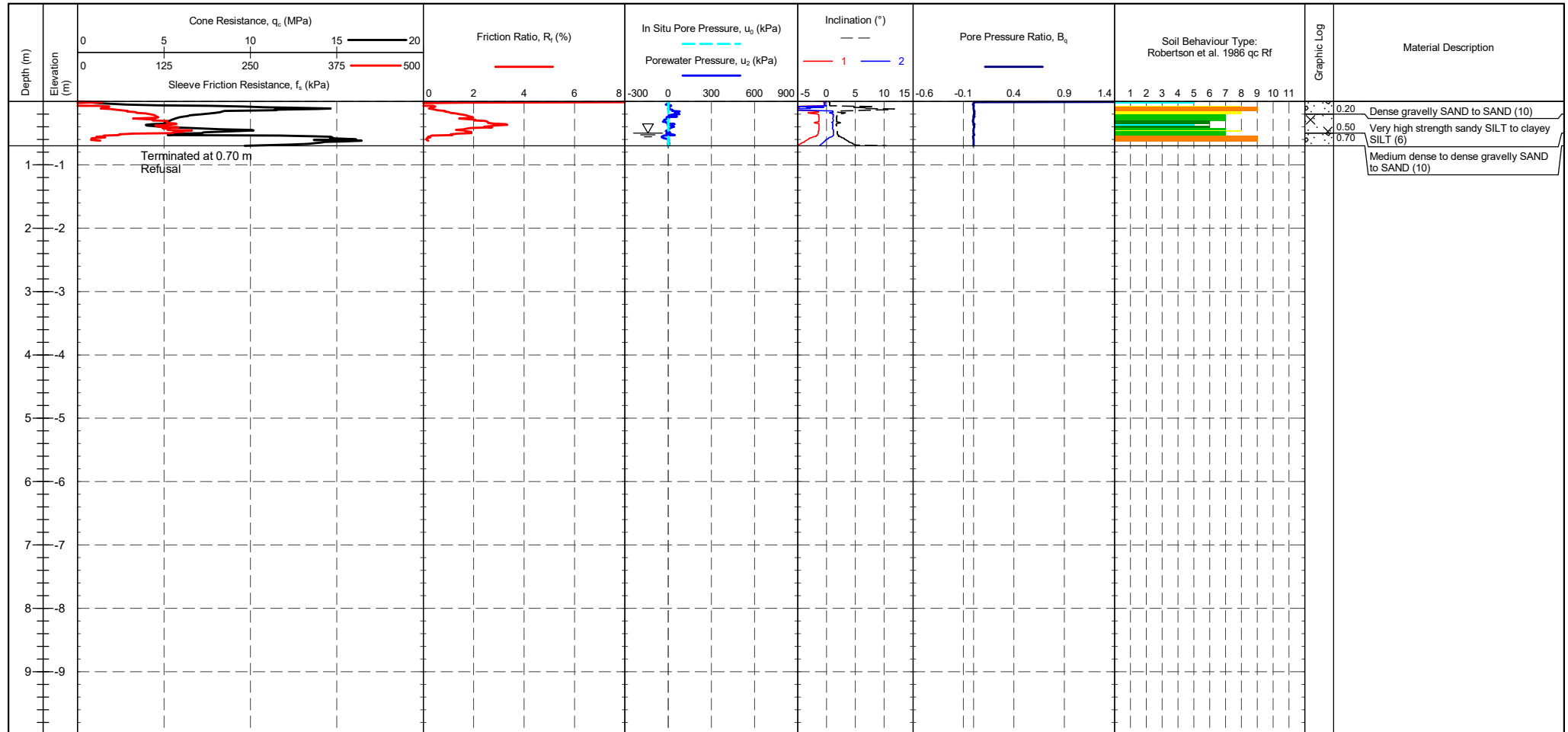
CPT04

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on inclination.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999	TEST TYPE : TE2	CPTU ZERO VALUES				METHOD: Robertson et al. 1986 qc Rf						Groundwater Level Dissipation Test
CALIBRATION DATE : 05/09/2023	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference	1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND	10 - Gravelly SAND to SAND 11 - Very stiff fine grained 12 - SAND to clayey SAND			
CONE MODEL : Subtraction	RIG : CPT 006 - Zoe	Tip	175 mV	171 mV	-0.045 MPa	2 - Organic material	6 - Sandy SILT to clayey SILT					
CONE AREA : 15cm ²	OPERATOR : JC & RB	Sleeve	273 mV	279 mV	0.004 kPa	3 - CLAY	7 - Silty SAND to sandy SILT					
CONE AREA RATIO : 0.79	FRICTION REDUCER : None	Pore Pressure 2	326 mV	307 mV	-0.004 kPa	4 - Silty CLAY to CLAY	8 - SAND to silty SAND					
FILTER POSITION : u2	WEATHER : Raining & Mild	X-Y Inclinator	2439 mV	2443 mV								
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes											

PointID

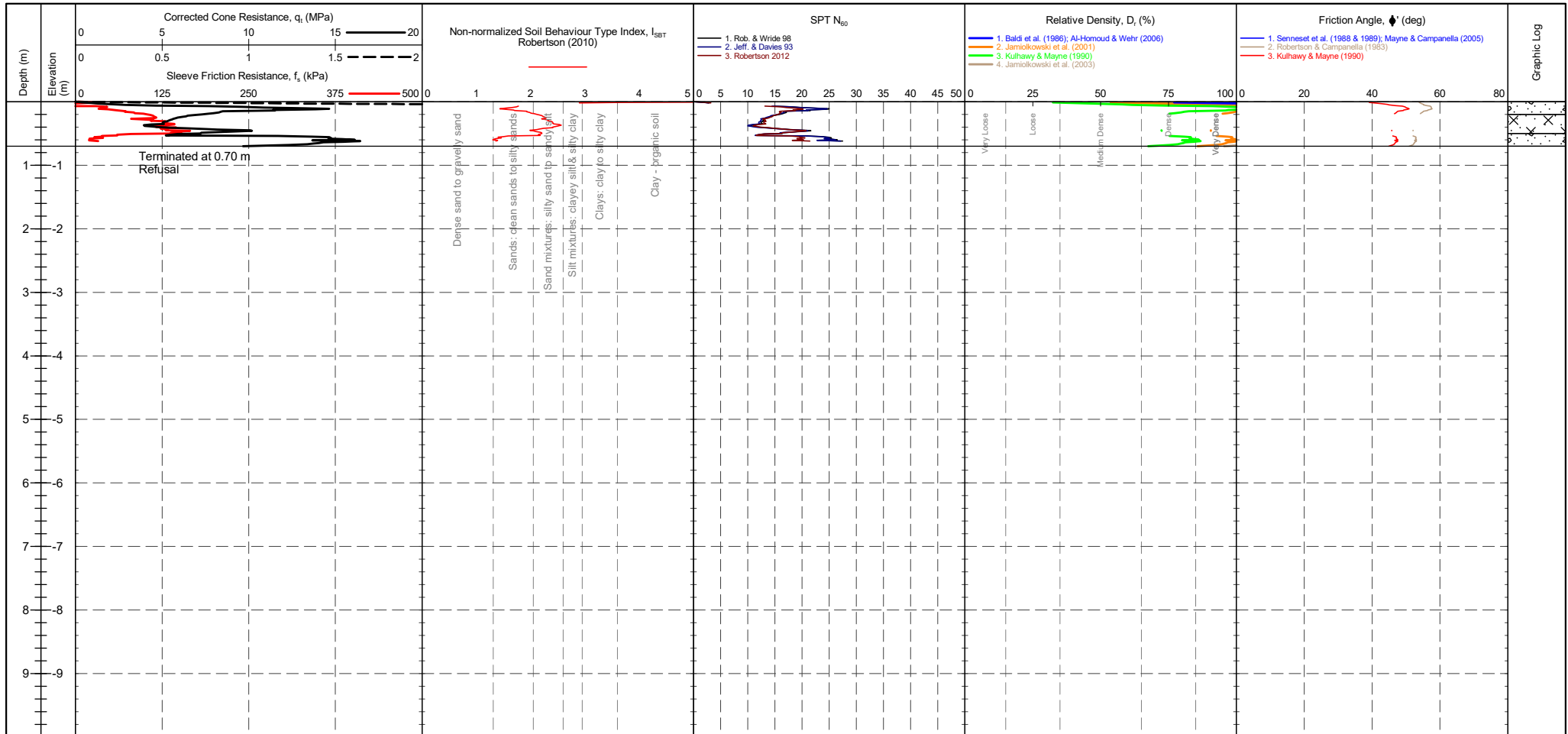
CPT04

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on inclination.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	175 mV	171 mV	-0.045 MPa
Sleeve	273 mV	279 mV	0.004 kPa
Pore Pressure 2	326 mV	307 mV	-0.004 kPa
X-Y Inclinator	2439 mV	2443 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level
Dissipation Test

PointID

CPT04

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on inclination.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

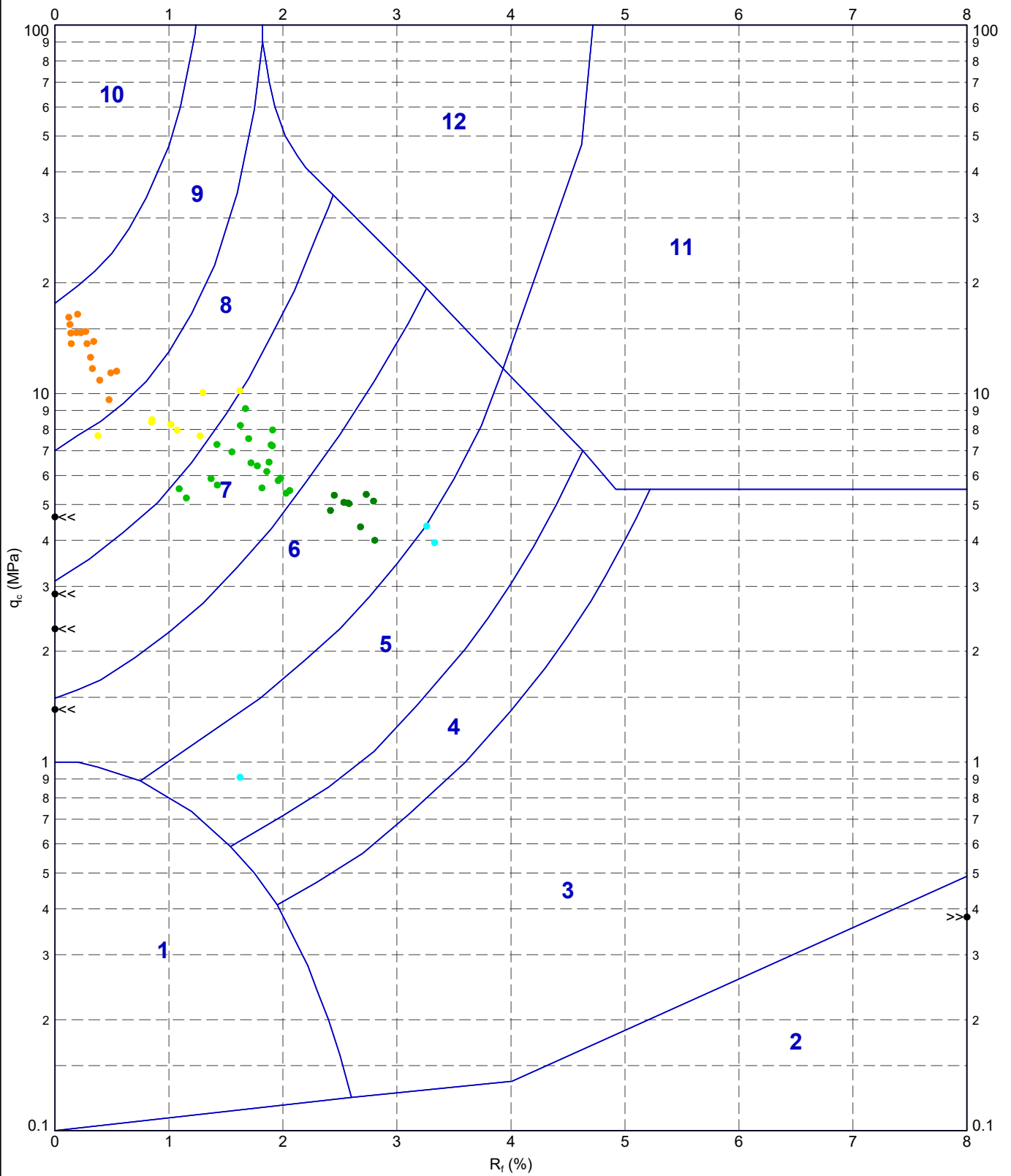
Transducer	Pre	Post	Difference
Tip	175 mV	171 mV	-0.045 MPa
Sleeve	273 mV	279 mV	0.004 kPa
Pore Pressure 2	326 mV	307 mV	-0.004 kPa
X-Y Inclinator	2439 mV	2443 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF - AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:11 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10]



METHOD: Robertson et al. 1986 q_c vs. R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT04

DRAWN	DATE	16/08/2024
CHECKED	DATE	16/08/2024
SCALE	Not To Scale	
PROJECT No	FIGURE No	A4
1240380		

PointID

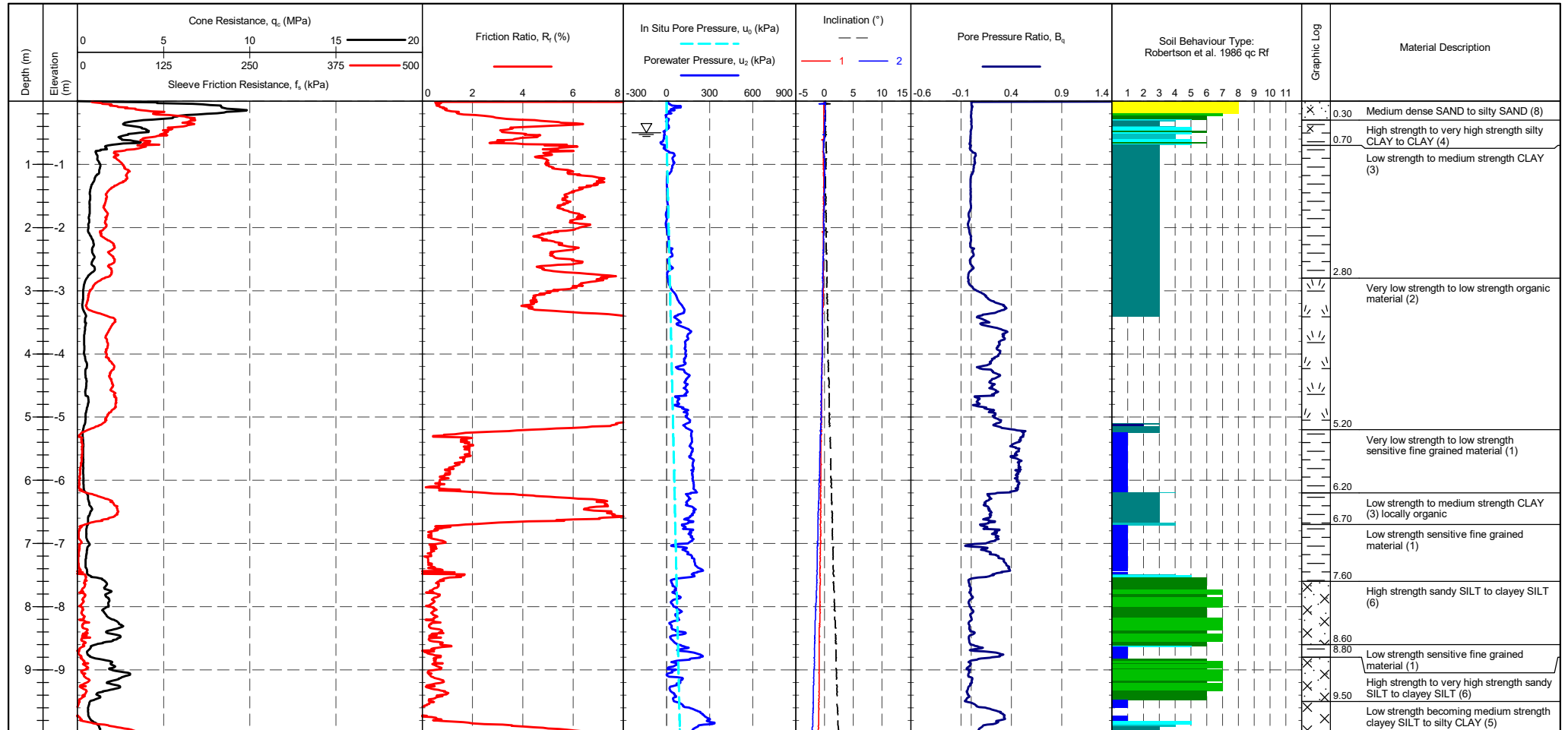
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES
Transducer Pre Post Difference
Tip 168 mV 178 mV 0.113 MPa
Sleeve 278 mV 278 mV 0 kPa
Pore Pressure 2 302 mV 368 mV 0.015 kPa
X-Y Inclinator 2496 mV 2482 mV

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

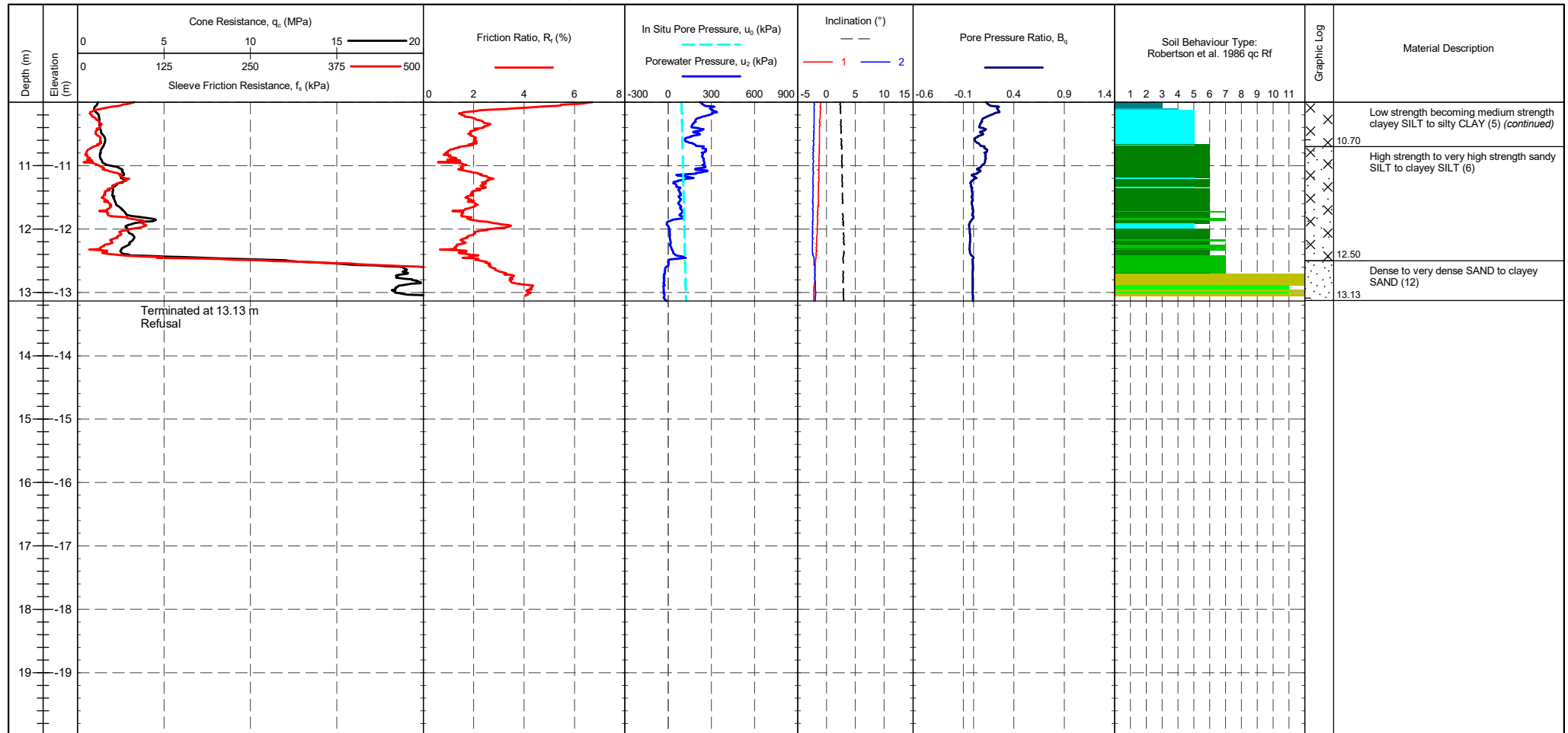
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	168 mV	178 mV	0.113 MPa
Sleeve	278 mV	278 mV	0 kPa
Pore Pressure 2	302 mV	368 mV	0.015 kPa
X-Y Inclinator	2496 mV	2482 mV	

METHOD: Robertson et al. 1986 q_c R_f

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater
Level

Dissipation Test

PointID

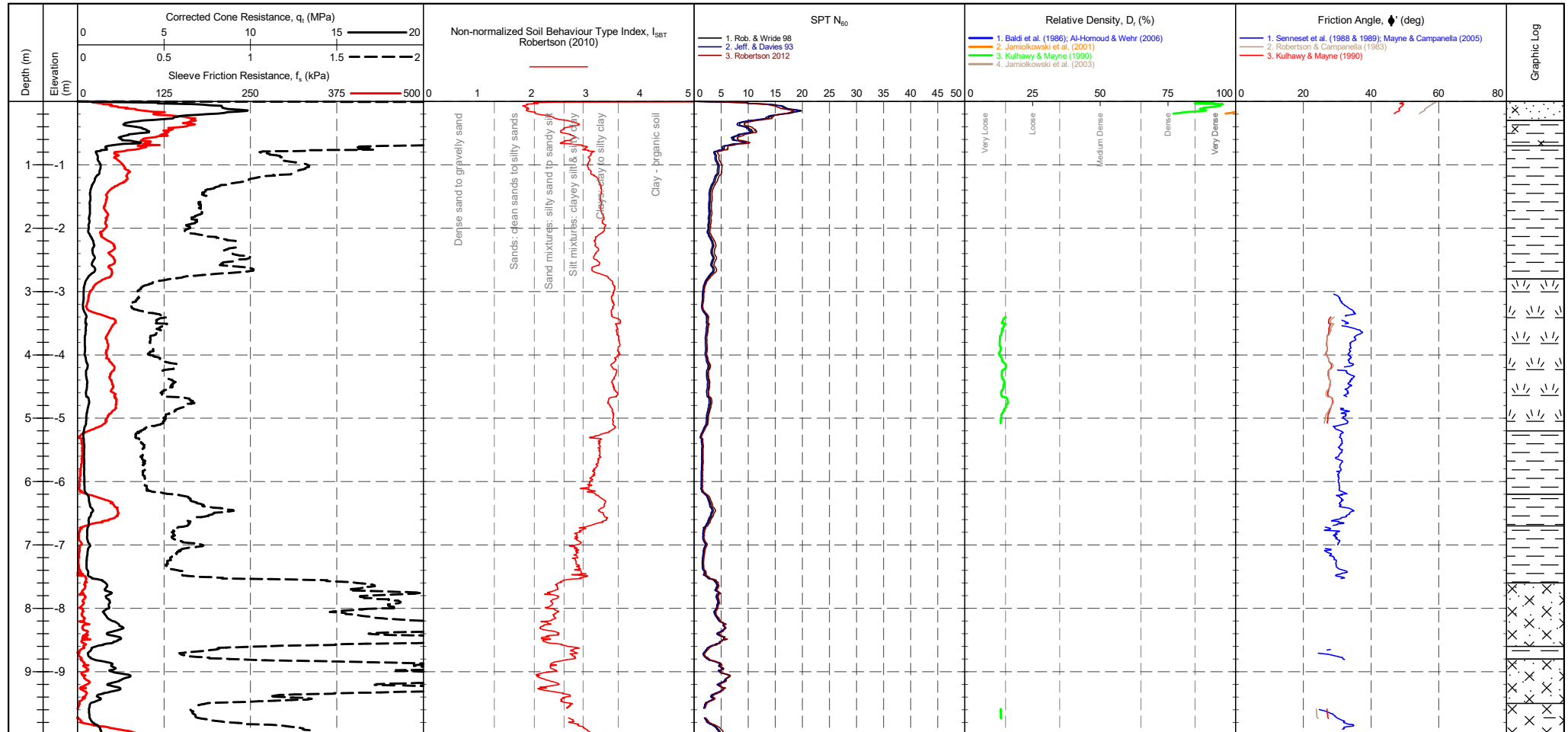
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre Post Difference
168 mV 178 mV 0.113 MPa
278 mV 278 mV 0 kPa
302 mV 368 mV 0.015 kPa
2496 mV 2482 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

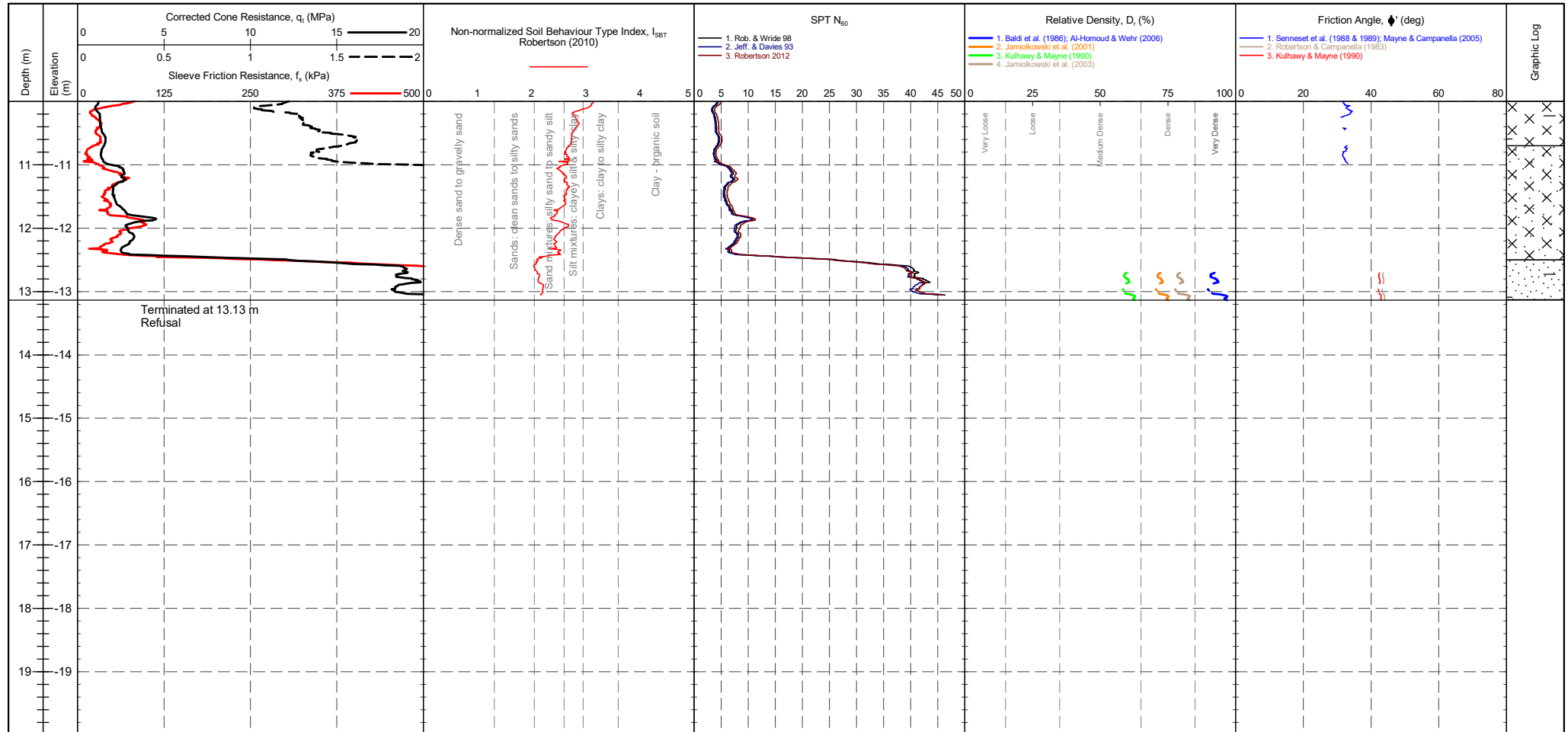
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre :
Post :
Difference :
168 mV : 178 mV : 0.113 MPa
278 mV : 278 mV : 0 kPa
302 mV : 368 mV : 0.015 kPa
2496 mV : 2482 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level
Dissipation Test

PointID

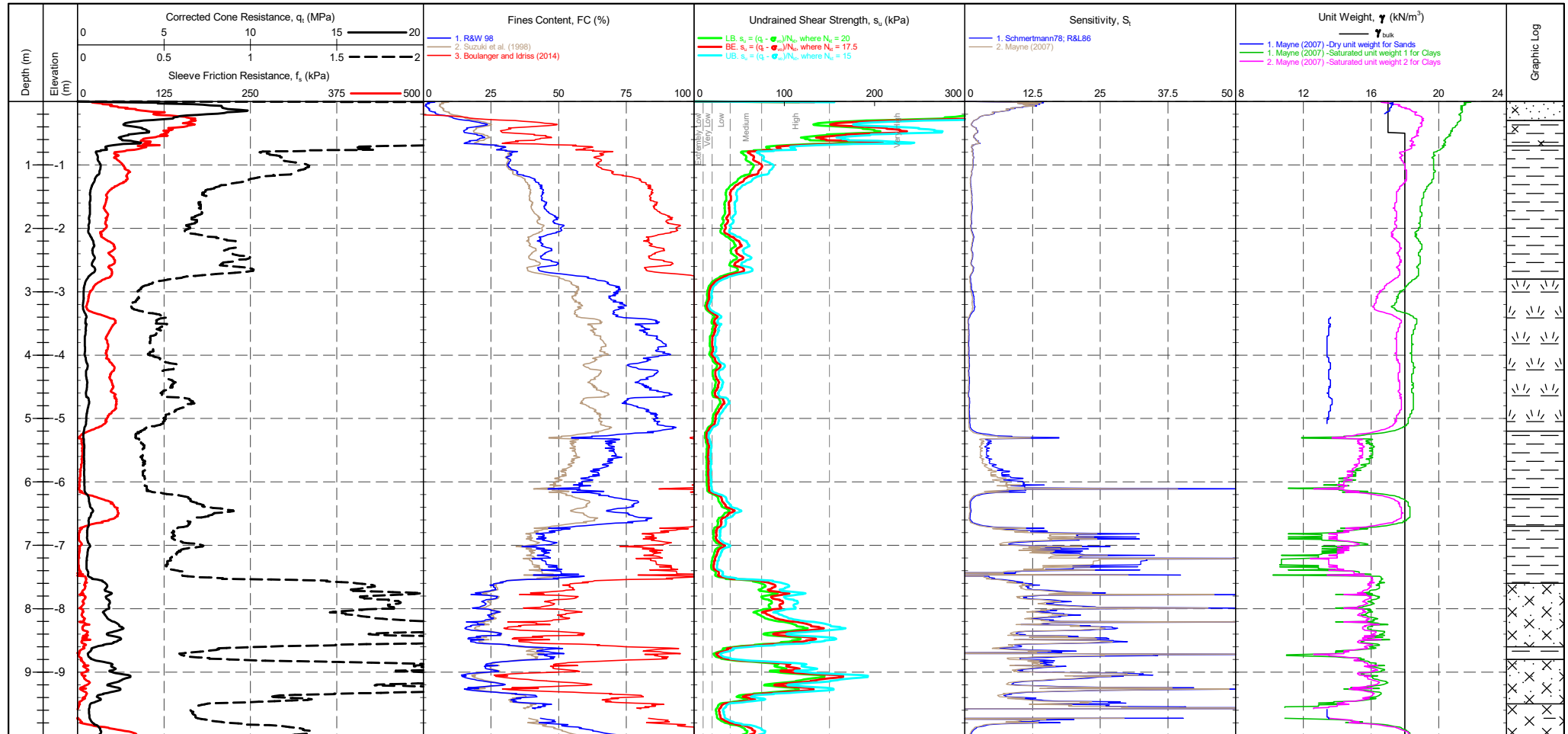
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
168 mV	178 mV	0.113 MPa
278 mV	278 mV	0 kPa
302 mV	368 mV	0.015 kPa
2496 mV	2482 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test

PointID

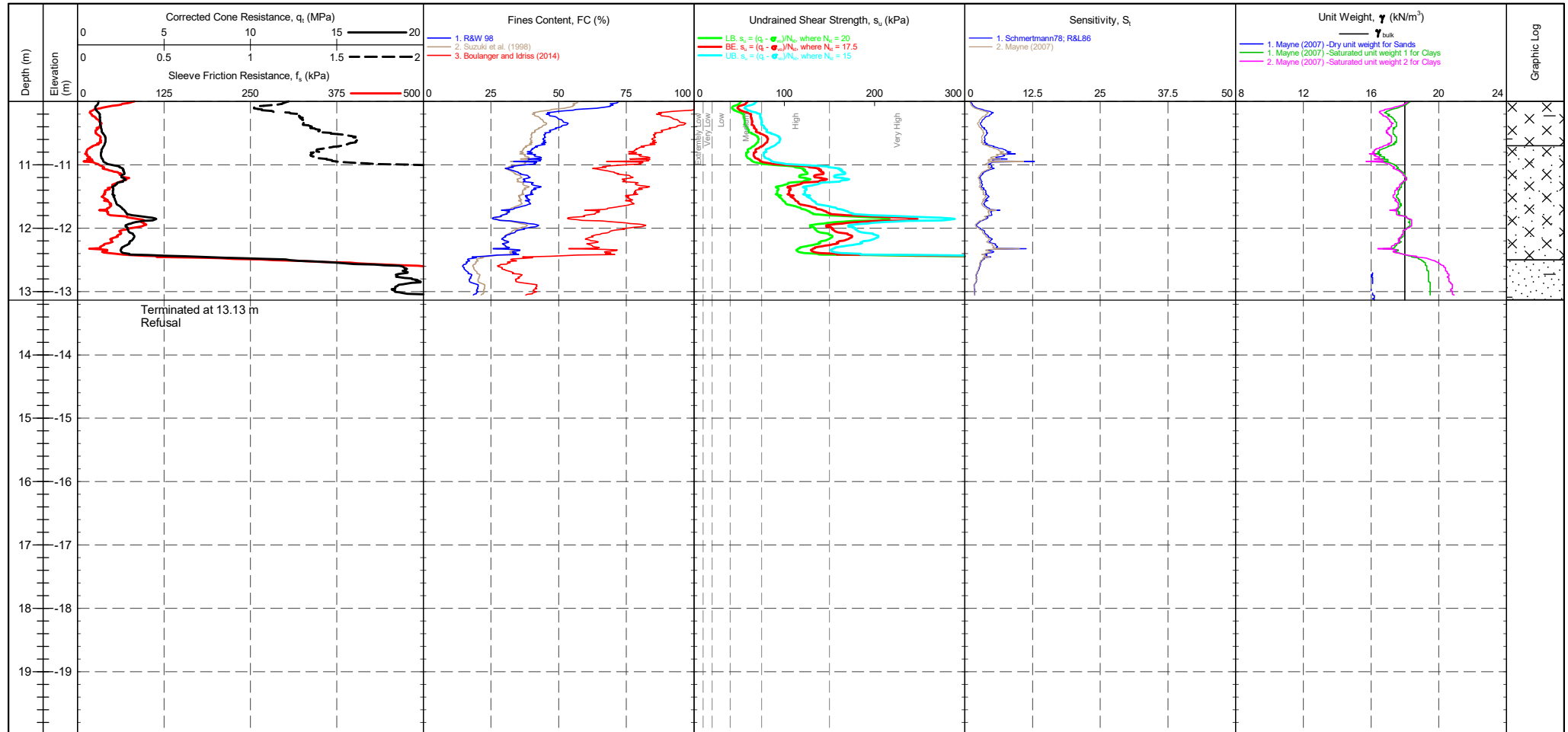
CPT04A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

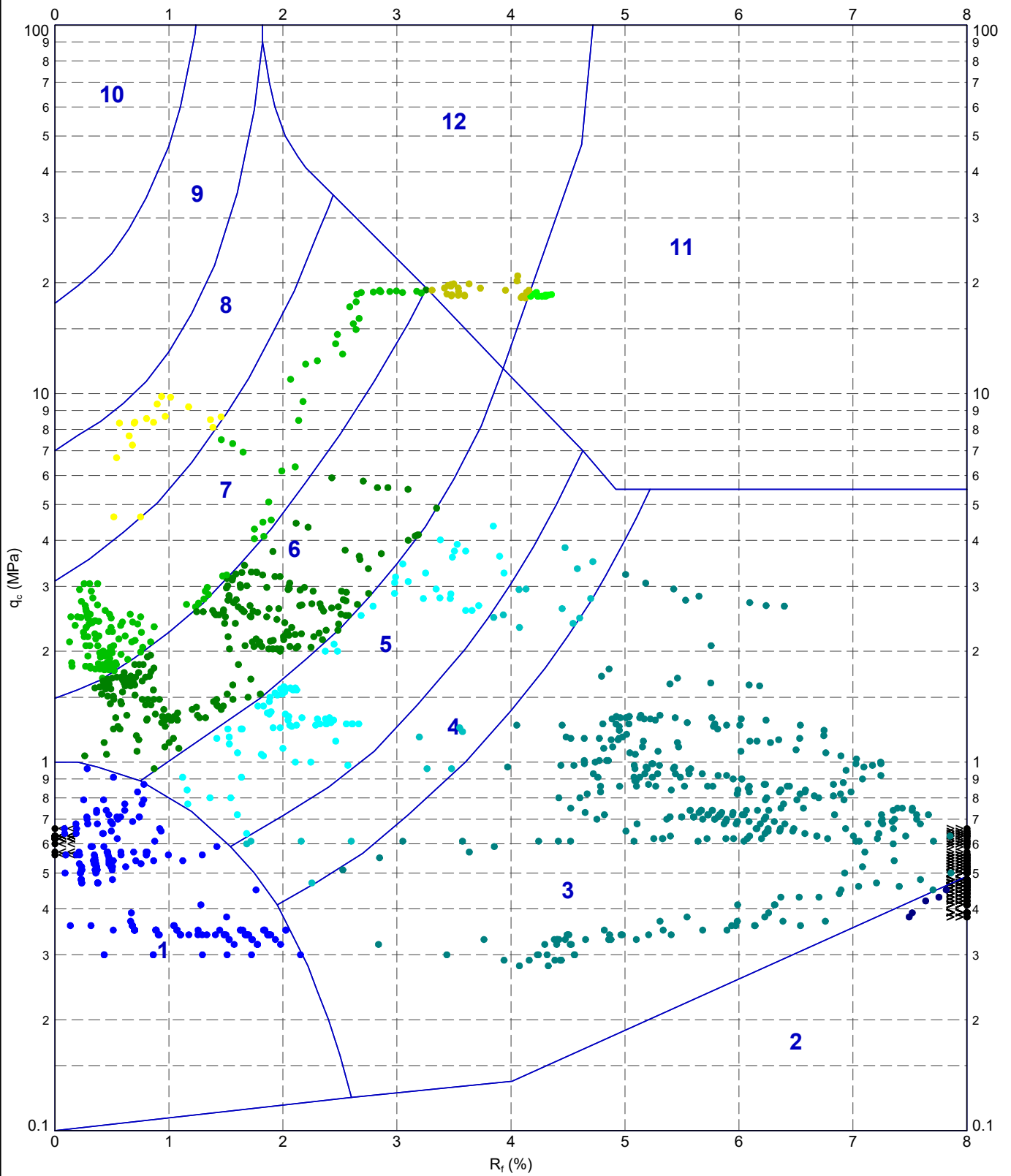
Transducer	Pre	Post	Difference
Tip	168 mV	178 mV	0.113 MPa
Sleeve	278 mV	278 mV	0 kPa
Pore Pressure 2	302 mV	368 mV	0.015 kPa
X-Y Inclinator	2496 mV	2482 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF - AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:12 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 qc Rf

- 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

	TITLE Remada Newport Glan Llyn Robertson et al. 1986 q _c vs. R _f - CPT04A	DRAWN	DATE	16/08/2024	
		CHECKED	DATE	16/08/2024	
		SCALE			A4
		PROJECT No			FIGURE No
		1240380			

PointID

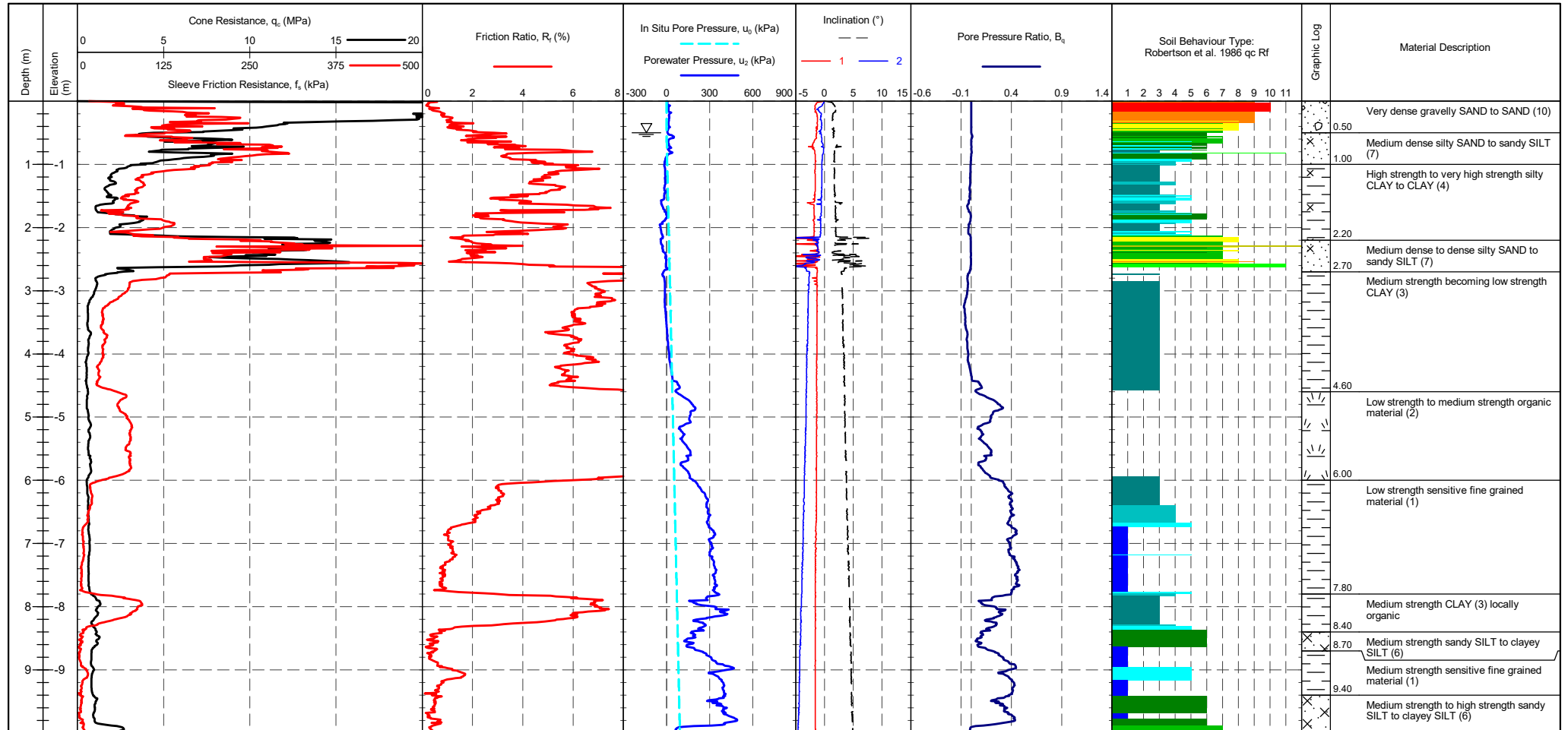
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	170 mV	171 mV	0.011 MPa
Sleeve	277 mV	279 mV	0.001 kPa
Pore Pressure 2	316 mV	323 mV	0.002 kPa
X-Y Inclinator	2486 mV	2265 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

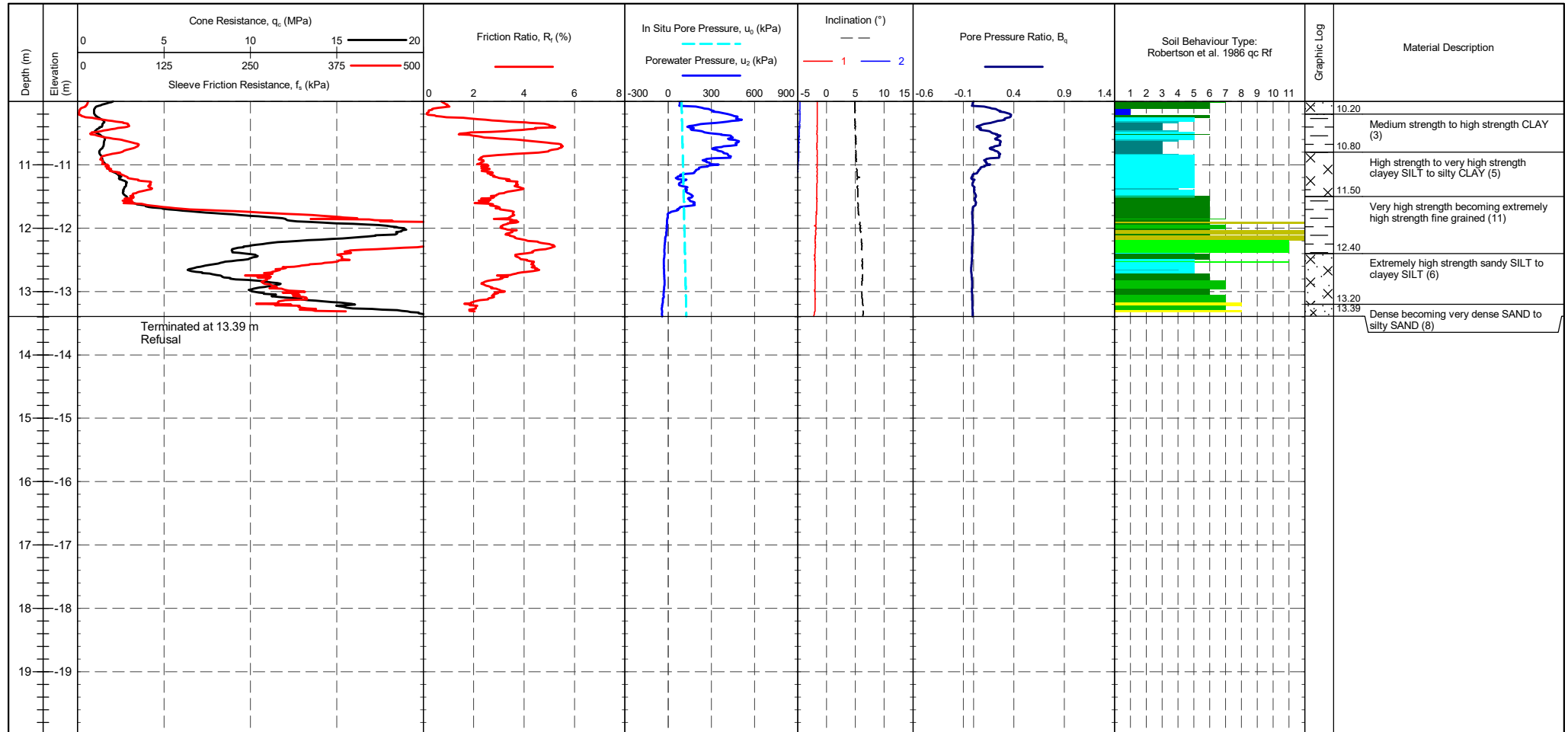
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	170 mV	171 mV	0.011 MPa
Sleeve	277 mV	279 mV	0.001 kPa
Pore Pressure 2	316 mV	323 mV	0.002 kPa
X-Y Inclinator	2486 mV	2265 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

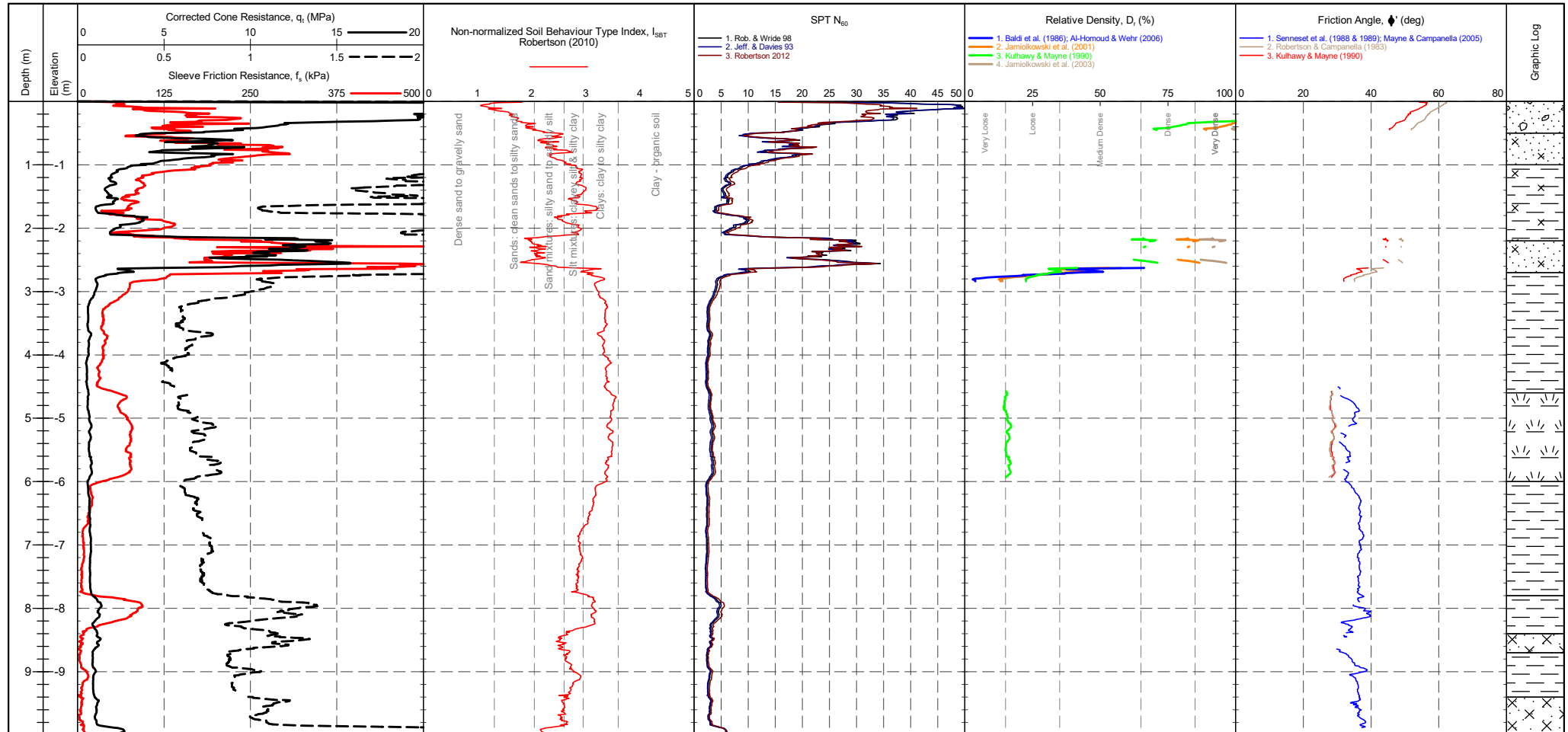
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre Post Difference
170 mV 171 mV 0.011 MPa
277 mV 279 mV 0.001 kPa
316 mV 323 mV 0.002 kPa
2486 mV 2265 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12				
Description	SBT Index, I_c	Description	SPT N value, NSPT	Description
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense
Sands	1.31-2.05	Dense	30 - 50	Dense
Gravelly sand	<1.31	Very Dense	>50	Very Dense

Groundwater Level

Dissipation Test

PointID

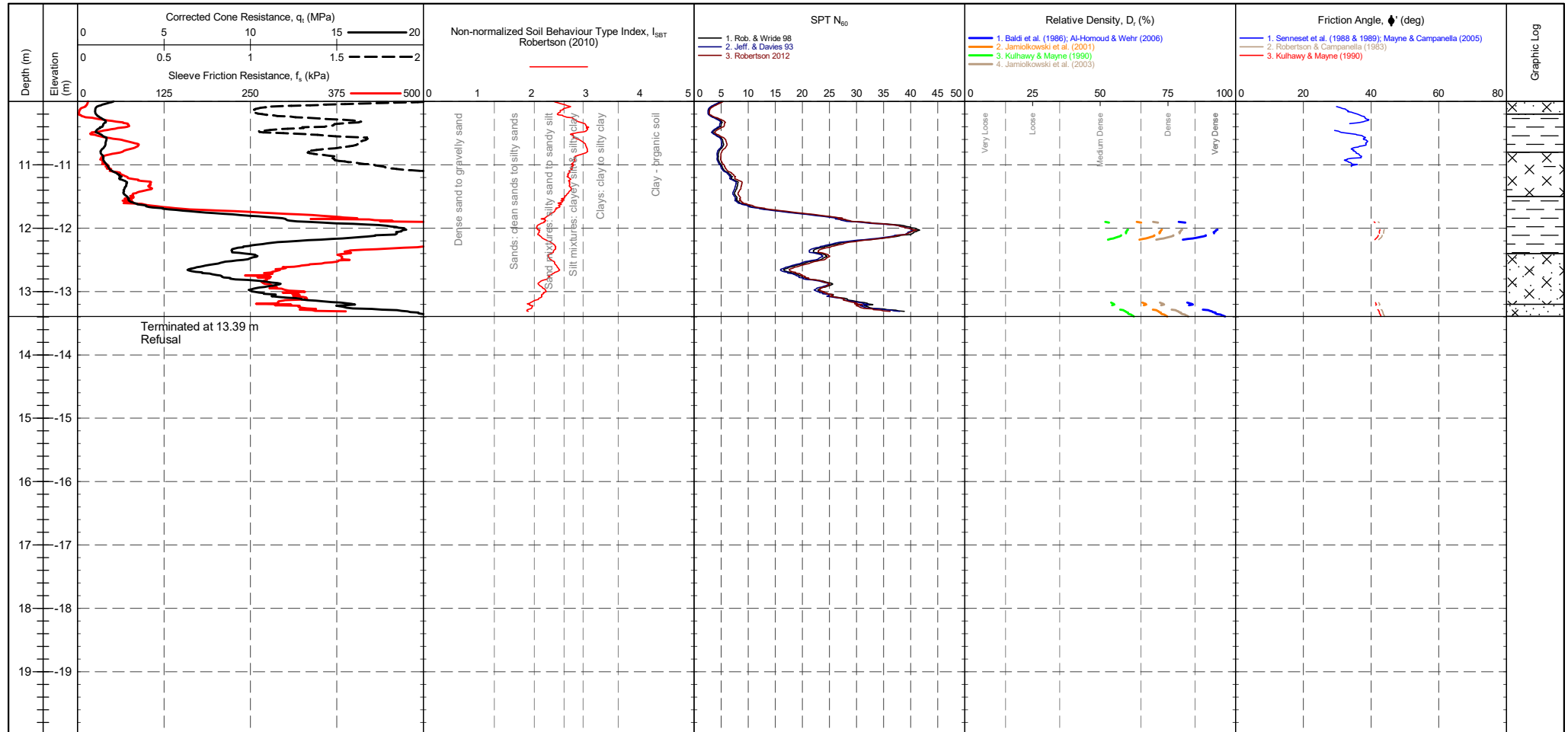
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre : 170 mV
Post : 171 mV
Difference : 0.011 MPa
277 mV
279 mV
0.001 kPa
316 mV
323 mV
0.002 kPa
2486 mV
2265 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

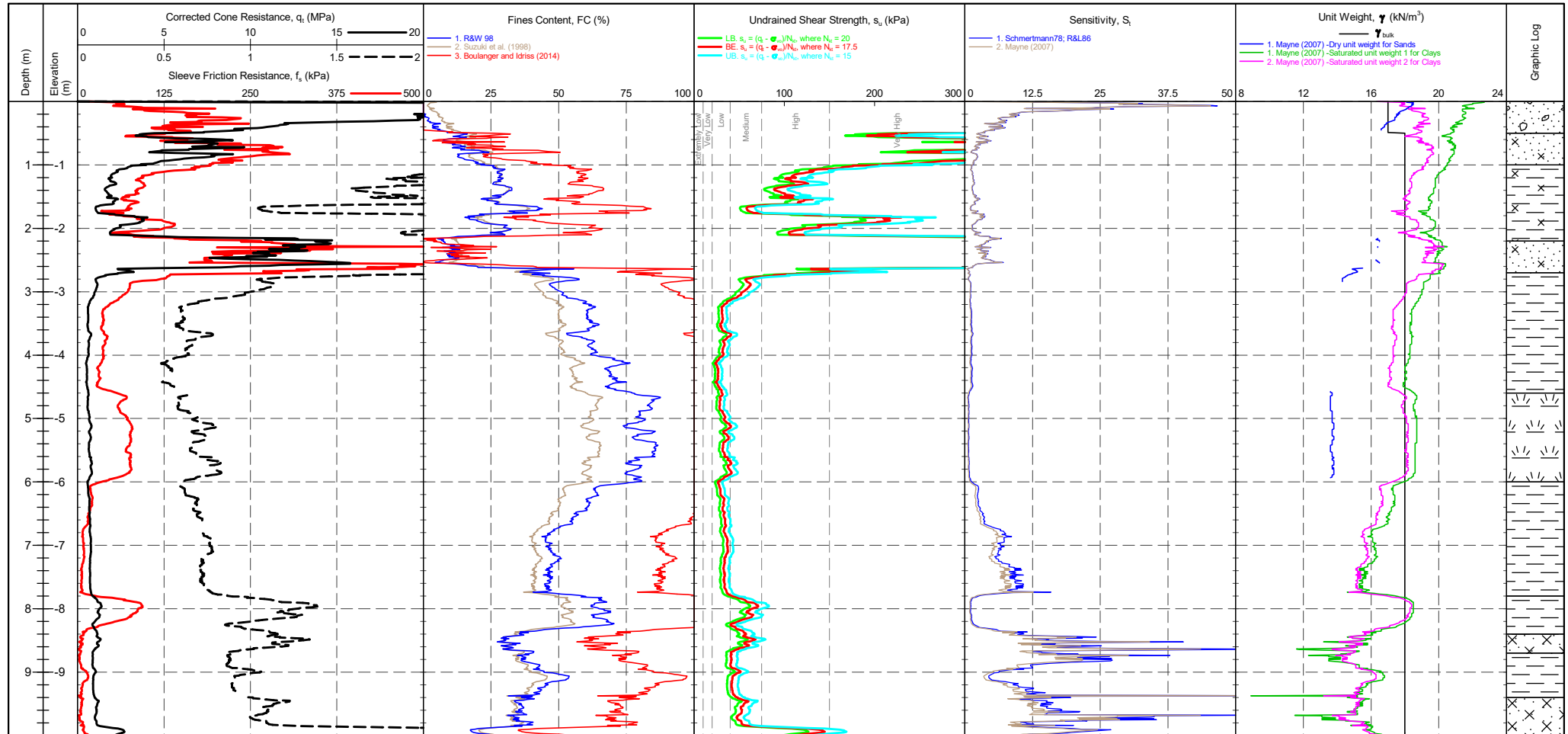
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer : Pre Post Difference
Tip : 170 mV 171 mV 0.011 MPa
Sleeve : 277 mV 279 mV 0.001 kPa
Pore Pressure 2 : 316 mV 323 mV 0.002 kPa
X-Y Inclinator : 2486 mV 2265 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level

Dissipation Test

PointID

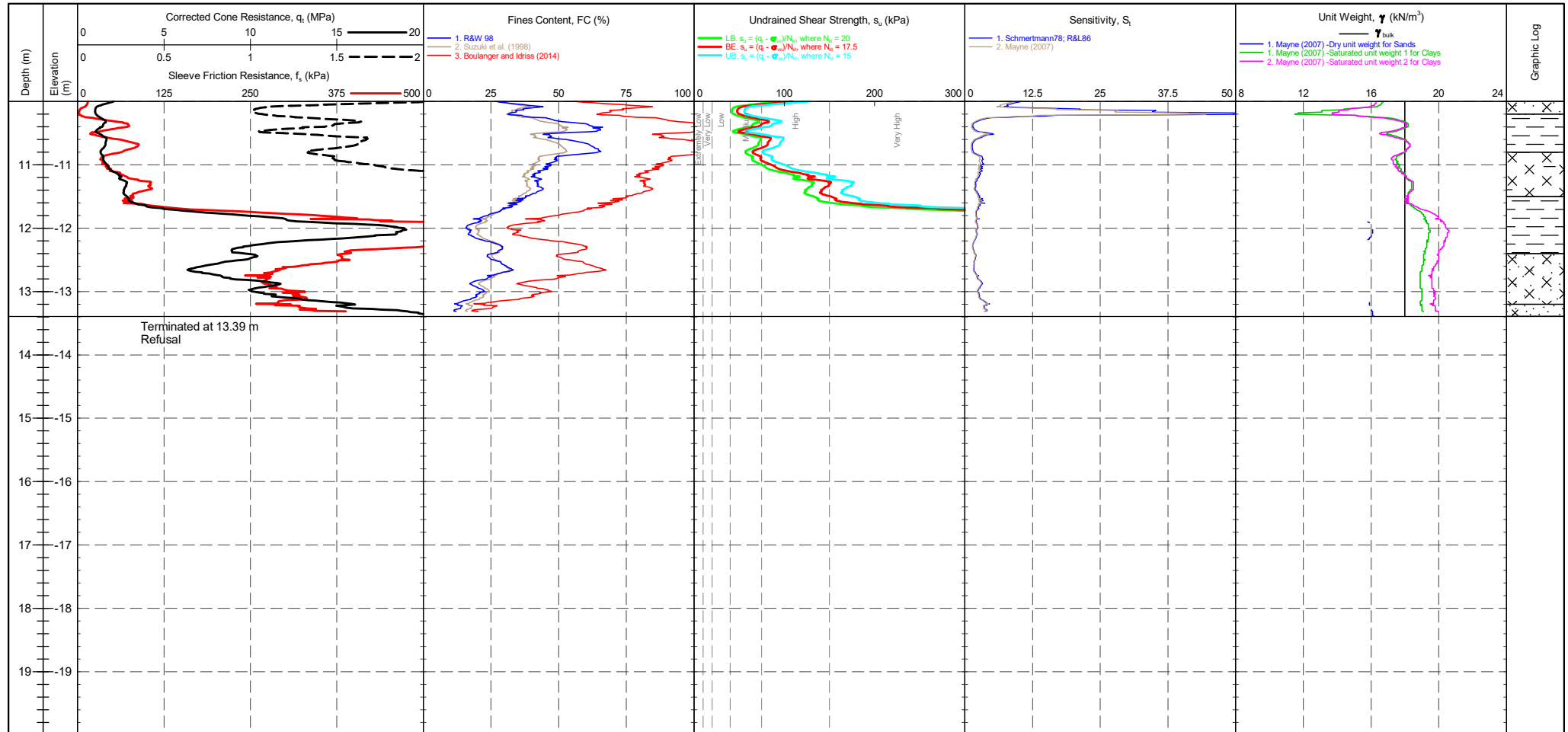
CPT05

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test stopped due to buckling rods.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

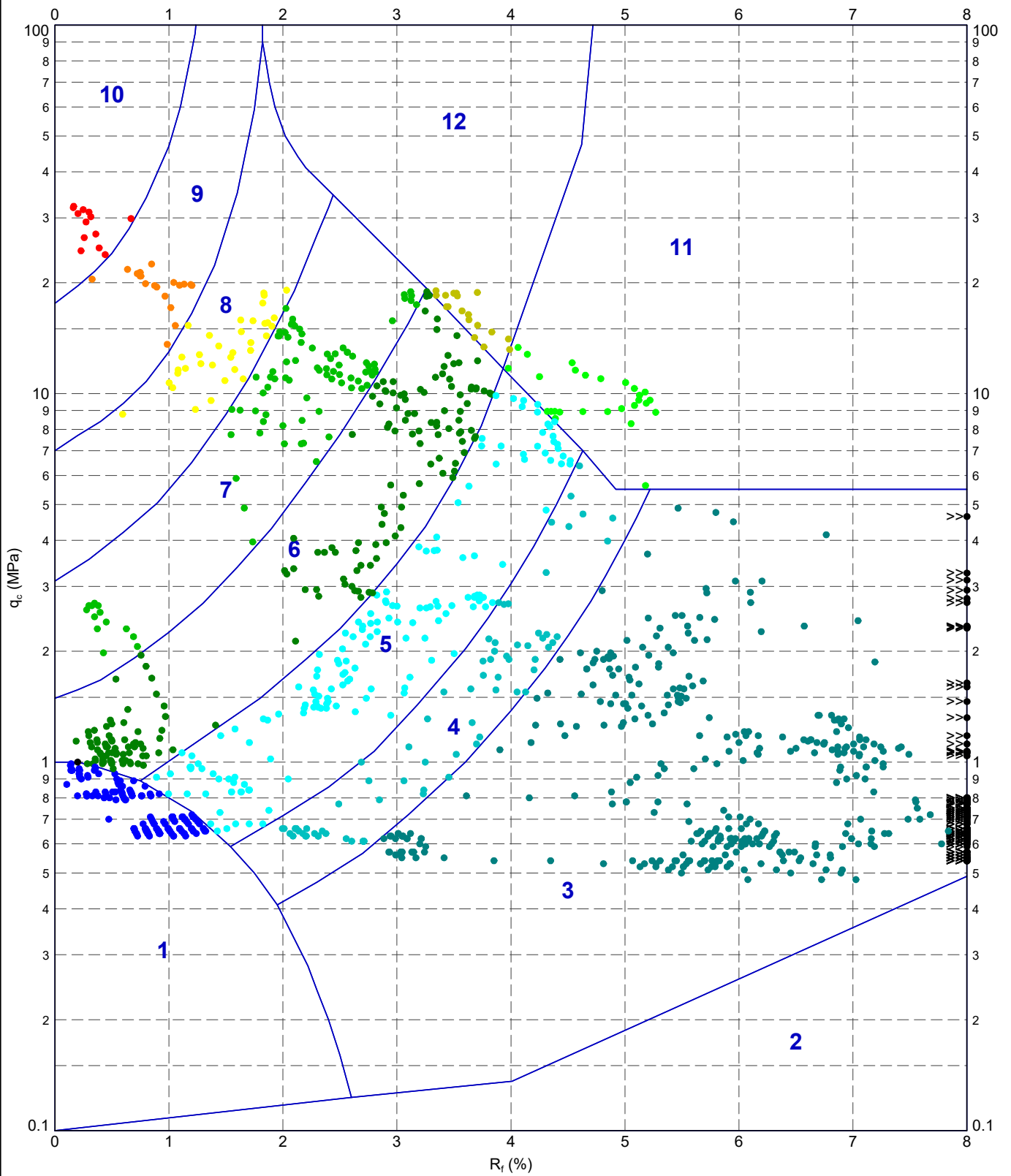
Transducer	Pre	Post	Difference
Tip	170 mV	171 mV	0.011 MPa
Sleeve	277 mV	279 mV	0.001 kPa
Pore Pressure 2	316 mV	323 mV	0.002 kPa
X-Y Inclinator	2486 mV	2265 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1240380 GLAN LLYN REMADA.GPJ <DrawingFile> 16/08/2024 16:13 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c R_f

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

IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT05

DRAWN

CHECKED

SCALE

PROJECT No

DATE

DATE

FIGURE No

16/08/2024

16/08/2024

Not To Scale

1240380

A4

PointID

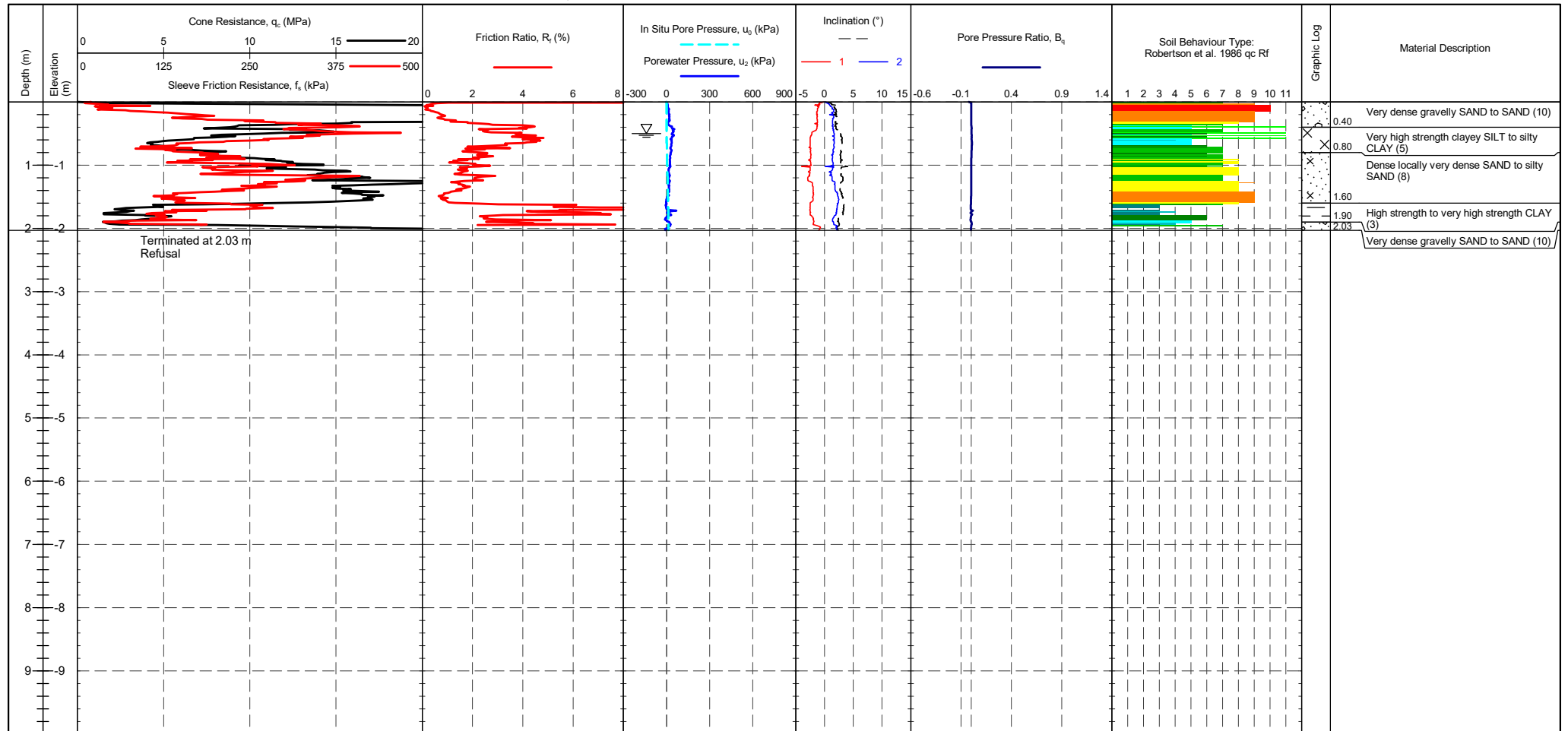
CPT06

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES
Transducer Pre Post Difference
Tip 167 mV 153 mV -0.158 MPa
Sleeve 276 mV 272 mV -0.003 kPa
Pore Pressure 2 314 mV 294 mV -0.005 kPa
X-Y Inclinator 2482 mV 2531 mV

METHOD: Robertson et al. 1986 qc Rf

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

Groundwater
Level

Dissipation Test

PointID

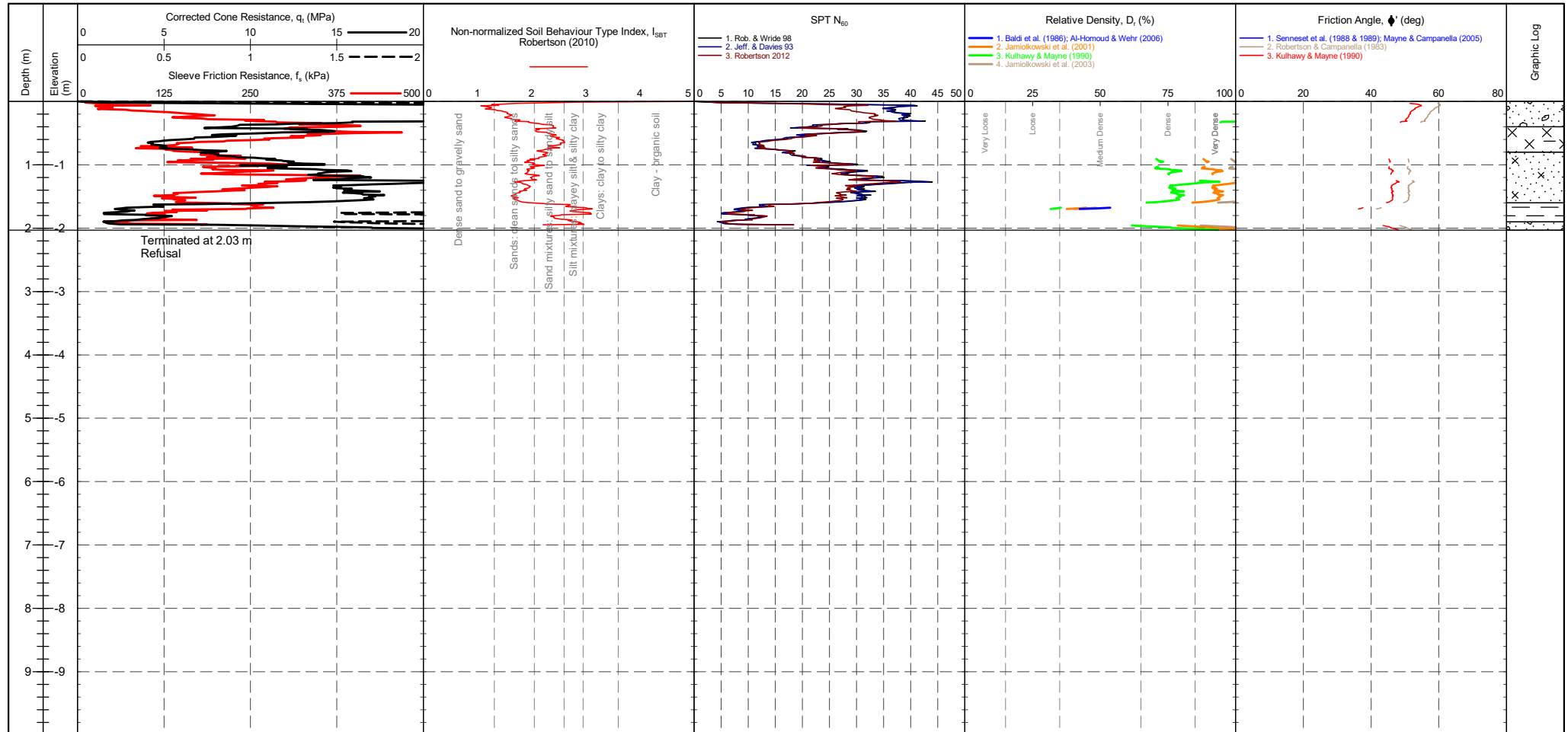
CPT06

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	167 mV	153 mV	-0.158 MPa
Sleeve	276 mV	272 mV	-0.003 kPa
Pore Pressure 2	314 mV	294 mV	-0.005 kPa
X-Y Inclinator	2482 mV	2531 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level
Dissipation Test

PointID

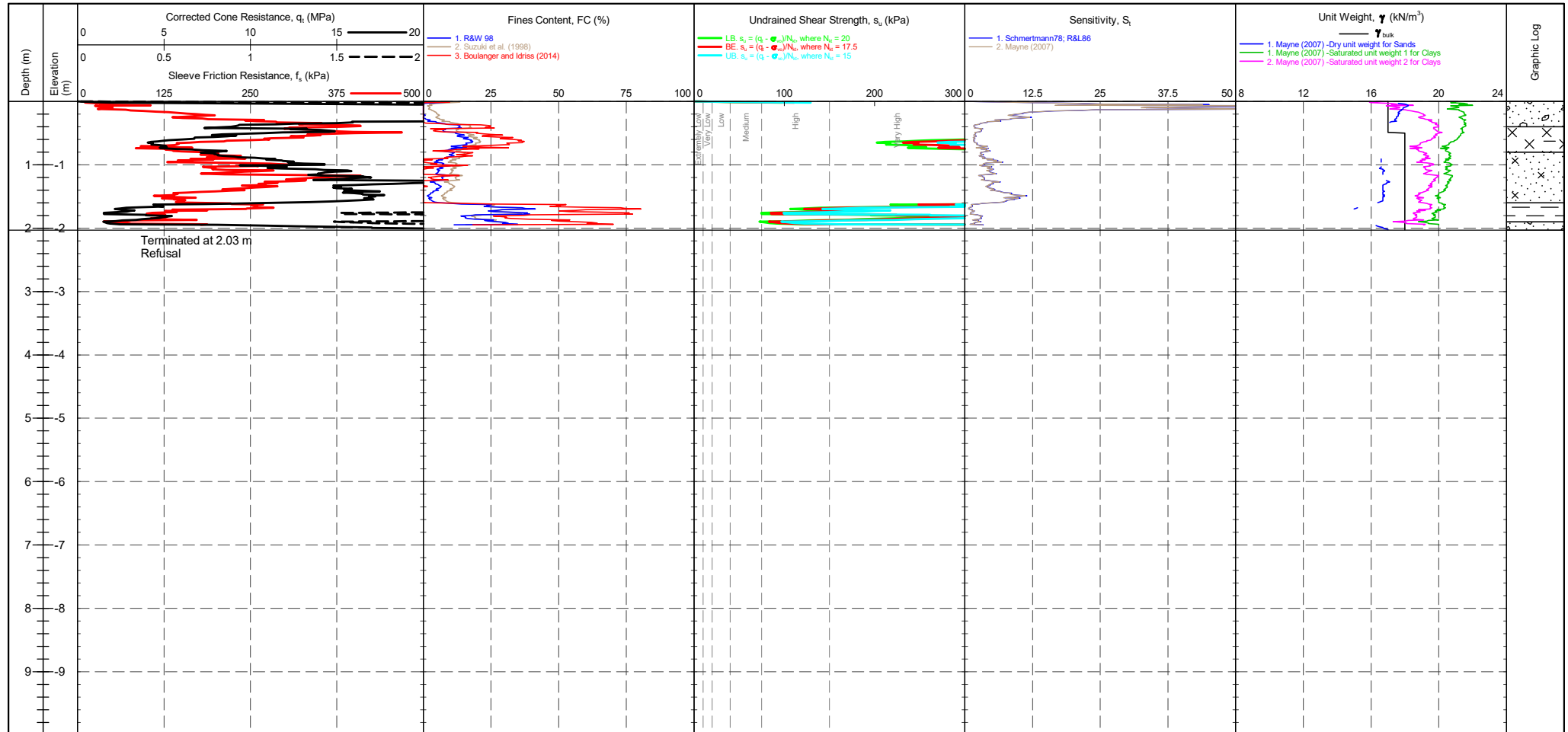
CPT06

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

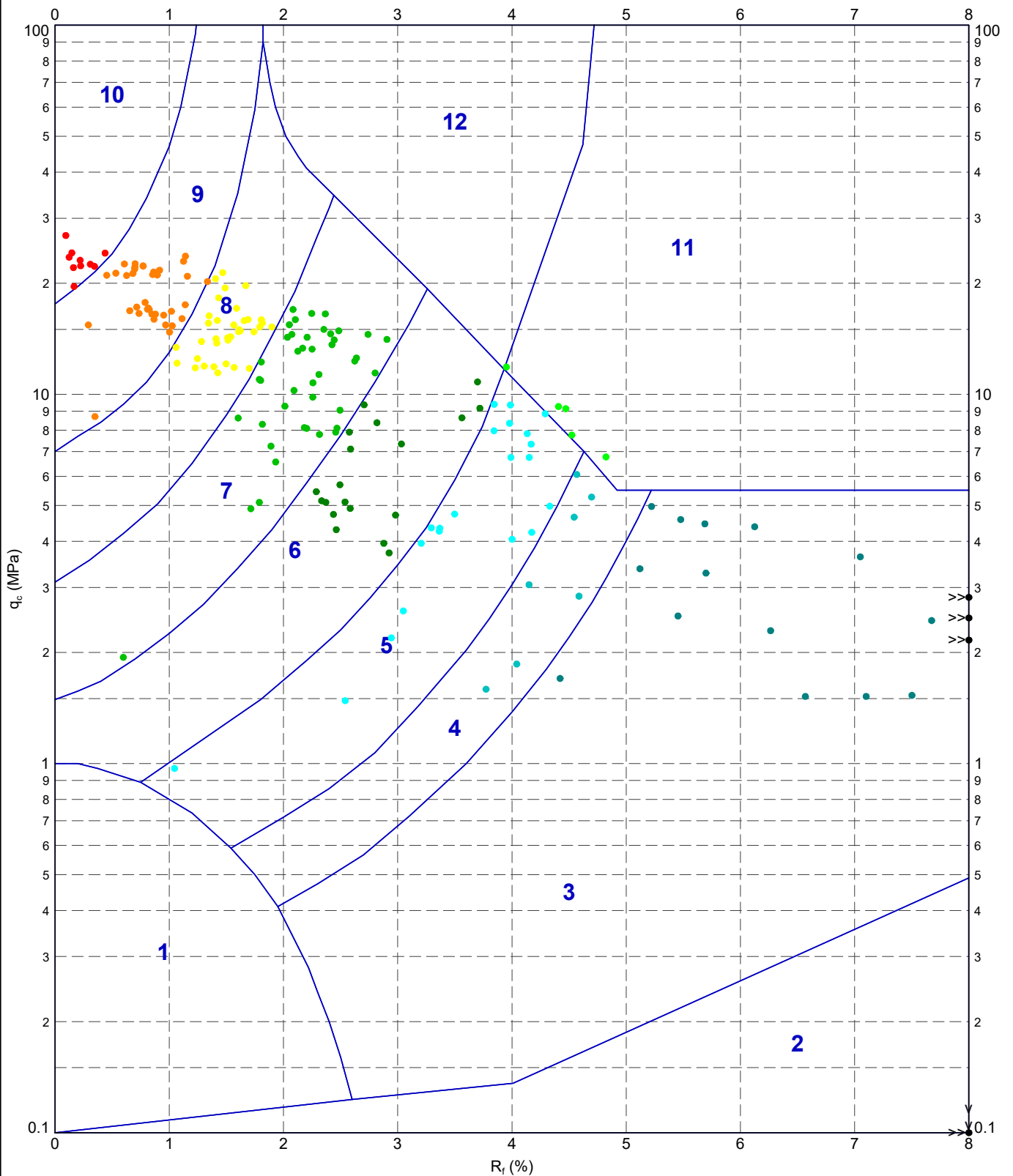
Transducer : Pre Post Difference
Tip : 167 mV 153 mV -0.158 MPa
Sleeve : 276 mV 272 mV -0.003 kPa
Pore Pressure 2 : 314 mV 294 mV -0.005 kPa
X-Y Inclinator : 2482 mV 2531 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11			
Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:14 10.03.00.09 Dargel Lab and in Situ Tool - DGD Lib: in Situ SI 2.02.0 2017-07-10 Proj: in Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 qc vs Rf

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

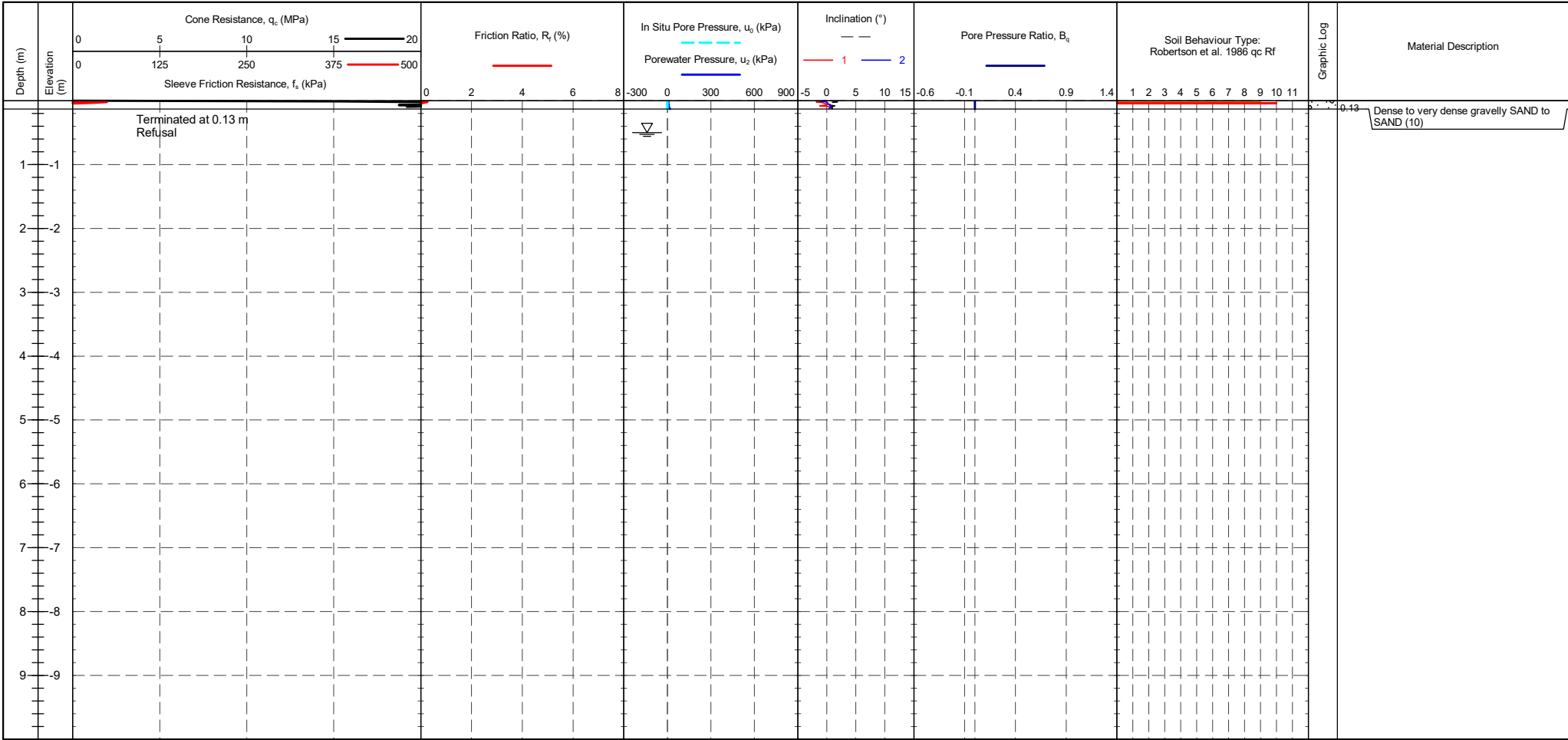
IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT06

DRAWN	DATE	16/08/2024
CHECKED	DATE	16/08/2024
SCALE	Not To Scale	
PROJECT No	FIGURE No	A4
1240380		

PointID
CPT06A

CLIENT : Remada	EASTING : 0.000 m	Remark: Test refused on total pressure.	SHEET : 1 OF 1
PROJECT : Glan Llyn	NORTHING : 0.000 m		STATUS : Final
LOCATION : Newport	ELEVATION : 0.000 m OD		TEST DATE : 08/08/2024
PROJECT No. : 1240380	CHECKED BY : DW		PLOT DATE : 16/08/2024
	TERMINATION REASON : Refusal		METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999	TEST TYPE : TE2	CPTU ZERO VALUES				METHOD: Robertson et al. 1986 qc Rf	Groundwater Level Dissipation Test
CALIBRATION DATE : 05/09/2023	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference		
CONE MODEL : Subtraction	RIG : CPT 006 - Zoe	Tip	153 mV	158 mV	0.056 MPa		
CONE AREA : 15cm ²	OPERATOR : JC & RB	Sleeve	275 mV	277 mV	0.001 kPa		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None	Pore Pressure 2	289 mV	295 mV	0.001 kPa		
FILTER POSITION : u2	WEATHER : Raining & Mild	X-Y Inclinator	2397 mV	2555 mV			
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes						

PointID

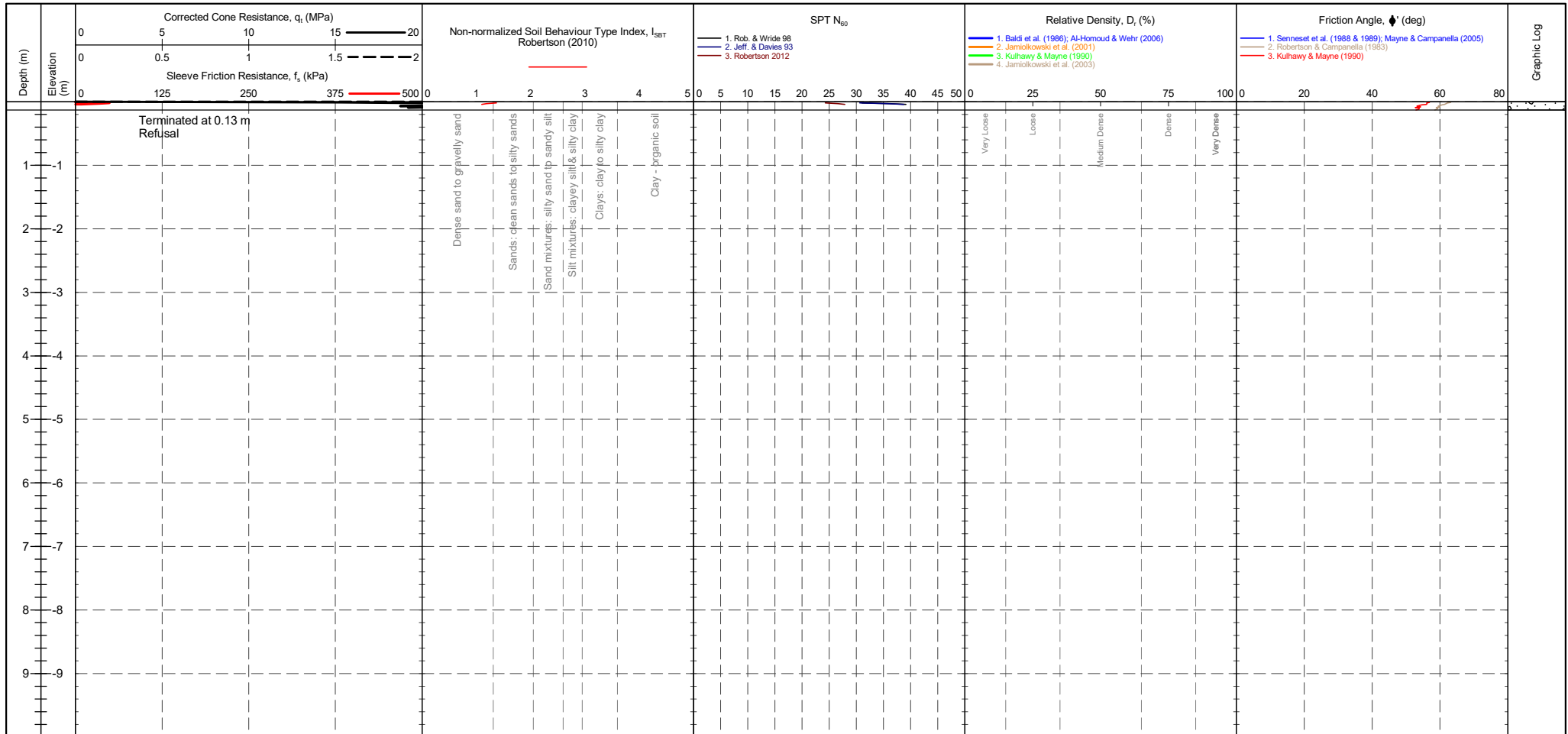
CPT06A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
153 mV
275 mV
289 mV
2397 mV

Post
158 mV
277 mV
295 mV
2555 mV

Difference
0.056 MPa
0.001 kPa
0.001 kPa

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

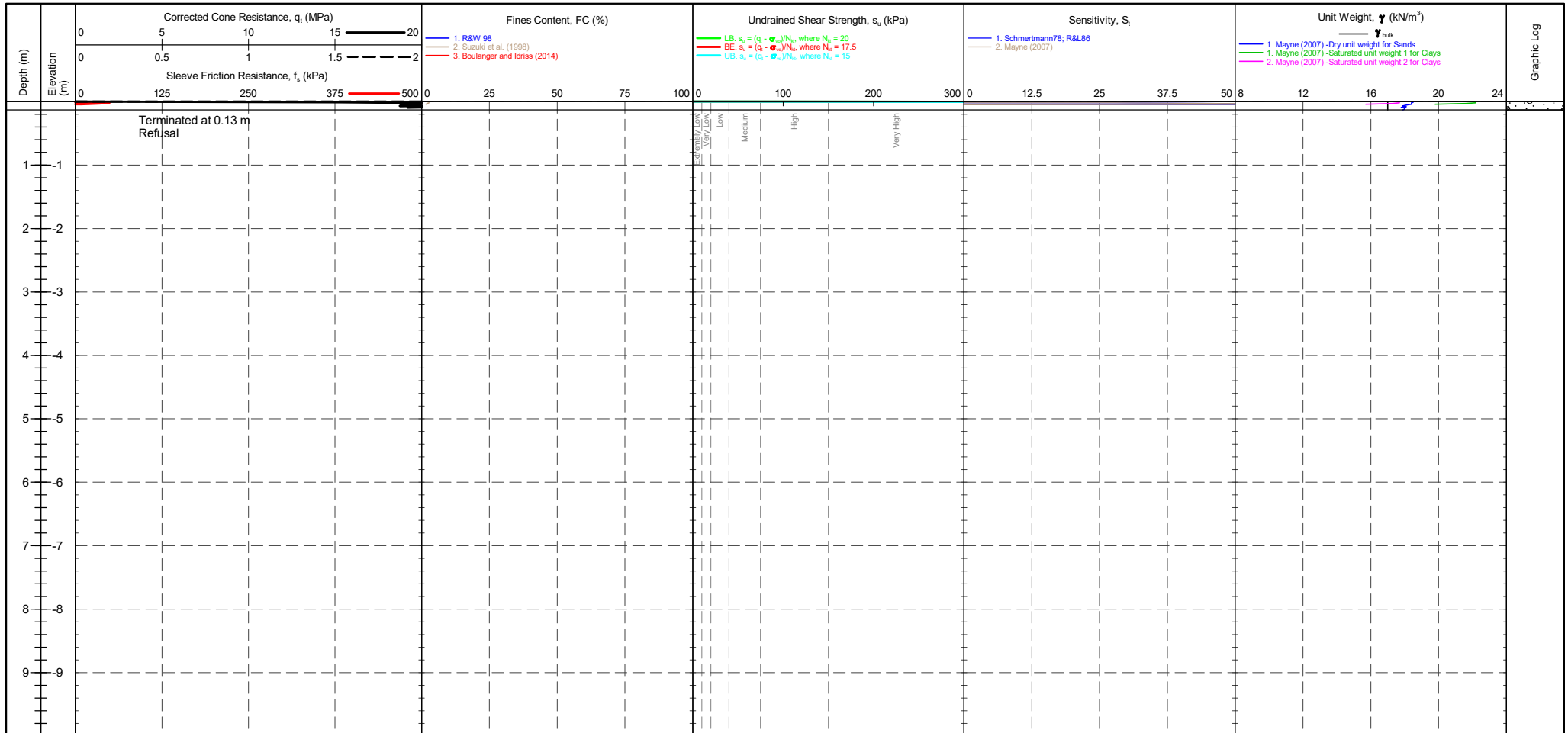
CPT06A

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

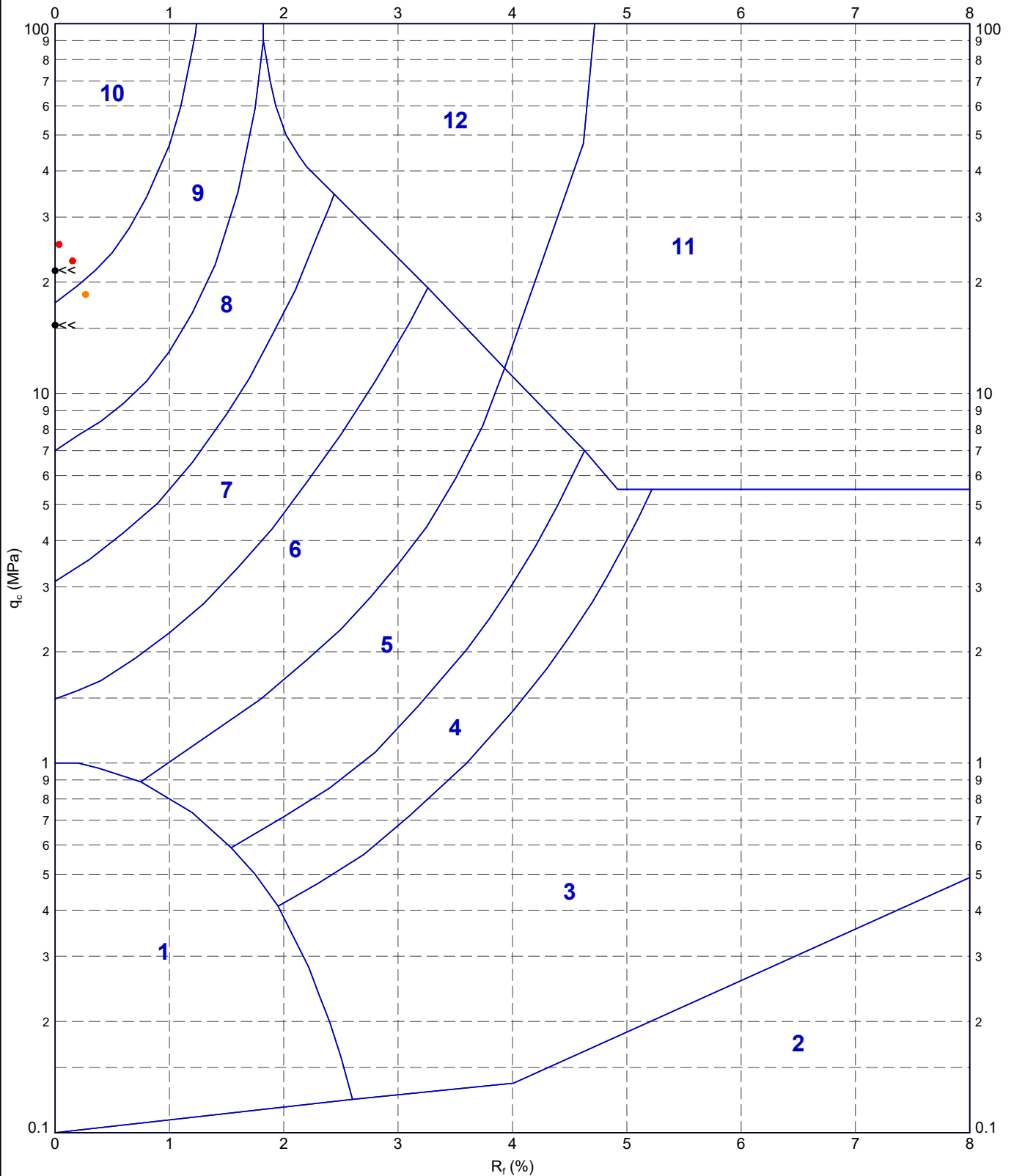
Transducer : Pre Post Difference
Tip : 153 mV 158 mV 0.056 MPa
Sleeve : 275 mV 277 mV 0.001 kPa
Pore Pressure 2 : 289 mV 295 mV 0.001 kPa
X-Y Inclinator : 2397 mV 2555 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11			
Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. Rf AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:15 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10]



METHOD: Robertson et al. 1986 qc Rf

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

IN SITU
SITE INVESTIGATION

Remada
Newport
Glan Llyn
Robertson et al. 1986 qc vs. Rf - CPT06A

DRAWN	DATE	16/08/2024
CHECKED	DATE	16/08/2024
SCALE	Not To Scale	
PROJECT No	FIGURE No	A4
1240380		

PointID

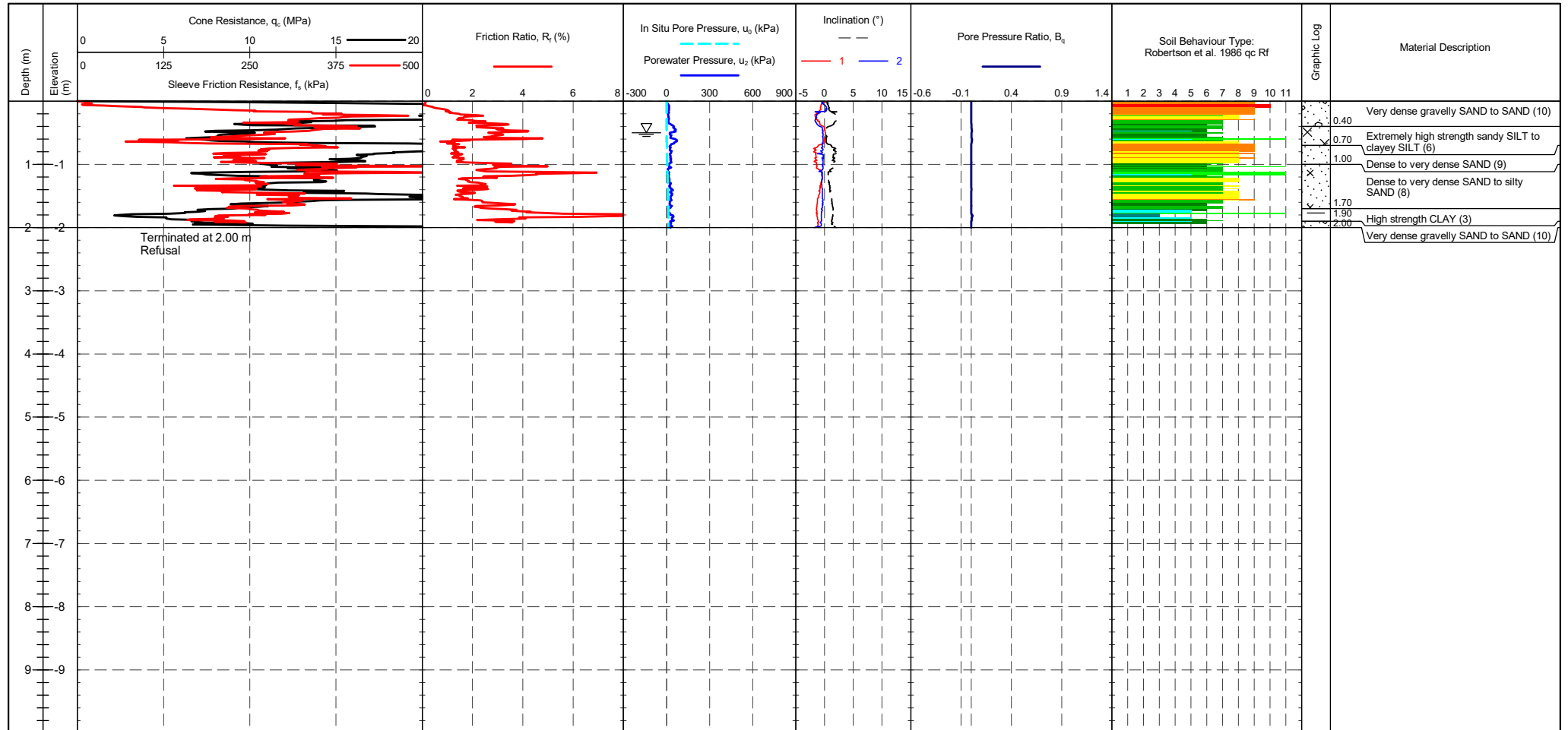
CPT06B

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CALIBRATION DATE : 05/09/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	159 mV	138 mV	-0.237 MPa
Sleeve	277 mV	278 mV	0.001 kPa
Pore Pressure 2	296 mV	274 mV	-0.005 kPa
X-Y Inclinator	2555 mV	2500 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater
Level

Dissipation Test

PointID

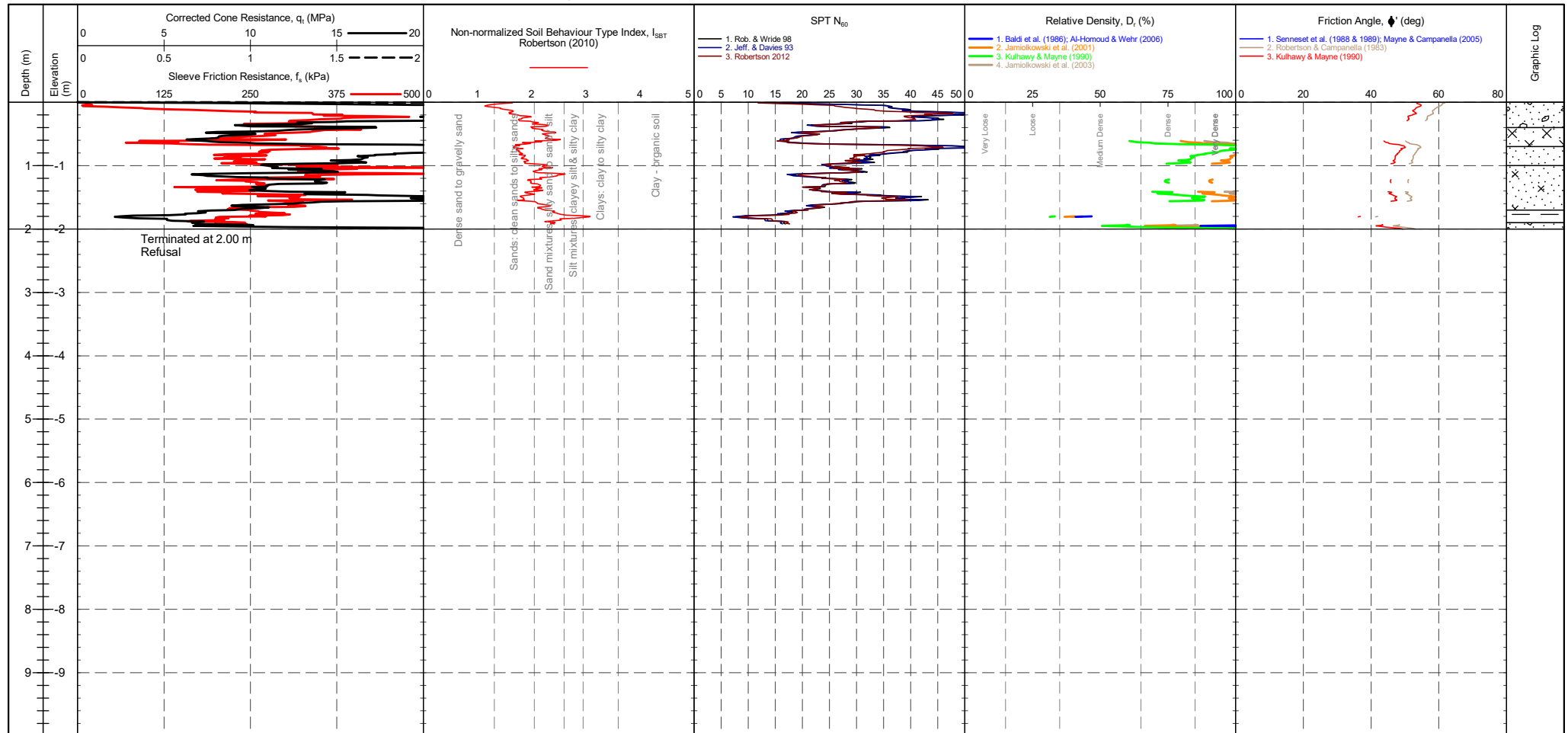
CPT06B

CLIENT : Remada
PROJECT: Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
 CONE MODEL : Subtraction
 CONE AREA : 15cm²
 CONE AREA RATIO : 0.79
 FILTER POSITION : u2
 FILTER TYPE : HDPE

TEST TYPE	: TE2
APPLICATION CLASS	: 2
RIG	: CPT 006 - Zoe
OPERATOR	: JC & RB
FRICTION REDUCER	: None
WEATHER	: Raining & Mild

Transducer	Pre	Post	Difference
Tip	159 mV	138 mV	-0.237 MPa
Pore	277 mV	278 mV	0.001 kPa
Pressure 2	296 mV	274 mV	-0.005 kPa
X-Y Inclinator	2555 mV	2500 mV	

CPTU ZERO VALUES

Description	SBT Index, Ic	Description	SPNT N value, NSPT	Description	Relative Density Dr (%)
Clays	2.95-3.60	Very Loose	0 - 4	Very Loose	0 - 15
Silt mixtures	2.60-2.95	Loose	4 - 10	Loose	15 - 35
Sand mixtures	2.05-2.60	Medium Dense	10 - 30	Medium Dense	35 - 65
Sands	1.31-2.05	Dense	30 - 50	Dense	65 - 85
Gravelly sand	<1.31	Very Dense	>50	Very Dense	>85

Groundwater Level

Dissipation Test

PointID

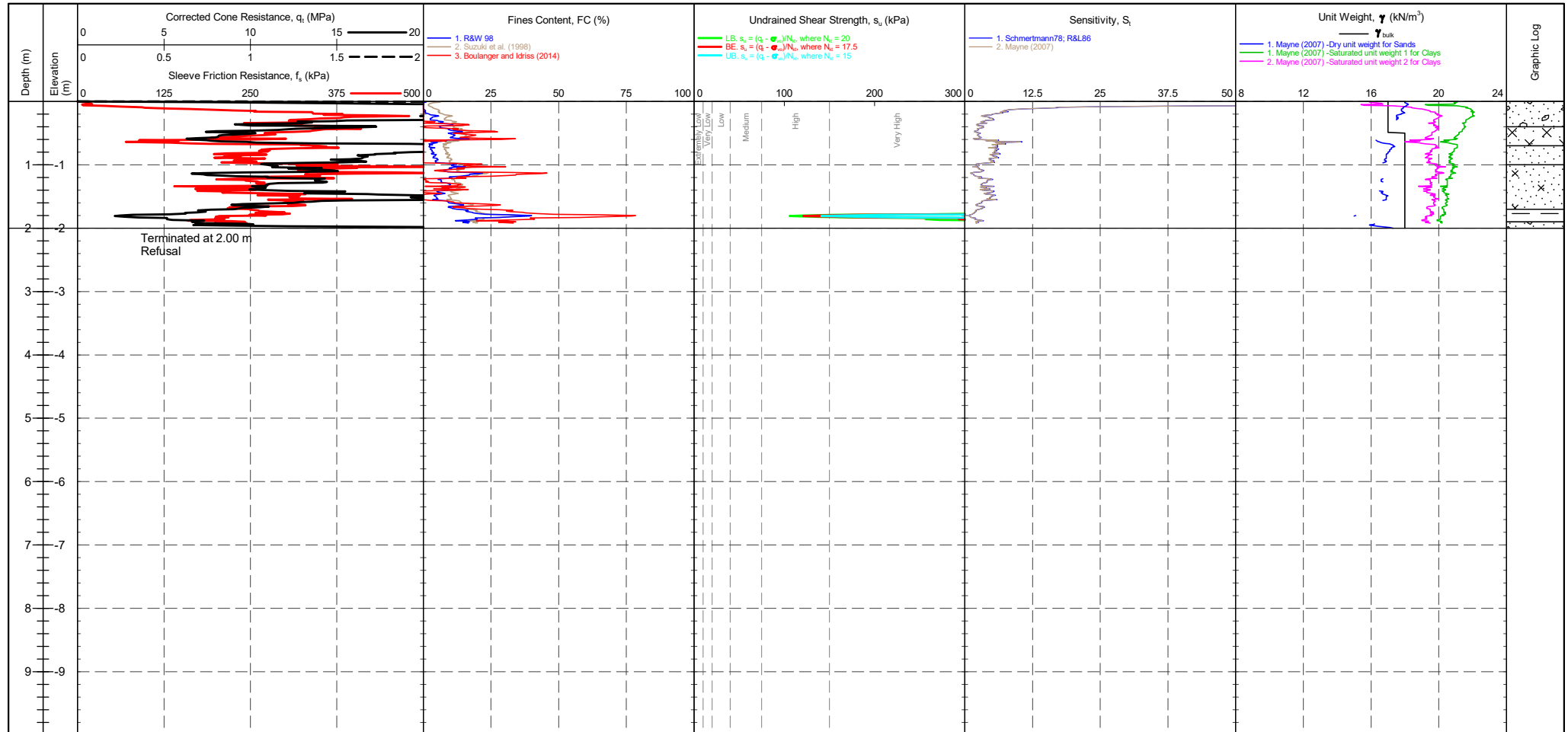
CPT06B

CLIENT : Remada
PROJECT : Glan Llyn
LOCATION : Newport
PROJECT No. : 1240380

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 1
STATUS : Final
TEST DATE : 08/08/2024
PLOT DATE : 16/08/2024
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1999
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 006 - Zoe
OPERATOR : JC & RB
FRICTION REDUCER : None
WEATHER : Raining & Mild

CPTU ZERO VALUES

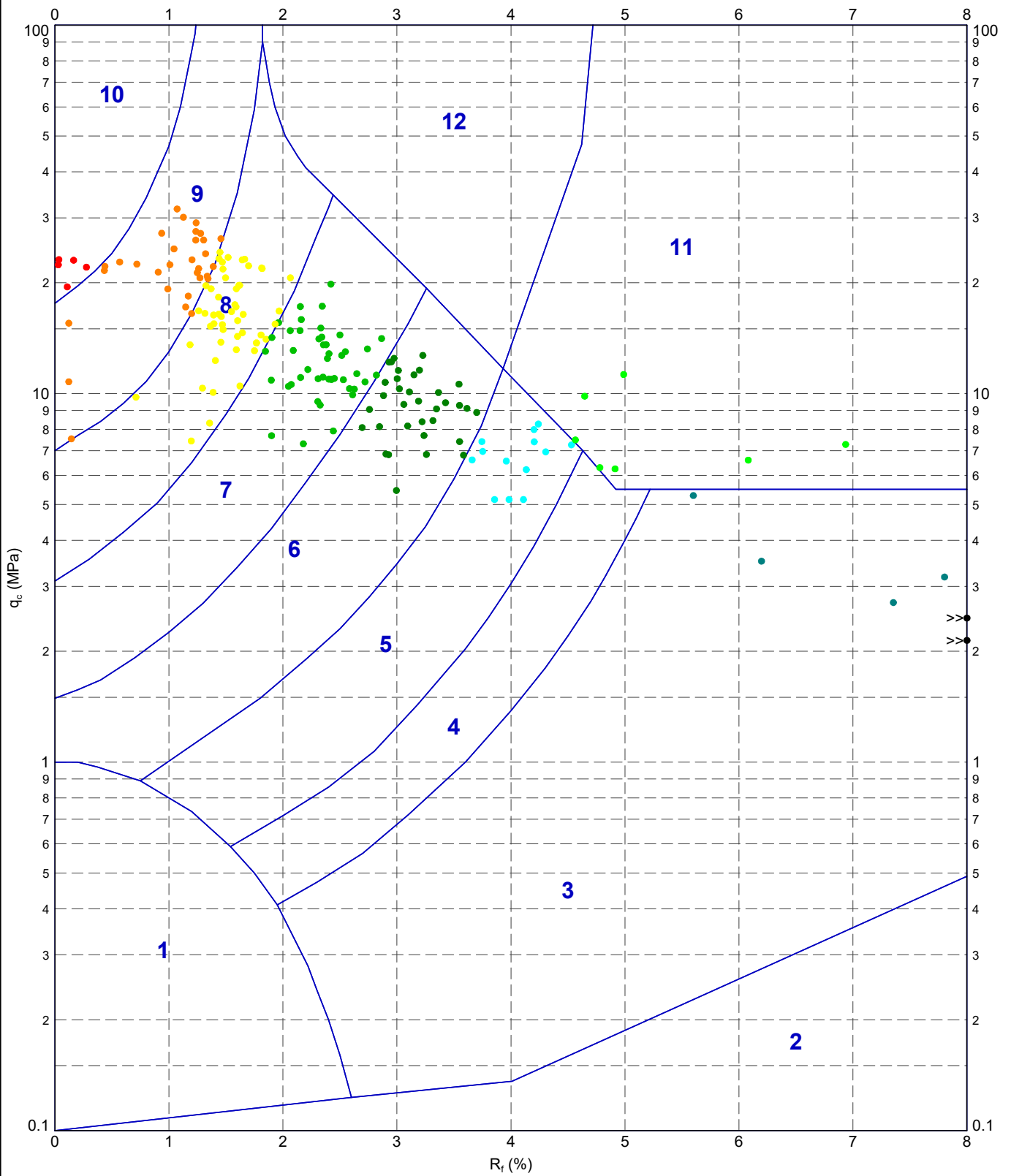
Transducer	Pre	Post	Difference
Tip	159 mV	138 mV	-0.237 MPa
Sleeve	277 mV	278 mV	0.001 kPa
Pore Pressure 2	296 mV	274 mV	-0.005 kPa
X-Y Inclinator	2555 mV	2500 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (kPa)
Extremely low strength	<10	Medium strength	40-75
Very low strength	10-20	High strength	75-150
Low strength	20-40	Very high strength	150-300
		Extremely high strength	>300

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF - AP 1240380 GLAN LLYN REMADA.GPJ <<DrawingFile>> 16/08/2024 16:15 10.03.00.09 Dargel Lab and In Situ Tool - DGD [Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10]



METHOD: Robertson et al. 1986 q_c vs R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 1 - Sensitive fine grained material | 4 - Silty CLAY to CLAY | 7 - Silty SAND to sandy SILT | 10 - Gravelly SAND to SAND |
| 2 - Organic material | 5 - Clayey SILT to silty CLAY | 8 - SAND to silty SAND | 11 - Very stiff fine grained |
| 3 - CLAY | 6 - Sandy SILT to clayey SILT | 9 - SAND | 12 - SAND to clayey SAND |

IN SITU
SITE INVESTIGATION

TITLE

Remada
Newport
Glan Llyn
Robertson et al. 1986 q_c vs. R_f - CPT06B

DRAWN

DATE

16/08/2024

CHECKED

DATE

16/08/2024

SCALE

Not To Scale

A4

PROJECT No

1240380

FIGURE No

IN SITU SITE INVESTIGATION

Unit 23 Hastings Innovation
Centre,
Highfield Drive
St. Leonards on Sea, East Sussex,
TN38 9UH, U.K.

Company No.: 6339499
VAT No.: 922 3561 41

