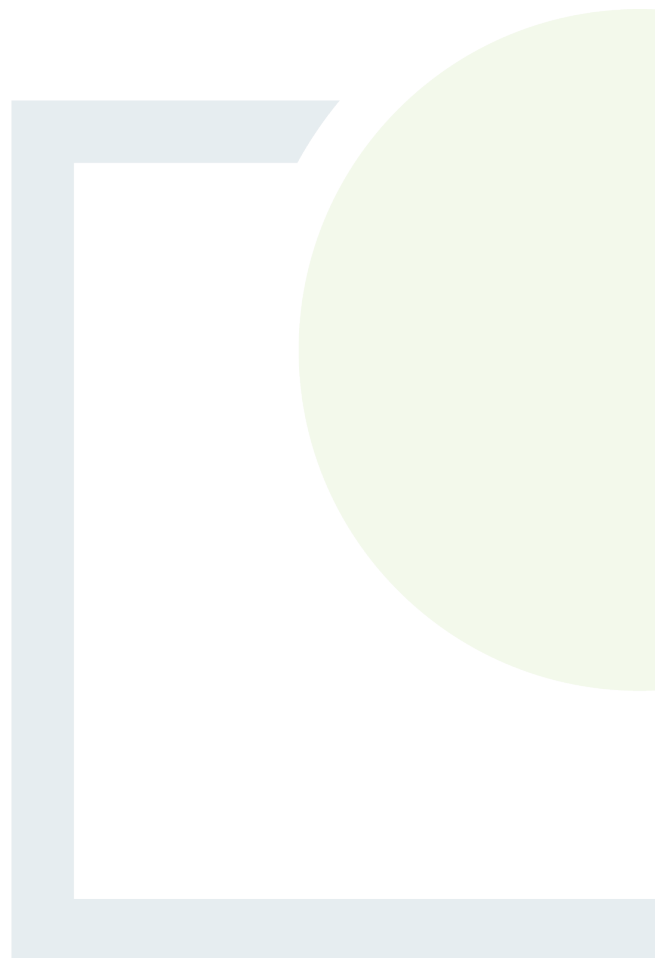




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APPENDIX 11.1

Geotech Assessment Report





CONSULTANTS IN ENGINEERING,
ENVIRONMENTAL SCIENCE &
PLANNING

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED COUNNAGAPPUL WIND FARM, CO. WATERFORD

Geotechnical Assessment Report (GAR)

Prepared for:
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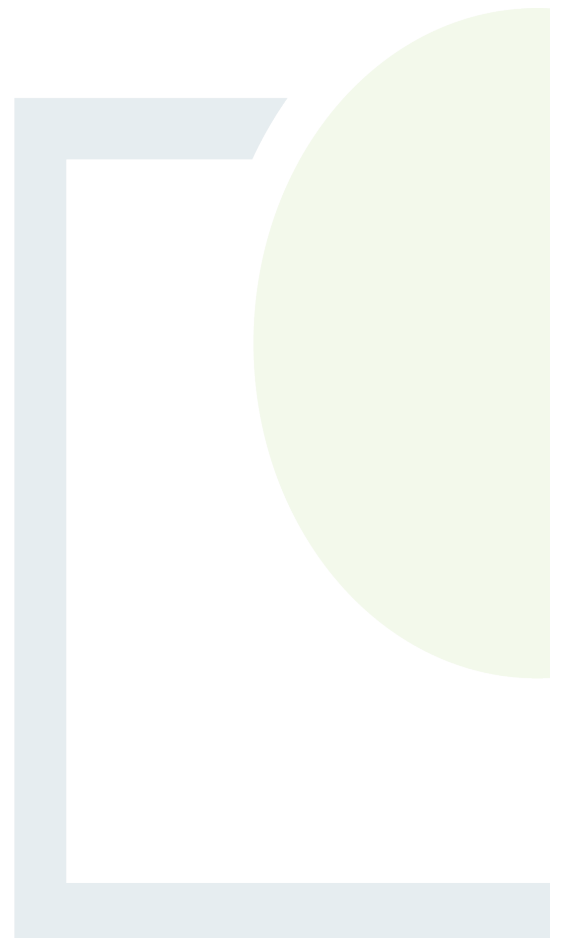


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1. INTRODUCTION

1.1 General

This document is the Geotechnical Assessment Report (GAR) for the proposed Coumragappul Windfarm site (Site). It has been prepared to accompany the Volume 2, Chapter 11 - Soils, Geology and Hydrogeology Chapter of the EIAR.

The GAR specifically focusses on:

- peat stability;
- assessment and interpretation of desk study, site reconnaissance and ground investigation findings; and
- geotechnical considerations for infrastructure elements across the Site.

1.2 Background and Experience

Fehily Timoney and Company (FT) is an Irish engineering, environmental science and planning consultancy with offices in Cork, Dublin and Carlow. The practice was established in 1990 and currently has 100 members of staff, including engineers, scientists, planners and technical support staff. FT deliver projects in Ireland and internationally in our core competency areas of Waste Management, Environment and Energy, Civils Infrastructure, Planning and GIS and Data Management.

FT have been involved in over 100 wind farm developments in both Ireland and the UK at various stages of development i.e. preliminary feasibility, planning, design, construction and operational stage and have established themselves as one of the leading engineering consultancies in peat stability assessment, geohazard mapping in peat land areas, investigation of peat failures and site assessment of peat.

1.3 Proposed Works

The Site is located approximately 15km north of Dungarvan, Co. Waterford and comprises agricultural fields and forestry across a mountainous terrain.

The proposed development comprises 10 no. turbine wind farm and associated infrastructure including internal access tracks, hard standings, permanent meteorological mast, onsite substation, internal electrical and communications cabling, temporary construction compound, a borrow pit, drainage infrastructure and all associated works related to the construction of the wind farm.

A detailed description of the elements included within the proposed development is included in Section 2.2 of Chapter 2 of the main EIAR. It should be noted that the Grid Connection Route (GCR) and the Turbine Delivery Route (TDR) are not included in this geotechnical assessment.

1.4 Contents of Report

The report includes the following:

- Desk study
- Peat Stability Assessment



- Site reconnaissance
- Summary of ground conditions
- Ground Investigation
- Geotechnical considerations for infrastructural elements
- Mitigation Measures



2. DESK STUDY

2.1 General

As part of this assessment a desk study was undertaken to determine the baseline conditions within the study area to provide relevant background information. The desk top study involved an examination of the following sources of information:

- Geology of Waterford
- Groundwater Protection Scheme for County Waterford
- Aerial imagery from Google, Bing and OSi (Geohive)
- Waterford City and County Development Plan 2022-2028
- Current and historical (6 inch and 25 inch) Ordnance Survey maps
- Waterford Renewables Energy Strategy 2016 – 2030
- Flood Risk Data
- Ecological Designations
- Mapping data of the area produced by the Geological Survey of Ireland (GSI)
 - *Quaternary subsoil geology*
 - *100k bedrock geology*
 - *Karst features*
 - *Geological heritage features*
 - *Aggregate potential*
 - *Landslide susceptibility*
 - *Catchment & Management Units*
 - *Groundwater Bodies Status and Risk*
 - *Drinking Water Protection Areas*
 - *Groundwater Resources (Aquifers)*
 - *Groundwater Wells and Springs*
 - *Groundwater Vulnerability*
- Datasets from the EPA
- European Union open datasets

The above references were consulted in July 2023.



2.2 Soils, Subsoil & Bedrock

The Geological Survey Ireland's (GSI) Quaternary Sediments mapping shows that the site is intermittently covered by a mantle of Blanket Peat. A wide (170-400m) north-south trending swath of till derived from Devonian sandstone traverses the middle of the site and is flanked on both sides by Blanket Peat and terminates 400m south of Milk Hill. This stratum is anticipated to underlie much of the peat deposits. A narrow (approx. 30m in width) linear deposit of Alluvium, straddling the Colligan River, runs along the eastern flank of the till. Similar deposits are found to the south of the site along Coumavane Stream.

The remaining areas of the site comprise bedrock outcrop/subcrop and scree deposits; the distribution of these strata reflect areas of higher more exposed elevations, which typically display steeper topographic relief.

From the site walkovers, and confirming GSI information, a thin mantle of Blanket Peat covers a large portion of the project area, with maximum peat depths of 700mm within the western portion of the site near turbine T03. In general, thinner peat layers are encountered in areas of higher elevation. The average recorded peat depth across the site is 0.14m below ground level (bgl).

The GSI 1:100,000 scale bedrock geology map shows that the main wind farm site is underlain by a conformable sequence of broadly northeast-southwest striking Upper Devonian rocks as set out in Table 9-6, which form the northern limb of a regional east-west trending antiformal structure. The south-eastern extent of the site is underlain by the Treanearla Formation. These are followed by the Sheskin and Kilnafrehan Conglomerate Formations which make up much of the central portion of the site. The north-western extent of the site is underlain by the Ballytrasna Formation.

2.3 Hydrogeology

2.3.1 Aquifer Classification

According to the GSI and EPA datasets, the site is entirely located within a locally important aquifer with bedrock which is moderately productive only in local zones. The site lies within the Kilrion and Comeragh groundwater bodies.

2.3.2 Groundwater Vulnerability

Groundwater vulnerability, as defined by the GSI, is the term used to represent the intrinsic and hydrogeological characteristics that determine the ease of which groundwater could be contaminated by human activities. The vulnerability of an aquifer to contamination is influenced by the leaching characteristics of the topsoil, the permeability and thickness of the subsoil, the presence of an unsaturated zone, the type of aquifer, and the amount and form of recharge (the hydraulic process where water moved downward from surface water to groundwater).

Groundwater vulnerability is determined mainly according to the thickness and permeability of the subsoil that underlies the topsoil, as both properties strongly influence the travel times and attenuation process of contaminants that could be released into the subsurface from below the topsoil.

The GSI's Groundwater Vulnerability mapping within the Site ranges from 'X – Rock at or near Surface' to 'H – High'. Areas of 'E – Extreme' Groundwater Vulnerability are located around mapped bedrock outcrop or subcrop, where a thin mantle of blanket peat is present.



2.3.3 Karst Features

According to the GSI mapping, there are no karst features recorded within the Site or the wider study area. Karst features are not likely to occur within the Site or broader study area due to the absence of carbonate bedrock. The closest mapped karst feature is a swallow hole within Waulsortian Limestone located approximately 10km west-northwest of the Site.

2.4 Landslide Susceptibility

From a review of the GSI Landslide Susceptibility database, the Project and proposed infrastructure locations are generally located within areas of 'Low' to 'Moderately High' susceptibility, with localised areas classified as 'High'. A summary of the GSI landslide susceptibility with respect to the Project is provided in Figure 11.13 in Chapter 11 of the main EIAR.

Turbines T2, T7, T8, T10, T11 and T12 and portions of the access roads linking these turbines are all located in areas mapped as having a 'Moderately High' to 'High' landslide susceptibility. These areas directly correlate with mapped Blanket Peat deposits. Field observations at these locations recorded slope angles ranging from 6 to 15° and peat depths of between 0.2 and 0.3m with no evidence of historic slope instability observed. In addition, desktop review of available aerial photography did not identify evidence of slope instability. It is therefore considered that the risk of landslide at the turbine locations and along the access tracks is considered to be negligible and that the GSI Landslide Susceptibility Classification rating at these locations does not accurately reflect actual ground conditions encountered on site i.e. shallow peat or complete absence of peat deposits.

The remaining turbines, substation, met mast, Colligan river crossing point, construction compound areas and borrow pit are all located in areas mapped as having a 'Moderately Low' to 'Low' landslide susceptibility. Conditions observed through field assessments are reflective of same.

Field observations indicate that the deeper peat deposits encountered at the Colligan River crossing (discussed in Section 11.3.10 in Chapter 11 of the main EIAR.) are isolated and not laterally continuous. They are therefore considered to pose a negligible risk with respect to slope instability.

No evidence of slope instability was observed at the Site and there are no historical records of landslide activity within 1km of the Site on the GSI database.

2.5 Ordnance Survey Data

The online ordnance survey imagery (OSI 2023) was reviewed as part of the desk study. Analysis of aerial imagery dating back to 2000 found there has been little change in the proposed wind farm location.

A review of the historical mapping for the area identified no notable features from a geotechnical point of view.

2.6 Previous Ground Investigation Data

Based on a review of the information available (GSI 2023), there are no publicly available intrusive investigation points within a 5km radius of the proposed site boundary.



3. PEAT STABILITY ASSESSMENT

Following the Site walkover and given the presence of small areas of peat deposits and peaty topsoil within the Site, a review of the published checklist for peat landslide hazard and risk assessment was carried out. This was undertaken in accordance with the following best practice guidance: Scottish Executive – Peat Landslide Hazard and Risk Assessments (2017).

The potential for a landslide risk is defined in the Scottish Executive “Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments” (2017) as the following:

- Peat is present at the development Site in excess of 0.5 m depth, and;
- There is evidence of current or historical landslide activity at the Site, or;
- Slopes > 2° are present on-Site, or;
- The works will impinge on the peat covered areas and cannot be relocated to avoid peat covered areas.

A peat survey was carried out by an FT Graduate Geotechnical Engineer (Dana Aspel BSc. MSc, FGS, MIAH) in July 2020 and an additional peat survey was carried out by FT Chartered Principal Geologist (Aaron Clarke BSc., MSc. EurGeol., PGeo.) in October 2022. Peat depths were taken using a hand held Van Walt peat probe at proposed turbine and associated infrastructure locations. Results from the surveys indicate that peat depths were generally very thin and characteristic of a highly organic Topsoil with a Peaty appearance. Depths ranged from 0.05 to 0.6m with mean and median values of 0.12 and 0.10m respectively.

The deepest deposit (0.60m) was encountered in the banks of a stream at ITM coordinates E 624238, N 608607 and is immediately flanked by shallow deposits to the east and west of 0.25 and 0.0m respectively. The survey results show this to be an outlier and not representative of peat depths across the Site. It will therefore be discounted. The next deepest deposit encountered was 0.40m.

As such and in accordance with the Scottish Executive Best Practice Guide for Proposed Electricity Generation Developments (2017), as peat deposits at the proposed turbine locations were <0.5m in depth a peat stability assessment was not warranted.



4. FINDINGS OF SITE RECONNAISSANCE

4.1 Site Reconnaissance

As part of the assessment of potential peat failure at the proposed site, FT carried out a site reconnaissance in conjunction with the desk study review described in Section 3. This comprised walkover inspections of the site with recording of salient geomorphological features with respect to the wind farm development which included peat depth and preliminary assessment of peat strength. General photographs of the site are included at the end of the main text.

The following salient geomorphological features were considered:

- Active, incipient or relict instability (where present) within the peat deposits;
- Presence of shallow valley or drainage line;
- Wet areas;
- Any change in vegetation;
- Peat depth;
- Slope inclination and break in slope.

The survey covered the proposed locations for the turbine bases and associated infrastructure.

The method adopted for carrying out the site reconnaissance relied on experienced practitioners carrying out a visual assessment of the site supplemented with measurement of slope inclinations.

4.2 Findings of Site Reconnaissance

The site reconnaissance comprised of walkover inspections of the site during July 2020 and October 2022 carried out by an FT Graduate Geotechnical Engineer (Dana Aspel BSc. MSc, FGS, MIAH) and an FT Chartered Principal Geologist (Aaron Clarke BSc., MSc. EurGeol., PGeo.) respectively.

The findings from the site walkovers have been used to optimise the layout of the infrastructure on site.

The main findings of the site walkover of the wind farm site are as follows:

1. The site is typically covered in a thin layer of peat and is located along a steep mountainous area. Peat depths vary across the site depending on mainly topography.
2. Peat depths recorded from peat probing across the site ranged from 0.1 to 0.7m with an average depth of 0.14m.
3. In general, thinner peat layers were encountered in areas of higher elevation/steeper terrain. Approximately 96% of the peat depths recorded across the Site were less than 0.5m. Where peat depths of >0.50m were encountered, these are considered to be isolated occurrences, which showed little to no lateral persistence and were not located in the vicinity of any proposed wind farm infrastructure.
4. Slope angle readings were obtained by FT during the site reconnaissance using a handheld Silva Clino Master which has an accuracy of +/- 0.25 degrees. Slope angles at the infrastructure locations were as follows:
 - a. Slopes at the proposed turbine locations range from 3 to 15°.



- b. Slopes at the proposed Colligan River crossing range from between 9 and 16° and form an approximate 5m deep and 20-30m wide north-south trending river valley. The valley walls were heavily vegetated with predominantly ferns. Washed Till (gravel, cobbles and boulders) was exposed within the bed of the Colligan River.
 - c. Slopes at the proposed substation location range from 8 to 16°.
 - d. Slopes at the proposed borrow pit location are typically <2°.
5. No evidence of past failures or any significant signs of peat instability were noted during the site reconnaissance.



5. SUMMARY OF SITE CONDITIONS AT INFRASTRUCTURE LOCATIONS

As part of the site reconnaissance, details of any soft ground and slope angles were recorded throughout the site. Inspections were completed at the proposed turbine locations, access tracks, constructions compounds, substations and borrow pits.

A summary of the site conditions at the proposed infrastructure locations is given in Table 5.1.

Table 5-1: Summary of Site Walkover Findings at Proposed Infrastructure Locations

| Infrastructure Element | Easting | Northing | Peat Depth (m) | Slope (o) |
|---|---------|----------|-----------------------------|-----------|
| T01 | 623835 | 610089 | 0.10 | 3 |
| T02 | 624451 | 610261 | 0.20 | 12 |
| T04 | 623768 | 609484 | 0.00 | 7 |
| T05 | 624336 | 609617 | 0.00 | 12 |
| T06 | 624980 | 609599 | 0.35 | 12 |
| T07 | 624818 | 608984 | 0.05 | 13 |
| T08 | 624438 | 608381 | 0.05 | 7 |
| T10 | 624741 | 608021 | 0.10 | 15 |
| T11 | 625250 | 607860 | 0.15 | 13 |
| T12 | 623731 | 608209 | 0.10 | 12 |
| Colligan River Crossing Point (East Bank) | 624257 | 608606 | 0.25 | 16 |
| Colligan River Crossing Point (West Bank) | 624216 | 608590 | 0.00-0.60 ^{Note 1} | 9 |
| Borrow Pit | 624463 | 610466 | 0.20 | 2 |
| On-Site Substation | 624063 | 609128 | 0.00 | 16 |

Note 1 - 0.60m deep peat deposit localised to area adjacent to Colligan River. Adjacent peat probe locations show peat depths of 0 to 0.25m. The deeper peat deposit was noted as an isolated occurrences, forming as a small pocket on the banks of the Colligan River and is believed to have no lateral persistence.



6. GROUND INVESTIGATION

One ground investigation has been undertaken across the site. This ground investigation was carried out by Ground Investigations Ireland (GII) during December 2022 and January 2023 and consisted of 21 no. trial pits and 2 no. rotary core boreholes.

The trial pits logs, photographs and associated laboratory testing are included in Appendix A of this report.

6.1 Summary of Ground Conditions

Trial pits were excavated at the turbine, met mast, substation, borrow pit and river crossing point locations. Boreholes were advanced at the proposed borrow pit location and at the proposed Colligan River crossing point. A summary of ground and groundwater conditions encountered during the intrusive ground investigation are presented in Table 6-1.

Table 6-1: Site Assessment Summary

| Site Element (Hole ID) | Strata Depth From To (m bgl) | | | | | | Groundwater Strike (m bgl) |
|------------------------|------------------------------|------------------------------------|---------------------|-----------------------------------|---------------------------------------|-------------------|----------------------------|
| | Peat | Fine Grained Till | Coarse Grained Till | Very Course Grained (>200mm) Till | Possible Bedrock <small>Note1</small> | Confirmed Bedrock | |
| T01 (TP-01) | 0.00-0.15 | 0.15-1.50 | - | 1.5-3.00 | 3.00 | - | 1.50 |
| T02 (TP-02) | 0.00-0.25 | 0.25-2.40 <small>Note 2</small> | - | - | 2.40 | - | 2.20 |
| T04 (TP-03) | 0.00-0.15 | - | 0.15-2.10 | - | 2.10 | - | Dry |
| T05 (TP-04) | 0.00-0.35 | 0.35-1.70 | 1.70-3.10 | - | 3.10 | - | Dry |
| T06 (TP-05) | 0.00-0.45 | 0.45-0.80 | 0.80-2.00 | - | 2.00 | - | 0.80 |
| T07 (TP-06) | 0.00-0.30 | 0.30-4.20 | - | - | 4.20 | - | Dry |
| T08 (TP-14) | 0.00-0.30 | 0.30-1.50 | 1.50-2.00 | 2.00-3.00 | 3.00 | - | Dry |
| T10 (TP-15) | 0.00-0.20 | 0.20-1.00 | 1.00-4.30 | - | 4.30 | - | 3.80 |
| T11 (TP-16) | 0.00-0.20 | 0.20-4.00 | - | - | 4.00 | - | Dry |
| T12 (TP-13) | 0.00-0.20 | 0.20-3.40 | - | - | 3.40 | - | 1.20 |
| Met Mast (TP-22) | 0.00-0.40 | 0.40-3.50 | - | 3.50-3.80 | 3.80 | - | 3.70 |



| Site Element (Hole ID) | Strata Depth From To (m bgl) | | | | | | Groundwater Strike (m bgl) |
|---|--|-----------------------|----------------------|-----------------------------------|--|------------------------|----------------------------|
| | Peat | Fine Grained Till | Coarse Grained Till | Very Course Grained (>200mm) Till | Possible Bedrock Note1 | Confirmed Bedrock | |
| Colligan River Crossing Point (TP-12 and BH-04) | 0.00-0.80 ^{Note 3} (TP-12) | 0.80-1.30 (TP-12) | 1.30-3.60 (TP-12) | - | 3.60 (TP-12) | 14.00-20.00 (BH-04) | 1.80 (TP-12) |
| | 0.00-0.25 (BH-04) | 6.50-14.00 (BH-04) | 0.25-6.50 (BH-04) | | | | Dry (BH-04) |
| Borrow Pit (TP-21 and BH-03) | 0.00-0.20 (TP-21) | - | 0.20-2.50 (TP-21) | - | 2.50 (TP-21) | 1.90-10.00 (BH-03) | 1.00 (TP-21) |
| | 0.00-0.30 (BH-03) | | 0.30-1.90 (BH-03) | | | | Dry (BH-03) |
| On-Site Substation (TP-007 to TP-11) | 0.00-0.15 (TP-07) | 0.15-3.00 (TP-07) | 1.80-3.70 (TP-10) | - | 3.00 (TP-07) 3.00 (TP-08) 3.50 (TP-09) 3.70 (TP-10) 2.80 (TP-11) | - | Dry (TP-7) |
| | 0.00-0.20 (TP-08) | 0.20-3.00 (TP-08) | | | | | 1.00 (TP-08) |
| | 0.00-0.40 (TP-09) | 0.40-3.50 (TP-09) | | | | | Dry (TP-9) |
| | 0.00-0.25 (TP-10) | 0.25-1.80 (TP-10) | | | | | Dry (TP-10) |
| | 0.00-0.20 (TP-11) | 0.20-2.80 (TP-11) | | | | | Dry (TP-11) |

Note 1 – typically described as COBBLES and BOULDERS at the base of trial pits. Trial pits terminated on these horizons and they were recorded as “Possible boulders of bedrock”.

Note 2 – stratum interbedded with coarse-grained till.

Note 3 – 0.80m deep peat deposit localised to area adjacent to Colligan River. An adjacent peat probe location (approximately 3m from the trial pit) shows a peat depth of 0.25m.

Ground conditions at key infrastructure locations generally comprise a thin mantle of peat over Glacial Till, which in turn is underlain by bedrock.

Peat deposits (where present) range in thickness from 0.15 to 0.80m with a mean and median peat thickness of 0.30 and 0.25m respectively. The deepest deposits are located adjacent to the Colligan River and are considered to be an isolated occurrence and not representative of the whole Site.

The Till deposits, which were found to comprise both fine and coarse grained material, were typically encountered immediately beneath the Blanket Peat to depths not exceeding of 4.3m.

However, in borehole BH-04 (located to the west of the proposed Colligan River crossing), Till was encountered between 0.25 and 14m bgl and was recorded as a dense GRAVEL, over very stiff CLAY and SILT. These thickened Till deposits are not typical of the overall Site and are likely a result of phased depositional episodes within the Colligan River valley base.



At the proposed borrow pit location bedrock was encountered at 1.90m bgl (BH-03). Bedrock comprised medium strong, thickly bedded, red fine-grained sandstone of the Ballytrasna Formation. Two distinct discontinuity sets were recorded within the sandstone with orientations of sub-horizontal to sub-vertical and spacings ranging from close (60-200mm) to wide (600-2000mm).

Groundwater strikes were recorded in several of the exploratory holes (Table 6-1) at depths ranging from 0.8 to 3.8m bgl. These readings were taken as each exploratory hole was being advance and therefore do not reflect potential seasonal groundwater variations.

6.2 Summary of Laboratory Tests

Samples were selected from the exploratory holes for a range of geotechnical and chemical testing to assist in the classification of soils and to provide information for the proposed design.

Chemical testing as required by the specification, including pH, total sulphur, water soluble sulphate, water soluble chloride, acid soluble sulphate, and organic matter testing was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer, California Bearing Ratio (CBR), Moisture Condition Value (MCV) and 2.5kg Rammer Compaction tests were carried out by Professional Soils Laboratory (PSL) in the UK.

The Atterberg tests carried out in cohesive till deposits indicate the samples were generally classified as Clay of low to intermediate plasticity. Particle size distribution tests in this material show the percentages of sands and gravels range between 16-57% and the fines contents range from 24-42%.

6.3 Summary of Geotechnical Parameters

Table 6.2 below summarises the characteristic geotechnical parameters for the main soil strata encountered on site on ground investigation carried out so far. Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values. Characteristic values are defined as a cautious estimate of the value affecting the occurrence of limit state based on clause 2.4.5.2 from Eurocode 7.

Table 6-2: Summary of Geotechnical Parameters

| Material Type/ Strata | Unit Weight | Geotechnical Parameters | | |
|-----------------------|-------------------------------|-------------------------|--------------------|------------|
| | | Undrained Parameters | Drained Parameters | |
| | γ (kN/m ³) | c_u (kPa) | ϕ' (°) | c' (kPa) |
| Peat | 10 | 4 | 25 | 4 |
| Cohesive Material | 19 | 30 | 30 | 0 |
| Granular Material | 21 | - | 32 | 0 |

The above parameters are indicative only and have been derived based on experience and from a review of the ground investigation carried out at the site.



Where direct measurement of parameters has not been carried out, established correlations with measured properties have been used to derive values.

A lower bound undrained shear strength (c_u) for the peat of 4kPa was selected. This is considered to be a conservative value. Recorded undrained shear strengths within the peat deposits typically attained values much higher than 4kPa. Geotechnical considerations for infrastructure elements

6.4 Turbine Foundations

Based on a review of the GSI information for the area and findings from the site reconnaissance carried out by FT, an assessment of the likely foundation types found that excavate and replace construction (founded) would be suitable for the turbine foundations.

It should be noted that a ground investigation will be carried out at each turbine location prior to construction to confirm the turbine foundation type. The ground investigation will be in the form of a borehole with in-situ SPT testing at 1.0m intervals in the overburden and follow-on rotary core through bedrock.

For gravity type turbine foundations, where the depth of excavation exceeds the minimum required founding depth for the proposed turbine base, up-fill material consisting of granular fill (6N/6P) in accordance with Transport Infrastructure Ireland (TII) requirements will be used to backfill the excavation to the required founding depth.

A selection of soil samples taken from various infrastructure locations across the site were subject to BRE-SD1 testing. The results indicate that the soil is slightly acidic and has low levels of chloride and sulphate therefore will not be aggressive to concrete. Results from the BRE-SD1 testing are included in Appendix 4 of the GII Ground Investigation Report which is included in Appendix A.

6.5 Colligan River Crossing

It is proposed to install a single span bridge structure over the Colligan River to allow access between turbines T8 and T12. In general, ground conditions at the river crossing are good, comprising dense to very dense GRAVEL and very stiff SILT and CLAY. Provided there is sufficient distance between the proposed bridge abutments and the adjacent Colligan River and associated valley walls, a bank seat type foundation can be constructed. This can be founded on the underlying dense to very dense GRAVEL and will require a regulating layer of Class 6N2 upfill. For this foundation option it is anticipated that a minimum 1.3m excavation depth is required to expose the underlying GRAVEL subgrade.

Further excavation may be required depending on the final bridge design and for the removal of localised soft spots. Piled foundations can also be considered, particularly if there is a concern of contamination of the Colligan River arising from excavations at the abutments. Due to the likely presence of cobbles and boulders within the underlying strata, bored end bearing piles are recommended. These can be advanced through the GRAVEL and terminate within the underlying very stiff CLAY at an anticipated depth of 10m bgl. It is estimated that approximately eight piles per abutment will be required, subject to loading and detailed design.

It is anticipated that the approach embankments to the bridge structure can be founded directly on top of the dense to very dense GRAVEL. The ground investigation findings indicate that the GRAVEL is encountered between 0.7 (BH-04) and 1.3m bgl (TP-12). Additional depth of excavation may be required where soft spots are encountered. Benching into the existing slopes may also be required due to sloping ground conditions.



Localised dig and replace of soft spots at both the bridge structure and approach earthworks may be required. Groundwater was encountered at a depth of 1.8m bgl within the trial pit displaying a moderate flow. This may necessitate appropriate temporary drainage measures during excavation works. There are no signs of slope instability at the site and following on from a slope stability analysis the construction of the bridge should not impact the slope stability in the area.

6.6 Access Tracks

Up to 0.96km of existing access tracks requiring upgrade are present across the site and based on anecdotal information have been in operation for a significant number of years. The existing access tracks were constructed using the excavate and replace construction technique.

Up to 11.94km of new proposed access roads will be constructed as part of the wind farm construction. Due to the ground conditions, the access tracks on site will be founded. The proposed make-up of the founded access tracks is a stone thickness of 500mm. The requirement for a layer of geotextile and geogrid and the necessary stone thickness will be confirmed prior to construction.

6.7 Crane Hardstands

The crane hardstands will be constructed using the founded technique (i.e. not floated technique).

Crane hardstands are generally constructed using compacted Class 1/6F material (in accordance with TII requirements) on a suitable sub-formation to achieve the required bearing resistance. The hardstands will be designed for the most critical loading combinations from the crane.

The founding levels for the hardstands may be variable across the site and will be determined prior to construction.

The expected make-up of the hardstands will include up to 1m of granular stone fill with a layer of geotextile and/or geogrid.

6.8 Substation Foundations & Platforms

The substation platforms will be constructed using the founded technique. The substation foundations will comprise strip/raft foundations under the main footprint of the building with possibly a basement/pit for cable connections.

Substation platforms are generally constructed using compacted Class 1/6F material (in accordance with TII requirements) on a suitable sub-formation to achieve the required bearing resistance.

Given the ground conditions present at the proposed substations, it is envisaged that the foundations will require to be founded on mineral soil or bedrock.

The make-up of the substation platform will include up to 750mm of granular stone fill with possibly a layer of geotextile and/or geogrid. At the underside of the substation foundations, a layer of structural up-fill (class 6N/6P - in accordance with TII requirements) will likely be required.

6.9 Temporary Construction Compound Platforms

The construction compound platforms will be constructed using founded techniques.



The construction compound platforms are generally constructed using compacted Class 1/6F material (in accordance with TII requirements) on a suitable sub-formation to achieve the required bearing resistance.

The make-up of the construction compound platform will include up to 1000mm of granular stone fill with possibly a layer of geotextile and/or geogrid.

6.10 Borrow Pit

At the proposed borrow pit location bedrock was encountered at 1.90m bgl (BH-03). Bedrock comprised medium strong, thickly bedded, red fine-grained sandstone of the Ballytrasna Formation. Site observations at nearby bedrock outcrops identified two distinct discontinuity sets within the sandstone with orientations of sub-horizontal to sub-vertical and spacings ranging from close (60-200mm) to wide (600-2000mm). Borehole logs from BH03 indicate two main discontinuity sets:

- Sub horizontal fractures with close (60-200mm) to medium (200-600) spacing; and
- Sub-vertical fractures with medium (200-600mm) to wide spacing (600-2000mm).

Point load and UCS testing was carried out on rock samples taken from the two boreholes carried out on Site (BH03 at the proposed Borrow Pit location and BH04 at the Colligan River Crossing). The results of these tests, coupled with the recorded discontinuity spacings indicate that the rock can be excavated by using a combination of digging and ripping techniques (after Pettifer and Fookes, 1994). Blasting will not be required .

Rock samples from the boreholes underwent additional testing to include natural water content, water absorption, magnesium sulphate soundness and Los Angeles Abrasion (LAV) testing. Results from this testing indicate that the rock present at the borrow pit is suitable for use as Class 1 General Fill as well as selected Class 6 materials (subject to further material acceptance testing). The laboratory results for all testing are included in Appendix 4 of the GII Ground Investigation Report (presented in Appendix A).

Imported stone fill be required to form the upper layers of the infrastructure elements.

6.11 Re-use of Site Won Material Other Than Bedrock

Soil samples from trial pits underwent, Partical Size Dstribution (PSD), compaction, Moisture Condition Value (MCV) and California Bearing Ratio (CBR) tests. The results from these tests indicate that the gravels present within the Site are suitable to be reused as general fill. The laboratory results for all testing are included in Appendix 4 of the GII Ground Investigation Report (presented in Appendix A).



7. CONSTRUCTION OF ACCESS TRACKS

There will be approximately 12.9km of internal access tracks associated with the Site. This will be a combination of existing track upgrade and construction of new tracks; approximately 11.94km of new track construction and approximately 0.96km of existing track upgrade.

7.1 Upgrade of Existing Access Tracks

This methodology includes procedures that will be included in the construction to minimise any adverse impact on peat stability.

- The following guidelines will be implemented in full:
- Excavation will be required on one or both sides of the existing access track to a competent stratum.
- Granular fill will be placed in layers in accordance with the designer's specification.
- The surface of the existing access track will be overlaid with up to 300mm of selected granular fill.
- Access roads will be finished with a layer of capping across the full width of the road.
- A layer of geogrid/geotextile may be required at the surface of the existing access road in areas of excessive rutting (to be confirmed by the site engineer).
- For excavations in spoil, side slopes shall be not greater than 1 (v): 2. This slope inclination will be reviewed during construction, as appropriate.
- The finished road width will be approximately 5m.
- On side long sloping ground any road widening works required will be done on the upslope side of the existing access road, where possible.
- A final surface layer will be placed over the existing access track, as per design requirements, to provide a suitable road profile and graded to accommodate wind turbine construction and delivery traffic.

7.2 Construction of New Access Tracks

The excavation of topsoil & spoil and founding of access roads on competent stratum for new access roads will be carried out at various locations on the site.

This methodology includes procedures that are to be included in the construction to minimise any adverse impact on peat stability.

- Interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.
- Excavation will take place to a competent stratum beneath the topsoil (as agreed with the site designer and resident engineer).
- Road construction will be carried out in sections of 50m lengths i.e. no more than 50m of access road to be excavated without re-placement with stone fill.
- The surface of the excavated access road will be overlaid with 500mm of selected granular fill. Granular fill to be placed in layers in accordance with the designer's specification.
- Access roads to be finished with a layer of capping across the full width of the road.



- A layer of geogrid/geotextile will be required at the surface of the competent stratum (subject to confirmation by the Site Engineer).
- A final surface layer will be placed over the excavated road, as per design requirements, to provide a suitable road profile and graded to accommodate wind turbine construction and delivery traffic.



8. SUMMARY AND RECOMMENDATIONS

8.1 Summary

FT was engaged by EM Power to undertake a geotechnical assessment of the proposed Coumragappul wind farm site. The assessment comprised a site walkover, desk study, summary of ground conditions and geotechnical considerations for the infrastructure elements.

The main findings of the site reconnaissance are as follows:

- The ground conditions typically comprise a thin mantle of peaty topsoil over mineral soil over bedrock.
- The bedrock is likely to be suitable for re-use within the lower layers of access roads, crane hardstands, lay down areas, etc.
- The borrow pit is to provide sufficient quantity of Class 1 general fill and selected Class 6 material (subject to further material acceptability testing)
- All proposed access tracks for the wind farm will comprise upgrading of existing founded access tracks and construction of new proposed access tracks using excavate and replace construction techniques.
- A network of existing tracks is present on the site. It is proposed to upgrade these existing tracks and construct additional tracks to provide access to the turbine locations.
- No evidence of past failures or any signs of instability were noted on site or as part of the desk study.

8.2 Mitigation Measures

Shallow peat depths and lack of evidence pertaining to historic peat failures indicate the Site poses an imperceptible risk with respect to peat instability. However, a number of mitigation/control measures are proposed to ensure that all works adhere to an acceptable standard of safety for work in upland site conditions. Mitigation/control measures identified for the infrastructure elements are discussed in Section 11.6, Volume 2, Chapter 11 of the main EIAR and should be taken into account and implemented throughout design and construction works.

There is a risk of water ingress during excavation for the footings above the level of bedrock at the site. As such, provisions should be made for sump pumping should water ingress occur. Should foundations be required to advance below bedrock dewatering infrastructure should be considered prior to construction commencing.



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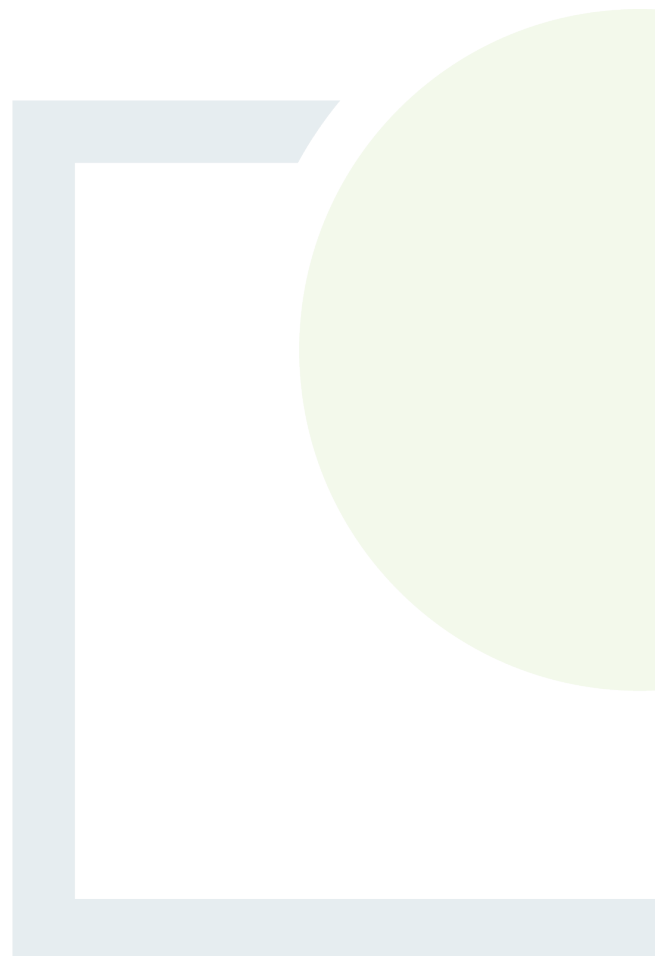
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APPENDIX **A**

GII Ground Investigation Report





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Ground Investigations Ireland
Cumnagappul Wind Farm
Fehily Timoney and Company
Ground Investigation Report
May 2023





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DOCUMENT CONTROL SHEET

| | |
|----------------|-----------------------------|
| Project Title | Coumnagappul Wind Farm |
| Engineer | Fehily Timoney and Company |
| Client | EMPower |
| Project No | 12325-10-22 |
| Document Title | Ground Investigation Report |

| Rev. | Status | Author(s) | Reviewed By | Approved By | Office of Origin | Issue Date |
|------|--------|-----------|-------------|-------------|------------------|------------------|
| A | Final | J Cashen | A Browne | C Finnerty | Dublin | 17 February 2023 |
| B | Final | J Cashen | A Browne | C Finnerty | Dublin | 18 April 2023 |
| C | Final | J Cashen | A Browne | C Finnerty | Dublin | 19 May 2023 |

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client. The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.



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GROUND INVESTIGATIONS IRELAND

Geotechnical & Environmental

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1.0 Preamble

On the instructions of Fehily Timoney and Company, a site investigation was carried out by Ground Investigations Ireland Ltd. (GII) between December 2022 and February 2023 at the site of the proposed wind farm at Coumnagappul, County Waterford,

2.0 Overview

2.1. Background

Construction of a new wind farm with associated substations, cabling and access road network is proposed at the site in Coumnagappul, County Waterford. The site forms part of the Comeragh Mountains and is located approximately 37 km to the West of Waterford City. At the time of the site investigation the site was greenfield and consisted of a mixture of agricultural land, marginal land, and peatland.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 21 No. Trial Pits to a maximum depth of 4.30m BGL
- Carry out 2 No. Rotary Core Boreholes to a maximum depth of 20.00m BGL
- Installation of 2 No. Groundwater monitoring wells
- Geotechnical & Environmental Laboratory testing
- Factual Report

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing were undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015+A1:2020.

3.2. Trial Pits

The trial pits were excavated using a 13 tonne tracked excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. A dynamic sample was completed from ground surface, with rotary coring beginning at the refusal depth of the dynamic sample.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the “overshoot” recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 3 of this Report.

3.4. Surveying

The exploratory hole locations have been recorded using a KQGeo M8 GNSS System which records the coordinates and elevation of the locations to ITM as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.5. Groundwater Monitoring Installations

Groundwater Monitoring Installations were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm uPVC/HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and

finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.6. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and chemical testing to assist in the classification of soils and to provide information for the proposed design.

Chemical testing as required by the specification, including pH, total sulphur, water soluble sulphate, water soluble chloride, acid soluble sulphate, and organic matter testing was carried out by Element Materials Technology Laboratory in the United Kingdom (UK).

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer, California Bearing Ratio (CBR), Moisture Condition Value (MCV) and 2.5kg Rammer Compaction tests were carried out by Professional Soils Laboratory (PSL) in the UK.

Rock testing consisting of uniaxial compressive strength, point load, natural water content, water absorption, magnesium sulphate soundness and Los Angeles Abrasion testing was also carried out by PSL in the UK.

The results of the laboratory testing are included in Appendix 4 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to in-situ and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were variable across the site but generally comprised;

- Peat / Peaty Topsoil
- Cohesive Deposits
- Granular Deposits
- Very Coarse Deposits
- Bedrock

PEAT: Peat or peaty Topsoil was encountered in all the exploratory holes and was present to a depth of 0.15m to 0.80m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the peat and were described typically as *brown / greyish brown / brownish grey / slightly sandy slightly gravelly CLAY with many cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with

granular lenses occasionally present in the glacial till matrix. These deposits had low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content, where noted on the exploratory hole logs.

GRANULAR DEPOSITS: Granular deposits were encountered below the peat or topsoil at TP-03 and TP-06, and below the cohesive deposits at most other locations, and were typically described as *grey and brown clayey sandy subangular to subrounded fine to coarse GRAVEL with some cobbles and boulders*. The secondary sand and fines constituents varied across the site and with depth, while low (<5%), medium (5%-20%) or high (20%-50%) cobble and boulder content was also present, where noted on the exploratory hole logs.

VERY COARSE DEPOSITS: Very coarse soils consisting of COBBLES and BOULDERS with variable amounts of finer material were observed at several exploratory hole locations. Excavation of the pits was terminated on encountering possible bedrock or large boulders. The secondary constituents present within the deposit consisted of *clayey sandy Gravel*, with the mass of the constituents varying between a little (<5%), some (5%-20%) or much (20%-50%), where noted on the exploratory hole logs.

BEDROCK: At BH-03, the rotary core borehole recovered *medium strong to very strong thickly bedded red fine to coarse grained SANDSTONE* which occasionally coarsened into a conglomerate. The degree of weathering ranged from fresh to moderately weathered. At BH-04, the rotary core borehole recovered *strong thickly bedded purple fine-grained SANDSTONE*. The degree of weathering ranged from fresh to slightly weathered. Both rock types are typical units within the Devonian Old Red Sandstone, which is noted in the geological mapping of the site.

The depth to rock at the rotary core borehole locations varies from 1.90m BGL in BH-03 to 14.00m BGL in BH-04. The total core recovery is good, typically 100%.

4.2. Groundwater

Groundwater strikes are noted on the trial pit logs where they occurred. Water strikes were not able to be accurately identified during the rotary core drilling as water is added as part of the drilling process. Therefore, no remarks on groundwater are included on the rotary core logs. It should be noted that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH-03 and BH-04 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 5 of this Report.

APPENDIX 1 - Figures





- Site Location
- ▭ Indicative Site Boundary

Engineer:



Project Code:

12325-10-22

Project Title:

Coumnagappul Wind Farm

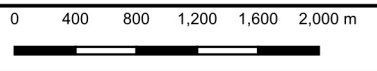
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Figure 1 - Site Location



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Drawn By:
JC

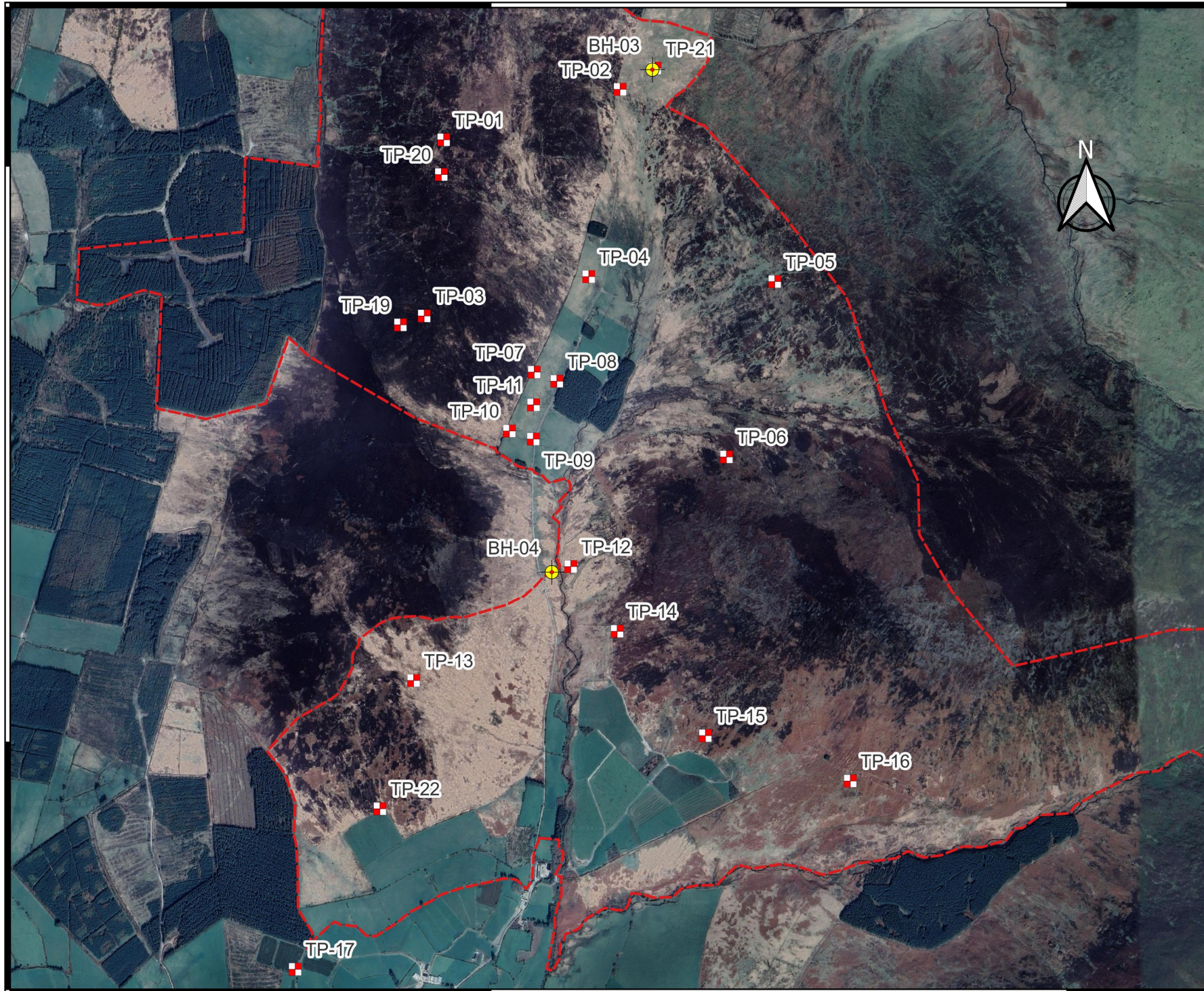
Date:
17-02-2022

624000E

626000E

610000N

608000N



- Site Location
- Indicative Site Boundary



Engineer:



Project Code:

12325-10-22

Project Title:

Coumragappul Wind Farm

Drawing Title:

Figure 2 - Site Investigation Points



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Drawn By:
JC

Date:
17-02-2022

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626000E

APPENDIX 2 – Trial Pit Records





| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.00m x 1.80m x 3.00m L x W x D | Ground Level (mOD) 432.98 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 623836.5 E 610086.8 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------------------|-------------|-----------------------|---|--------|----------------|
| 0.50 0.50 | B T | | | 432.83 | (0.15) 0.15 | PEAT | | |
| | | | | 432.68 | (0.15) 0.30 | Soft grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse | | |
| | | | | | (1.20) | Soft to firm brownish grey sandy gravelly CLAY with high subangular to subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse | | |
| | | | Fast ingress(1) at 1.50m. | 431.48 | 1.50 | Grey COBBLES with some boulders and much clayey sandy subangular to subrounded fine to coarse Gravel | | ∇ ₁ |
| 2.00 2.00 | B T | | | | (1.50) | | | |
| | | | | 429.98 | 3.00 | Complete at 3.00m | | |

| | |
|--|--|
| Plan . | Remarks Groundwater encountered at 1.50m BGL; fast ingress Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion |
| | Scale (approx) 1:25 Logged By SG Figure No. 12325-10-22.TP-01 |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 6.00m x 1.80m x 2.40m L x W x D | Ground Level (mOD) 414.89 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624448.4 E 610261.6 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|-----------------------------------|-----------------|--|-------------|-----------------------|---|--------|-------|
| 0.50 | HV 35.5kPa B RHV 13kPa T | | 57,72,85/Av. 71.33 22,24,32/Av. 26.00 | 414.64 | (0.25) | PEAT | | |
| 0.50 | | | | | 0.25 | Soft to firm grey mottled brown slightly sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse | | |
| 0.50 | | | | | 0.30 | Dark brown and black slightly clayey slightly sandy subangular to subrounded fine to coarse GRAVEL. Visually assessed as loose. | | |
| 0.50 | | | | | 0.55 | Firm grey slightly sandy slightly gravelly CLAY with high subangular cobble content. Gravel is subrounded fine to coarse | | |
| 1.50 | B T | | Seepage(1) at 2.20m. | 413.89 | (1.40) | | | |
| 1.50 | | | | | 2.40 | Complete at 2.40m | | |
| | | | | 412.49 | | | | |

| | |
|-------------|--|
| Plan | Remarks |
| . | Groundwater encountered at 2.20m BGL; seepage |
| . | Trial pit stable |
| . | Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material |
| . | Termination reason: Obstruction; possible boulders or bedrock |
| . | Trial pit backfilled upon completion |
| . | |
| . | |
| . | |
| . | |
| . | |
| | Scale (approx) 1:25 |
| | Logged By SG |
| | Figure No. 12325-10-22.TP-04 |



| | | | | | | | | | |
|--|--|---|--|-------------------------------------|--|-----------------------------------|--|----------------------------------|--|
| Machine : 13T Tracked Excavator | | Dimensions 5.40m x 1.90m x 2.10m L x W x D | | Ground Level (mOD) 387.31 | | Client EMPower | | Job Number 12325-10-22 | |
| Method : Trial Pit | | Location (dGPS) 623769 E 609475.6 N | | Dates 08/12/2022 | | Engineer Fehily Timoney | | Sheet 1/1 | |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 | B T | | | 387.16 | (0.15) 0.15 | PEAT | | |
| | | | | | (0.35) | Grey slightly clayey slightly silty sandy subangular to subrounded fine to coarse GRAVEL. Visually assessed as loose. | | |
| | | | | 386.81 | (0.50) (0.10) | Black subangular to subrounded fine to coarse GRAVEL. Visually assessed as loose. | | |
| | | | | 386.71 | (0.60) | Light greyish brown clayey sandy subangular to subrounded fine to coarse GRAVEL with high subangular to subrounded cobble and boulder content. Visually assessed as loose to medium dense. | | |
| 1.50 1.50 | B T | | | | (1.50) | | | |
| | | | | | 2.10 | Complete at 2.10m | | |

| | | | |
|-----------------|---|------------------------|--|
| Plan | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | |
| | Scale (approx) 1:25 | Logged By SG | Figure No. 12325-10-22.TP-03 |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.20m x 1.80m x 3.10m L x W x D | Ground Level (mOD) 349.82 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624339.8 E 609612.1 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|-------------------------------------|-----------------|--|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 34.5kPa B RHV 12.4kPa T | | 54,74,80/Av. 69.33 22,24,28/Av. 24.67 | 349.47 | 0.35 (0.35) | PEAT Soft to firm brown mottled grey slightly sandy slightly gravelly CLAY with low subrounded cobble content. Gravel is subangular to subrounded fine to coarse. Granular lenses noted within soil mass. | | |
| 1.50 1.50 | B T | | | 348.72 | 1.10 (0.60) | Firm greyish brown slightly sandy gravelly CLAY with low subrounded cobble content. Gravel is subangular to subrounded fine to coarse | | |
| 2.50 2.50 | B T | | | 348.12 | 1.70 (1.40) | Brownish grey clayey sandy subangular to subrounded fine to coarse GRAVEL with high subrounded cobble & boulder content. Visually assessed as loose to medium dense. Clay bands noted within soil mass. | | |
| | | | | 346.72 | 3.10 | Complete at 3.10m | | |

| | | |
|-----------------|---|-------------------------------|
| Plan | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | |
| | | Scale (approx) 1:25 |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 5.50m x 1.70m x 2.00m L x W x D | Ground Level (mOD) 406.39 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624985.1 E 609594.9 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|-----------|------------------------------------|-----------------|---|-------------|-----------------------|--|--------|-------|
| 0.50 | HV 35.4kPa B RHV 8.5kPa T | | 65,79,68/Av. 70.67 20,15,16/Av. 17.00 Medium ingress(1) at 0.80m. | 405.94 | 0.45 | PEAT | | |
| 0.50 | | | | | 0.35 | Soft dark brownish grey slightly sandy gravelly CLAY with low subrounded cobble content. Gravel is subangular to subrounded fine to coarse | | |
| 0.50 | | | | | 0.80 | Grey onto brown clayey sandy subangular to subrounded fine to coarse GRAVEL with high subangular to subrounded cobble and boulder content. Visually assessed as loose to medium dense. | | ∇1 |
| 1.50 | B T | | | 404.39 | (1.20) | | | |
| 1.50 | | | | | 2.00 | Complete at 2.00m | | |

| | |
|-------------|--|
| Plan | Remarks |
| . | Groundwater encountered at 0.80m BGL; medium ingress |
| . | Trial pit stable |
| . | Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material |
| . | Termination reason: Obstruction; possible boulders |
| . | Trial pit backfilled upon completion |
| . | |
| . | |
| . | |
| . | |
| . | |
| | Scale (approx) 1:25 |
| | Logged By SG |
| | Figure No. 12325-10-22.TP-05 |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 6.00m x 1.80m x 4.20m L x W x D | Ground Level (mOD) 352.62 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624817.5 E 608986.7 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 | B T | | | 352.32 | (0.30) 0.30 | PEAT | | |
| 1.50 1.50 | B T | | | 351.92 | (0.40) 0.70 | Grey clayey silty very gravelly fine to coarse SAND with medium subrounded cobble content. Gravel is subangular to subrounded fine to coarse. Visually assessed as loose to medium dense. | | |
| 3.00 3.00 | B T | | | | (2.90) | Firm orangish brown slightly sandy slightly gravelly CLAY with high subangular to subrounded cobbles and boulder content. Granular lenses noted within the soil mass. Gravel is subangular to subrounded fine to coarse. | | |
| 4.00 4.00 | B T | | | 349.02 | 3.60 (0.60) | Firm orangish brown slightly sandy gravelly CLAY with high subangular to subrounded cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 348.42 | 4.20 | Complete at 4.20m | | |

| | | | |
|-------------|--|------------------|-------------------|
| Plan | Remarks | | |
| | <p>No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion</p> | | |
| | Scale (approx) | Logged By | Figure No. |
| | 1:40 | SG | 12325-10-22.TP-06 |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.00m x 1.90m x 3.00m L x W x D | Ground Level (mOD) 327.15 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624150.6 E 609280.9 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|----------------------------------|-----------------|--|----------------------------|--|--|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 32kPa B RHV 8.5kPa T | | 52,66,75/Av. 64.33 12,20,18/Av. 16.67 | 327.00 326.85 326.55 | (0.15) 0.15 (0.15) 0.30 (0.30) 0.60 | PEAT Soft grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. Firm brownish grey slightly sandy slightly gravelly CLAY with high subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 1.50 1.50 | B T | | | | (2.40) | | | |
| | | | | 324.15 | 3.00 | Complete at 3.00m | | |

| | |
|------|--|
| Plan | Remarks |
| | No groundwater encountered Trial pit unstable; side walls spalling Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion |
| | Scale (approx) 1:25 |
| | Logged By SG |
| | Figure No. 12325-10-22.TP-07 |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 5.80m x 1.70m x 3.00m L x W x D | Ground Level (mOD) 315.65 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624229.1 E 609249.2 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|------------------------------------|-----------------|--|----------------------|----------------------------------|--|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 31.5kPa B RHV 8.5kPa T | | 54,60,76/Av. 63.33 14,18,19/Av. 17.00 Seepage(1) at 1.00m. | 315.45 314.95 | (0.20) 0.20 (0.50) 0.70 | PEAT Soft grey slightly sandy slightly gravelly CLAY with low subrounded boulder content. Gravel is subangular to subrounded fine to coarse. Firm brownish grey slightly sandy gravelly CLAY with high subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 1.50 1.50 | B T | | | | (1.70) | | | |
| 3.00 3.00 | B T | | | 313.25 312.65 | 2.40 (0.60) 3.00 | Firm to stiff greyish brown slightly gravelly sandy CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Complete at 3.00m | | |

| | | | | | | |
|---|--|-------------------|-----------|------------|------|----|
| Plan . | Remarks Groundwater encountered at 1.00m BGL; Seepage Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-08</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-08 | | | | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 5.80m x 1.70m x 3.50m L x W x D | Ground Level (mOD) 298.89 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624147.4 E 609048.6 N | Dates 09/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|-------------------------|-----------------|--|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 | HV 25.8kPa RHV 12kPa | | 42,53,60/Av. 51.67 24,27,21/Av. 24.00 | 298.49 | 0.40 | PEAT | | |
| | | | | | (0.40) | | | |
| | | | | | 0.40 | Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse | | |
| | | | | | (0.40) | | | |
| | | | | | 0.80 | Soft to firm grey mottled brown and black slightly sandy gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 1.00 1.00 | B T | | | 298.09 | 0.80 | | | |
| | | | | | (0.90) | | | |
| | | | | | 1.70 | Firm brown slightly sandy gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 2.00 2.00 | B T | | | 297.19 | 1.70 | | | |
| | | | | | (1.00) | | | |
| | | | | | 2.70 | Firm to stiff brownish grey slightly sandy gravelly CLAY with high subangular to subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 3.50 3.50 | B T | | | 296.19 | 2.70 | | | |
| | | | | | (0.80) | | | |
| | | | | | 3.50 | Complete at 3.50m | | |
| | | | | | | | | |

| | | | |
|---|---|--|------------------------|
| Plan . | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | |
| | <table border="1"> <tr> <td>Scale (approx) 1:25</td> <td>Logged By SG</td> <td>Figure No. 12325-10-22.TP-09</td> </tr> </table> | Scale (approx) 1:25 | Logged By SG |
| Scale (approx) 1:25 | Logged By SG | Figure No. 12325-10-22.TP-09 | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 5.60m x 1.60m x 3.70m L x W x D | Ground Level (mOD) 312.81 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624064.4 E 609076.5 N | Dates 09/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------|-------------|-----------------------|---|--------|-------|
| 1.00 1.00 | B T | | | 312.56 | (0.25) 0.25 | PEAT | | |
| | | | | 312.21 | (0.35) 0.60 | Soft grey slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 312.01 | (0.20) 0.80 | Soft orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | | (1.00) | Firm brown slightly sandy slightly gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 2.50 2.50 | B T | | | 311.01 | 1.80 | Brown very clayey very gravelly fine to coarse SAND with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. Visually assessed as loose to medium dense. | | |
| | | | | | (0.90) | | | |
| 3.50 3.50 | B T | | | 310.11 | 2.70 | Yellowish brown clayey very sandy subangular to subrounded fine to coarse GRAVEL with medium subangular to subrounded cobble and boulder content. Visually assessed as loose to medium dense. | | |
| | | | | | (1.00) | | | |
| | | | | 309.11 | 3.70 | Complete at 3.70m | | |

| | | |
|---|--|-------------------------------|
| Plan . | Remarks No groundwater encountered Trial pit unstable; side walls collapsing Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | |
| | | Scale (approx) 1:25 |



| | | | | |
|---|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.40m x 1.80m x 2.80m L x W x D | Ground Level (mOD) 312.36 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624148.4 E 609167.3 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------|-------------|-----------------------|---|--------|-------|
| 0.50 0.50 | B T | | | 312.16 | (0.20) 0.20 | PEAT | | |
| | | | | 311.86 | (0.30) 0.50 | Soft to firm orangish brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 311.16 | (0.70) 1.20 | Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| 1.50 1.50 | B T | | | 310.06 | (1.10) 2.30 | Firm greyish brown sandy gravelly CLAY with high subrounded cobble and boulder content. Gravel is subrounded fine to coarse. | | |
| 2.50 2.50 | B T | | | 309.56 | (0.50) 2.80 | Firm light yellowish brown slightly gravelly sandy CLAY with high subangular to subrounded cobble and boulder content. Gravel is subrounded fine to coarse. | | |
| | | | | | | Complete at 2.80m | | |

| | | | | | | | | | | |
|-------------|--|--|--|--|--|--|------------------|-------------------|--|--|
| Plan | | | | | | | | | | |
| | | | | | | Remarks | | | | |
| | | | | | | No groundwater encountered | | | | |
| | | | | | | Trial pit stable | | | | |
| | | | | | | Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material | | | | |
| | | | | | | Termination reason: Obstruction; possible boulders or bedrock | | | | |
| | | | | | | Trial pit backfilled upon completion | | | | |
| | | | | | | Scale (approx) | Logged By | Figure No. | | |
| | | | | | | 1:25 | SG | 12325-10-22.TP-11 | | |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 6.00m x 1.80m x 3.60m L x W x D | Ground Level (mOD) 264.51 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624277.4 E 608606.3 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|--------------------------------|-----------------|---|-------------|-----------------------|---|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 16kPa B RHV 5kPa T | | 30,34,32/Av. 32.00 12,8,10/Av. 10.00 | 263.71 | (0.80) 0.80 | Very soft clayey PEAT | | |
| 1.50 1.50 | B T | | Medium ingress(1) at 1.80m. | 263.21 | (0.50) 1.30 | Soft grey slightly sandy gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| 3.00 3.00 | B T | | | 260.91 | (2.30) 3.60 | Purplish grey sandy very clayey subangular to subrounded fine to coarse GRAVEL with medium subangular to subrounded cobble and boulder content. Visually assessed as loose to medium dense. | | ∇1 |
| | | | | | | Complete at 3.60m | | |

| | |
|-------------|--|
| Plan | Remarks |
| . | Groundwater encountered at 1.80m BGL; medium ingress |
| . | Trial pit stable |
| . | Shear hand vane carried out on intact lump sample |
| . | Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material |
| . | Termination reason: Obstruction; possible boulders or bedrock |
| . | Trial pit backfilled upon completion |
| | Scale (approx) 1:25 |
| | Logged By SG |
| | Figure No. 12325-10-22.TP-12 |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 5.20m x 1.60m x 3.40m L x W x D | Ground Level (mOD) 300.99 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 623732.3 E 608211.1 N | Dates 09/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|----------------------|-------------|-----------------------|---|--------|-------|
| 1.00 1.00 | B T | | Seepage(1) at 1.20m. | 300.79 | (0.20) 0.20 | PEAT | | |
| | | | | 300.49 | (0.30) 0.50 | Soft grey onto orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 299.59 | (0.90) 1.40 | Firm greyish brown slightly sandy slightly gravelly CLAY with low subrounded cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| 2.00 2.00 | B T | | | 298.49 | (1.10) 2.50 | Firm brownish grey slightly sandy slightly gravelly CLAY with medium subrounded cobble content. Gravel is subrounded fine to coarse. | | |
| | | | | 297.59 | (0.90) 3.40 | Firm brownish grey slightly sandy slightly gravelly CLAY with high subrounded cobble and occasional boulder content. Gravel is subrounded fine to coarse. | | |
| | | | | | | Complete at 3.40m | | |

| | | | | | | |
|-----------------|---|-------------------|-----------|------------|------|----|
| Plan | Remarks Groundwater encountered at 1.20m BGL; seepage Trial pit unstable; side walls collapsing Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-13</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-13 | | | | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 5.50m x 1.80m x 3.00m L x W x D | Ground Level (mOD) 267.80 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 624438.4 E 608381.8 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|------------------------------------|-----------------|---|-------------|-----------------------|---|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 36kPa B RHV 21kPa T | | 32,57,55./Av. 36.00 18,24,21/Av. 21.00 | 267.50 | (0.30) 0.30 | PEAT | | |
| | | | | | (0.60) | Firm brown slightly sandy slightly gravelly CLAY with medium cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 266.90 | 0.90 (0.60) | Firm brownish grey slightly silty slightly sandy gravelly CLAY with high subrounded cobble and boulder content. | | |
| 1.50 1.50 1.50 1.50 | HV 65kPa B RHV 28.33kPa T | | 55,68,72/Av. 65.00 24,30,31/Av. 28.33 | 266.30 | 1.50 (0.50) | Black clayey silty sandy subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content. Visually assessed as loose to medium dense. | | |
| | | | | 265.80 | 2.00 (1.00) | Grey COBBLES and BOULDERS with some grey sandy gravelly Clay | | |
| | | | | 264.80 | 3.00 | Complete at 3.00m | | |

| | |
|------|--|
| Plan | Remarks |
| | No groundwater encountered Trial pit unstable; side walls spalling Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion |
| | Scale (approx) 1:25 |
| | Logged By SG |
| | Figure No. 12325-10-22.TP-14 |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 6.00m x 2.20m x 4.30m L x W x D | Ground Level (mOD) 273.73 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624744.4 E 608019.9 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | | | |
|-----------|---------------------------------------|-----------------|---|-------------|--|---|--------|-------|--------|---|--|
| 0.50 | HV 47.67kPa B RHV 20.33kPa T | | 25,59,59/Av. 47.67 5,28,28/Av. 20.33 | 273.53 | (0.20) | PEAT Soft to firm brown slightly sandy gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | | | | |
| 0.50 | | | | | (0.80) | | | | | | |
| 0.50 | | | | | HV 62.33kPa B RHV 29kPa T | 52,68,67/Av. 62.33 24,32,31/Av. 29.00 | 272.73 | | 1.00 | Brownish grey clayey silty very sandy subangular to subrounded fine to coarse GRAVEL with medium subrounded cobble and boulder content. Visually assessed as loose to medium dense. | |
| 0.50 | | | | | | | | | (0.80) | | |
| 1.50 | B T | | 271.93 | 1.80 | Grey clayey silty very sandy subangular to subrounded fine to coarse GRAVEL with bands of brown and black very gravelly fine to coarse Sand. Visually assessed as loose to medium dense. | | | | | | |
| 1.50 | | | | (1.90) | | | | | | | |
| 2.50 | B T | | 270.03 | 3.70 | Grey subangular to subrounded fine to coarse GRAVEL with high cobble content. Visually assessed as loose to medium dense. | | | | | | |
| 2.50 | | | | (0.60) | | | | | | | |
| 3.50 | B T | | 269.43 | 4.30 | Complete at 4.30m | | | | | | |
| 3.50 | | | | | | | | | | | |
| | | | Seepage(1) at 3.80m. | | | | | | | | |

| | | |
|-------------|--|------------------|
| Plan | Remarks | |
| . | Groundwater encountered at 3.80m BGL; seepage | |
| . | Trial pit unstable; side walls spalling | |
| . | Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material | |
| . | Termination reason: Obstruction; possible boulders or bedrock | |
| . | Trial pit backfilled upon completion | |
| . | Scale (approx) | Logged By |
| . | 1:40 | SG |
| . | Figure No. | |
| . | 12325-10-22.TP-15 | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.00m x 2.20m x 4.00m L x W x D | Ground Level (mOD) 300.66 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 625247.1 E 607862.5 N | Dates 07/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|------------------------------------|-----------------|---|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 41kPa B RHV 25.67kPa T | | 50,43,30/Av. 41.00 50,22,5/Av. 25.67 | 300.46 | (0.20) 0.20 | PEAT | | |
| | | | | 300.16 | (0.30) 0.50 | Soft to firm grey slightly silty slightly sandy gravelly CLAY with low subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 299.76 | (0.40) 0.90 | Firm brown slightly sandy slightly gravelly CLAY with medium subrounded cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| 1.50 1.50 | B T | | | 298.86 | (0.90) 1.80 | Firm brownish grey slightly silty slightly sandy gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| 2.50 2.50 | B T | | | | (1.90) | | | |
| 3.50 3.50 | B T | | | 296.96 | 3.70 (0.30) | Firm brownish grey slightly silty sandy gravelly CLAY with medium subrounded cobble and boulder content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 296.66 | 4.00 | | | |

| | | | | | | |
|---|---|-------------------|-----------|------------|------|----|
| Plan . | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-16</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-16 | | | | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 4.70m x 1.60m x 2.40m L x W x D | Ground Level (mOD) 257.57 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 623321.2 E 607209.4 N | Dates 09/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|-----------------------|-----------------|---|-------------|-----------------------|---|--------|-------|
| 0.50 0.50 | HV 39kPa RHV 13kPa | | 82,100,53/Av. 78.33 28,28,23/Av. 26.33 | 257.37 | (0.20) 0.20 | TOPSOIL | | |
| | | | | 257.12 | (0.25) 0.45 | Soft dark brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| 1.00 1.00 | B T | | | 256.07 | (1.05) 1.50 | Firm brownish grey slightly sandy gravelly CLAY with low subrounded cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 255.17 | (0.90) 2.40 | Firm brownish grey slightly sandy gravelly CLAY with medium subangular to subrounded cobble content. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | | | Complete at 2.40m | | |

| | | | | | | |
|--|---|-------------------|-----------|------------|------|----|
| Plan . | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-17</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-17 | | | | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.00m x 1.90m x 1.70m L x W x D | Ground Level (mOD) 388.46 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 623686.4 E 609444.8 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|---------------|-------------|-----------------------|--|--------|-------|
| 1.00 1.00 | B T | | | 388.31 | (0.15) 0.15 | PEAT | | |
| | | | | | (0.25) | Soft grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | |
| | | | | 388.06 | 0.40 | Light greyish brown clayey sandy subrounded fine to coarse GRAVEL with high subrounded cobble and boulder content. Visually assessed as loose to medium dense. Interbedded with black clayey sandy subangular to subrounded fine to coarse Gravel | | |
| | | | | | (1.30) | | | |
| | | | | 386.76 | 1.70 | Complete at 1.70m | | |

| | | | | | | |
|---|---|-------------------|-----------|------------|------|----|
| Plan . | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-19</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-19 | | | | |



| | | | | |
|---|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator Method : Trial Pit | Dimensions 6.00m x 1.80m x 2.70m L x W x D | Ground Level (mOD) 429.22 | Client EMPower | Job Number 12325-10-22 |
| | Location (dGPS) 623828.3 E 609966.1 N | Dates 08/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | |
|-----------|----------------|-----------------|---------------|-------------|-----------------------|---|-------------------|-------|--|
| 1.00 | B T | | | 429.07 | (0.15) | PEAT | | | |
| 1.00 | | | | 428.92 | 0.15 0.30 | Soft grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse. | | | |
| | | | | 428.42 | (0.50) | Orangish brown very clayey very sandy subangular to subrounded fine to coarse GRAVEL with medium subrounded cobble. Visually assessed as loose. | | | |
| | | | | | (1.90) | | | | |
| | | | | | 426.52 | 2.70 | Complete at 2.70m | | |

| | | | | | | |
|--|---|-------------------|-----------|------------|------|----|
| Plan . | Remarks No groundwater encountered Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | | | | | |
| | <table border="1"> <tr> <td>Scale (approx)</td> <td>Logged By</td> <td>Figure No.</td> </tr> <tr> <td>1:25</td> <td>SG</td> <td>12325-10-22.TP-20</td> </tr> </table> | Scale (approx) | Logged By | Figure No. | 1:25 | SG |
| Scale (approx) | Logged By | Figure No. | | | | |
| 1:25 | SG | 12325-10-22.TP-20 | | | | |



| | | | | |
|--|---|-------------------------------------|-----------------------------------|----------------------------------|
| Machine : 13T Tracked Excavator | Dimensions 8.20m x 1.30m x 2.50m L x W x D | Ground Level (mOD) 413.56 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 624569.4 E 610334.9 N | Dates 18/01/2023 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|--------------|----------------|-----------------|-----------------------------|-------------|-----------------------|--|--------|-------|
| 0.50 0.50 | B T | | | 413.36 | (0.20) 0.20 | Peaty TOPSOIL | | |
| | | | | 413.16 | (0.20) 0.40 | Firm brown slightly sandy gravelly CLAY | | |
| | | | Medium Ingress(1) at 1.00m. | 412.46 | (0.70) 1.10 | Dark brown slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with low cobble content. Visually assessed as loose. | | ∇1 |
| 1.50 1.50 | B T | | | 411.86 | (0.60) 1.70 | Grey slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with low cobble and boulder content. Visually assessed as loose to medium dense. | | |
| 2.50 2.50 | B T | | | 411.06 | (0.80) 2.50 | Grey slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with high cobble and boulder content. Visually assessed as loose to medium dense. | | |
| | | | | | | Complete at 2.50m | | |

| | | | | | | | | | |
|-------------|--|--|--|--|--|--|------------------|-------------------|--|
| Plan | | | | | | | | | |
| | | | | | | Remarks | | | |
| | | | | | | Groundwater encountered at 1.00m BGL; Medium ingress | | | |
| | | | | | | Trial pit stable | | | |
| | | | | | | Shear hand vanes not completed at all scheduled depth intervals due to granular material | | | |
| | | | | | | Termination reason: Obstruction; possible boulders or bedrock | | | |
| | | | | | | Trial pit backfilled upon completion | | | |
| | | | | | | Scale (approx) | Logged By | Figure No. | |
| | | | | | | 1:25 | CMP | 12325-10-22.TP-22 | |



| | | | | |
|---------------------------------|--|------------------------------|----------------------------|---------------------------|
| Machine : 13T Tracked Excavator | Dimensions 5.60m x 1.60m x 3.80m L x W x D | Ground Level (mOD) 270.14 | Client EMPower | Job Number 12325-10-22 |
| Method : Trial Pit | Location (dGPS) 623615.3 E 607766.2 N | Dates 09/12/2022 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | Sample / Tests | Water Depth (m) | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water |
|------------------------------|---------------------------------|-----------------|---|------------------|----------------------------------|---|--------|-------|
| 0.50 0.50 0.50 0.50 | HV 39kPa B RHV 13kPa T | | 82,100,53/Av. 78.33 28,28,23/Av. 26.33 | 269.74 269.44 | (0.40) 0.40 (0.30) 0.70 | Dark brown gravelly PEAT Soft to firm orangish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to coarse. Firm greyish brown slightly sandy gravelly CLAY with low subrounded cobble content. Gravel is subrounded fine to coarse. | | |
| 1.50 1.50 | B T | | | 268.34 | (1.10) 1.80 | Firm brownish grey slightly sandy slightly gravelly CLAY with high subrounded cobble content. Gravel is subrounded fine to coarse. | | |
| 2.50 2.50 | B T | | | 266.64 | (1.70) 3.50 (0.30) 3.80 | Grey subangular to subrounded COBBLES with much brownish grey slightly sandy gravelly Clay. Complete at 3.80m | | ∇1 |
| | | | Fast ingress(1) at 3.70m. | 266.34 | | | | |

| | | |
|-----------------|---|-------------------------------|
| Plan | Remarks Groundwater encountered at 3.70m BGL; fast ingress Trial pit stable Shear hand vanes not completed at all scheduled depth intervals due to either stiffness or high granular content of material Termination reason: Obstruction; possible boulders or bedrock Trial pit backfilled upon completion | |
| | | Scale (approx) 1:25 |

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Trial Pit Photographs**

TP01



TP01



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Trial Pit Photographs**

TP01



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TP02



TP02



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TP03



TP03



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TP04



TP04



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TP05



TP05



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Trial Pit Photographs**

TP22



APPENDIX 3 – Rotary Borehole Records





| | | | | |
|--|--|------------------------------------|----------------------------|---------------------------|
| Machine : Beretta T-44 Flush : Water Core Dia: 63.50 mm Method : Rotary Cored | Casing Diameter 96.00mm cased to 10.00m | Ground Level (mOD) 413.58 | Client EMPower | Job Number 12325-10-22 |
| | Location 624560.9 E 610333.1 N | Dates 18/01/2023- 19/01/2023 | Engineer Fehily Timoney | Sheet 1/1 |

| Depth (m) | TCR (%) | SCR (%) | RQD (%) | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|-------------------|---------|---------|---------|----|----------------------------|-------------|--------------------------|---|--------|-------|-------|
| 0.00 0.00-0.50 | 60 | 0 | | | B | 413.28 | (0.30) | Peaty TOPSOIL | | | |
| | | | | | | 413.08 | (0.30) (0.20) 0.50 | Light reddish brown slightly sandy gravelly CLAY. | | | |
| 0.50 0.50-0.73 | 67 | 0 | | | 10,12/45,5 SPT(C) 50/75 | | (1.40) | Recovery consists of red slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL. Driller Notes: Gravel (Dense) | | | |
| 1.90 2.00 | 100 | 59 | 52 | | | 411.68 | 1.90 | Moderately weak to medium strong thickly bedded red fine to coarse grained SANDSTONE. Beds occasionally coarsen into a conglomerate. Slightly weathered to moderately weathered. | | | |
| 3.50 | 100 | 59 | 56 | 7 | | | (4.70) | 1.90m to 6.60m BGL - Two Fracture Sets - F1: 20 to 40 degrees, close to medium spaced, undulating, rough with clay infill and brown staining. F2: 60 to 80 degrees, medium to widely spaced, undulating, rough with clay infill and brown staining. | | | |
| 5.00 | 100 | 75 | 54 | | | | | | | | |
| 6.50 6.60 | 100 | 100 | 82 | | | 406.98 | 6.60 | Medium strong thickly bedded red fine grained SANDSTONE. Slightly weathered to fresh | | | |
| 8.00 | 100 | 80 | 73 | 6 | | | (3.40) | Vugs encountered between 8.20m to 8.40m BGL | | | |
| 9.50 | 100 | 100 | 58 | | | | | | | | |
| 10.00 | | | | | | 403.58 | 10.00 | | | | |

Remarks
Dynamic sample from GL to 0.50m BGL - Recovery 60%
Bentonite seal installed from 10.00m to 9.00m BGL. 50mm slotted standpipe installed from 9.00m to 8.00m BGL. 50mm plain standpipe with a bentonite seal installed from 8.00m to GL with a raised cover.

| | |
|---------------------------------|-----------|
| Scale (approx) | Logged By |
| 1:50 | CMP |
| Figure No. 12325-10-22.BH-03 | |



| | | | | |
|--|---|---|-----------------------------------|----------------------------------|
| Machine : Beretta T-44 Flush : Water Core Dia: 63.50 mm Method : Rotary Cored | Casing Diameter 96.00mm cased to 20.00m | Ground Level (mOD) 265.86 | Client EMPower | Job Number 12325-10-22 |
| | Location 624211.9 E 608589.9 N | Dates 23/01/2023- 24/01/2023 | Engineer Fehily Timoney | Sheet 1/2 |

| Depth (m) | TCR (%) | SCR (%) | RQD (%) | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|-------------------|---------|---------|---------|----|-------------------------------|-------------|-----------------------|---|--------|-------|-------|
| 0.00 0.00-0.70 | 50 | 0 | | | B | 265.61 | (0.25) 0.25 | Peaty TOPSOIL | | | |
| | | | | | | | (0.45) 0.70 | Brown slightly sandy slightly gravelly CLAY | | | |
| 0.70 0.70-1.00 | 31 | 0 | | | 7,9/18,32 SPT(C) 50/150 | 265.16 | | Recovery consists of purple slightly sandy slightly clayey subangular to subrounded fine to coarse GRAVEL with low cobble and boulder content. Driller Notes: Gravel and Cobbles (Dense). | | | |
| 2.00 2.00-2.45 | 37 | 0 | | | 7,7/11,9,16,14 SPT(C) N=50 | | | | | | |
| 3.50 3.50-3.88 | 40 | 0 | | | 6,8/8,13,29 SPT(C) 50/225 | | (5.80) | | | | |
| 5.00 5.00-5.45 | 13 | 0 | | | 5,7/8,8,8,11 SPT(C) N=35 | | | | | | |
| 6.50 6.50-6.95 | 25 | 0 | | | 8,7/7,8,11,12 SPT(C) N=38 | 259.36 | 6.50 | Recovery consists of brown sandy slightly gravelly slightly clayey SILT with low cobble content. Driller Notes: Brown Sand (Very Stiff). | | | |
| | | | | | | | (1.50) | | | | |
| 8.00 8.00-8.45 | 50 | 0 | | | 4,6/7,7,9,16 SPT(C) N=39 | 257.86 | 8.00 | Recovery consists of brown slightly sandy slightly gravelly slightly silty CLAY with low cobble content. Driller Notes: Brown Clay (Very Stiff). | | | |
| 9.50 9.50-9.65 | | | | | 13,12/50 SPT(C) 50/0 | | | | | | |

| | | |
|---|--|-------------------------|
| Remarks Dynamic sample from GL to 0.70m BGL - Recovery 60% Bentonite seal installed from 20.00m to 19.00m BGL. 50mm slotted standpipe installed from 19.00m to 15.00m BGL. 50mm plain standpipe with a bentonite seal installed from 15.00m to GL with a raised cover. | Scale (approx) 1:50 | Logged By CMP |
| | Figure No. 12325-10-22.BH-03 | |



| | | | | |
|--|---|---|-----------------------------------|----------------------------------|
| Machine : Beretta T-44 Flush : Water Core Dia: 63.50 mm Method : Rotary Cored | Casing Diameter 96.00mm cased to 20.00m | Ground Level (mOD) 265.86 | Client EMPower | Job Number 12325-10-22 |
| | Location 624211.9 E 608589.9 N | Dates 23/01/2023- 24/01/2023 | Engineer Fehily Timoney | Sheet 2/2 |

| Depth (m) | TCR (%) | SCR (%) | RQD (%) | FI | Field Records | Level (mOD) | Depth (m) (Thickness) | Description | Legend | Water | Instr |
|----------------------|---------|---------|---------|----|---------------------------------|-------------|-----------------------|---|--------|-------|-------|
| 11.00 11.00-11.38 | 63 | 0 | | | 7,10/8,16,26 SPT(C) 50/225 | | (6.00) | | | | |
| 12.50 12.50-12.88 | 55 | 0 | | | 10,10/13,19,18 SPT(C) 50/225 | | | | | | |
| 14.00 | 18 | 0 | | | | 251.86 | 14.00 | Medium strong thickly bedded purple fine grained SANDSTONE. Slightly weathered to fresh with occasional vugs | | | |
| 15.50 | 100 | 70 | 54 | | | | | 1.90m to 6.60m BGL - Two Fracture Sets - F1: 20 to 40 degrees, close to medium spaced, undulating, rough with brown and black staining. F2: 60 to 80 degrees, medium to widely spaced, undulating, rough with brown and black staining. | | | |
| 17.00 | 100 | 100 | 80 | | | | | 19.50m to 19.80m BGL - Possible Fault Breccia: Weathered rock recovered as clayey gravelly Cobbles | | | |
| 18.50 | 100 | 77 | 40 | 8 | | | (6.00) | | | | |
| 20.00 | 100 | 56 | 37 | | | 245.86 | 20.00 | | | | |

Remarks

Scale (approx)
1:50

Logged By
CMP

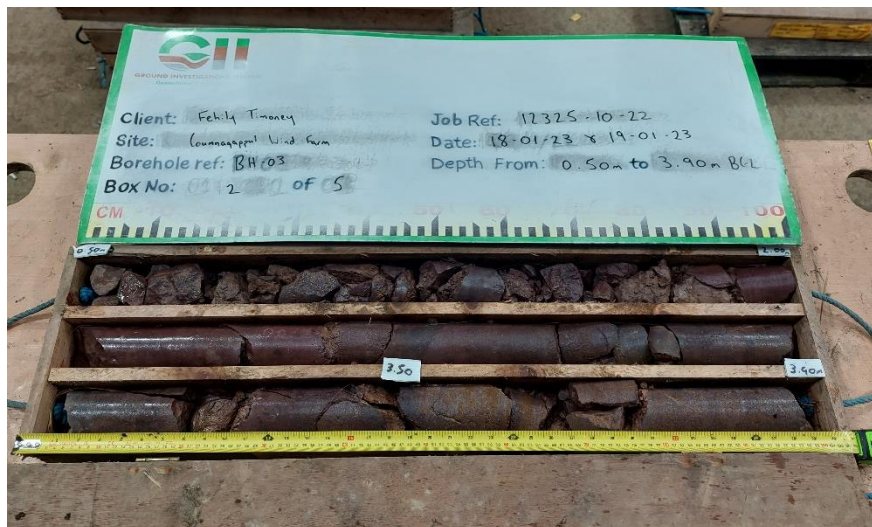
Figure No.
12325-10-22.BH-03

Coumnagappul Wind Farm – Rotary Core Photographs

BH-03

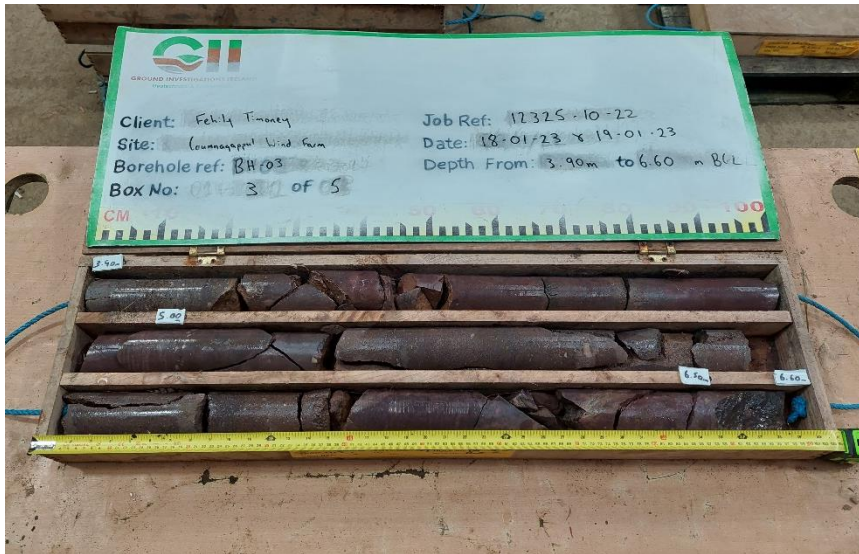


BH-03



Coumnagappul Wind Farm – Rotary Core Photographs

BH-03



BH-03



Coumnagappul Wind Farm – Rotary Core Photographs

BH-03



Coumnagappul Wind Farm – Rotary Core Photographs

BH-04



BH-04



Coumnagappul Wind Farm – Rotary Core Photographs

BH-04



BH-04



BH-04

Coumnagappul Wind Farm – Rotary Core Photographs



APPENDIX 4 – Laboratory Testing



Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland



Attention : Steven Kenny
Date : 16th January, 2023
Your reference :
Our reference : Test Report 22/20554 Batch 1
Location : Coumnagappul V.F
Date samples received : 13th December, 2022
Status : Final Report
Issue : 1

Twenty one samples were received for analysis on 13th December, 2022 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/20554

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

| | |
|---------|--|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| >> | Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher. |
| * | Analysis subcontracted to an Element Materials Technology approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

HWOL ACRONYMS AND OPERATORS USED

| | |
|-------|--|
| HS | Headspace Analysis. |
| EH | Extractable Hydrocarbons - i.e. everything extracted by the solvent. |
| CU | Clean-up - e.g. by florisil, silica gel. |
| 1D | GC - Single coil gas chromatography. |
| Total | Aliphatics & Aromatics. |
| AL | Aliphatics only. |
| AR | Aromatics only. |
| 2D | GC-GC - Double coil gas chromatography. |
| #1 | EH_Total but with humics mathematically subtracted |
| #2 | EU_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 |
| MS | Mass Spectrometry. |

EMT Job No: 22/20554

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/S ANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|-----------------|---|----------------------------------|---|-------------------------|------------------------|---|------------------------------|
| TM21 | Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4. | PM24 | Preparation of Soil and Marine Sediment Samples for Total Organic Carbon. | | | AD | Yes |
| TM30 | Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH ₄ ⁺ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l | PM20 | Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker. | Yes | | AD | Yes |
| TM50 | Acid soluble sulphate (Total Sulphate) analysed by ICP-OES | PM29 | A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed. | | | AD | Yes |
| TM73 | Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser. | PM11 | Extraction of as received solid samples using one part solid to 2.5 parts deionised water. | Yes | | AR | No |
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Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland



Attention : James Cashen
Date : 16th January, 2023
Your reference : 12325-10-2222
Our reference : Test Report 22/20742 Batch 1
Location : Conmnagappul Wind Farm
Date samples received : 15th December, 2022
Status : Final Report
Issue : 1

Twenty nine samples were received for analysis on 15th December, 2022 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/20742

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

| | |
|---------|--|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| >> | Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher. |
| * | Analysis subcontracted to an Element Materials Technology approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

HWOL ACRONYMS AND OPERATORS USED

| | |
|-------|--|
| HS | Headspace Analysis. |
| EH | Extractable Hydrocarbons - i.e. everything extracted by the solvent. |
| CU | Clean-up - e.g. by florisil, silica gel. |
| 1D | GC - Single coil gas chromatography. |
| Total | Aliphatics & Aromatics. |
| AL | Aliphatics only. |
| AR | Aromatics only. |
| 2D | GC-GC - Double coil gas chromatography. |
| #1 | EH_Total but with humics mathematically subtracted |
| #2 | EU_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 |
| MS | Mass Spectrometry. |

EMT Job No: 22/20742

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/S ANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|-----------------|--|----------------------------------|---|-------------------------|------------------------|---|------------------------------|
| TM21 | Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4. | PM24 | Preparation of Soil and Marine Sediment Samples for Total Organic Carbon. | | | AD | Yes |
| TM30 | Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l | PM20 | Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker. | Yes | | AD | Yes |
| TM50 | Acid soluble sulphate (Total Sulphate) analysed by ICP-OES | PM29 | A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed. | | | AD | Yes |
| TM73 | Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser. | PM11 | Extraction of as received solid samples using one part solid to 2.5 parts deionised water. | Yes | | AR | No |
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Ground Investigations Ireland
Catherinstown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland



Attention : James Cashen
Date : 27th March, 2023
Your reference : 12325-10-22
Our reference : Test Report 23/4264 Batch 1
Location : Coumnagappul Wind Farm
Date samples received : 17th March, 2023
Status : Final Report
Issue : 1

One sample was received for analysis on 17th March, 2023 and was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Bruce Leslie

Project Manager

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/4264

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

Please include all sections of this report if it is reproduced

All solid results are expressed on a dry weight basis unless stated otherwise.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

| | |
|---------|--|
| # | ISO17025 (UKAS Ref No. 4225) accredited - UK. |
| SA | ISO17025 (SANAS Ref No.T0729) accredited - South Africa |
| B | Indicates analyte found in associated method blank. |
| DR | Dilution required. |
| M | MCERTS accredited. |
| NA | Not applicable |
| NAD | No Asbestos Detected. |
| ND | None Detected (usually refers to VOC and/SVOC TICs). |
| NDP | No Determination Possible |
| SS | Calibrated against a single substance |
| SV | Surrogate recovery outside performance criteria. This may be due to a matrix effect. |
| W | Results expressed on as received basis. |
| + | AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page. |
| >> | Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher. |
| * | Analysis subcontracted to an Element Materials Technology approved laboratory. |
| AD | Samples are dried at 35°C ±5°C |
| CO | Suspected carry over |
| LOD/LOR | Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS |
| ME | Matrix Effect |
| NFD | No Fibres Detected |
| BS | AQC Sample |
| LB | Blank Sample |
| N | Client Sample |
| TB | Trip Blank Sample |
| OC | Outside Calibration Range |

HWOL ACRONYMS AND OPERATORS USED

| | |
|-------|--|
| HS | Headspace Analysis. |
| EH | Extractable Hydrocarbons - i.e. everything extracted by the solvent. |
| CU | Clean-up - e.g. by florisil, silica gel. |
| 1D | GC - Single coil gas chromatography. |
| Total | Aliphatics & Aromatics. |
| AL | Aliphatics only. |
| AR | Aromatics only. |
| 2D | GC-GC - Double coil gas chromatography. |
| #1 | EH_Total but with humics mathematically subtracted |
| #2 | EU_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 |
| MS | Mass Spectrometry. |

EMT Job No: 23/4264

| Test Method No. | Description | Prep Method No. (if appropriate) | Description | ISO 17025 (UKAS/S ANAS) | MCERTS (UK soils only) | Analysis done on As Received (AR) or Dried (AD) | Reported on dry weight basis |
|-----------------|--|----------------------------------|---|-------------------------|------------------------|---|------------------------------|
| TM30 | Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996 | PM15 | Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground. | | | AD | Yes |
| TM38 | Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I | PM20 | Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker. | Yes | | AD | Yes |
| TM50 | Acid soluble sulphate (Total Sulphate) analysed by ICP-OES | PM29 | A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed. | | | AD | Yes |
| TM73 | Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser. | PM11 | Extraction of as received solid samples using one part solid to 2.5 parts deionised water. | Yes | | AR | No |
| | | | | | | | |
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LABORATORY REPORT



Contract Number: PSL23/0371

Report Date: 10 February 2023
Client's Reference: 12325-10-22
Client Name: Ground Investigations Ireland Ltd
Catherinstown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen

Contract Title: Coumnagappul Wind Farm
Date Received: 19/1/2023
Date Commenced: 19/1/2023
Date Completed: 10/2/2023

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
(Director)

R Berriman
(Quality Manager)


S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

S Eyre
(Senior Technician)

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(Senior Technician)

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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|-------------|---------------|-------------|-------------|--------------|--|
| TP01 | | B+T | 0.50 | | Brown very sandy GRAVEL. |
| TP02 | | B+T | 1.50 | | Brown slightly sandy slightly gravelly SILT. |
| TP03 | | B+T | 1.50 | | Brown slightly sandy gravelly CLAY. |
| TP04 | | B+T | 0.50 | | Brown slightly sandy slightly gravelly CLAY. |
| TP04 | | B+T | 1.50 | | Brown sandy GRAVEL. |
| TP04 | | B+T | 2.50 | | Brown slightly sandy gravelly CLAY. |
| TP05 | | B+T | 0.50 | | Brown clayey sandy GRAVEL. |
| TP05 | | B+T | 1.50 | | Brown clayey sandy GRAVEL with many cobbles. |
| TP06 | | B+T | 0.50 | | Brown clayey SAND & GRAVEL. |
| TP06 | | B+T | 1.50 | | Brown sandy slightly gravelly CLAY. |
| TP06 | | B+T | 3.00 | | Brown sandy slightly gravelly CLAY. |
| TP06 | | B+T | 4.00 | | Brown sandy slightly gravelly CLAY. |
| TP07 | | B+T | 1.50 | | Brown sandy gravelly CLAY. |
| TP08 | | B+T | 1.50 | | Brown very sandy GRAVEL. |
| TP08 | | B+T | 3.00 | | Brown SAND & GRAVEL. |
| TP09 | | B+T | 1.00 | | Dark brown very sandy GRAVEL. |
| TP09 | | B+T | 2.00 | | Brown slightly clayey sandy GRAVEL. |
| TP09 | | B+T | 3.50 | | Brown sandy slightly gravelly CLAY. |
| TP10 | | B+T | 1.00 | | Brown sandy GRAVEL. |



Cumnagappul Wind Farm

Contract No:

PSL23/0371

Client Ref:

12325-10-22

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Description of Sample |
|-------------|---------------|-------------|-------------|--------------|---|
| TP10 | | B+T | 2.50 | | Brown slightly clayey very sandy GRAVEL. |
| TP10 | | B+T | 3.50 | | Brown clayey very sandy GRAVEL. |
| TP11 | | B+T | 0.50 | | Brown sandy GRAVEL. |
| TP11 | | B+T | 1.50 | | Brown sandy GRAVEL. |
| TP11 | | B+T | 2.50 | | Brown SAND & GRAVEL. |
| TP12 | | B+T | 3.00 | | Brown sandy slightly clayey GRAVEL. |
| TP13 | | B+T | 1.00 | | Brown slightly sandy slightly gravelly CLAY. |
| TP13 | | B+T | 2.00 | | Brown very sandy GRAVEL. |
| TP14 | | B+T | 0.50 | | Brown very sandy GRAVEL. |
| TP14 | | B+T | 1.50 | | Brown slightly sandy gravelly CLAY. |
| TP15 | | B+T | 0.50 | | Brown very sandy GRAVEL. |
| TP15 | | B+T | 2.50 | | Brown slightly clayey sandy GRAVEL. |
| TP16 | | B+T | 1.50 | | Brown sandy slightly gravelly CLAY. |
| TP16 | | B+T | 2.50 | | Brown clayey SAND & GRAVEL. |
| TP16 | | B+T | 3.50 | | Brown slightly clayey SAND & GRAVEL. |
| TP17 | | B+T | 1.00 | | Brown slightly clayey sandy GRAVEL. |
| TP19 | | B+T | 1.00 | | Brown slightly sandy gravelly CLAY with some cobbles. |
| TP20 | | B+T | 1.00 | | Brown slightly sandy gravelly CLAY with some cobbles. |
| TP22 | | B+T | 1.50 | | Brown sandy slightly gravelly CLAY. |



Cumnagappul Wind Farm

Contract No:

PSL23/0371

Client Ref:

12325-10-22

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density Mg/m ³ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|-------------|---------------|-------------|----------------|-----------------|-------------------------------------|-------------------------------------|---|-----------------------------------|----------------------------------|-------------------------------------|---------------------|----------------------------|
| TP01 | | B+T | 0.50 | | 13 | | | | NP | | | |
| TP02 | | B+T | 1.50 | | 19 | | | | NP | | | |
| TP04 | | B+T | 0.50 | | 20 | | 47 | 22 | 25 | 81 | | Intermediate Plasticity CI |
| TP04 | | B+T | 1.50 | | 8.4 | | | | | | | |
| TP05 | | B+T | 0.50 | | 18 | | | | | | | |
| TP06 | | B+T | 0.50 | | 15 | | | | NP | | | |
| TP06 | | B+T | 1.50 | | 17 | | 33 | 17 | 16 | 54 | | Low Plasticity CL |
| TP06 | | B+T | 3.00 | | 18 | | 34 | 17 | 17 | 61 | | Low Plasticity CL |
| TP06 | | B+T | 4.00 | | 18 | | | | | | | |
| TP07 | | B+T | 1.50 | | 12 | | 30 | 16 | 14 | 51 | | Low Plasticity CL |
| TP08 | | B+T | 1.50 | | 7.2 | | | | NP | | | |
| TP08 | | B+T | 3.00 | | 10 | | | | NP | | | |
| TP09 | | B+T | 1.00 | | 12 | | | | NP | | | |
| TP09 | | B+T | 2.00 | | 14 | | | | NP | | | |
| TP09 | | B+T | 3.50 | | 20 | | 34 | 19 | 15 | 81 | | Low Plasticity CL |
| TP10 | | B+T | 1.00 | | 11 | | | | NP | | | |
| TP10 | | B+T | 2.50 | | 9.3 | | | | NP | | | |
| TP11 | | B+T | 0.50 | | 9.7 | | | | | | | |
| TP11 | | B+T | 1.50 | | 9.4 | | | | NP | | | |

SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



Coumnagappul Wind Farm

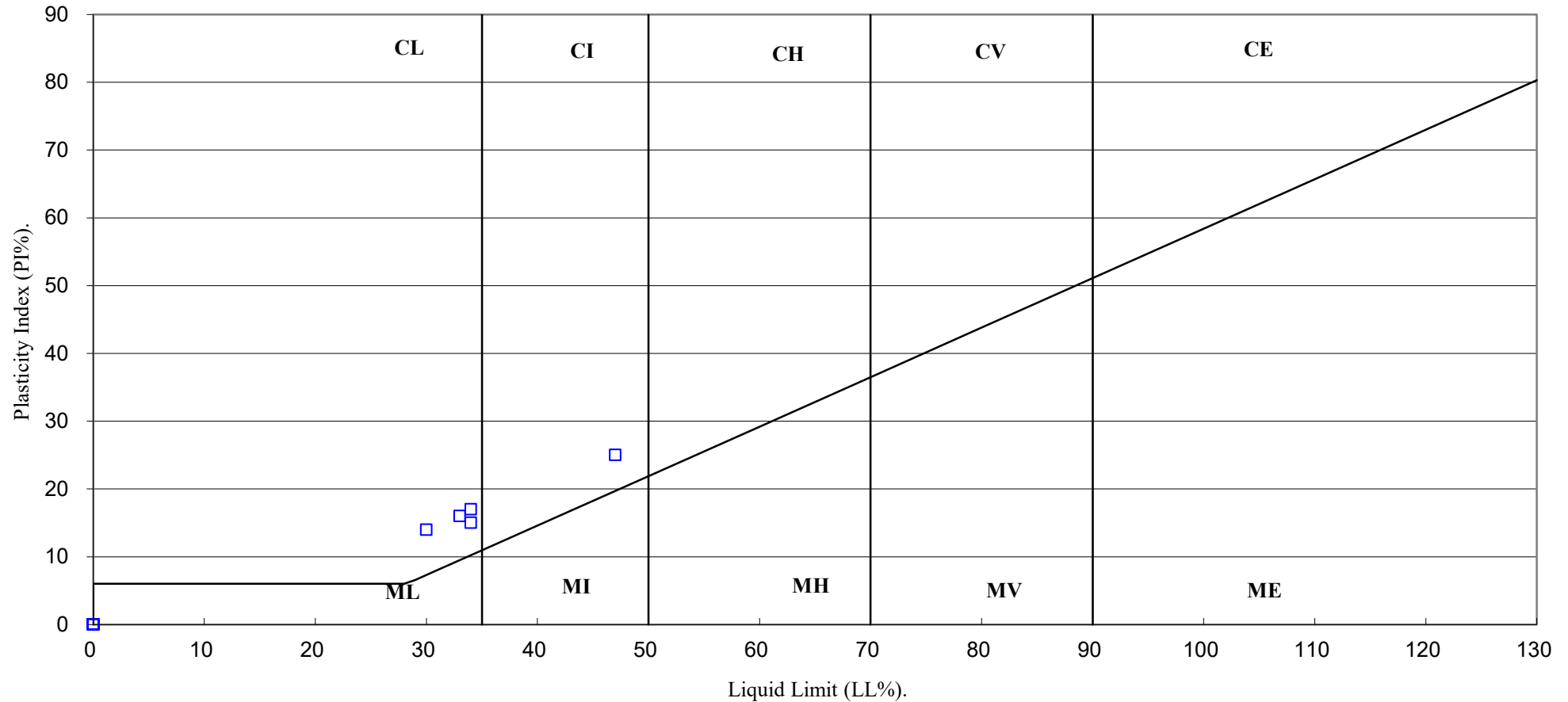
Contract No:

PSL23/0371

Client Ref:

12325-10-22

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Coumnagappul Wind Farm

Contract No:

PSL23/0371

Client Ref:

12325-10-22

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

| Hole Number | Sample Number | Sample Type | Top Depth m | Base Depth m | Moisture Content % Clause 3.2 | Linear Shrinkage % Clause 6.5 | Particle Density Mg/m ³ Clause 8.2 | Liquid Limit % Clause 4.3/4 | Plastic Limit % Clause 5.3 | Plasticity Index % Clause 5.4 | Passing .425mm % | Remarks |
|-------------|---------------|-------------|----------------|-----------------|-------------------------------------|-------------------------------------|---|-----------------------------------|----------------------------------|-------------------------------------|---------------------|----------------------------|
| TP11 | | B+T | 2.50 | | 12 | | | | NP | | | |
| TP13 | | B+T | 1.00 | | 15 | | | 36 | 19 | 17 | 63 | Intermediate Plasticity CI |
| TP13 | | B+T | 2.00 | | 8.5 | | | | NP | | | |
| TP14 | | B+T | 0.50 | | 11 | | | | NP | | | |
| TP15 | | B+T | 0.50 | | 21 | | | | NP | | | |
| TP16 | | B+T | 1.50 | | 12 | | | 33 | 17 | 16 | 68 | Low Plasticity CL |
| TP16 | | B+T | 2.50 | | 11 | | | | | | | |
| TP16 | | B+T | 3.50 | | 11 | | | | NP | | | |
| TP17 | | B+T | 1.00 | | 9.1 | | | | NP | | | |
| TP22 | | B+T | 1.50 | | 12 | | | 31 | 16 | 15 | 67 | Low Plasticity CL |
| TP22 | | B+T | 2.50 | | 14 | | | 37 | 19 | 18 | 36 | Intermediate Plasticity CI |
| | | | | | | | | | | | | |
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SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.



Coumnagappul Wind Farm

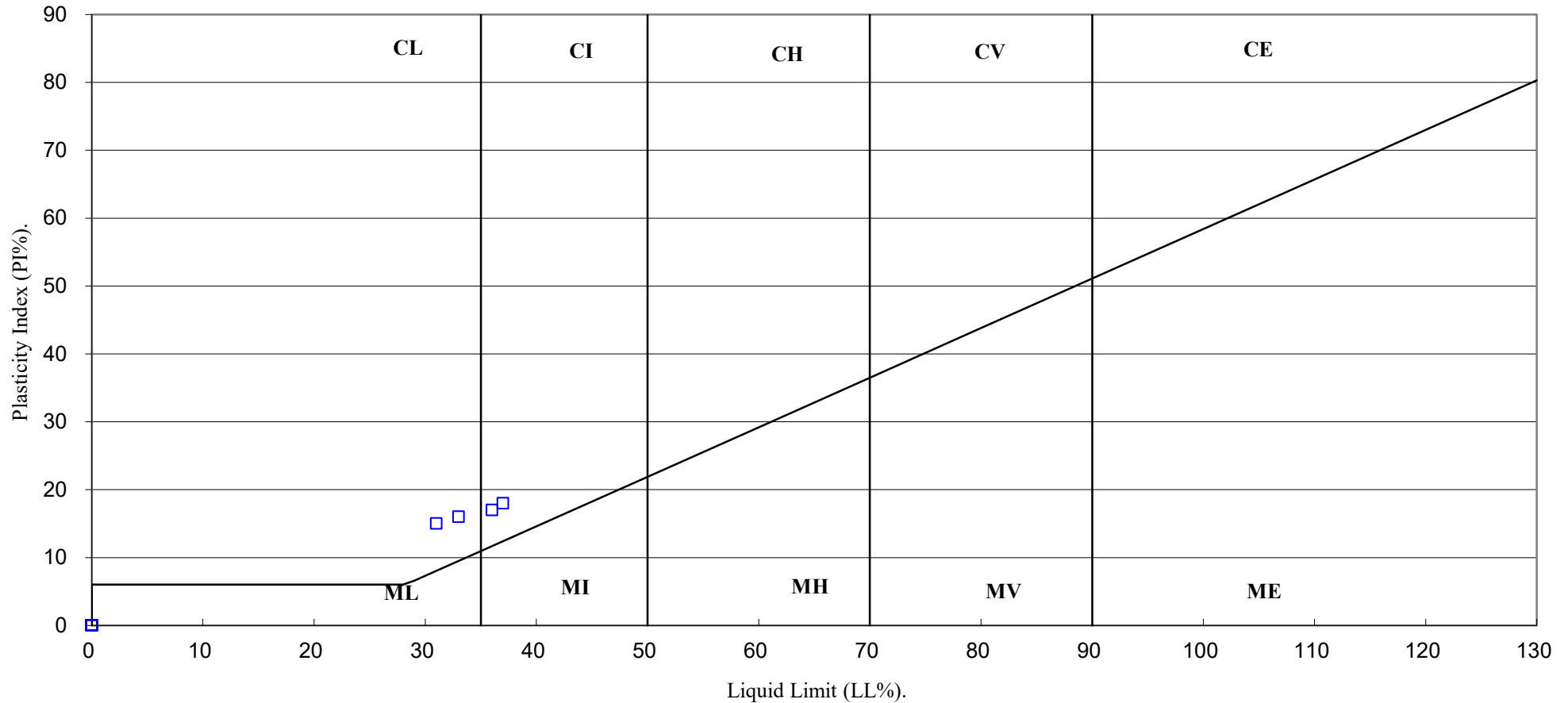
Contract No:

PSL23/0371

Client Ref:

12325-10-22

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Coumnagappul Wind Farm

Contract No:

PSL23/0371

Client Ref:

12325-10-22

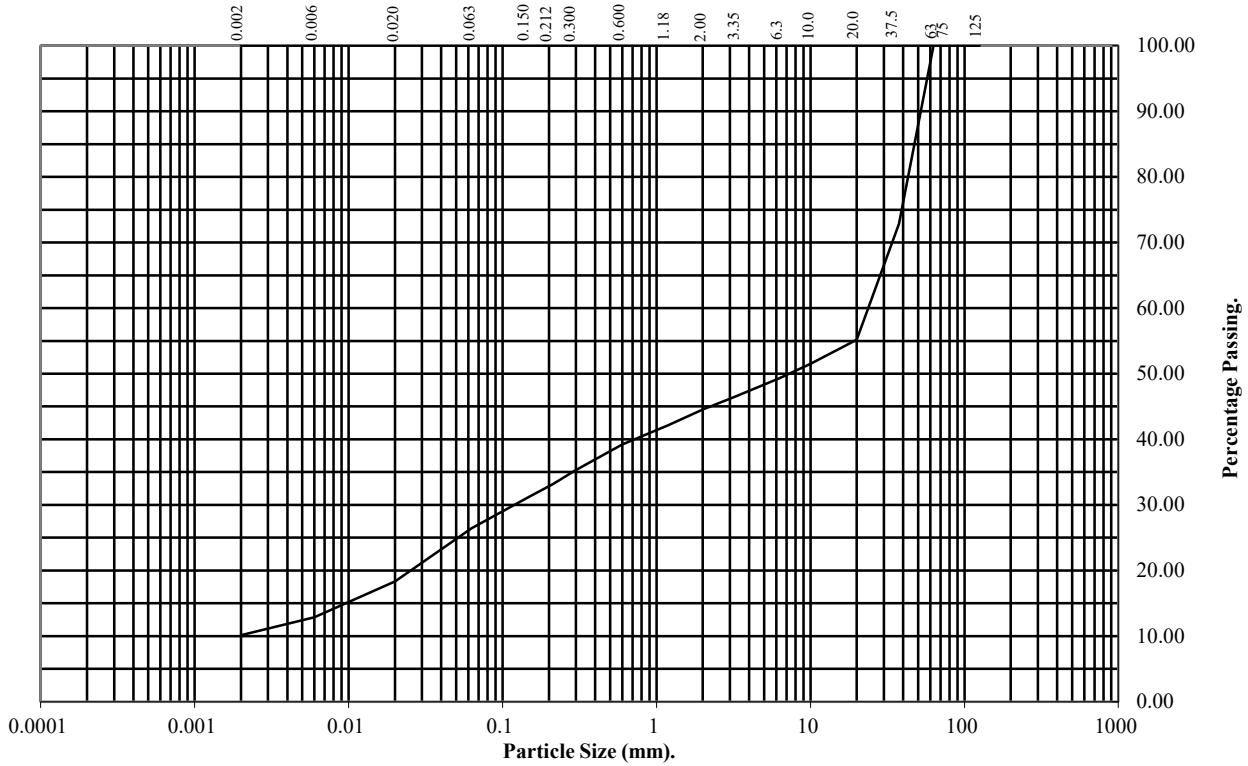
PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP03 **Top Depth (m):** 1.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 73 |
| 20 | 55 |
| 10 | 52 |
| 6.3 | 49 |
| 3.35 | 47 |
| 2 | 45 |
| 1.18 | 42 |
| 0.6 | 39 |
| 0.3 | 35 |
| 0.212 | 33 |
| 0.15 | 31 |
| 0.063 | 26 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 18 |
| 0.006 | 13 |
| 0.002 | 10 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 55 |
| Sand | 19 |
| Silt | 16 |
| Clay | 10 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

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| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

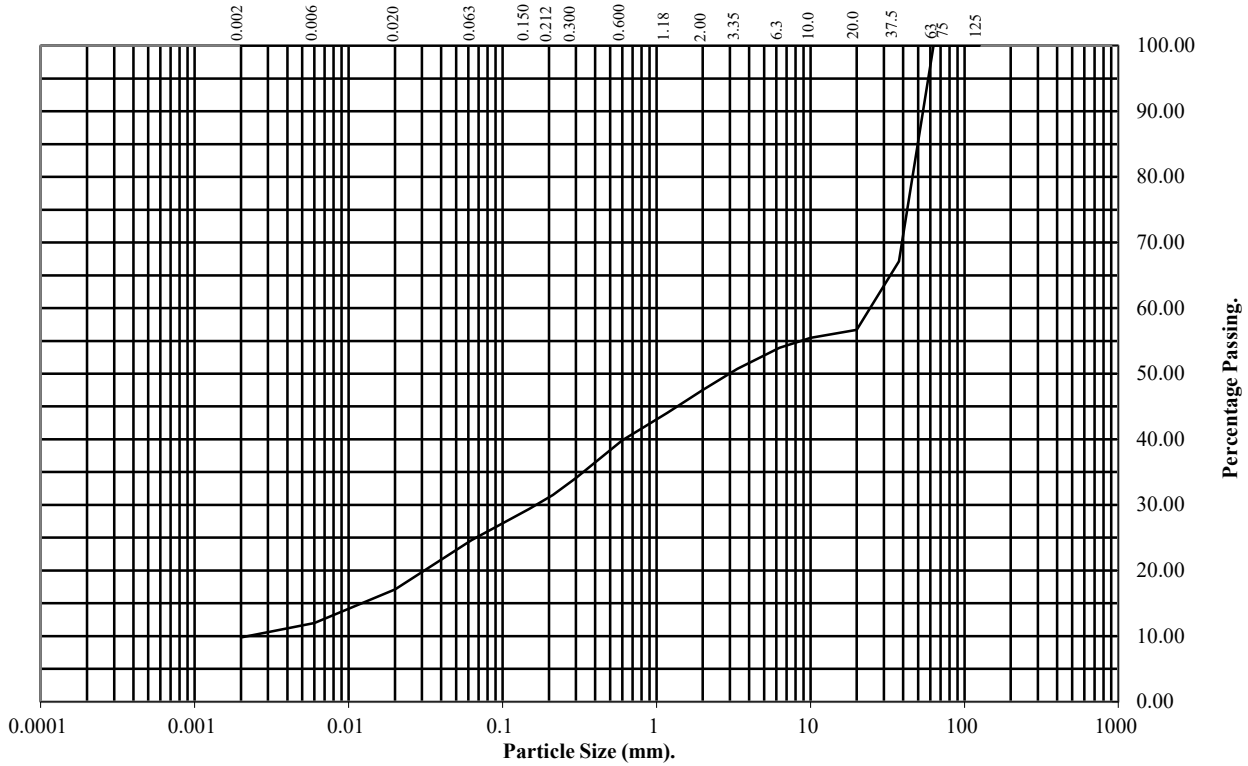
PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP04 **Top Depth (m):** 2.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 67 |
| 20 | 57 |
| 10 | 55 |
| 6.3 | 54 |
| 3.35 | 51 |
| 2 | 48 |
| 1.18 | 44 |
| 0.6 | 40 |
| 0.3 | 34 |
| 0.212 | 32 |
| 0.15 | 29 |
| 0.063 | 25 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 17 |
| 0.006 | 12 |
| 0.002 | 10 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 52 |
| Sand | 23 |
| Silt | 15 |
| Clay | 10 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

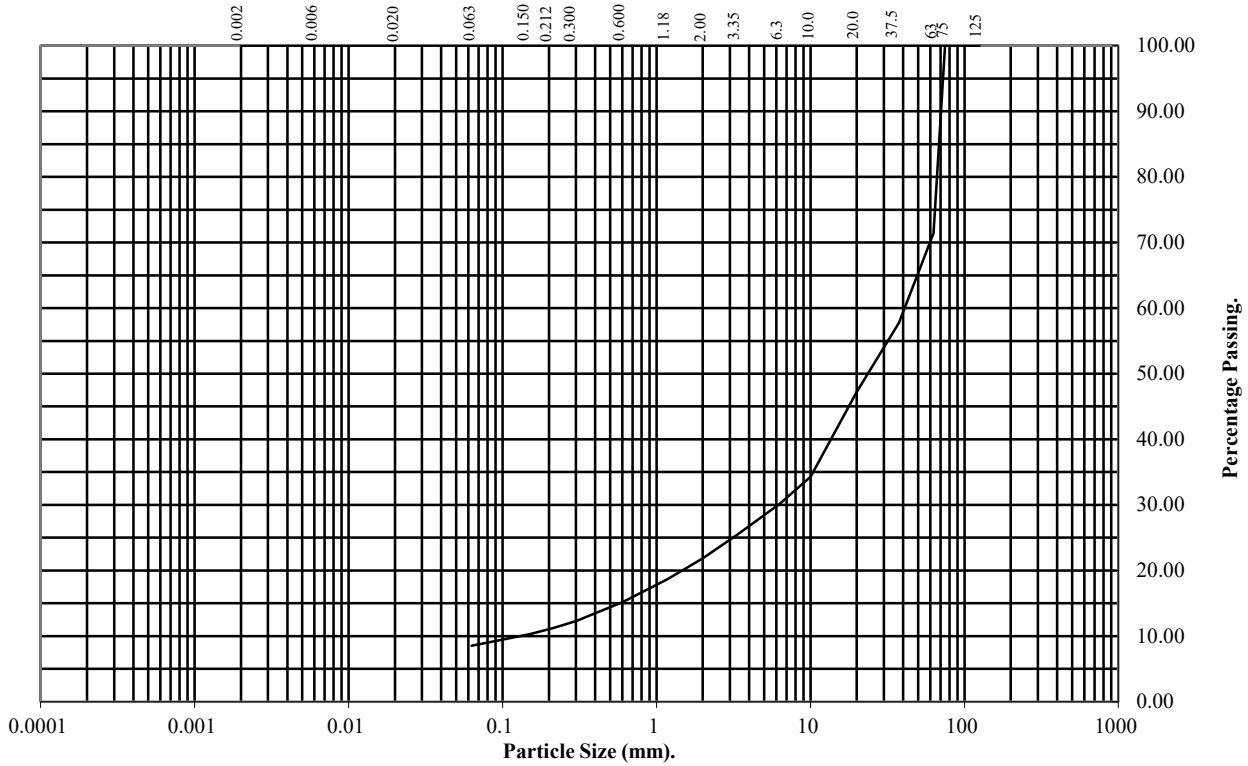
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP05 **Top Depth (m):** 1.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 71 |
| 37.5 | 58 |
| 20 | 47 |
| 10 | 34 |
| 6.3 | 30 |
| 3.35 | 25 |
| 2 | 22 |
| 1.18 | 19 |
| 0.6 | 15 |
| 0.3 | 12 |
| 0.212 | 11 |
| 0.15 | 10 |
| 0.063 | 9 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 29 |
| Gravel | 49 |
| Sand | 13 |
| Silt/Clay | 9 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

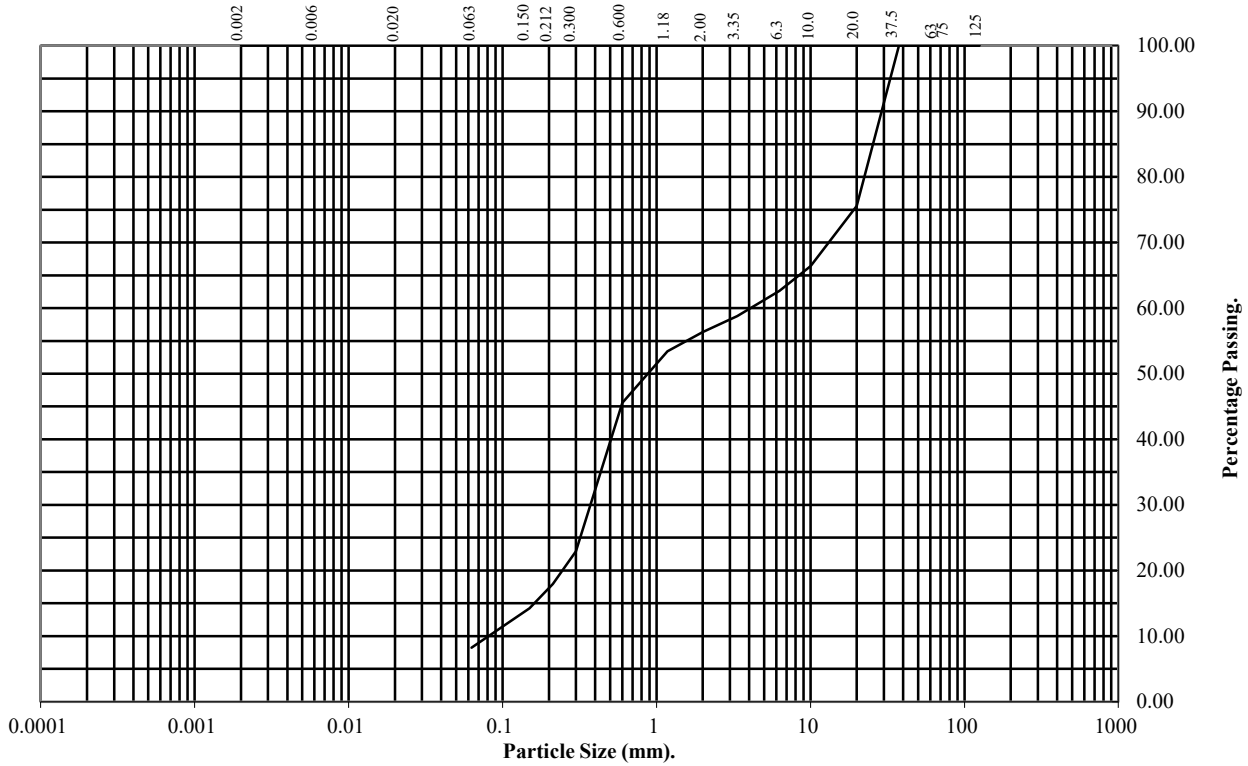
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **TP06** Top Depth (m): **0.50**

Sample Number: Base Depth(m):

Sample Type: **B+T**



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 76 |
| 10 | 66 |
| 6.3 | 63 |
| 3.35 | 59 |
| 2 | 56 |
| 1.18 | 53 |
| 0.6 | 46 |
| 0.3 | 23 |
| 0.212 | 18 |
| 0.15 | 14 |
| 0.063 | 8 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 44 |
| Sand | 48 |
| Silt/Clay | 8 |

Remarks:
See Summary of Soil Descriptions



Counnagappul Wind Farm

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| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

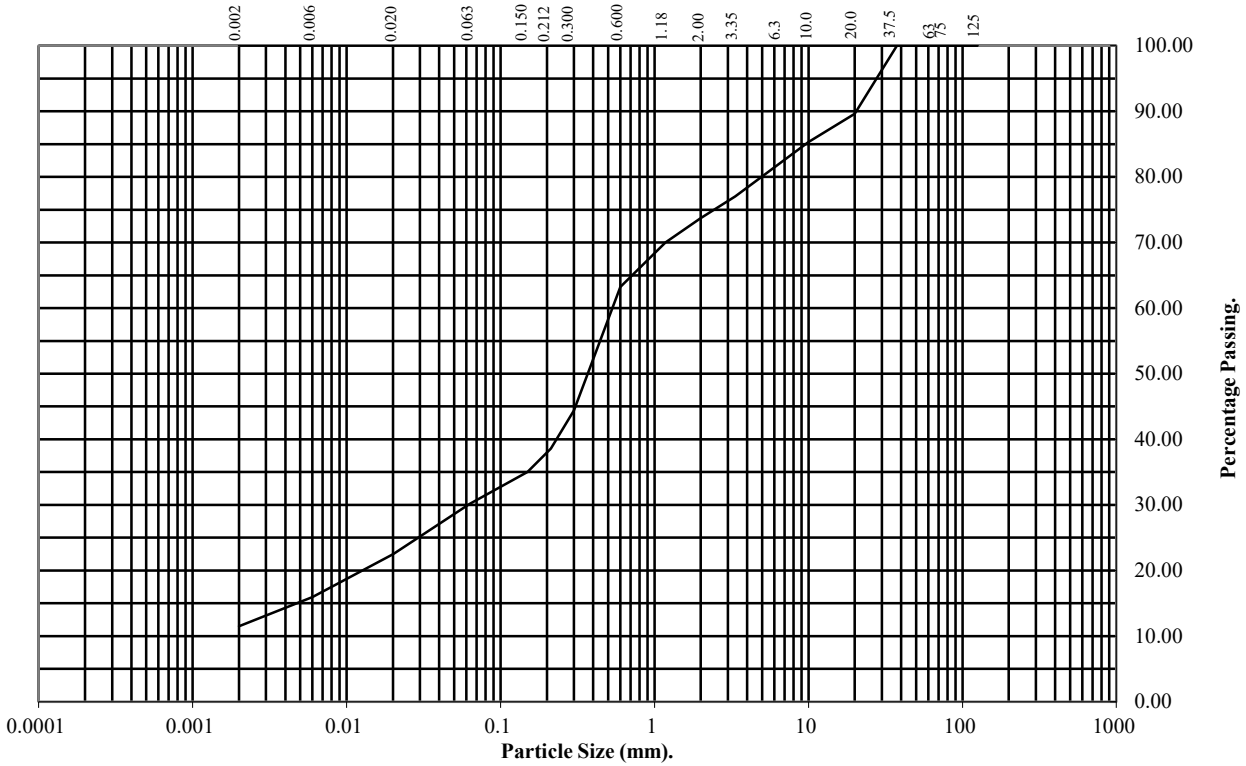
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP06 **Top Depth (m):** 1.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 90 |
| 10 | 85 |
| 6.3 | 82 |
| 3.35 | 77 |
| 2 | 74 |
| 1.18 | 70 |
| 0.6 | 63 |
| 0.3 | 44 |
| 0.212 | 39 |
| 0.15 | 35 |
| 0.063 | 30 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 22 |
| 0.006 | 16 |
| 0.002 | 12 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 26 |
| Sand | 44 |
| Silt | 18 |
| Clay | 12 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

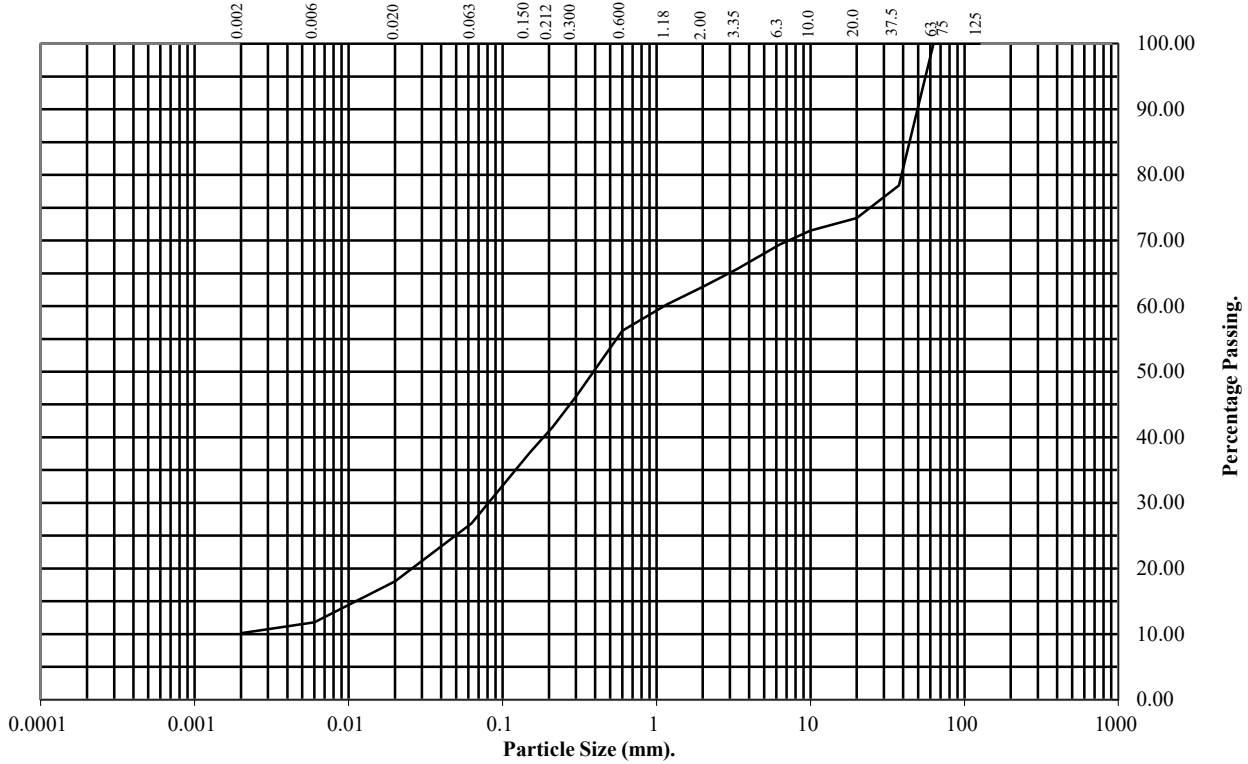
PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP07 **Top Depth (m):** 1.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 78 |
| 20 | 73 |
| 10 | 72 |
| 6.3 | 69 |
| 3.35 | 66 |
| 2 | 63 |
| 1.18 | 60 |
| 0.6 | 56 |
| 0.3 | 46 |
| 0.212 | 42 |
| 0.15 | 38 |
| 0.063 | 27 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 18 |
| 0.006 | 12 |
| 0.002 | 10 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 37 |
| Sand | 36 |
| Silt | 17 |
| Clay | 10 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

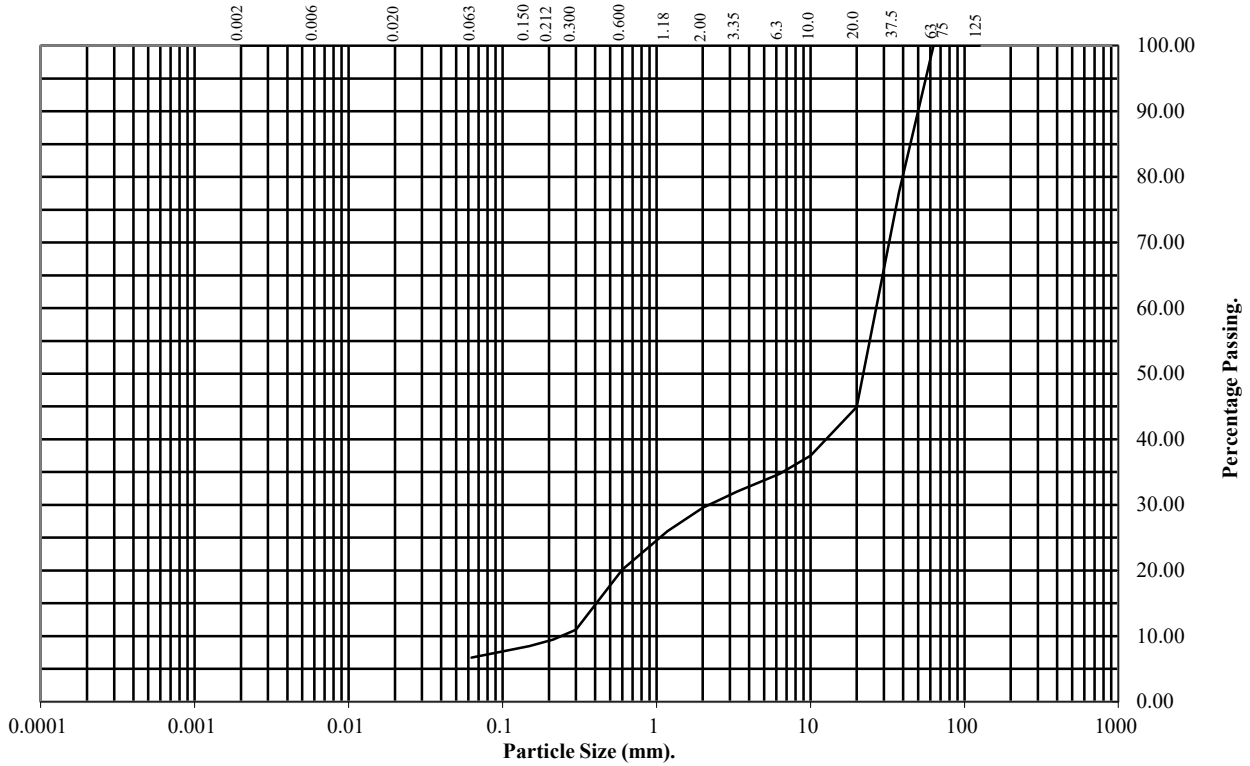
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP10 **Top Depth (m):** 2.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 78 |
| 20 | 45 |
| 10 | 38 |
| 6.3 | 35 |
| 3.35 | 32 |
| 2 | 30 |
| 1.18 | 26 |
| 0.6 | 20 |
| 0.3 | 11 |
| 0.212 | 9 |
| 0.15 | 8 |
| 0.063 | 7 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 70 |
| Sand | 23 |
| Silt/Clay | 7 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

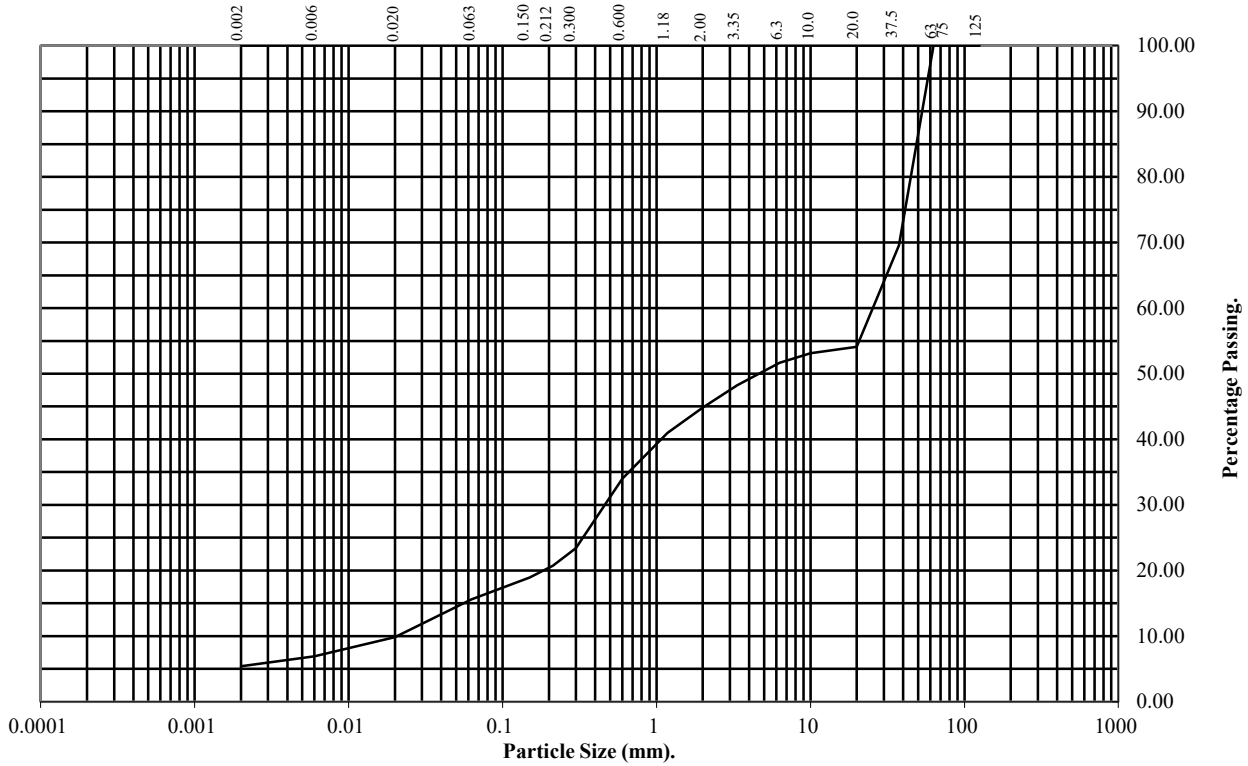
PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP10 **Top Depth (m):** 3.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 70 |
| 20 | 54 |
| 10 | 53 |
| 6.3 | 52 |
| 3.35 | 48 |
| 2 | 45 |
| 1.18 | 41 |
| 0.6 | 34 |
| 0.3 | 23 |
| 0.212 | 21 |
| 0.15 | 19 |
| 0.063 | 16 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 10 |
| 0.006 | 7 |
| 0.002 | 5 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 55 |
| Sand | 29 |
| Silt | 11 |
| Clay | 5 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

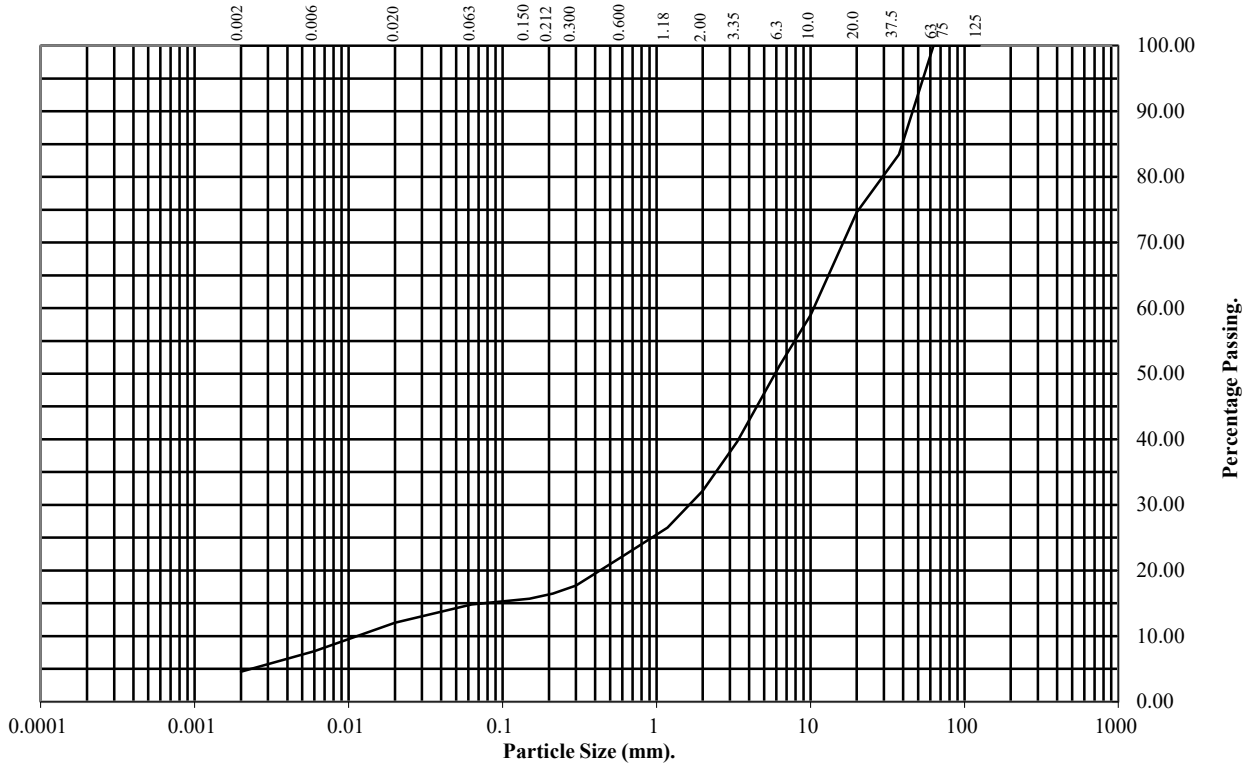
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP12 **Top Depth (m):** 3.00

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 83 |
| 20 | 75 |
| 10 | 59 |
| 6.3 | 51 |
| 3.35 | 40 |
| 2 | 32 |
| 1.18 | 27 |
| 0.6 | 22 |
| 0.3 | 18 |
| 0.212 | 16 |
| 0.15 | 16 |
| 0.063 | 15 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 12 |
| 0.006 | 8 |
| 0.002 | 5 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 68 |
| Sand | 17 |
| Silt | 10 |
| Clay | 5 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

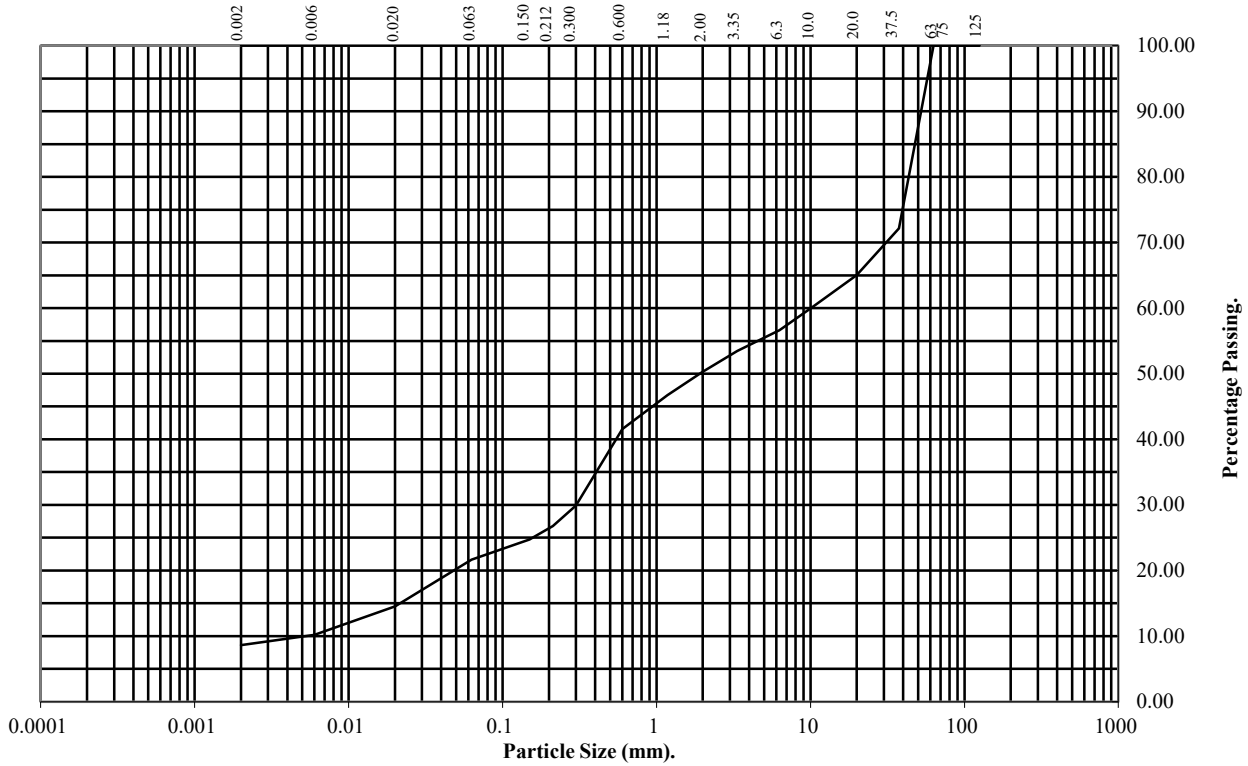
PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: TP14 **Top Depth (m):** 1.50

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

Sample Type: B+T



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 72 |
| 20 | 65 |
| 10 | 60 |
| 6.3 | 57 |
| 3.35 | 53 |
| 2 | 50 |
| 1.18 | 47 |
| 0.6 | 42 |
| 0.3 | 30 |
| 0.212 | 27 |
| 0.15 | 25 |
| 0.063 | 22 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 15 |
| 0.006 | 10 |
| 0.002 | 9 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 50 |
| Sand | 28 |
| Silt | 13 |
| Clay | 9 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

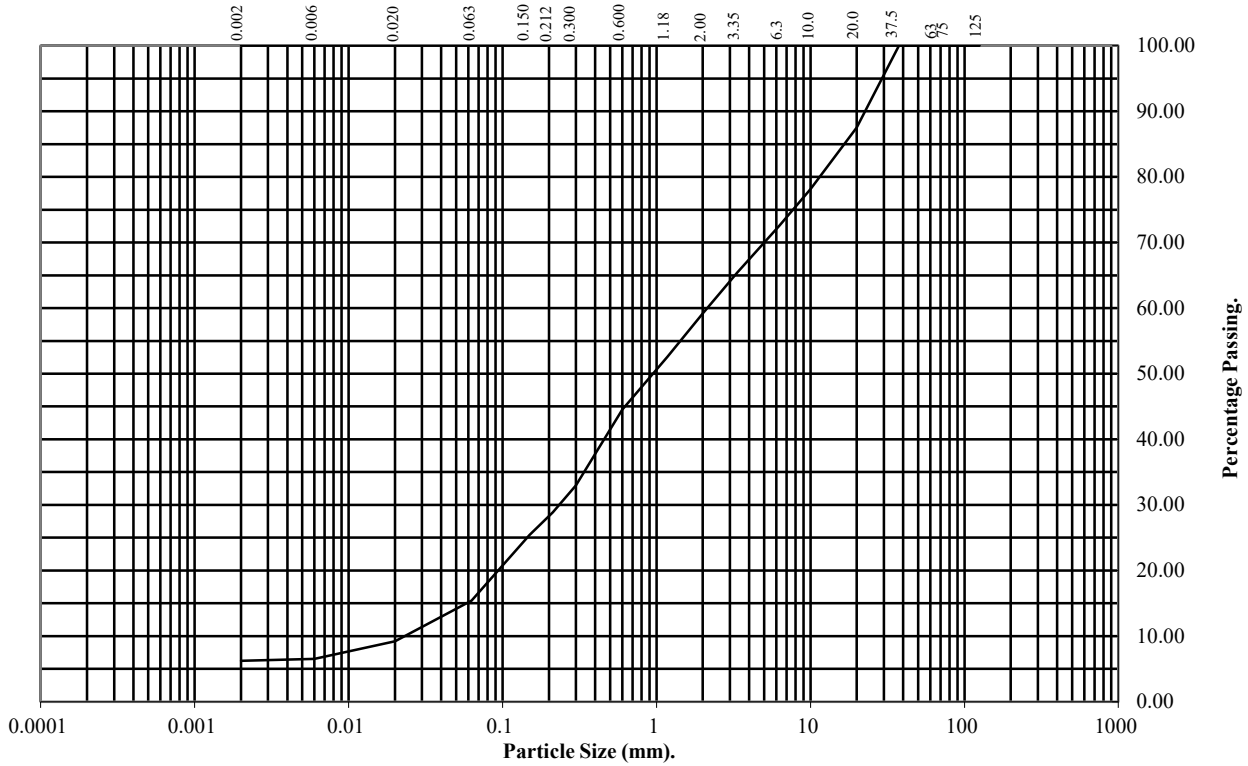
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP16** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B+T**



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 100 |
| 20 | 88 |
| 10 | 78 |
| 6.3 | 73 |
| 3.35 | 65 |
| 2 | 59 |
| 1.18 | 53 |
| 0.6 | 45 |
| 0.3 | 33 |
| 0.212 | 29 |
| 0.15 | 25 |
| 0.063 | 15 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 9 |
| 0.006 | 7 |
| 0.002 | 6 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 41 |
| Sand | 44 |
| Silt | 9 |
| Clay | 6 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

Contract No:
PSL23/0371
Client Ref:
12325-10-22

PARTICLE SIZE DISTRIBUTION TEST

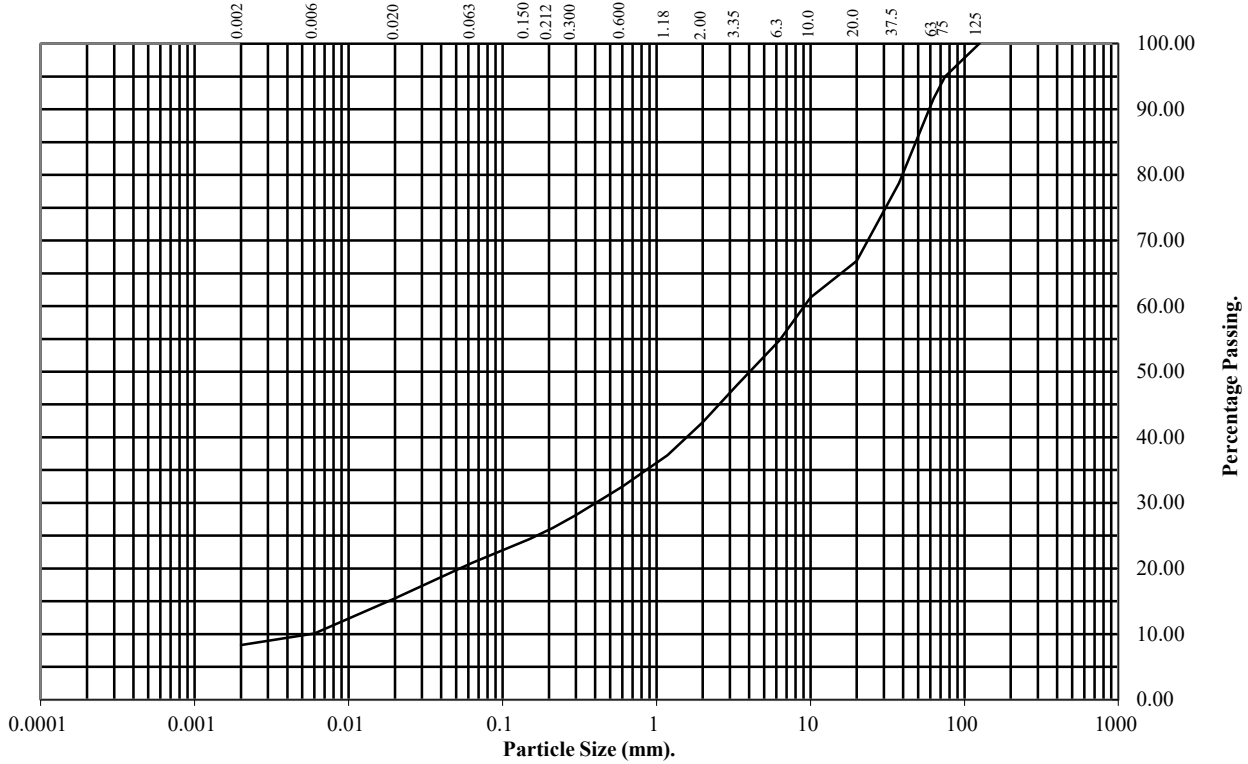
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP19** Top Depth (m): **1.00**

Sample Number: Base Depth(m):

Sample Type: **B+T**



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 95 |
| 63 | 92 |
| 37.5 | 79 |
| 20 | 67 |
| 10 | 61 |
| 6.3 | 55 |
| 3.35 | 48 |
| 2 | 42 |
| 1.18 | 37 |
| 0.6 | 32 |
| 0.3 | 28 |
| 0.212 | 26 |
| 0.15 | 24 |
| 0.063 | 21 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 15 |
| 0.006 | 10 |
| 0.002 | 8 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 8 |
| Gravel | 50 |
| Sand | 21 |
| Silt | 13 |
| Clay | 8 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

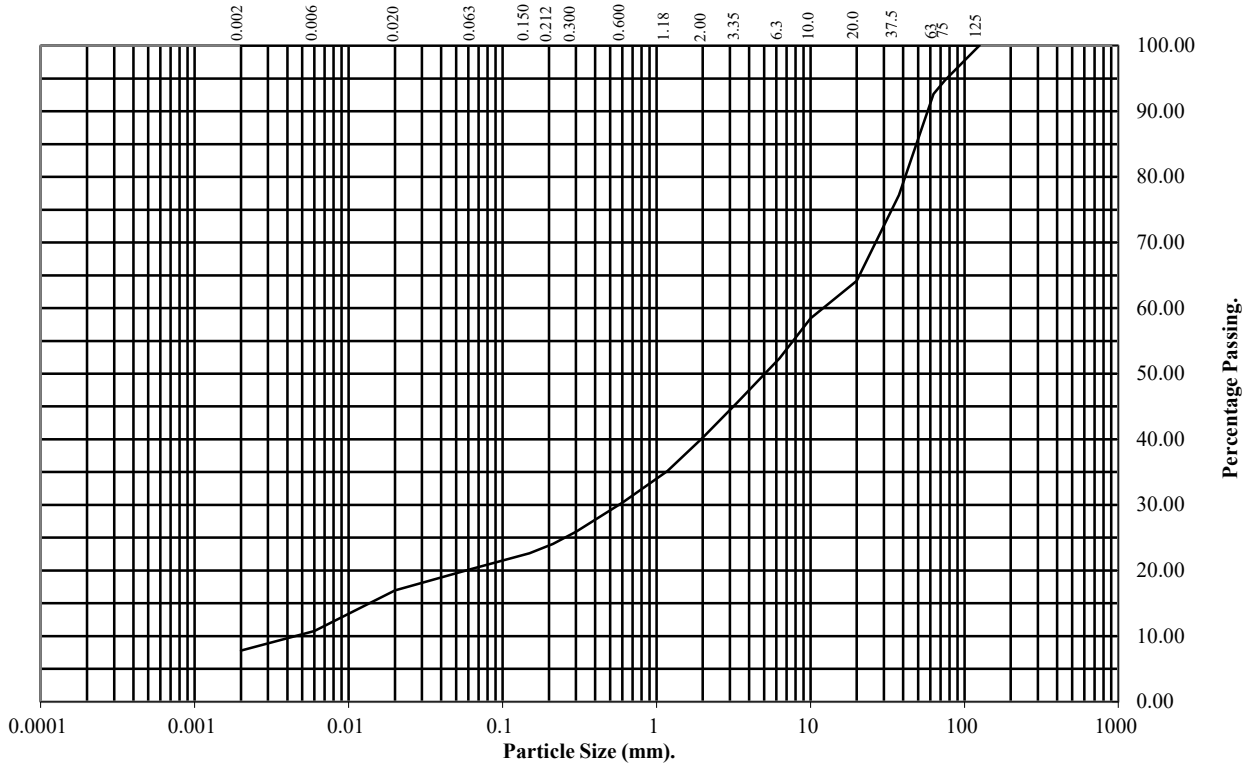
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP20** Top Depth (m): **1.00**

Sample Number: Base Depth(m):

Sample Type: **B+T**



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 95 |
| 63 | 93 |
| 37.5 | 77 |
| 20 | 64 |
| 10 | 58 |
| 6.3 | 52 |
| 3.35 | 46 |
| 2 | 40 |
| 1.18 | 35 |
| 0.6 | 30 |
| 0.3 | 26 |
| 0.212 | 24 |
| 0.15 | 23 |
| 0.063 | 20 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 17 |
| 0.006 | 11 |
| 0.002 | 8 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 7 |
| Gravel | 53 |
| Sand | 20 |
| Silt | 12 |
| Clay | 8 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

PARTICLE SIZE DISTRIBUTION TEST

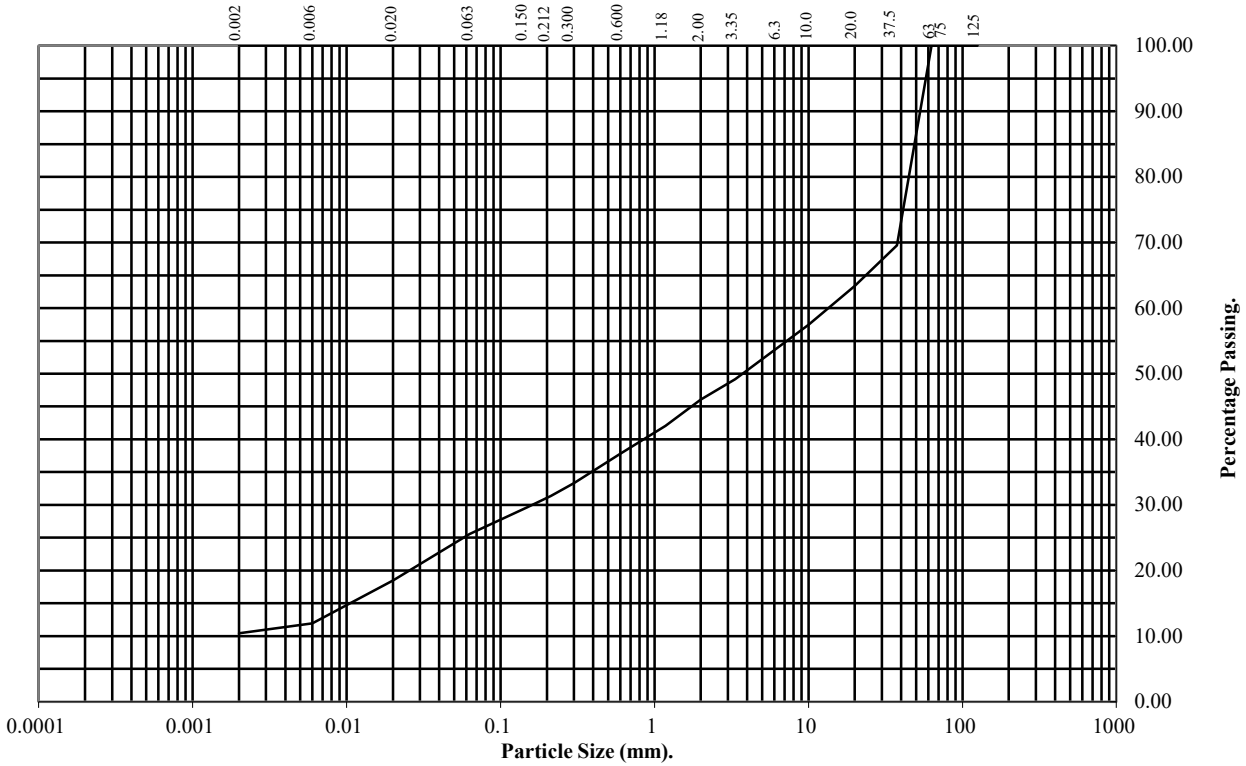
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: **TP22** Top Depth (m): **2.50**

Sample Number: Base Depth(m):

Sample Type: **B+T**



| BS Test Sieve (mm) | Percentage Passing |
|--------------------|--------------------|
| 125 | 100 |
| 75 | 100 |
| 63 | 100 |
| 37.5 | 70 |
| 20 | 63 |
| 10 | 57 |
| 6.3 | 54 |
| 3.35 | 49 |
| 2 | 46 |
| 1.18 | 42 |
| 0.6 | 38 |
| 0.3 | 33 |
| 0.212 | 31 |
| 0.15 | 30 |
| 0.063 | 26 |

| Particle Diameter | Percentage Passing |
|-------------------|--------------------|
| 0.02 | 18 |
| 0.006 | 12 |
| 0.002 | 10 |

| Soil Fraction | Total Percentage |
|---------------|------------------|
| Cobbles | 0 |
| Gravel | 54 |
| Sand | 20 |
| Silt | 16 |
| Clay | 10 |

Remarks:
See Summary of Soil Descriptions



Coumnagappul Wind Farm

| |
|---------------------|
| Contract No: |
| PSL23/0371 |
| Client Ref: |
| 12325-10-22 |

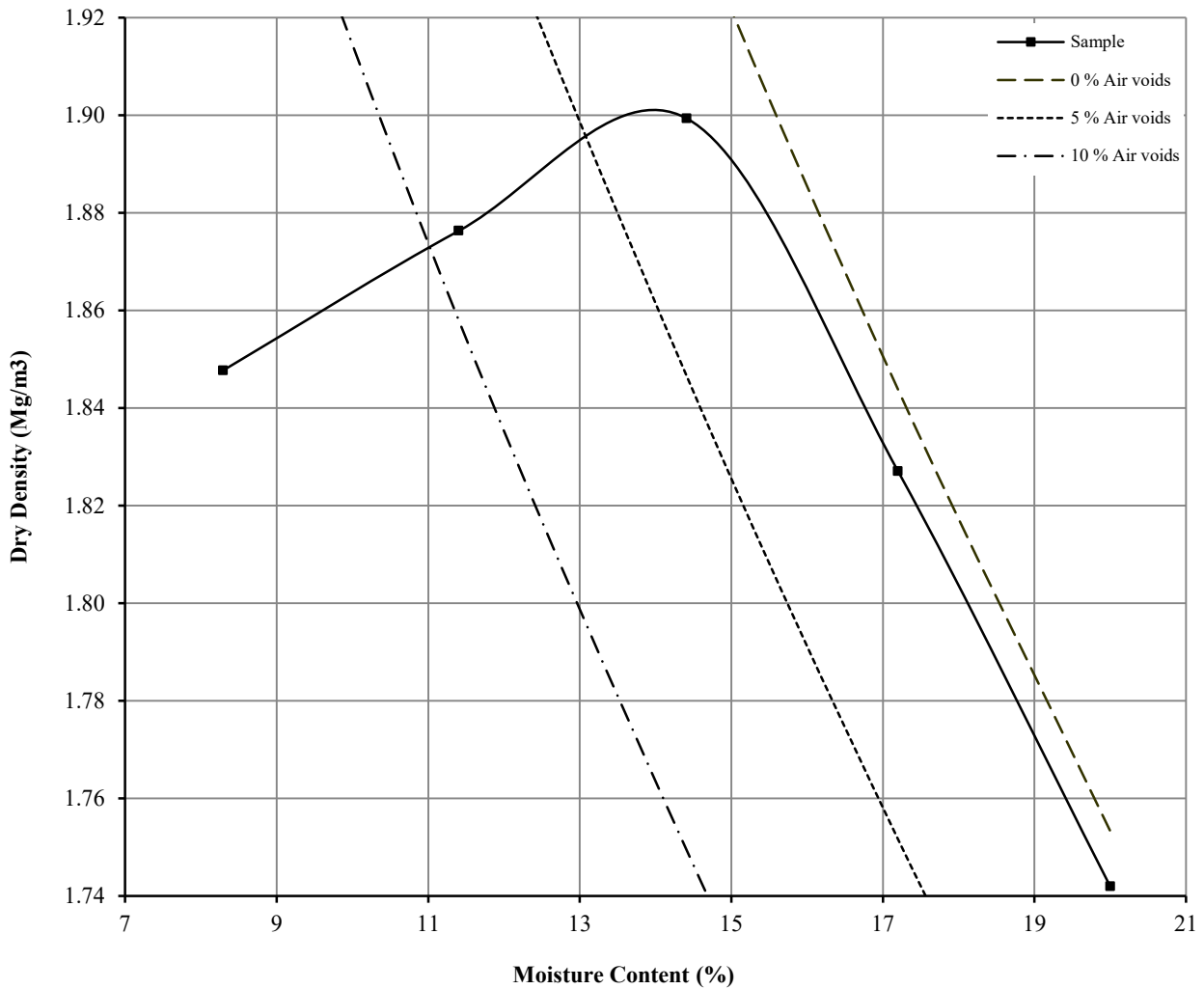
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP19 Top Depth (m) : 1.00

Sample Number: Base Depth (m) :

Sample Type: B+T



| | | | | |
|---|------|--|--|------------------|
| Initial Moisture Content: | 14 | Method of Compaction: | 2.5kg | Separate Samples |
| Particle Density (Mg/m ³): | 2.7 | Assumed | Material Retained on 37.5 mm Test Sieve (%): | 21 |
| Maximum Dry Density (Mg/m ³): | 1.90 | Material Retained on 20.0 mm Test Sieve (%): | 12 | |
| Optimum Moisture Content (%): | 14 | | | |
| Remarks See summary of soil descriptions | | | | |

| | | |
|--|---------------------------------|-------------|
|   | <h2>Coumnagappul Wind Farm</h2> | Contract |
| | | PSL23/0371 |
| | | Client Ref |
| | | 12325-10-22 |

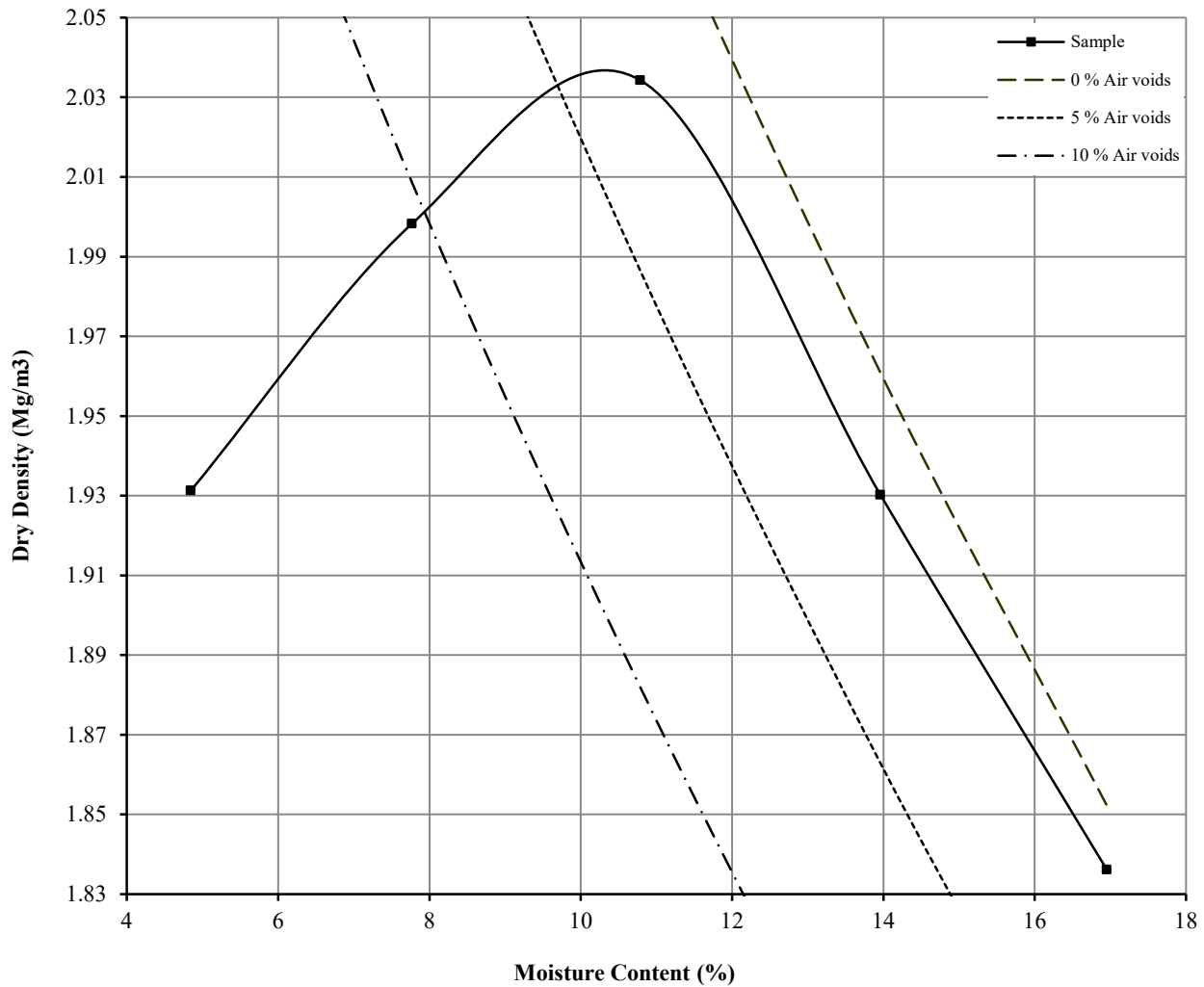
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: **TP20** Top Depth (m) : **1.00**

Sample Number: Base Depth (m) :

Sample Type: **B+T**



| | | | | |
|---|------|-----------------------|--|------------------|
| Initial Moisture Content: | 11 | Method of Compaction: | 2.5kg | Separate Samples |
| Particle Density (Mg/m ³): | 2.7 | Assumed | Material Retained on 37.5 mm Test Sieve (%): | 23 |
| Maximum Dry Density (Mg/m ³): | 2.03 | | Material Retained on 20.0 mm Test Sieve (%): | 13 |
| Optimum Moisture Content (%): | 11 | | | |
| Remarks See summary of soil descriptions | | | | |



Coumnagappul Wind Farm

Contract
PSL23/0371
Client Ref
12325-10-22

CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

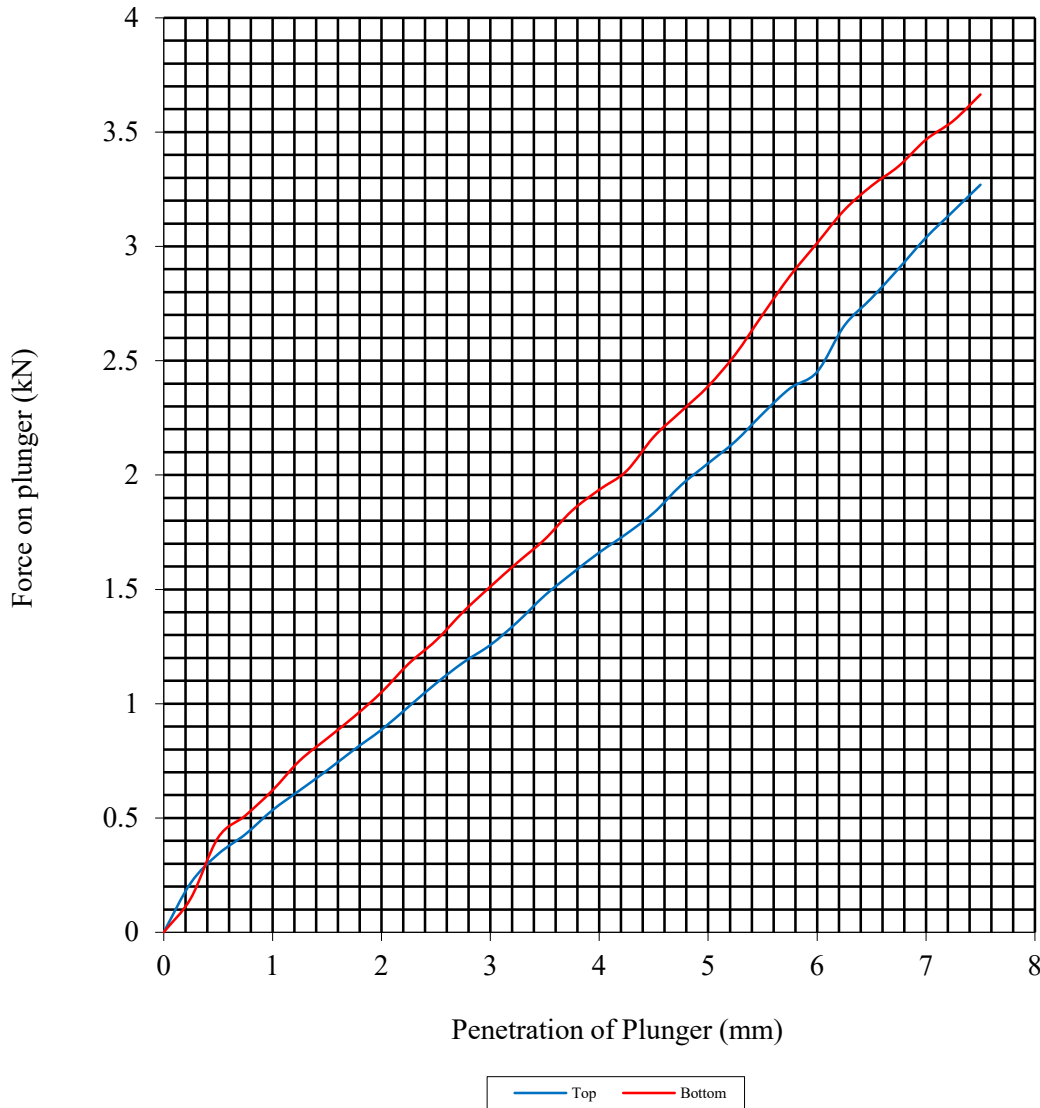
Hole Number: TP19

Top Depth (m): 1.00

Sample Number:

Base Depth (m):

Sample Type: B+T



| Initial Sample Conditions | | Sample Preparation | | Final Moisture Content % | | C.B.R. Value % | |
|--|------|--------------------|------|---|----|----------------|------|
| Moisture Content: | 14 | Surcharge Kg: | 4.00 | Sample Top | 15 | Sample Top | 10.3 |
| Bulk Density Mg/m ³ : | 2.18 | Soaking Time hrs | 0 | Sample Bottom | 14 | Sample Bottom | 11.9 |
| Dry Density Mg/m ³ : | 1.90 | Swelling mm: | 0.00 | Remarks : See Summary of Soil Descriptions. | | | |
| Percentage retained on 20mm BS test sieve: | | 33 | | | | | |
| Compaction Conditions | | 2.5kg | | | | | |



Coumnagappul Wind Farm

Contract No:
PSL23/0371
Client Ref:
12325-10-22

CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

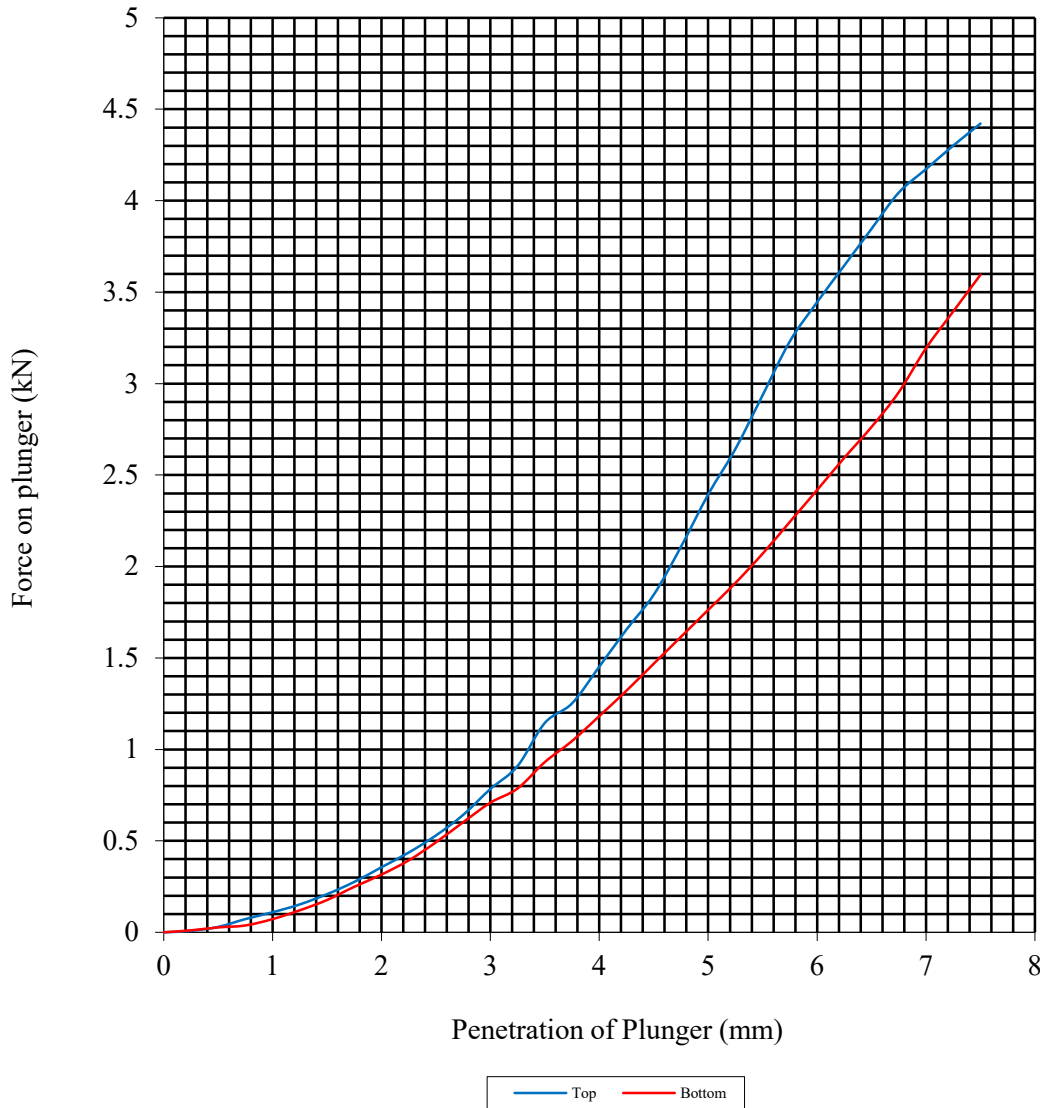
Hole Number: TP20

Top Depth (m): 1.00

Sample Number:

Base Depth (m):

Sample Type: B+T



| Initial Sample Conditions | | Sample Preparation | | Final Moisture Content % | | C.B.R. Value % | |
|--|------|--------------------|------|---|----|----------------|------|
| Moisture Content: | 11 | Surcharge Kg: | 4.00 | Sample Top | 11 | Sample Top | 12.0 |
| Bulk Density Mg/m ³ : | 2.24 | Soaking Time hrs | 0 | Sample Bottom | 11 | Sample Bottom | 8.8 |
| Dry Density Mg/m ³ : | 2.03 | Swelling mm: | 0.00 | Remarks : See Summary of Soil Descriptions. | | | |
| Percentage retained on 20mm BS test sieve: | | 36 | | | | | |
| Compaction Conditions | | 2.5kg | | | | | |



Coumnagappul Wind Farm

Contract No:
PSL23/0371
Client Ref:
12325-10-22

MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

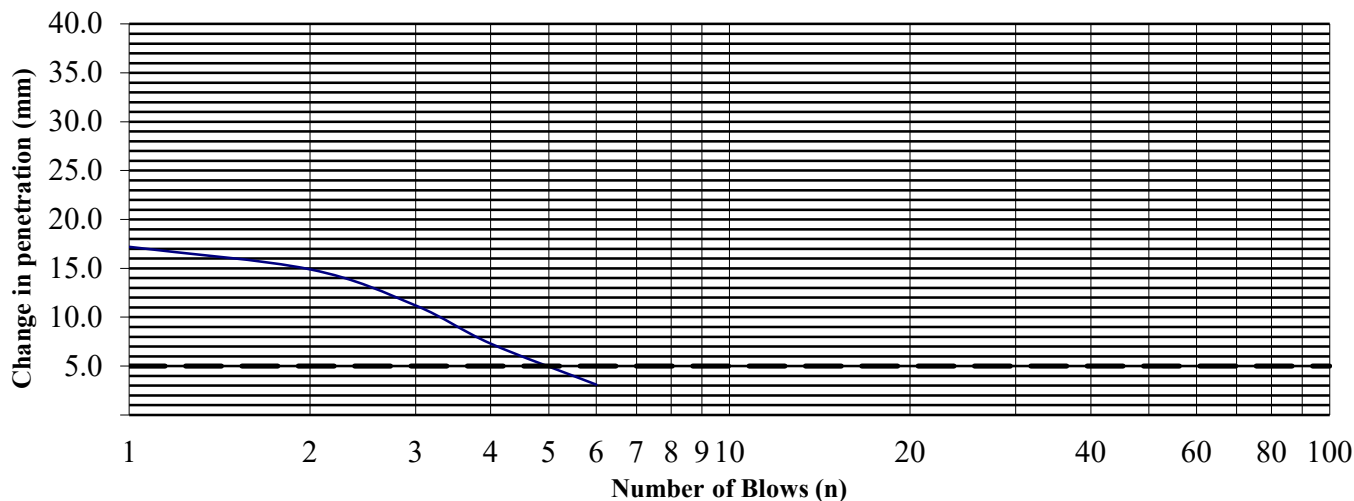
Hole Number: TP19 Top Depth (m): 1.00

Sample Number: Base Depth (m):

Sample Type: B+T

| | |
|--|----|
| Material Retained on the 20mm BS Test Sieve (%): | 33 |
| Interpretation based on steepest straight line intercept with 5mm change in penetration. | |

MCV Determination



| Blows (N) | Penetration (mm) | n to 4n (mm) |
|-----------|------------------|--------------|
| 1 | 59.2 | 17.2 |
| 2 | 50.4 | 14.9 |
| 3 | 46.0 | 11.2 |
| 4 | 42.0 | 7.3 |
| 6 | 37.6 | 3.1 |
| 8 | 35.5 | |
| 12 | 34.8 | |
| 16 | 34.7 | |
| 24 | 34.5 | |
| 32 | | |
| 48 | | |
| 64 | | |
| 96 | | |
| 128 | | |
| 192 | | |
| 256 | | |

Test Results.

| | |
|----------------------|-----|
| Moisture Content (%) | 14 |
| MCV | 6.9 |



Coumnagappul Wind Farm

Contract No:
PSL23/0371
Client Ref:
12325-10-22

MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

Hole Number: TP20 Top Depth (m): 1.00

Sample Number: Base Depth (m):

Sample Type: B+T

| | |
|--|----|
| Material Retained on the 20mm BS Test Sieve (%): | 36 |
| Interpretation based on steepest straight line intercept with 5mm change in penetration. | |

MCV Determination



| Blows (N) | Penetration (mm) | n to 4n (mm) |
|-----------|------------------|--------------|
| 1 | 56.4 | 12.6 |
| 2 | 50.1 | 12.2 |
| 3 | 46.7 | 12.2 |
| 4 | 43.8 | 10.0 |
| 6 | 40.2 | 8.3 |
| 8 | 37.9 | 6.5 |
| 12 | 34.5 | 3.8 |
| 16 | 33.8 | |
| 24 | 31.9 | |
| 32 | 31.4 | |
| 48 | 30.7 | |
| 64 | | |
| 96 | | |
| 128 | | |
| 192 | | |
| 256 | | |

Test Results.

| | |
|----------------------|-----|
| Moisture Content (%) | 11 |
| MCV | 9.0 |



Coumnagappul Wind Farm

Contract No:
PSL23/0371
Client Ref:
12325-10-22



DETS

Certificate of Analysis

Certificate Number 23-04983

Issued: 07-Mar-23

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 23-04983

Client Reference PSL23/0371

Order No (not supplied)

Contract Title Coumnagappul Wind Farm

Description 2 Soil samples.

Date Received 01-Mar-23

Date Started 01-Mar-23

Date Completed 07-Mar-23

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By



Kirk Bridgewood
General Manager



2139

Summary of Chemical Analysis

Soil Samples

Our Ref 23-04983

Client Ref PSL23/0371

Contract Title Coumnagappul Wind Farm

| | | |
|---------------|---------|---------|
| Lab No | 2132758 | 2132759 |
| Sample ID | TP12 | TP13 |
| Depth | 3.00 | 1.00 |
| Other ID | | |
| Sample Type | B | B |
| Sampling Date | n/s | n/s |
| Sampling Time | n/s | n/s |

| Test | Method | LOD | Units | | |
|---------------------------------|-------------|------|-------|--------|-----|
| Metals | | | | | |
| Magnesium Aqueous Extract | DETSC 2076* | 10 | mg/l | < 10 | |
| Inorganics | | | | | |
| pH | DETSC 2008# | | pH | 7.1 | |
| Organic matter | DETSC 2002# | 0.1 | % | | 1.4 |
| Chloride Aqueous Extract | DETSC 2055 | 1 | mg/l | 2.3 | |
| Nitrate Aqueous Extract as NO3 | DETSC 2055 | 1 | mg/l | < 1.0 | |
| Sulphate Aqueous Extract as SO4 | DETSC 2076# | 10 | mg/l | < 10 | |
| Sulphur as S, Total | DETSC 2320 | 0.01 | % | < 0.01 | |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.02 | |

Information in Support of the Analytical Results

Our Ref 23-04983
 Client Ref PSL23/0371
 Contract Coumnagappul Wind Farm

Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---------|----------------|--------------|---------------------|--|-----------------------------------|
| 2132758 | TP12 3.00 SOIL | | PT 1L | Sample date not supplied, Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Metals ICP Prep (182 days), pH + Conductivity (7 days) | |
| 2132759 | TP13 1.00 SOIL | | PT 1L | Sample date not supplied, Organic Matter (Manual) (28 days) | |

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report



LABORATORY REPORT



Contract Number: PSL23/1459

Report Date: 14 April 2023
Client's Reference: 12325-10-22
Client Name: Ground Investigations Ireland Ltd
Catherinstown House
Hazelhatch Road
Newcastle
Co Dublin
D22 YD52

For the attention of: James Cashen

Contract Title: Coumnagappul Wind Farm
Date Received: 9/3/2023
Date Commenced: 9/3/2023
Date Completed: 14/4/2023

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
(Director)

R Berriman
(Quality Manager)


S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

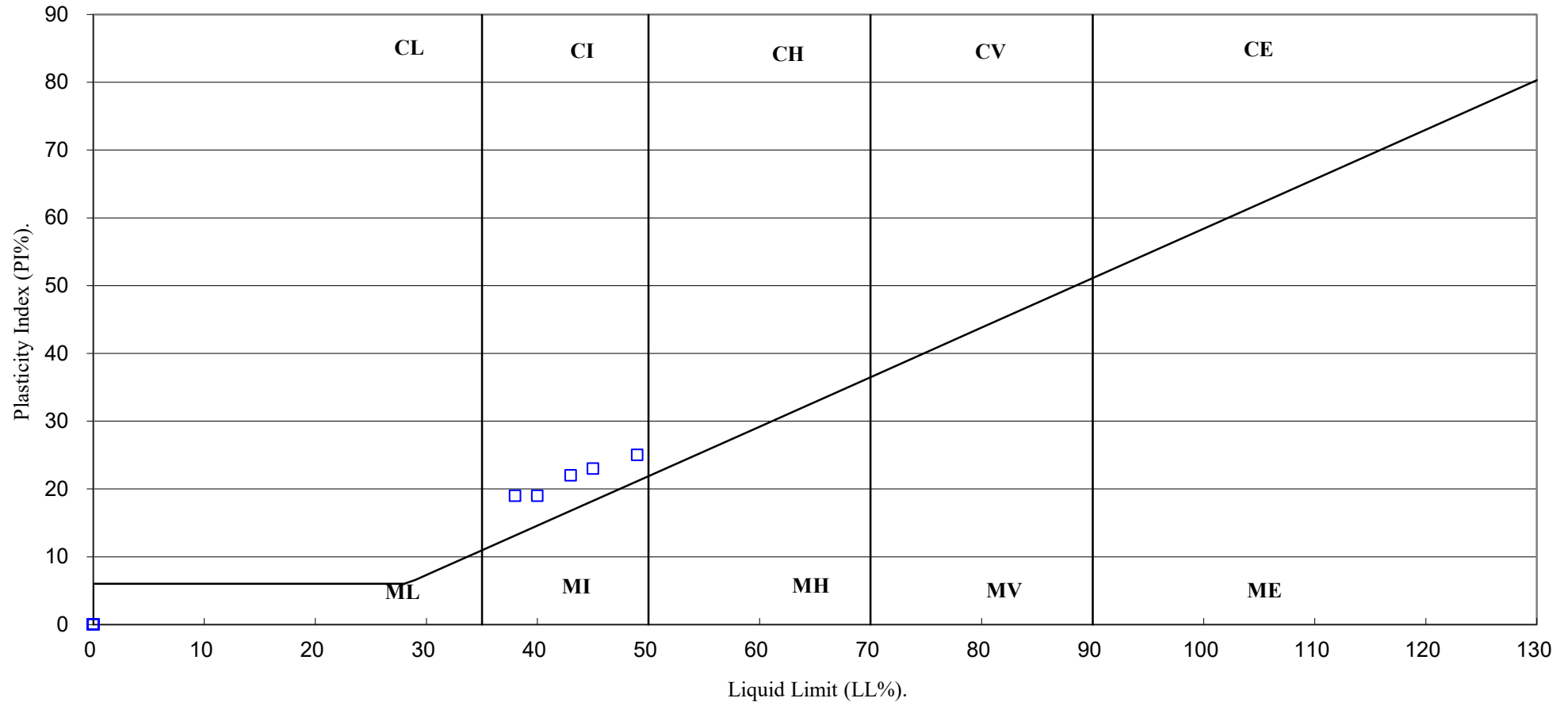
S Eyre
(Senior Technician)

T Watkins
(Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



Coumnagappul Wind Farm

Contract No:

PSL23/1459

Client Ref:

12325-10-22

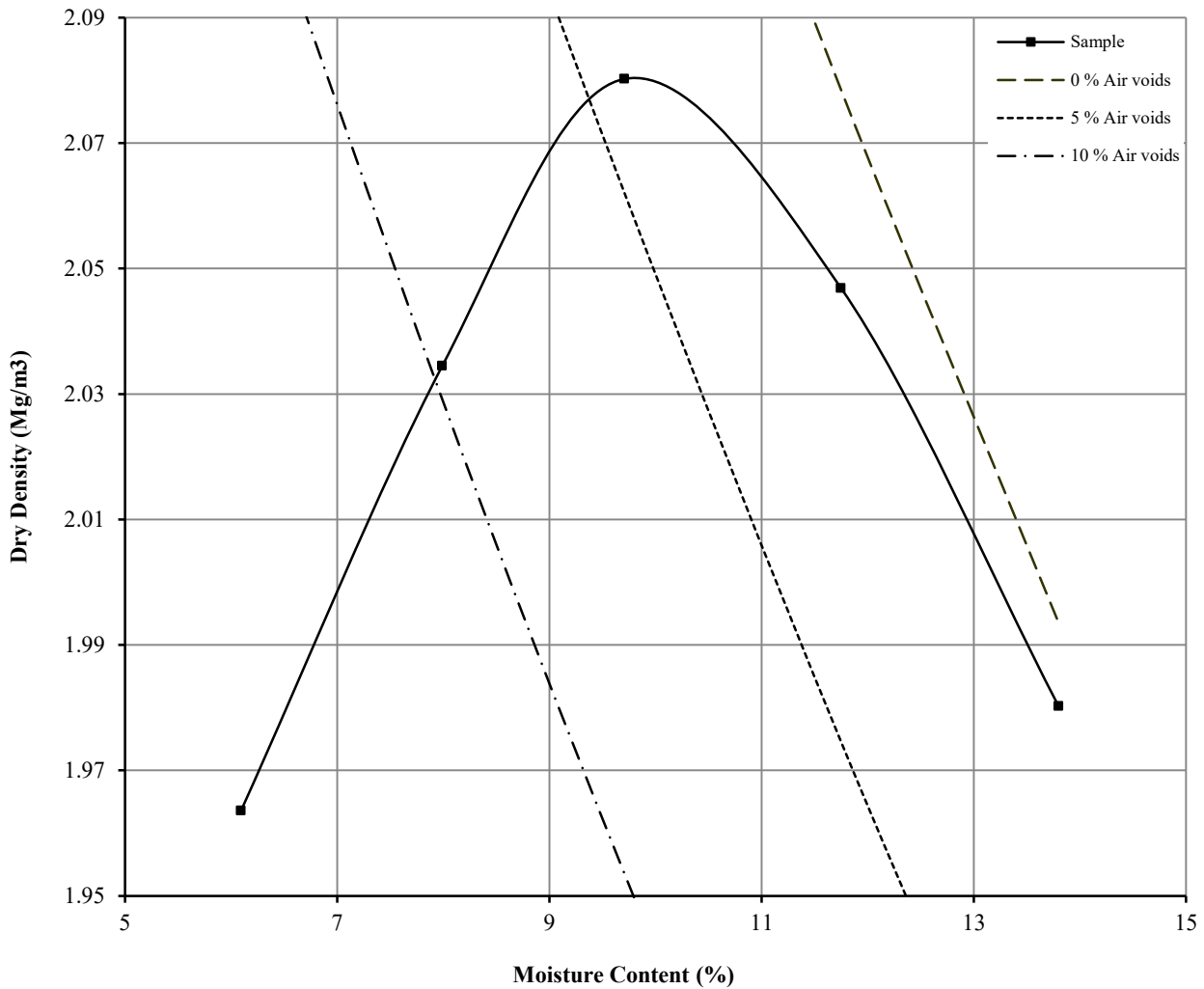
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : Clause 3.4 : 1990

Hole Number: TP-21 Top Depth (m) : 1.50

Sample Number: Base Depth (m) :

Sample Type: B



| | | | | |
|---|------|--|--|------------------|
| Initial Moisture Content: | 9.7 | Method of Compaction: | 2.5kg | Separate Samples |
| Particle Density (Mg/m ³): | 2.75 | Measured | Material Retained on 37.5 mm Test Sieve (%): | 47 |
| Maximum Dry Density (Mg/m ³): | 2.08 | Material Retained on 20.0 mm Test Sieve (%): | 4 | |
| Optimum Moisture Content (%): | 10 | | | |
| Remarks See summary of soil descriptions | | | | |

| | | |
|--|---------------------------------|-------------|
|   | <h2>Coumnagappul Wind Farm</h2> | Contract |
| | | PSL23/1459 |
| | | Client Ref |
| | | 12325-10-22 |

CALIFORNIA BEARING RATIO TEST

Non compliance with BS 1377 : Part 4 : 1990

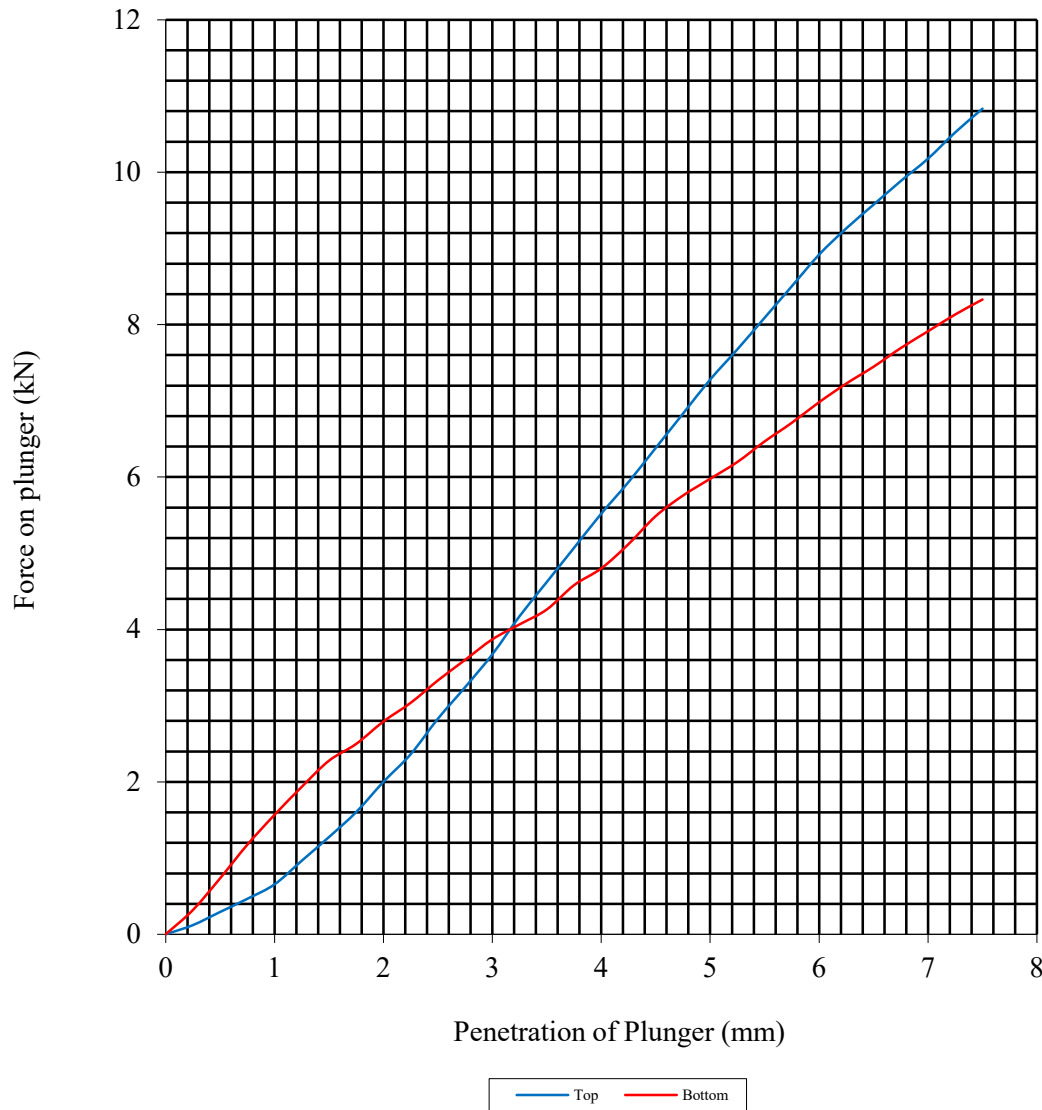
Hole Number: TP-21

Top Depth (m): 1.50

Sample Number:

Base Depth (m):

Sample Type: B



| Initial Sample Conditions | | Sample Preparation | | Final Moisture Content % | | C.B.R. Value % | |
|--|------|--------------------|------|---|-----|----------------|------|
| Moisture Content: | 9.7 | Surcharge Kg: | 4.20 | Sample Top | 9.4 | Sample Top | 36.4 |
| Bulk Density Mg/m3: | 2.28 | Soaking Time hrs | 0 | Sample Bottom | 10 | Sample Bottom | 29.9 |
| Dry Density Mg/m3: | 2.08 | Swelling mm: | 0.00 | Remarks : See Summary of Soil Descriptions. | | | |
| Percentage retained on 20mm BS test sieve: | | 51 | | | | | |
| Compaction Conditions | | 2.5kg | | | | | |



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

MOISTURE CONDITION VALUE

BS1377 : Part 4 : 1990 Clause 5.4

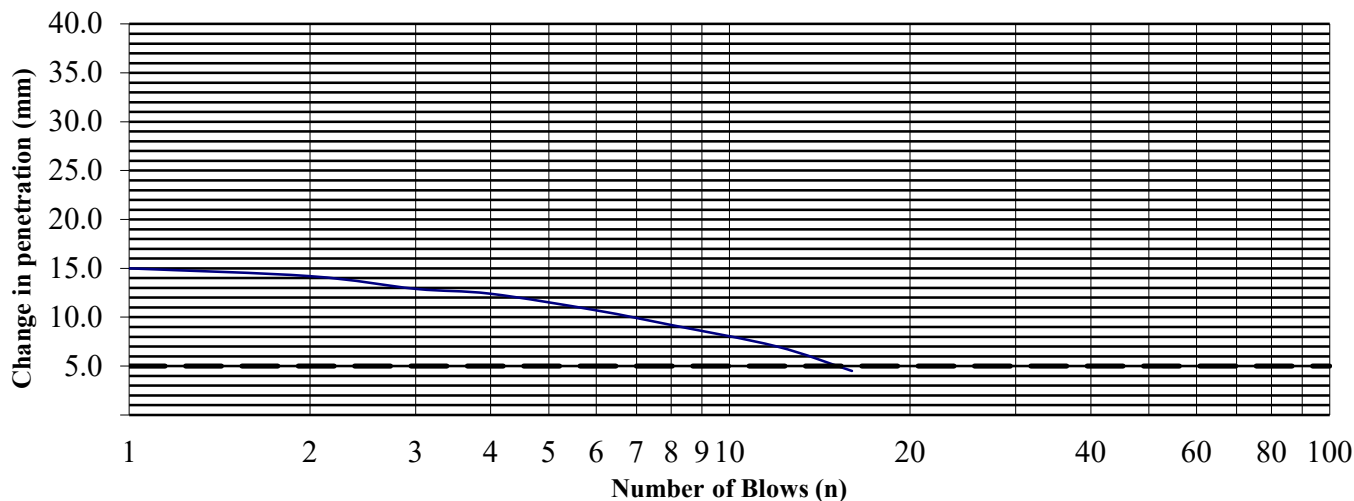
Hole Number: TP-21 Top Depth (m): 1.50

Sample Number: Base Depth (m):

Sample Type: B

| | |
|--|----|
| Material Retained on the 20mm BS Test Sieve (%): | 51 |
| Interpretation based on steepest straight line intercept with 5mm change in penetration. | |

MCV Determination



| Blows (N) | Penetration (mm) | n to 4n (mm) |
|-----------|------------------|--------------|
| 1 | 61.3 | 15.0 |
| 2 | 53.7 | 14.2 |
| 3 | 49.4 | 12.9 |
| 4 | 46.3 | 12.4 |
| 6 | 42.3 | 10.7 |
| 8 | 39.5 | 9.2 |
| 12 | 36.5 | 7.0 |
| 16 | 33.9 | 4.5 |
| 24 | 31.6 | |
| 32 | 30.3 | |
| 48 | 29.5 | |
| 64 | 29.4 | |
| 96 | | |
| 128 | | |
| 192 | | |
| 256 | | |

Test Results.

| | |
|----------------------|------|
| Moisture Content (%) | 9.7 |
| MCV | 11.8 |



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

DETERMINATION OF LOS ANGELES COEFFICIENT

BS EN ISO 1097 Part 2 : 2020

Hole Number: BH-03 Top Depth (m): 1.90
Sample Number: 1 Base Depth (m): 6.50
Sample Type: C Sample Date:
Sample Description: See summary of soil descriptions

| Test Specimen Details: | Mass (g) | Mass (%) |
|--|----------|----------|
| Passing 14mm sieve | 5000 | 100 |
| Retained 12.5mm sieve | 1834 | 37 |
| Retained 10mm sieve | 3166 | 63 |
| Retained 1.6mm sieve post rotation and washing | 3672 | n/a |

| Test Results: | |
|----------------|----|
| LA Coefficient | 27 |

Remarks:



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

DETERMINATION OF LOS ANGELES COEFFICIENT

BS EN ISO 1097 Part 2 : 2020

Hole Number: BH-03 Top Depth (m): 1.90
Sample Number: 2 Base Depth (m): 6.50
Sample Type: C Sample Date:
Sample Description: See summary of soil descriptions

| Test Specimen Details: | Mass (g) | Mass (%) |
|--|----------|----------|
| Passing 14mm sieve | 5000 | 100 |
| Retained 12.5mm sieve | 1851 | 37 |
| Retained 10mm sieve | 3149 | 63 |
| Retained 1.6mm sieve post rotation and washing | 3615 | n/a |

| Test Results: | |
|----------------|----|
| LA Coefficient | 28 |

Remarks:



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

DETERMINATION OF LOS ANGELES COEFFICIENT

BS EN ISO 1097 Part 2 : 2020

Hole Number: BH-03 Top Depth (m): 6.60
Sample Number: 1 Base Depth (m): 10.00
Sample Type: C Sample Date:
Sample Description: See summary of soil descriptions

| Test Specimen Details: | Mass (g) | Mass (%) |
|--|----------|----------|
| Passing 14mm sieve | 5000 | 100 |
| Retained 12.5mm sieve | 1681 | 34 |
| Retained 10mm sieve | 3319 | 66 |
| Retained 1.6mm sieve post rotation and washing | 3824 | n/a |

| Test Results: | |
|----------------|----|
| LA Coefficient | 24 |

Remarks:



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

DETERMINATION OF LOS ANGELES COEFFICIENT

BS EN ISO 1097 Part 2 : 2020

Hole Number: BH-03 Top Depth (m): 6.60
Sample Number: 2 Base Depth (m): 10.00
Sample Type: C Sample Date:
Sample Description: See summary of soil descriptions

| Test Specimen Details: | Mass (g) | Mass (%) |
|--|----------|----------|
| Passing 14mm sieve | 5000 | 100 |
| Retained 12.5mm sieve | 1635 | 33 |
| Retained 10mm sieve | 3365 | 67 |
| Retained 1.6mm sieve post rotation and washing | 3797 | n/a |

| Test Results: | |
|----------------|----|
| LA Coefficient | 24 |

Remarks:





Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

WATER CONTENT OF ROCK

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

| Hole Number | Sample Number | Sample Type | Top Depth (m) | Base Depth (m) | Water Content (%) | Sample Description | Remarks |
|-------------|---------------|-------------|---------------|----------------|-------------------|--------------------------|---------|
| BH-03 | | C | 2.10 | | 1.0 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 3.20 | | 1.4 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 3.80 | | 1.2 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 4.80 | | 1.5 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 6.90 | | 1.1 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 7.95 | | 1.0 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 8.45 | | 0.8 | Reddish brown SANDSTONE. | |
| BH-03 | | C | 9.21 | | 0.9 | Reddish brown SANDSTONE. | |
| | | | | | | | |
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|---|---|--|-----------------------------------|
|  |  | <p style="font-size: 1.2em; margin: 0;">Counnagappul Wind Farm</p> | Contract No: PSL23/1459 |
| | | | Client Ref: 12325-10-22 |
| | | | |
| | | | |

SUMMARY OF POINT LOAD TEST RESULTS

ISRM Suggested Methods : 2007

| Borehole Number | Depth (m) | Sample Ref | Test Type | Orientation Par / Perp | Dimensions (mm) | | Area (mm ²) | D _c ² | D _c (mm) | Failure Load (P) | | I _s (MPa) | Corr Fac F | I _{s50} (MPa) | Failure Type | Remarks |
|-----------------|-----------|------------|-----------|---------------------------|-----------------|------|-------------------------|-----------------------------|---------------------|------------------|-------|----------------------|------------|------------------------|--------------|---------|
| | | | | | W | D | | | | (Mpa) | (kN) | | | | | |
| | | | | | BH-03 | 2.10 | | | | | A | | | | | |
| BH-03 | 3.20 | | A | Perp | 63 | 41 | 2583 | 3288.78 | 57.35 | - | 3.89 | 1.18 | 1.064 | 1.26 | Valid | |
| BH-03 | 3.80 | | A | Perp | 63 | 42 | 2646 | 3368.99 | 58.04 | - | 3.74 | 1.11 | 1.069 | 1.19 | Valid | |
| BH-03 | 4.80 | | A | Perp | 63 | 31 | 1953 | 2486.64 | 49.87 | - | 4.01 | 1.61 | 0.999 | 1.61 | Valid | |
| BH-03 | 6.90 | | A | Perp | 63 | 40 | 2520 | 3208.56 | 56.64 | - | 11.27 | 3.51 | 1.058 | 3.72 | Valid | |
| BH-03 | 7.95 | | A | Perp | 63 | 37 | 2331 | 2967.92 | 54.48 | - | 12.87 | 4.34 | 1.039 | 4.51 | Valid | |
| BH-03 | 8.45 | | A | Perp | 63 | 41 | 2583 | 3288.78 | 57.35 | - | 10.88 | 3.31 | 1.064 | 3.52 | Valid | |
| BH-03 | 9.21 | | A | Perp | 63 | 39 | 2457 | 3128.35 | 55.93 | - | 12.21 | 3.90 | 1.052 | 4.10 | Valid | |
| BH-04 | 15.40 | | A | Perp | 63 | 41 | 2583 | 3288.78 | 57.35 | - | 11.87 | 3.61 | 1.064 | 3.84 | Valid | |
| BH-04 | 16.40 | | A | Perp | 63 | 32 | 2016 | 2566.85 | 50.66 | - | 6.77 | 2.64 | 1.006 | 2.65 | Valid | |
| BH-04 | 18.20 | | A | Perp | 63 | 27 | 1701 | 2165.78 | 46.54 | - | 7.41 | 3.42 | 0.968 | 3.31 | Valid | |
| | | | | | | | | | | | | | | | | |
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*Note All testing carried out on samples at as received water content Par = parallel, Perp = perpendicular, U = Random A = Axial, D = Diametral, I = Irregular

| | | | |
|--|---|---------------------------------|--------------|
|  |  | <h2>Coumnagappul Wind Farm</h2> | Contract No: |
| | | | PSL23/1459 |
| | | | Client Ref: |
| | | | 12325-10-22 |

UNIAXIAL COMPRESSIVE STRENGTH

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

Borehole Number: BH-03 **Top Depth (m):** 2.40
Sample Number: - **Base Depth (m):** 2.60
Sample Type: C **Sample Date:** -
Storage Condition: Sealed in core box **Date of Receipt** 08/03/2023
Sample Description: Reddish brown SANDSTONE

| Specimen Details/Conditions | |
|---|--------|
| Diameter - mm: | 63.20 |
| Height - mm: | 160.12 |
| Water Content - %: | 1.3 |
| Sample Mass - g: | 1393.4 |
| Bulk Density - Mg/m ³ : | 2.77 |
| Dry Density - Mg/m ³ : | 2.74 |
| Height Ratio: * Sample complies with H:D ratio | 2.5 |
| Degree of Saturation - %: | 91 |
| Assumed Specific Gravity for Degree of Saturation: | 2.85 |

| Test Result | |
|--|----------------|
| Load Frame/Machine: | CM1/Controls |
| Date of test: | 04/04/2023 |
| Test Duration - mins: | 00:32 |
| Orientation: | Unknown |
| Stress Rate - MPa/s: | 0.85 |
| Strain at Failure - kN: | 85.27 |
| Unconfined Compressive Strength - Mpa: | 27.2 |
| Mode of Failure: | Vertical Shear |

Remarks: -



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

UNIAXIAL COMPRESSIVE STRENGTH

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

Borehole Number: BH-03 **Top Depth (m):** 8.00
Sample Number: - **Base Depth (m):** 8.20
Sample Type: C **Sample Date:** -
Storage Condition: Sealed in core box **Date of Receipt** 08/03/2023
Sample Description: Reddish brown SANDSTONE

| Specimen Details/Conditions | |
|---|--------|
| Diameter - mm: | 63.00 |
| Height - mm: | 160.20 |
| Water Content - %: | 1.3 |
| Sample Mass - g: | 1397.2 |
| Bulk Density - Mg/m ³ : | 2.80 |
| Dry Density - Mg/m ³ : | 2.76 |
| Height Ratio: * Sample complies with H:D ratio | 2.5 |
| Degree of Saturation - %: | 95 |
| Assumed Specific Gravity for Degree of Saturation: | 2.87 |

| Test Result | |
|--|----------------|
| Load Frame/Machine: | CM1/Controls |
| Date of test: | 04/04/2023 |
| Test Duration - mins: | 00:42 |
| Orientation: | Unknown |
| Stress Rate - MPa/s: | 0.68 |
| Strain at Failure - kN: | 89.17 |
| Unconfined Compressive Strength - Mpa: | 28.6 |
| Mode of Failure: | Vertical Shear |

Remarks: -



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

UNIAXIAL COMPRESSIVE STRENGTH

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006

Borehole Number: BH-04 **Top Depth (m):** 15.00
Sample Number: - **Base Depth (m):** 15.35
Sample Type: C **Sample Date:** -
Storage Condition: Sealed in core box **Date of Receipt** 08/03/2023
Sample Description: Reddish brown SANDSTONE

| Specimen Details/Conditions | |
|---|--------|
| Diameter - mm: | 63.20 |
| Height - mm: | 159.80 |
| Water Content - %: | 1.1 |
| Sample Mass - g: | 1390.3 |
| Bulk Density - Mg/m ³ : | 2.77 |
| Dry Density - Mg/m ³ : | 2.74 |
| Height Ratio: * Sample complies with H:D ratio | 2.5 |
| Degree of Saturation - %: | 81 |
| Assumed Specific Gravity for Degree of Saturation: | 2.85 |

| Test Result | |
|--|----------------|
| Load Frame/Machine: | CM1/Controls |
| Date of test: | 04/04/2023 |
| Test Duration - mins: | 00:41 |
| Orientation: | Unknown |
| Stress Rate - MPa/s: | 0.73 |
| Strain at Failure - kN: | 93.70 |
| Unconfined Compressive Strength - Mpa: | 29.9 |
| Mode of Failure: | Vertical Shear |

Remarks: -



Coumnagappul Wind Farm

Contract No:
PSL23/1459
Client Ref:
12325-10-22

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 03 May 2023
Test Report Ref: TR 948966

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Magnesium Sulfate Value of aggregate sample within the size range 10mm to 14mm in accordance with **BS EN 1367-2 : 2009**

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 1.9-6.5M - Sample 2 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 20/04/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

Magnesium Sulfate Value Portion 1 (MS_1) = 6.4%

Magnesium Sulfate Value Portion 2 (MS_2) = 5.8%

Mean Magnesium Sulfate Value (MS) = 6%

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments

Proportion by mass of laboratory sample used for the test portion = 5% (nearest 5%)

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 03 May 2023
Test Report Ref: TR 948967

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Magnesium Sulfate Value of aggregate sample within the size range 10mm to 14mm in accordance with **BS EN 1367-2 : 2009**

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 1.9-6.5M - Sample 1 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 20/04/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

Magnesium Sulfate Value Portion 1 (MS_1) = 6.8%

Magnesium Sulfate Value Portion 2 (MS_2) = 6%

Mean Magnesium Sulfate Value (MS) = 6%

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments

Proportion by mass of laboratory sample used for the test portion = 5% (nearest 5%)

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 03 May 2023
Test Report Ref: TR 948969

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Magnesium Sulfate Value of aggregate sample within the size range 10mm to 14mm in accordance with **BS EN 1367-2 : 2009**

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 6.6-10.0M - Sample 1 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 20/04/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

Magnesium Sulfate Value Portion 1 (MS_1) = 9.9%

Magnesium Sulfate Value Portion 2 (MS_2) = 12.2%

Mean Magnesium Sulfate Value (MS) = 11%

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments

Proportion by mass of laboratory sample used for the test portion = 5% (nearest 5%)

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 03 May 2023
Test Report Ref: TR 948970

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS: To determine the Magnesium Sulfate Value of aggregate sample within the size range 10mm to 14mm in accordance with **BS EN 1367-2 : 2009**

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 6.6-10.0M - Sample 2 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 20/04/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

Magnesium Sulfate Value Portion 1 (MS_1) = 9.4%

Magnesium Sulfate Value Portion 2 (MS_2) = 10.2%

Mean Magnesium Sulfate Value (MS) = 10%

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments

Proportion by mass of laboratory sample used for the test portion = 5% (nearest 5%)

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 15 May 2023
Test Report Ref: TR 948964

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density and water absorption for aggregate sample between 4 mm and 31.5mm, in accordance with
BS EN 1097-6: 2013 Clause 8

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 1.9-6.5M - Sample 1 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 12/05/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

| | |
|---|------------------------|
| Particle density on an oven-dried basis = | 2.60 Mg/m ³ |
| Particle density on a saturated and surface-dried basis = | 2.63 Mg/m ³ |
| Apparent Particle density = | 2.66 Mg/m ³ |
| Water absorption (of dry mass) = | 0.7 % |

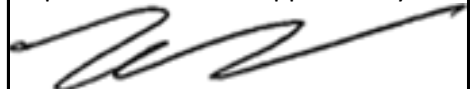
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These results relate only to the items tested.

Comments:

None

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
5 - 7 Hexthorpe Road
Hexthorpe
Doncaster
West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 15 May 2023
Test Report Ref: TR 948965

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density and water absorption for aggregate sample between 4 mm and 31.5mm, in accordance with
BS EN 1097-6: 2013 Clause 8

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 1.9-6.5M - Sample 2 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 12/05/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

| | |
|---|------------------------|
| Particle density on an oven-dried basis = | 2.57 Mg/m ³ |
| Particle density on a saturated and surface-dried basis = | 2.59 Mg/m ³ |
| Apparent Particle density = | 2.62 Mg/m ³ |
| Water absorption (of dry mass) = | 0.8 % |

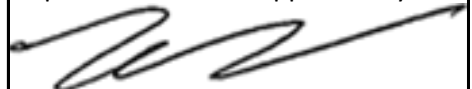
This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments:

None

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

Professional Soils Laboratory
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Hexthorpe
Doncaster
West Yorkshire
DN4 0AR

Date: 15 May 2023
Test Report Ref: TR 948971

Order No: PSL23/1459

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Contract: Coumnagappul Wind Farm

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density and water absorption for aggregate sample between 4 mm and 31.5mm, in accordance with
BS EN 1097-6: 2013 Clause 8

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 6.6-10.0M - Sample 1 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 12/05/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

| | |
|---|------------------------|
| Particle density on an oven-dried basis = | 2.74 Mg/m ³ |
| Particle density on a saturated and surface-dried basis = | 2.75 Mg/m ³ |
| Apparent Particle density = | 2.78 Mg/m ³ |
| Water absorption (of dry mass) = | 0.5 % |

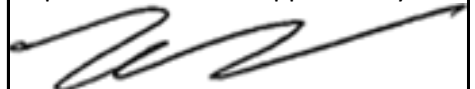
This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments:

None

Report checked and approved by:



Ewen McKay

Assistant Soils Team Manager

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West Yorkshire
DN4 0AR
Contract: Coumnagappul Wind Farm

Date: 15 May 2023
Test Report Ref: TR 948972

Order No: PSL23/1459

Page 1 of 1

LABORATORY TEST REPORT

TEST REQUIREMENTS:

To determine the Particle Density and water absorption for aggregate sample between 4 mm and 31.5mm, in accordance with
BS EN 1097-6: 2013 Clause 8

SAMPLE DETAILS:

| | |
|-----------------------------------|---|
| Certificate of sampling received: | No |
| Laboratory Ref. No: | S109969 |
| Client Ref. No: | BH-03 @ 6.6-10.0M - Sample 2 |
| Date and Time of Sampling: | 08/03/2023 |
| Date of Receipt at Lab: | 17/04/2023 |
| Date of Start of Test: | 12/05/2023 |
| Sampling Location: | Unknown |
| Name of Source: | Unknown |
| Method of Sampling: | Unknown |
| Sampled By: | Client (Test results apply to sample as received) |
| Tested By: | OR |
| Material Description: | Rock Core |
| Target Specification: | N/A |

RESULTS:

| | |
|---|------------------------|
| Particle density on an oven-dried basis = | 2.71 Mg/m ³ |
| Particle density on a saturated and surface-dried basis = | 2.73 Mg/m ³ |
| Apparent Particle density = | 2.76 Mg/m ³ |
| Water absorption (of dry mass) = | 0.7 % |

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

Comments:

None

Report checked and approved by:



Ewen McKay
Assistant Soils Team Manager

APPENDIX 5 – Groundwater Monitoring





GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

GROUNDWATER MONITORING

Coumnagappul Wind Farm

| BOREHOLE | DATE | TIME | GROUNDWATER (m BGL) | Comments |
|----------|------------|----------|---------------------|--------------|
| BH-03 | 22/02/2023 | 10:45:00 | 2.01 | Before Purge |
| BH-03 | 22/02/2023 | 11:50:00 | 2.07 | After Purge |
| BH-04 | 22/02/2023 | 09:00:00 | 7.83 | Before Purge |
| BH-04 | 22/02/2023 | 09:55:00 | 7.93 | After Purge |
| | | | | |
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